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Prescription of antiviral therapy after herpes zoster in general practice:

who receives therapy?

Abstract

Background
Antivirals can accelerate rash healing during an acute zoster episode and can limit the severity and duration of pain. Their use within 7 days of rash onset is recommended among specific patient groups.

Aim
To describe antiviral prescription patterns and patient characteristics associated with antiviral receipt after zoster diagnosis.

Design and setting
Descriptive study and risk factor analysis using electronic healthcare records from UK general practice.

Method
Incident adult zoster cases occurring between 2000 and 2011 were identified in the General Practice Research Database. Therapy records were searched for antiviral prescriptions of aciclovir, famciclovir, or valaciclovir within 7 days of zoster diagnosis. The proportion of incident zoster cases receiving antivirals was calculated and multivariable logistic regression used to assess associations between patient characteristics and antiviral use.

Results
Of 142 216 incident zoster cases 58.1% received an antiviral prescription. The majority (69.0%) were aciclovir. The proportion receiving antiviral prescriptions increased with age up to 65 years, then declined to 56.8% among patients aged ≥85 years. Being female and of higher socioeconomic status were associated with higher antiviral receipt. Antivirals were more commonly prescribed to immunosuppressed patients with herpes zoster (odds ratio 1.27; 95% CI = 1.22 to 1.33), however they were not given routinely to this patient group.

Conclusion
Antiviral therapies for zoster are under-prescribed in UK general practice even among groups, such as immunosuppressed and older individuals, for whom guidelines recommend treatment. Patients may present too late to receive treatment or physicians may decide that antivirals are not essential treatment. Consideration could be given to reviewing the guidelines.

Keywords
antivirals; database; epidemiology; general practice; GPRD; herpes zoster; shingles; United Kingdom.

INTRODUCTION

Herpes zoster presents as a painful unilateral vesicular dermatomal rash[1] resulting from reactivation of latent varicella zoster virus infection. Reactivation is thought to result from waning cell-mediated immunity. Zoster is common among older people with a lifetime risk of 10–30%, rising to 50% among those living to ≥85 years.[2] Post-herpetic neuralgia develops in around 20% of individuals aged ≥50 years[3] and causes persistent severe pain for months to years after rash onset.[4]

Antivirals have been demonstrated in multiple clinical trials to accelerate rash healing and limit the severity and duration of pain during an acute zoster episode.[4] There is also some evidence suggesting they may reduce the risk of post-herpetic neuralgia,[5–7] possibly by reducing neural damage which may contribute to its development.[4] Treatment options for post-herpetic neuralgia are limited, therefore the potential use of antivirals to prevent post-herpetic neuralgia is particularly important.

Current UK guidelines advise GPs to prescribe oral antiviral drugs within 72 hours of rash onset for: people aged ≥50 years, ophthalmic zoster, other non-truncal disease, immunosuppression, or individuals with moderate to severe pain or rash.[8] Guidelines further recommend treatment up to 1 week after rash onset, particularly when characteristics for severe zoster or complications are present, such as continued vesicle formation, older age, immunosuppression, or severe pain.[8]

Research on the proportion of zoster individuals prescribed antivirals is limited[3] and previous studies have reported overall use, rather than by specific risk groups. Zoster incidence is likely to increase in the UK, due to population ageing and increasing use of immunosuppressive therapies, and it is important to understand current prescribing patterns.

This study aims to analyse antiviral prescription patterns by patient characteristics after a zoster diagnosis in UK general practice.

METHOD

This is a descriptive and risk factor analysis of UK electronic healthcare records over a study period from 1 January 2000 to 13 June 2011.

Data source

This study utilised data from the UK General Practice Research Database (GPRD), a large computerised database of anonymised patient records that contains complete prescribing and diagnostic information in primary care and feedback from hospital referrals. It is one of the largest sources of continuous patient records in the UK, containing data on approximately 7% of the UK population and is broadly representative of patient and practice characteristics in the UK.

