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Topical antibiotics to prevent surgical site infection after minor surgery in primary care

Clare Heal[1], Phoebe Lepper[1], Jennifer Banks[1]

1 James Cook University, Mackay Base Hospital, Mackay, Australia

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Corresponding author: Prof Clare Heal, PhD, James Cook University Rural Clinical School, Mackay Base Hospital Mackay QLD 4740, Australia. Tel. 0457506701. Email: clare.heal@jcu.edu.au

ABSTRACT

Background: Surgical site infection (SSI) after minor surgery in primary care can compromise cosmetic outcomes, delay wound healing and increase costs. In addition to efficacy, adverse effects must be considered when considering antibiotic prophylaxis. There is no prior published literature regarding the proportion of general practitioners (GPs) who use topical antibiotics as SSI prophylaxis following minor surgery.

Objectives: To identify the proportion of GPs in a regional center in Queensland, Australia who apply topical antibiotics to wounds prevent SSIs after minor surgery.

Method: A database of 90 GPs was established, and they were invited to complete a questionnaire.

Results: The response rate was 62% (56/90). Topical antibiotics prophylaxis was reported as being used always or sometimes in routine practice by 18% (10/56) of participants after both skin lesion excision and repair of lacerations. In the context of high-risk situations, on the other hand, use was higher. They were more likely to be used in high-risk situations, most frequently in diabetic patients (41.0% [23/56]) and immunocompromised patients (46.5% [26/56]).

Conclusions: Evidence-based prescribing of antibiotics is vital. Topical antibiotic prophylaxis is often prescribed excessively after clean dermatological surgery, however, in our sample of GPs, only 18% used topical antibiotics always or sometimes in their practice.

Introduction

Surgical site infections (SSI) account for up to 20% of healthcare associated infections, [1] which amounts to approximately 35,000-40,000 infections in Australia each year [2].

As Australia has the highest rate of skin cancer in the world, and as the majority of skin cancer is managed in general practice [3], GP minor surgery and optimal post-operative management is a particular issue for Australian GPs. It is projected that close to a million surgical procedures for both squamous cell carcinoma (SCC) and basal cell carcinoma (BCC) will be performed in 2016 [4], the majority of these by general practitioners (GPs).

The acceptable rate of SSI following clean minor surgery (Class 1) is less than 5% [5], however, the infection rate may

be higher because of body site, [6,7] the pathology of the lesion removed [6-8] or environmental conditions [8,9].

Limited guidelines exist regarding antibiotic prophylaxis of dermatological procedures [10-12,13], and those available guidelines do not recommend any type of antibiotic to prevent SSI in clean (class 1) minor surgery [11]. The National Institute for Health and Care Excellence (NICE) guidelines also state "do not use topical antibiotics in wounds healing by primary intention to reduce the risk of surgical site infection." [12] In practice, antibiotic prophylaxis is prescribed excessively or inappropriately for dermatological surgery, in general, and it is recommended it be reserved for high-risk situations [13-15]. A recent Cochrane Review found moderate quality evidence that topical antibiotics probably prevent SSI compared to no treatment (RR 0.61, 95% CI 0.42 to 0.87), but did not recommend use in clean (class 1) surgery, where the baseline infection rate is already low. There was insufficient evidence in the review to make judgments about adverse events such as allergic contact dermatitis and antibiotic resistance [16] that limits the ability to make an overall evaluation of the use of topical antibiotics.

Currently, there is no data available to assess the proportion of Australian GPs who use topical antibiotics as SSI prophylaxis in wounds healing by primary intention. The aim of this study was to identify the proportion of GPs in Mackay, Queensland who use topical antibiotics to prevent SSI in excisions and lacerations healing by primary intention as well as identifying the class of topical antibiotics used and clinical and patient factors that may influence this use.

Methods

Study design and setting

All GPs, including GP registrars working within the 4740 postcode, were initially identified by a search of the Townsville-Mackay Medicare Local Service Finder. Each GP clinic was contacted by a study author (PL) to confirm the GPs working at that service. Those GPs who were on leave at the time of the survey were excluded as were GPs working in settings that did not involve minor surgery (women's health, occupational health). A database of 90 GPs was established.

Sample size

Based on an estimated incidence of 50% for our primary outcome (incidence of prescribing topical antibiotics), the sample size was calculated to be 47 for 95% confidence and 10% precision.

