Lower Limb Amputation Wound Care: Is There A Consensus On Wound Management? Are Post-Operative Instructions Clear?

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Citation

Abstract
BACKGROUND: Lower limb amputation is often performed in patients who have co-morbidities associated with reduced wound healing ability and predisposition to infection. For this reason care must be taken to ensure, when appropriate, that patients receive post-operative antibiotics and have their wound reviewed in a structured timely fashion, to reduce rates of secondary complications. However, guidelines and literature regarding this topic are few. OBJECTIVES: To discover the surgical opinion regarding post-operative amputation wound review and antibiotic prophylaxis in a single hospital and to review clinical practice and amputee patient outcomes. METHOD: A questionnaire was used to assess the opinion of surgeons and nurses working on the vascular team. An 8-month retrospective review of 29 lower limb amputations among 27 patients was conducted focusing on instructions for first review of the stump wound, use of post-operative antibiotics, antibiotic duration, and infection rates among these patients. RESULTS: There was a wide range of opinion among vascular surgeons, regarding the time to first review of the stump wound, use of antibiotics, and the length of antibiotic course. Not all patients received antibiotics, and a portion of those receiving no/or a short course of antibiotics developed wound infections. Communication by the operating surgeon, via patient notes and verbal handover, to nurses and junior staff was poor. CONCLUSION: All patients undergoing lower limb amputation should receive post-operative antibiotics for at least 24hrs. We have piloted an amputation wound observation chart, to communicate all aspects of immediate post-operative patient care.

INTRODUCTION
Lower limb amputation is often performed in patients who have co-morbidities associated with reduced wound healing ability and predisposition to infection, the commonest of these being old age, diabetes mellitus, smoking, ongoing bacterial colonisation and underlying vascular disease leading to poor tissue perfusion. Wound infection following lower limb amputation ultimately leads to a longer hospital stay, which in turn leads to greater risk of secondary morbidities such as hospital-acquired infections or more serious medical complications.

For this reason, it is vital the post-operative wound be reviewed in a timely fashion with an objective documented assessment. Post-operative antibiotic prophylaxis needs to be considered if the patient is at a high risk of infection, if not in all patients following limb amputations.

However, little evidence exists regarding the proven efficacy of using prophylactic antibiotics, and the length of time these should be continued. This study looks at recent literature, the views of the vascular surgeons at the Royal Derby Hospital regarding post-operative amputation wound care and antibiotic cover, and a retrospective study of lower limb amputation patients over an 8 month period.

The need for such a study and research has been highlighted in previous publications and also from opinion amongst junior doctors in training and nursing staff taking part in the day-to-day management of the amputees.

Our aim in this study was to gauge the opinions within one department to see if there is a consensus in post-operative wound management amongst the senior vascular surgeons, as well as to garner the opinion of junior doctors and nurses regarding their view on communication of post-operative wound care instructions. This was undertaken to see whether some formal guidance (i.e., proforma or guidelines) would improve post-operative patient care.
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Figure 1
Figure 1: Necrotic skin edges and cellulitis on a day-4 post-operative below-knee amputation stump in a type-1 diabetic patient.

METHOD
A questionnaire was used to assess the opinion of consultant vascular surgeons, along with general surgical registrars and those senior house officers working on the vascular team. A total of 16 people completed the questionnaire: 6 consultants, 7 registrars and 3 SHOs. In combination with this, we used a modified questionnaire to assess opinion of trained nurses working specifically on the vascular ward; a total of 14 nurses completed this questionnaire.

A retrospective patient ID search was performed on the Royal Derby Hospital patient registry using the codes for above-knee amputation (AKA) and below-knee amputation (BKA) operations performed during 8 months between March 1st 2009 and November 1st 2009. This delivered 31 operations for 29 patients, of which 27 patient notes were able to be retrieved and 29 operations analysed. The data collected included antibiotic usage, post-operative care instructions and complications, patient length of hospital stay and destination on discharge.

RESULTS

QUESTIONNAIRE
The questionnaire asked doctors and nurses when they would first review a post-operative amputation wound. Results indicate that junior doctors would review the wound earlier at around day 2 or day 3, and that opinion among specialist registrars and consultants is divided, with an even split between day 2 and day 5 (fig. 2). Nurses were asked, if they did not receive clear instructions, when they would review the wound: the average consensus was day 3, with a range of day 1 to day 5.

Figure 2
Figure 2: Views of vascular surgeons regarding length of time to first review of amputation wound

When asked if they would prescribe post-operative antibiotics, 69% of doctors stated they would. The length of the post-operative antibiotic course they would prescribe is mostly agreed upon at around 1 or 2 days; however, a proportion of doctors would prescribe 5 days of antibiotics (fig. 3). Also of note is the variance in the choice of prophylactic antibiotics if no allergies were to be considered.