Selecting incident zoster cases

An incident zoster case was anyone aged ≥18 years with a diagnostic code for zoster

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How this fits in

This article is the first to describe who receives antiviral therapy following a zoster diagnosis within the UK. It highlights that antivirals are under-prescribed in UK primary care, including among those particularly recommended for treatment, such as older individuals and those with immunosuppressive conditions. Although patients may present too late to receive therapy, under-treatment may reflect poor adherence to treatment guidelines. Consideration could be given to reviewing the guidelines.

in GPRD during the study period, without any consultations for zoster during the previous year. For patients with recurrent zoster episodes during the study period only the first episode was included. Those with zoster episodes occurring within 1 year of the start date were excluded, to remove potentially incorrectly dated prevalent cases.[9] Patients diagnosed with zoster encephalitis, zoster meningitis, or with another central nervous system complication within 7 days of the first zoster record were also excluded (n = 113) as they would typically be treated in secondary care. Read Codes indicating the anatomical site of zoster were searched for in all records within a zoster episode, defined as 1 year following first zoster record. Site of zoster was categorised into ophthalmic, other non-truncal and unspecified site; there is no existing Read Code for truncal zoster.

Sociodemographic characteristics of zoster cases

Age, sex, and geographical health region were obtained from the extracted GPRD data. Age was categorised as 18–49, 50–64, 65–74, 75–84, or ≥85 years. Socioeconomic status was analysed using quintiles of the Index of Multiple Deprivation (IMD) score, available for patients registered at English practices agreeing to link medical records with other databases. The patient's home postcode is mapped at the lower level super output level to the corresponding 2007 IMD score; a low quintile represents the least deprived. As patient-level IMD score was not available for patients from unlinked practices in England, a sensitivity analysis was run using practice-level IMD quintile when patient-level IMD quintile was unavailable.[10]

Identifying comorbidities at zoster diagnosis

As NHS guidelines recommend antiviral prescription for all immunosuppressed individuals, prescribing patterns were explored in this group. Patients were considered severely immunosuppressed if they had a diagnosis within 2 years preceding their zoster episode of leukaemia, lymphoma, or a bone marrow transplant or if they had ever had a diagnosis of HIV, a splenectomy, an organ/tissue transplant, myeloma diagnosis, or 'other immune deficiencies' (for example, immunodeficiency with predominantly antibody defects such as selective IgA immune deficiency and agammaglobulinemia, aplastic anaemias, and non-specific diagnoses of immune disorder). Patients prescribed at least one immunosuppressive medication, including oral corticosteroids, ≤3 months before their zoster episode were also considered severely immunosuppressed.

To explore antiviral prescribing patterns among patients with moderate immunosuppression, the following autoimmune conditions were flagged: diabetes, rheumatoid arthritis, inflammatory bowel disease, and systemic lupus erythematosus.

Antiviral use

Antiviral prescriptions including aciclovir, famciclovir, or valaciclovir within 7 days of a zoster diagnosis were identified from GPRD therapy records.

Data analysis

Data were analysed using STATA/MP (version 11.2). The proportion of incident zoster cases receiving antivirals was determined, and described by various patient characteristics. The association between antiviral use and patient characteristics was assessed using multivariable logistic regression adjusting for age, sex, region, year, zoster site, and immunosuppression status. Socioeconomic status was not adjusted for as it was only available for selected English practices.

RESULTS

Between 2000 and 2011 142 216 incident zoster cases were identified. Of these 82 656 (58.1%) received an antiviral prescription within 7 days of diagnosis in GPRD. Of those prescribed antivirals 80 751 (97.7%) were given on the day of the zoster diagnosis. The most commonly prescribed antiviral was aciclovir (69.0%), followed by famciclovir (27.8%) and valaciclovir (3.5%). A small number (n = 224) of cases had two different antivirals prescribed on the same day and were included in both antiviral groups (therefore totals do not add up to 100%).

