Skin infections and antibiotic prescribing: a comparison of surveillance and prescribing data

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INTRODUCTION
The appropriate use of antibiotics is important in limiting the encouragement of resistant organisms. Understanding what is happening in general practice is critical when interpreting data on antibiotic prescribing. Prescription of antibiotics by GPs has been previously examined in the context of the incidence of respiratory tract infections, using prescribing analysis and cost (PACT) data on dispensed antibiotics. A well-recognised positive association has been found between prescriptions for antibiotics and the number of persons presenting to GPs with acute respiratory infections. Trends in the prescribing of flucloxacillin are not consistent with those for the majority of commonly prescribed antibiotics. The aim of the current study was to examine relevant national prescribing data in relation to the available data on the incidence and seasonality of skin infections, for which flucloxacillin is commonly prescribed.

Skin conditions are a major cause for consultation in primary care. In the Fourth National Morbidity Survey in England and Wales conducted in 1991–1992 (MSGP4), 2.8% of children aged 0–4 years and 1.6% of those aged 5–15 years consulted with a skin condition. It was estimated that nationally there were more than 10 million consultations for skin conditions in general practice.
of which 2.4 million were initiated because of infection. Doctors, however, are only consulted on a minority of occasions: Bruinzeels and colleagues, using parent diary cards of 1805 Dutch children, estimated that 28% of all skin problems prompted consultation with a GP. These figures are all numerically similar to those observed in the Weekly Returns Service (WRS) of the Royal College of General Practitioners (RCGP) recorded up to 2003. A two-point comparison made of the Dutch national morbidity surveys in 1987 and 2001, suggested that the overall incidence of skin conditions was lower in 2001, although the incidence of skin infections had increased.

Loffeld et al reported a study of seasonality in attendees for impetigo at a paediatric Accident and Emergency (A&E) department. The study found increased attendance in late summer and highlighted the significance of higher temperatures. Similar findings have been noted using data from the WRS. Researchers concluded that this seasonal peak was probably due to increased insect activity.

In recent years the treatment of common skin infections has been largely based on the use of topical antibiotic creams (mupirocin, fusidic acid, and steroid/antibiotic combinations). Oral antibiotics, notably fluclaxacinil and erythromycin, have also been used, sometimes in combination with topical preparations. The evidence supporting their use is not strong, and in a recent Cochrane Review of treatment, no advantage was found for erythromycin as compared with topical antibiotics; there has not been a separate evaluation of fluclaxacinil.

The majority of skin infections are caused by Staphylococcus aureus and a few by Streptococcus pyogenes. Serious complications from infection are currently rare but there is some concern about increased likelihood of antibacterial resistance, most notably to fusidic acid. The significance of this increased resistance is difficult to establish because conventional antibacterial assays do not measure dose in usual topical use, which has a much higher local concentration of antibiotic than is used in laboratory assays.

**METHOD**

Weekly incidence data from the RCGP WRS for skin and subcutaneous skin infections (ICD9 680–686; subsequently referred to as skin infections) and impetigo (ICD9 684) were assembled into quarterly data sets over the years 1999–2005. Individual diagnoses within the group ‘skin infections’ include: carbuncle and furuncle (ICD9 680); cellulitis and abscess of finger and toe (681); other cellulitis and abscess (682); acute lymphadenitis (683); impetigo (684); pilonidal cyst (685); and other local infections of skin and subcutaneous tissue (686). Infected wounds are classified elsewhere. Incidence in each quarter is described as a mean weekly rate per 100 000 persons monitored. The WRS is a sentinel practice monitoring network involving approximately 75 practices and 700 000 persons at the midpoint of this study. Participating GPs summarise all consultations according to the disease/problem concerned using Read Codes, and determine the appropriate episode type to distinguish new episodes of illness from ongoing consultations. These data are routinely analysed by age group and sex.

PACT data were provided by the Prescription Pricing Authority (PPA) covering quarterly numbers of items of the selected antibiotics: fluclaxacinil (British National Formulary [BNF] classification 5.1.1.2) available as a syrup, capsule, or as an injection; and topical preparations including mupirocin (BNF 13.10.1.1), fusidic acid (BNF 5.1.7), and corticosteroids with fusidic acid (BNF 13.4). Data for erythromycin, available as capsule or tablet and separately as a syrup, was also examined as a potential confounder.