Figure 3
Figure 3: Views of vascular surgeons regarding appropriate duration of post-operative antibiotic course

Doctors agreed that the following factors would necessitate an earlier first wound review: continuous pyrexia, raised WCC, increased pain, soaked dressing, stump erythema, or raised heart rate, and that the following factors would not necessitate an earlier wound review: one-off temperature spike, hypotension, smoker, vascular graft in-situ, diabetic
controlled on diet or insulin. This data correlated with the opinion of the nursing staff when asked the same question.

Nursing staff were asked their opinion on communication between operating surgeon and ward nursing staff: 50% stated that communication was “good”, with 43% stating it was “bad” and 7% stating it was “very bad”.

One hundred per cent of nurses stated that they record all their wound observations in the nursing notes, 64% stated they would not bleep a doctor at the time of dressing change, and 100% stated that a post-operative amputation wound proforma would be useful and would be adhered to.

**PATIENT ANALYSIS**

During the 8-month period, 29 lower limb amputations were performed; 18 BKAs and 13 AKAs. The group of patients consisted of 21 men (77.8%) and 6 women (22.2%), whose average age was 69.8 years (range: 48-88).

Indications for amputation were largely of vascular origin (Table 1), the majority being for a necrotic/infected ulcer or for acute ischaemia. Other indications included elective amputations for a stable deformity (contracture, Charcot foot, burns), and those patients with ongoing infection caused by the stated limb; 86% of the patients were noted to have diabetes mellitus, with 72% being treated for hypertension.

**Figure 4**

Table 1: Patient indications for amputation

<table>
<thead>
<tr>
<th>Indication</th>
<th>Number of Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Critical Limb Ischaemia</td>
<td>20</td>
</tr>
<tr>
<td>(necrotic/infected ulcer, cellulitis, sepsis)</td>
<td></td>
</tr>
<tr>
<td>Acute Limb Ischaemia</td>
<td>5</td>
</tr>
<tr>
<td>Elective</td>
<td>3</td>
</tr>
</tbody>
</table>

A key area of interest were the operative notes; particularly post-operative instructions; whether a first wound review time and post-operative antibiotics (and their duration) were recommended; 44.4% of operative notes clearly stated a post-operative wound review time, ranging from 1 day to 5 days. Of these patients, 42% had the wound reviewed earlier than stated, 42% had the wound reviewed later than stated, and 16% had the wound reviewed in accordance with what was stated in the operative notes. There was no justification written in the notes for the earlier or delayed first review.

Antibiotics were recommended in 52% of operative notes, and of these, 47% clearly stated which antibiotic to give, and 87% stated the length of the antibiotic course. The actual antibiotic prescribed varied ranging from broad-spectrum antibiotics such as Co-amoxiclav or Cefuroxime and Metronidazole to Gentamicin or Vancomycin in high-risk patients.

Looking at post-operative events, the day when the post-operative wound was first reviewed ranged from 1 to 8, with the majority lying between 3 and 6 (fig. 4).

Seventy-two per cent of patients received post-operative antibiotics. The length of the post-operative antibiotic course ranged from 1 day to 20 days, with an average course length of 5 days (fig. 5). Forty-one per cent of patients had been started on antibiotics prior to surgery, and continued these post-operatively.

**Figure 5**

Figure 4: Day amputation wound was first reviewed post-operatively
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**OUTCOMES**

This study identified discrepancies in the post-operative care of lower limb amputations amongst the senior vascular surgeons in our department. This may be indicative of the lack of consensus in the literature.

Across both doctors and nurses, there was a wide range of opinion as to when a wound should be assessed post-operatively for the first time. The spread was over 4 days.

It was shown that there is a split in opinion regarding the use of post-operative antibiotics. In addition to this, a clear variance in the choice of antibiotics and the length of post-operative antibiotic course was evident, and this variance was observed throughout all grades of doctors.

The view of the nursing staff, often the first line of patient care, clearly demonstrates that communication between themselves and the operating surgeon is lacking, and that an adjunct to improve this situation would be useful and would be adhered to.

We have highlighted the difficulty in post-operative wound care if operative notes do not clearly state a first wound review time, and which antibiotics to give and for how long. Secondary to this, this study shows that when such information is written clearly in the notes, in the majority of cases the instructions are not adhered to.

When we look closely at events post-operatively, we observe that the day the amputation wound is first reviewed varies considerably, and this variance does not appear to be linked to altering patient wound factors. Also, not all patients receive post-operative antibiotics, and once again the type and length of antibiotic course is highly variable and in some cases not appropriate to prevent post-operative wound infection.

From the notes it is demonstrated that post-operative amputation inpatient stay is often very prolonged, with half of the patients being discharged to a community hospital; social placement represents the largest factor for delayed discharge and longer inpatient stay.

Of the patients who received no antibiotics post-operatively (28%), one developed a wound infection with wound dehiscence and pyrexia and subsequently needed to be started on IV antibiotics. Three patients who received a short course of antibiotics (1 stat dose or two doses) developed a wound infection and two of these patients became septic.