The proportion of patients prescribed antivirals increased with age up to

Table 1. Proportion of patients prescribed antiviral medication, by patient characteristics

Patient characteristic	*n*	% Treated	Unadjusted OR (95% CI)	Adjusted OR (95% CI)[a]	*P*-value
Age group, years					
18–49	38 665	52.2	1.00	1.00	
50–64	42 631	58.6	1.30 (1.26 to 1.34)	1.29 (1.26 to 1.33)	
65–74	29 203	62.6	1.53 (1.49 to 1.58)	1.53 (1.49 to 1.58)	
75–84	23 341	62.0	1.50 (1.45 to 1.55)	1.49 (1.44 to 1.54)	
≥85	8376	56.8	1.21 (1.15 to 1.26)	1.17 (1.12 to 1.23)	<0.01
Zoster site					
Site unspecified	139 214	58.4	1.00	1.00	
Non-truncal zoster (excluding ophthalmic)	873	30.9	0.32 (0.28 to 0.37)	0.34 (0.30–0.40)	
Ophthalmic zoster	2129	49.4	0.69 (0.64 to 0.76)	0.66 (0.61 to 0.72)	<0.01
Sex					
Male	57 096	56.5	1.00	1.00	
Female	85 120	59.2	1.12 (1.09 to 1.14)	1.11(1.09 to 1.13)	<0.01
Year diagnosed					
2000	8638	45.7	1.00	1.00	
2001	10 202	48.5	1.12 (1.06 to 1.18)	1.12 (1.06 to 1.19)	
2002	11 114	50.7	1.22 (1.16 to 1.29)	1.22 (1.15 to 1.29)	
2003	12 130	54.3	1.41 (1.33 to 1.49)	1.40 (1.32 to 1.48)	
2004	13 080	56.7	1.56 (1.47 to 1.65)	1.55 (1.46 to 1.63)	
2005	13 663	58.7	1.69 (1.60 to 1.78)	1.68 (1.59 to 1.77)	
2006	13 933	59.4	1.74 (1.65 to 1.84)	1.72 (1.63 to 1.81)	
2007	13 897	61.9	1.93 (1.83 to 2.04)	1.90 (1.80 to 2.01)	
2008	13 997	63.1	2.03 (1.93 to 2.15)	2.01 (1.90 to 2.13)	
2009	14 021	64.0	2.11 (2.00 to 2.23)	2.08 (1.97 to 2.20)	
2010	13 518	65.3	2.24 (2.12 to 2.37)	2.21 (2.09 to 2.33)	
2011	4023	64.2	2.13 (1.97 to 2.30)	2.07 (1.91 to 2.24)	<0.01
Region					
Yorkshire and Humber	6682	51.9	1.00	1.00	
North West	18 808	59.1	1.34 (1.27 to 1.42)	1.30 (1.23 to 1.37)	
North East	3076	52.8	1.04 (0.95 to 1.13)	1.00 (0.92 to 1.09)	
East Midlands	5789	54.6	1.11 (1.04 to 1.20)	1.10 (1.03 to 1.18)	
West Midlands	13 664	55.4	1.15 (1.09 to 1.22)	1.12 (1.06 to 1.19)	
East of England	13 274	58.2	1.29 (1.22 to 1.37)	1.25 (1.18 to 1.33)	
South West	12 056	59.4	1.36 (1.28 to 1.44)	1.29 (1.21 to 1.37)	
South Central	15 632	57.2	1.24 (1.17 to 1.31)	1.19 (1.12 to 1.26)	
London	11 551	55.4	1.15 (1.09 to 1.23)	1.10 (1.04 to 1.17)	
South East Coast	11 950	59.2	1.34 (1.27 to 1.43)	1.26 (1.19 to 1.34)	
Northern Ireland	5114	67.7	1.94 (1.80 to 2.09)	1.89 (1.75 to 2.04)	
Scotland	11 475	63.1	1.59 (1.49 to 1.69)	1.48 (1.39 to 1.57)	
Wales	13 145	58.8	1.32 (1.25 to 1.40)	1.23 (1.16 to 1.31)	<0.01
IMD quintile[c]					
(Least deprived) 0	19 762	58.4	1.00	1.00	
1	19 650	57.9	0.98 (0.94 to 1.02)	0.97 (0.93 to 1.01)	
2	16 050	57.4	0.96 (0.92 to 1.00)	0.95 (0.91 to 0.99)	
3	13 892	56.2	0.91 (0.87 to 0.95)	0.91 (0.87 to 0.95)	
(Most deprived) 4	9364	54.6	0.86 (0.81 to 0.90)	0.85 (0.81 to 0.90)	<0.01[b]