These data were examined separately in children aged 0–14 years and in adults aged ≥15 years. Fluclaxacinil capsules were compared with adult incidences and fluclaxacinil syrups with children. Where appropriate, trends in incidence and prescribing were investigated by regression analysis.

**RESULTS**

The quarterly incidence of skin infections and impetigo, and prescriptions of the selected antibiotics in children and adults are described in Figures 1 and 2. Episodes of impetigo were more common in children than in adults, but when all skin infections were examined together the difference was less marked. The same seasonal trends were evident in all the quarterly datasets with the peak of clinical incidence occurring in the third quarter (July–September). In children, but not in adults, there were slight decreasing linear trends of diagnosed skin infections and impetigo between 1999 and 2003; the regression coefficient was −0.67 (95% confidence interval [CI] = −2.01 to 0.67) for children and −0.08
(95% CI = –0.54 to 0.38) for adults, which equated to annual reductions (1999–2003) of 2.4% and 0.5%, respectively, in the incidence rate of skin infection. During 2004 and 2005 there were more pronounced reductions in the incidence, especially for children.

In 1999 there were a total of 2.7 million flucloxacillin prescriptions issued (7.7% of all antibiotic prescriptions), and in 2005 this figure rose to 3.3 million (9.8%). Quarterly prescribing data presented for flucloxacillin syrups and topical antibiotics (mupirocin, fusidic acid, and corticosteroids with fusidic acid) are presented in Figure 1; these are contrasted with incidence data for skin infections and impetigo in children aged 0–14 years. Prescriptions dispensed for flucloxacillin syrups were relatively constant over the 7 years: there was a quarterly peak each year during the third quarter. Prescribing data for flucloxacillin capsules and data for topical antibiotics (as above, Figure 1) are contrasted with incidence data in adults (aged ≥15 years) in Figure 2. There was a gradually increasing linear trend for prescriptions dispensed for flucloxacillin capsules from 1999 to 2003, which levelled off during 2004 and 2005. Prescriptions for topical mupirocin and fusidic acid were relatively constant but demonstrated a similar seasonal trend. The seasonal pattern of topical corticosteroids with fusidic acid prescriptions was less well defined: more prescriptions were dispensed in quarterly periods 2 (April–June) and 3 (July–September) than quarters 1 (January–March) and 4 (October–December). Over the years 1999 to 2002 there was a slight upward trend in the number of dispensed prescriptions for topical corticosteroids with fusidic acid.

Overall, the number of erythromycin prescriptions is broadly similar to that of flucloxacillin. The seasonality of erythromycin prescriptions differed from that of flucloxacillin (data not shown). Peak prescribing was evident in the winter quarters, and was consistent with the winter increase in the incidence of respiratory tract infections.1

**DISCUSSION**

**Summary of main findings**

The incidence of total skin infections and of impetigo showed seasonal variation with a peak in the third quarter.11 In the years 1999–2005 the incidence as reported in the WRS decreased slightly, especially over the last 2 years. Dispensed prescriptions for flucloxacillin capsules increased gradually from 1999 to 2003 and then levelled off, but for flucloxacillin syrups and topical antibiotics there was little overall change. Thus, although the incidence of skin infections in adults was less in 2003 than in 1999, there has not been a decrease in prescriptions dispensed for flucloxacillin capsules. Prescribing patterns of erythromycin did not suggest any shift in doctor prescribing preference from erythromycin to flucloxacillin.

**Strengths and limitations of the study**

These morbidity episode data are based on persons presenting to GPs in a sentinel practice surveillance scheme specifically designed to capture all morbidities and the relevant episode type reported at every consultation. The discipline of data recording was established for the purpose of undertaking national morbidity surveys. Routine capture using patient electronic medical records was established for the fourth survey in 1991.4 In a comparison of
annual prevalence rates reported in the WRS in 2001 with equivalent data from MSGP4 in 1991, an approximate 25% increase in the numbers of persons presenting with skin infections was noted during a 1-year period.\textsuperscript{21} A similar survey in the Netherlands also noted an increase.\textsuperscript{4} Episode incidence data for skin infections have been recorded in the WRS since 1994; there was very little change between 1994 and 1999, and from 2000 onwards the recorded incidence of skin infections has fallen slightly.\textsuperscript{10,21}