Overall, 24% of patients experienced a post-operative wound infection (Table 2).

**Figure 6**

Figure 5: Duration of post-operative antibiotic course in amputee patients

![Graph showing duration of post-operative antibiotic course](image)

The average number of days spent as an inpatient post-operatively was 19.6 (range 5-47). In the majority of cases the reason for prolonged inpatient stay was difficulty with social placement.

Once discharged, 52% of patients returned home, 28% were transferred to a rehabilitation hospital, and 20% went to a nursing home.

<table>
<thead>
<tr>
<th>Post-operative complication</th>
<th>Number of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>17</td>
</tr>
<tr>
<td>Wound infection</td>
<td>7</td>
</tr>
<tr>
<td>Sepsis</td>
<td>2</td>
</tr>
<tr>
<td>Medical issue (Myocardial infarction, pneumonia, renal failure, Clostridium difficile infection)</td>
<td>3</td>
</tr>
<tr>
<td>Conversion to AKI</td>
<td>1</td>
</tr>
<tr>
<td>Bed sores</td>
<td>1</td>
</tr>
</tbody>
</table>

**Table 2: Post-operative complications in amputation patients**
DISCUSSION

Regarding the management of major limb amputations; there seems to exist a distinctive lack of clinical guidelines and relevant up-to-date literature. The authors of this paper were able to find only a handful of applicable studies that provide strong evidence for the use of post-operative prophylactic antibiotics following lower limb amputation, and the post-operative factors associated with wound healing.

An extensive study of 959 lower limb amputations by Aulivola et al., looked at post-operative morbidity and mortality; and recorded post-operative wound infection rates of 5.5% and 6.7% for BKAs and AKAs, respectively; these figures are considerably lower than the combined post-operative infection rate of 24% in this study. This may be reflective of patient factors, notably a high prevalence of diabetes mellitus, or the clinical factors surrounding post-operative wound management i.e., antibiotic prophylaxis and first wound review time, as identified in this study.

An excellent review by McIntosh et al. was able to identify four controlled trials that provide evidence for the use of post-operative antibiotics following major limb amputation. We identified one other paper, published since then, that compared 24hr versus 5-day prophylactic antibiotic use and concluded that a prolonged 5-day course of combined antibiotics reduced stump infection rate and in-hospital stay. This data supports our evidence that a short course of antibiotics is often inadequate, and a longer post-operative course of at least 2 days should be considered in all patients.

Post-operative care instructions are set as a mandatory part of operation notes as stipulated by the Royal College of Surgeons in their guidelines ‘Good Surgical Practice’. From our review, it appears we sometimes fall short in giving clear guidance, or indeed in following the post-operative instructions.

With this in mind and the opinions garnered from junior doctors and nursing staff, we developed a wound observation chart to help improve patient care (fig. 8), which is currently being piloted at this hospital. This observation chart enables the operating surgeon to clearly state first wound review time, and which antibiotics they want to prescribe, along with the length of the antibiotic course. It also provides an objective means of scoring the wound, based upon the wound factors identified as important by doctors from our questionnaire. Should the situation arise where a doctor is not present at the dressing change, it provides a means of nursing staff recording accurate information regarding the wound, and the chart details any scenario when doctors should be contacted. Co-ordinating the wound observations onto one single chart eliminates any opportunity for poor verbal handover between staff, thereby increasing patient continuity of care. It also allows quick reference for the surgeon reviewing the patient in the immediate post-operative period, whether he was familiar with the patient or not. Such an observation chart is the first step towards a lower limb amputation care pathway booklet, to improve and streamline patient care. Secondly, we propose the development of post-operative amputation wound management clinical guidelines, to unite differing surgical views within our department to provide a standard of practice that can be utilized by all.
This study also showed that further emphasis needs to be placed upon the co-ordination of social care and placement, and its organisation early in the post-operative phase. It is well known that amputees require input from all branches of the multidisciplinary team (MDT), and any mechanism that hastens the completion if these various assessments, be it a simple proforma or weekly MDT meeting, would significantly reduce in-hospital patient stay.

We do recognize limitations in this study. This was a relatively small study within one department, performed retrospectively with no control. The views of doctors represent only a small cross-section of current surgical opinion. This study also did not account for Methicillin-resistant Staphylococcus aureus (MRSA) colonisation, and its effect on wound infection prognosis, as highlighted by previous studies. This study was performed with the aim to assess both the opinion and clinical practice of post-operative amputation wound management by surgeons at the Royal Derby Hospital Vascular Department; it came about due to the highlighted need of junior doctors on the ward.

To see whether the results of our study can be utilized to improve practice within the department, we aim to perform an audit in the near future to assess whether the observation chart improves patient management and communication.

Our main emphasis was on wound review; however, there is scope for further studies looking at specific antibiotic prophylaxis, duration of antibiotic cover, special cases of MRSA infection, or a much larger study looking at amputation wound review.

References
5. Good Surgical Practice (2008), Royal College of Surgeons, England.
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