Questionnaire

The two-page questionnaire was designed by one author (PL) with assistance from other authors (CH and JB), using current guidelines and literature to ensure content validity. The questionnaire was pilot tested in May 2014 and based on feedback was further refined before distribution. The questionnaire aimed to investigate topical antibiotic prescribing both in routine practice and in the context of high-risk situations. The categories of "always and sometimes" were further combined for the purposes of interpretation to indicate that topical antibiotics were used "ever," as opposed to "seldom or never."

Data collection

The questionnaire, information sheet, and consent form were individually posted to all GPs in the database. Each practice was initially sent an email to inform them of the survey and to request the return of the completed questionnaires and consent forms. After a period of three months, a second copy of the survey was sent to eligible participants with a follow-up email. Data from completed questionnaires were de-identified and stored securely.

Data analysis

Data collected from the survey was analyzed using Statistical Package for Social Sciences (SPSS, Inc. version 22). Participant characteristics and outcomes were presented using frequencies and descriptive statistics. Comparisons of outcomes were analyzed with a Chi-squared test or Fisher's exact test where appropriate, with a p value less than 0.05 considered significant.

Ethical considerations

Ethical approval for the study was obtained from the James Cook University Human Research Ethics Committee (H5616).

Results

Completed surveys were returned by 56/90 participants (62% response rate). The characteristics of those GPs who responded are presented in Table 1. Of the participants who responded, 53.6% were male, 60% (34/56) were aged 46-55, and 34% had a length of practice between 21 and 30 years. This is representative of the demographics of GPs in Mackay.

Use of topical antibiotics after excisions and lacerations in the context of routine practice

In the context of routine practice, topical antibiotics were reported to be used always or sometimes (as opposed to seldom and never) to prevent wound infections after minor skin excisions by 18% (10/56) of participants. After lacerations, 18% (10/56) of participants also reported using topical antibiotics always or sometimes (Table 2). There was no association between the GP characteristics of age, gender, and length of time in practice and the use of topical antibiotics in excisions and lacerations.

TABLE 1. Characteristics of respondents

Characteristics		N (%) N=56
Gender	Male	30 (53.6)
	Female	26 (46.4)
Age in years **	< 30	2 (3.6)
	30-44	13 (23.2)
	45-59	34 (60.7)
	60 and older	5 (8.9)
Length of practice in GP (Y)	10 years or less	15 (26.8)
	11-20	16 (28.6)
	21-30	19 (33.9)
	More than 30 years	6 (10.7)

** 2 participants did not report age

Class of topical antibiotics used

The different subtypes of topical antibiotics used by GPs in any area of their practice are reported in Table 3. The two most commonly used antibiotics were chloramphenicol, which was reported to be used by 56.6% (30/53) of GPs, and mupirocin, which was reported to be used by 43.4% (23/53) of GPs.

There was no significant association between GP characteristics and the class of topical antibiotic used.

Use of topical antibiotics in the context of high-risk situations

The reported use of topical antibiotics was higher in the context of clinical situations that are considered to be at higher risk for infection (Table 4). A total of 41.0% (23/56) of GPs reported ever (always or sometimes) using topical antibiotics in diabetic patients, 46.5% (26/56) of GPs reported the same for immunocompromised patients, 46.5% (26/56) for patients with previous surgical site infection, 39.3% (22/56) for lower limb sites, 17.9% (10/56) for upper limb sites and 33.4% (19/56) for facial wounds. GPs who had been in practice for less than ten years reported they were significantly more likely to use antibiotics always or sometimes for immunocompromised patients (p= 0.01), and patients with previous surgical site infections (p= 0.02) compared with GPs who had been in practice for a longer period.

Discussion

The judicious use of antibiotics is critical. In addition to efficacy, health system costs, side effects, and the rise in antibiotic resistance must be taken into account when considering antibiotic use prophylactically. While there is much discussion about GP oral antibiotic use, we believe that this is the first study to establish the frequency of topical antibiotic use in the context of minor surgery by GPs.