AV = antivirals. [a]Adjusted for age, sex, region, year, zoster site and immunosuppression status, based on severe immunosuppression. [b]Test for trend. [c]Analysis restricted to patients registered at English practices with IMD score available.

65–74 years, when the percentage plateaued and then reduced to 56.8% among patients aged ≥85 years (Table 1). Females were more likely to be prescribed antivirals compared to males (adjusted odds ratio [AOR] 1.11, 95% confidence interval [CI] = 1.09 to 1.13). However, the sex difference disappeared among patients aged ≥75 years (Figure 1) (in χ^2 tests $P>0.2$).

Patients with an ophthalmic zoster diagnosis were less likely to receive antivirals compared to patients with zoster at an unspecified site (AOR 0.66, 95% CI = 0.61 to 0.72) (Table 1). Similarly, patients with other non-truncal zoster were less likely to be prescribed antivirals (AOR 0.34, 95% CI = 0.30 to 0.40) (Table 1).

The percentage of patients receiving antivirals increased every year between 2000 and 2010, from 45.7% to 65.3% and this trend remained after adjusting for confounders (Table 1). Antiviral use varied by UK region. The lowest use of antivirals was in the north-east regions of England, specifically Yorkshire and Humber (51.9%) and the North East (52.8%). The highest use was in Northern Ireland (67.7%), where patients were 89% more likely to receive antivirals compared to patients in Yorkshire and Humber (AOR 1.89, 95% CI = 1.75 to 2.04). IMD score was available for 78 718/112 482 patients (70.0%) in England. The percentage of patients prescribed antivirals reduced with increasing IMD quintile, with 58.4% of patients in quintile zero and 54.6% in quintile four (most deprived) having received antiviral therapy (Table 1). Using practice-level IMD score for cases in England missing patient-level IMD, the results did not change (data not shown).

Zoster patients with immunosuppression were 27% more likely to receive antivirals compared to patients without immunosuppression (AOR 1.27, 95% CI = 1.22 to 1.33) (Table 2). Some evidence for greater antiviral use was found for all patients with severe immunosuppression, excluding myeloma (AOR 1.03, 95% CI = 0.85 to 1.24) (Table 2).

Of the selected autoimmune conditions considered to cause moderate immunosuppression, there was strong evidence that patients with rheumatoid arthritis were more likely to receive antiviral therapy, compared to patients without rheumatoid arthritis (Table 2). This effect was seen both among rheumatoid arthritis patients not taking immunosuppressive therapies (AOR 1.17, 95% CI = 1.05 to 1.29), and among rheumatoid arthritis patients on immunosuppressive therapy (AOR 1.28, 95% CI = 1.14 to 1.42). A similar pattern was seen among systemic lupus erythematosus patients (Table 2). Patients with inflammatory bowel disease were only more likely to receive therapy if they were on immunosuppressants (AOR 1.52, 95% CI