Over the last 5 years GPs have made increasing use of deputising services for out-of-hours work and by 2004 very few were providing these services. While it is now a requirement of the WRS that records are continuously updated with out-of-hours consultation diagnoses, these were commonly not entered in time to be included in the relevant weekly return. This is likely to have caused a small reduction in the number of consultations for these conditions, especially among children where consultations often take place as an emergency, at short notice because of the anxiety that a new rash may be something serious. The recent report from Birmingham Children’s Hospital suggested that the incidence of skin infections was increasing, but data were based on hospital attendances for impetigo in the A&E department, a group which could formerly have visited their GP.\textsuperscript{9}

Flucloxacillin and topical antibiotics are only available on prescription. PACT data provided by the NHSBSA PPD are particularly important because they measure what has been dispensed and not simply what has been reported as prescribed. Practice reported prescribing may underestimate true prescribing because of failure to report, but may overestimate because it includes prescriptions that are never dispensed. PACT data include all prescriptions dispensed by retail pharmacists thus providing the most accurate and comprehensive estimate of drugs available in the community. They are not available in age-specific form although inferences can be made from the presentation and dose details as shown here with regard to flucloxacillin.

Comparison with existing literature
In previous and current analyses of the seasonal trends in incidence of skin infections and impetigo,\textsuperscript{15,21} no evidence was found of the increased incidence reported by both Loffeld et al\textsuperscript{\textit{et al}} and Koning et al.\textsuperscript{\textit{et al}}\textsuperscript{15,22}

The Koning et al study was a two-point comparison, which is not an adequate basis to describe trends: both the WRS and prescribing data presented here are from continuous surveillance programmes. The increase in A&E department attendance for impetigo reported by Loffeld et al in 1552 children over an 8-year period (less than 200 a year) was not based on a known denominator. Additionally, the study was conducted during a period of major change in the provision of out-of-hours services.\textsuperscript{15-20} Therefore the slightly reduced incidence seen in the last 2 years in general practice should be interpreted with caution.

Implications for future research and clinical practice
The changes in incidence of skin infections and flucloxacillin prescribing are diametrically opposed, which can only mean that adults are more likely to receive a flucloxacillin prescription than previously. However, speculation remains about the reasons that lie behind these changes. The incidence data together with the relative constancy of topical prescriptions and flucloxacillin syrup suggest that there has been no recent underlying change in the incidence of skin infections. It is possible that, at least in adults, doctors are treating skin infections more aggressively. It is also possible that flucloxacillin is more widely used for conditions other than skin infections; for example, prophylactically following the suture of wounds, or after dog bites. However, if this were the case the same trends would be expected in children as in adults.

This report emphasises the importance of careful and disciplined data capture of simple and minor infections to understand antibiotic use. In many practices these minor infections are recorded in the free text section of the electronic notes and are often not coded as diagnostic Read Codes. These findings provide no support for the view that doctors are prescribing fewer antibiotics for skin infections: in adults there appears to be an increase despite an overall decrease in the incidence of skin infections. A decreasing incidence of acute respiratory infections and a smaller reduction in the number of dispensed antibiotics has been previously shown, suggesting that the rate of prescribing antibiotics for diagnosed cases may even be increasing.\textsuperscript{1} Using data on morbidity reported and prescriptions issued from the General Practice Research Database, Ashworth and colleagues demonstrated similar downward trends of both respiratory infections and antibiotic prescribing, but found evidence of reduced prescribing per consultation reported.\textsuperscript{27} Smith et al, also found reductions in diagnosis-related prescribing episodes for ‘cough/cold’ and sore throat, although there was variation in prescribing across different regions of the UK.\textsuperscript{28}

GPs should not become complacent about antibiotic prescribing. This analysis supports the view that doctors have increased their likelihood of prescribing flucloxacillin capsules to adults but there
has been little change in the use of flucloxacillin syrups in children and of topical antibiotics (which are probably equally effective).

While some comparisons have been made with antibiotic prescribing for respiratory infections, these are mostly viral and therefore issues of appropriateness of prescribing are quite different.

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Ethics committee
Not applicable

Competing interests
The authors have stated that there are none

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