TABLE 2. Frequency of topical antibiotic use in the context of routine practice

Frequency	Excisions %	Lacerations %
Never	29 (51.8)	36 (64.3)
Seldom	17 (30.4)	10 (17.9)
Sometimes	8 (14.3)	9 (16.1)
Always	2 (3.6)	1 (1.8)

TABLE 3. Types of topical antibiotics used**

Antibiotic Used	Frequency N (%)*
Mupirocin	23 (43.4)
Chloramphenicol	30 (56.6)
Polymixin B sufate	1 (1.9)
bacitracin zinc, neomycin sulfate, polymyxin B sulfate combination ointment (TAO)	1(1.9)
Neomycin	2 (3.8)
Not used	10 (18.8)

* There was missing data from 3 GPs, denominator=53 GPs

** This question referred to topical antibiotics used in any clinical situation by GPs

One other study of topical antibiotic use was identified in the literature. This was a survey of UK plastic surgeons regarding topical chloramphenicol use, which was initially conducted in 1999 and then repeated in 2010. In the initial survey, 66% of UK plastic surgeons reported using topical chloramphenicol ointment in their practice, and in 2010 a slightly higher proportion of 72% was reported [17,18]. This is higher than the reported rate of 18% in our GP survey and may in part be due to a difference in types of surgery or patient expectations.

It was interesting that, in the context of routine practice, topical antibiotics were reported to be used always or sometimes by the same number of GPs (18%) after excisions as lacerations. Excisions are classified as class 1 wounds with an acceptable postoperative infection rate of less than 5% [5], while lacerations are classified class 3 wounds, with an acceptable infection rate of 10-17% [19]. Assuming that the relative risk reduction in both clinical situations is the same, topical antibiotics would be of more clinical value after lacerations than skin excisions, where the likely absolute risk reduction in infection would be higher.

In our previous studies of risk factors for infection, we established excision from the lower limb as being the most significant independent risk factor for SSI, with infection rates as high as 30% [6,7,20] and, therefore, in the context of high-risk practice, the reported high frequency of use of topical antibiotics by GPs in excisions from the lower limb (39%) is probably justified. The evidence for diabetes as a risk factor

TABLE 4. Antibiotic use in high-risk situations

Frequency N (%)	Diabetes Mellitus	Immuno-compromised	Previous SSI	Lower limb sites	Upper limb sites	Facial Sites
Never	14 (25)	11 (19.6)	13 (23.2)	16 (28.6)	25 (44.6)	22 (39.3)
Seldom	19 (33.9)	18 (32.1)	17 (30.4)	18 (32.1)	21 (37.5)	18 (32.1)
Sometimes	19 (33.9)	16 (28.6)	21 (37.5)	19 (33.9)	10 (17.8)	18 (26.8)
Always	4 (7.1)	10 (17.9)	5 (8.9)	3 (5.3)	0 (0)	1 (1.8)

for surgical site infection after minor surgery has been conflicting [6,7], and the frequency of use of topical antibiotics in diabetic patients (41%) is not justified, based on our previous research. Excisions from the facial regions have a lower than average rate of wound infection [21], however, GPs reported that they were more likely to use topical antibiotics in this situation (33.4%) compared with routine skin excisions. This may be a reflection of concern about cosmetic appearance, but again, considering the low infection rate in this clinical situation, it is not likely justified.

Chloramphenicol has been shown to result in a statistically significant decrease in wound infection after minor skin excisions, and this is reflected by topical chloramphenicol being the most commonly reported topical antibiotic used [22]. However, mupirocin was not shown to be effective compared with a placebo in preventing surgical site infection, even though it is the second highest reported topical antibiotic used in our survey [23]. Secondary to contamination, there has been a recent shortage in Australia, and worldwide, of mupirocin and Fucidin ointment (Leo Laboratories, Berkshire, UK) [24], and therefore chloramphenicol ointment is one of the few options available in Australia. However, despite proven efficacy, chloramphenicol ointment is not approved for use on wounds, and therefore must be prescribed off-label for this purpose. Chloramphenicol is also now available over the counter in Australia, which may increase inappropriate use. With all topical antibiotics, there is a risk of allergic contact dermatitis as well as antibiotic resistance [25].

There were some limitations associated with our study. The sample was a small number of GPs in one regional area. Some practices involved have participated in skin cancer research in the past and therefore may be more knowledgeable of current guidelines than the general practice population. Our infection rate has been shown to be higher than other similar GP cohorts, likely due to our tropical environment; therefore, our prescribing may not be the same as other parts of Australia with lower infection rates. The power of the study was restricted due to the small sample size. Some outcomes showed a tendency to statistical significance, but there was not enough power to establish statistical significance.

Implications for General Practice

Evidence-based prescribing of antibiotics is vital. In practice, antibiotic prophylaxis is often prescribed excessively or inappropriately for dermatological surgery [13-15]; however, in our sample of GPs only 18% used topical antibiotics always or sometimes in their practice. It is evident that topical antibiotics are used too frequently for prophylaxis against infection after clean surgery and that they should be reserved for high-risk situations.

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