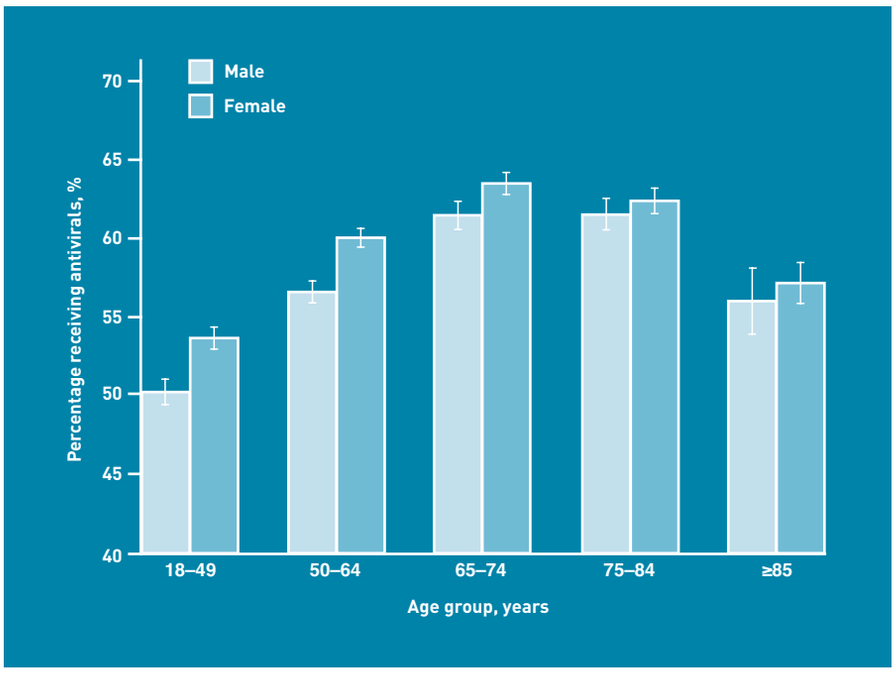

Figure 1. Percentage of patients receiving antiviral therapy, by age and sex (error bars represent 95% CIs).

= 1.24 to 1.85). Patients with diabetes were not more likely to be prescribed antivirals (Table 2).

DISCUSSION

Summary

In the UK between 2000 and 2011, the overall proportion of patients prescribed antivirals within 7 days of a zoster diagnosis was low (58.1%) though a clear increase was seen over time. Aciclovir was the most common antiviral prescribed. Antiviral prescriptions increased with age; however this trend stopped after age 65 years and prescriptions declined among patients ≥85 years. Being female, of higher socioeconomic status, and registered at a GP in Northern Ireland or Scotland was associated with higher antiviral receipt. Although antivirals were more commonly prescribed to immunosuppressed patients with herpes zoster, they were not given routinely in general practice to this patient group.

Why are antiviral prescriptions for zoster low? The finding that a low proportion of patients are prescribed antivirals for an acute episode of zoster correlates with a previous study of GPRD data reporting that 56.3% of 27 225 immunocompetent patients with herpes zoster aged ≥50 years received antivirals between 2000 and 2006.[3] These findings could suggest a lack of adherence to guidelines. Antivirals are generally safe, well tolerated,[4] and aciclovir is inexpensive, therefore neither adverse effects nor cost implications can explain their low use following zoster diagnosis. It is possible that antivirals are not seen as essential treatment, as they do not provide a cure, rather they can reduce duration of the rash and the severity of pain during the episode. Although antivirals are suggested to reduce the risk of post-herpetic neuralgia, evidence is inconclusive,[5–7] which may again deter physicians from prescribing them. This may be especially pertinent to mild cases of zoster.

An alternative explanation is patients are presenting too late to receive treatment; more than 72 hours after rash onset. This 72-hour cut-off reflects an arbitrary criterion used in clinical trials of antiviral therapy in patients with herpes zoster.[4] This may be an unrealistic time frame for patients to secure an appointment with their GP.[4] Therefore guidelines encourage GPs to 'consider' use of antivirals within 7 days of rash onset for older or immunosuppressed patients. The guidelines for treating patients presenting after 72 hours from rash onset lack clarity, and furthermore, are based on limited evidence[11–12] both of which may deter prescribing.

Patients may also present following the 7-day window when it is too late to receive antiviral therapy. Although data on time from actual rash onset to presentation to the GP is not available in this data set, two previous UK studies suggest patients present soon after rash onset: Scott *et al* reported that 50–60% of patients aged >50 years presented to GPs within 72 hours of rash onset,[13] and analyses of data from Thomas *et al* shows that 65% of adult patients with herpes zoster presented by 72 hours, with less than 7% presenting after 7 days.[14]

Additionally, a small proportion of immunosuppressed patients who get disseminated zoster will be referred, as per guidelines, to secondary care for systemic therapy and their antiviral use not recorded here. However this would not explain the low prescribing rates for the majority of patients in this study.

Why are there age, sex, regional, and socioeconomic differences? As expected the proportion of patients with herpes zoster prescribed antivirals increases with age. Explanations for why this trend plateaus at age 65 years and subsequently declines among the oldest may include; older patients being in nursing homes and presenting to GPs later, or reluctance to prescribe to older patients nearing the end of their life. Patients in Scotland and Northern Ireland were more often treated with antivirals, which may

Table 2. Proportion of patients prescribed antiviral medication, by comorbidities

Patient characteristic	*n*	% Treated	Unadjusted OR (95% CI)	Adjusted OR (95% CI)[a]	*P*-value
Conditions causing severe immunosuppression[b]					
Severe immunosuppression	8924	64.9	1.36 (1.30 to 1.42)	1.27 (1.22 to 1.33)	<0.01
HIV	132	64.4	1.30 (0.91 to 1.86)	1.51 (1.06 to 2.17)	0.02
Leukaemia[c]	203	64.0	1.28 (0.96 to 1.71)	1.31 (0.98 to 1.76)	0.07
Lymphoma[c]	441	62.4	1.19 (0.98 to 1.45)	1.17 (0.96 to 1.43)	0.11
Myeloma	479	61.8	1.17 (0.97 to 1.40)	1.03 (0.85 to 1.24)	0.78
Organ/tissue transplant[d]	341	63.3	1.25 (1.00 to 1.55)	1.30 (1.04 to 1.62)	0.02
Splenectomy	263	63.9	1.27 (0.99 to 1.64)	1.25 (0.97 to 1.62)	0.08
Other immune deficiencies	144	67.4	1.49 (1.05 to 2.11)	1.42 (1.00 to 2.03)	0.05
Immunosuppressive therapy[e]	2174	66.8	1.46 (1.33 to 1.60)	1.37 (1.25 to 1.50)	<0.01
Oral corticosteroid therapy	6149	65.1	1.36 (1.29 to 1.44)	1.27 (1.21 to 1.34)	<0.01
Autoimmune diseases					
Diabetes	11 015	61.3	1.15 (1.11 to 1.20)	1.03 (0.99 to 1.07)	0.21
Rheumatoid Arthritis (RA)					
No RA	139 113	58.0	1.00	1.00	
RA without immunosuppressive therapy	1639	63.6	1.27 (1.14 to 1.40)	1.17 (1.05 to 1.29)	<0.01
RA with immunosuppressive therapy	1464	66.2	1.42 (1.27 to 1.58)	1.28 (1.14 to 1.42)	<0.01
Systemic lupus erythematosus (SLE)					
No SLE	141 824	58.1	1.00	1.00	
SLE without immunosuppressive therapy	223	63.2	1.24 (0.94 to 1.63)	1.20 (0.91 to 1.58)	0.20
SLE with immunosuppressive therapy	169	72.8	1.93 (1.37 to 2.71)	2.11 (1.49 to 2.97)	<0.01
Inflammatory bowel disease (IBD)					
No IBD	140 665	58.1	1.00	1.00	
IBD without immunosuppressive therapy	1083	60.4	1.10 (0.97 to 1.24)	1.05 (0.93 to 1.19)	0.43
IBD with immunosuppressive therapy	468	68.4	1.56 (1.28 to 1.90)	1.52 (1.24 to 1.85)	<0.01

[a]Adjusted for age, sex, region, year, zoster site. [b]Compared to population without specified diagnosis. [c]Diagnoses <2 years before zoster episode. [d]Bone marrow transplants included if <2years before zoster episode. [e]Excluding oral corticosteroids. Other immune deficiencies: for example immunodeficiency with predominantly antibody defects such as selective IgA immune deficiency and agammaglobulinemia, aplastic anaemias such as pancytopenia, and non-specific diagnoses of immune disorder.

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Ethical approval

Ethics approval was obtained from the GPRD Independent Scientific Advisory Committee and LSHTM Ethics Committee.

Provenance

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Competing interests

The authors have declared no competing interest.

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reflect patients accessing GP services more quickly or different prescribing cultures among physicians. Reasons why males and people of lower socioeconomic status were less likely to receive antivirals may include differences in when these groups access care or physicians differentially prescribing antivirals among these groups.

Antiviral use among patients with immunosuppression. It is recommended antivirals be given routinely to patients with immunosuppression; however the proportion receiving treatment ranged between 62–68%. This may again be explained by delay in consulting GPs, some patients with severe underlying comorbidities accessing antiviral therapy through secondary care or physicians not seeing antiviral treatment as a necessity.

Antiviral use by zoster site. Ophthalmic and other non-truncal zoster cases were less commonly prescribed antivirals than zoster cases where site was unspecified, even after adjusting for age, sex, region, year, and immunosuppression status. This is a surprising finding considering guidelines suggest these groups routinely be given antiviral therapy. Patients with Ramsay Hunt Syndrome, the most common other non-truncal diagnosis, may present initially without an obvious rash and delayed diagnosis might contribute to lower prescription rates in this group. Ophthalmic zoster patients may be immediately referred to secondary care for treatment, resulting in lower prescribing rates among this group. However, misclassification of zoster site is

likely as the zoster site was seldom recorded. Despite this, it is surprising that less than 50% of cases with a definite diagnosis of ophthalmic or other non-truncal zoster received antivirals.

Strengths and limitations

The GPRD is one of the largest databases of healthcare records and has excellent capture of primary care prescriptions. However, these data may not fully capture prescriptions in secondary care. A minority of patients, particularly those with severe underlying comorbidities, may obtain antiviral prescriptions in secondary or tertiary care. Therefore this study may underestimate the prescription of antivirals following an acute zoster episode. However, as these patients received a zoster diagnosis in primary care, it is likely that most would have received any subsequent antiviral prescription from their GP. Finally, there may be misclassification of immunosuppression status as newer biologic therapies are poorly recorded in GPRD and some patients on long-term immunosuppressive therapies may be given prescriptions 6-monthly and would not have been detected; it is unclear whether receipt of antivirals among such individuals would differ from that among those identified as immunosuppressed in this study.

Comparison with existing literature

Studies from the US, Italy, and Australia report higher proportions of patients with herpes zoster receiving antiviral prescriptions. A retrospective study of healthcare records in Italy between 2003 and 2005 found 78% of 3260 immunocompetent patients with herpes zoster aged ≥50 years received antivirals.[15] In Australia analysis of healthcare records between 2000–2006 showed that 73.5% of 379 incident zoster cases aged ≥50 years received antivirals[16] and a similarly high proportion was found in the US where 71.3% of 8741 newly diagnosed zoster adults (aged ≥19) received antivirals;[17] both studies included immunosuppressed and immunocompetent individuals. In contrast, data from a large database of general practice records in the Netherlands in 2001 found 22.5% of 1129 patients with herpes zoster aged ≥44 years received antivirals.[18] Observed variation in prescribing patterns between countries may reflect differences in healthcare systems or distribution of patients with characteristics more/less likely to get antivirals in study populations, or to variations in data quality.

Implications for research and practice

The proportion of patients in the UK receiving antivirals following a diagnosis of zoster in primary care is low. This research highlights the problem of under-prescribing of antivirals for zoster in UK general practice even for groups where clear guidelines recommend treatment.

Further research is required to understand the basis for the low proportions given antivirals. This is particularly pertinent for older and immunocompromised patients. Controlled trials assessing the benefits of antivirals prescribed >72 hours after rash onset would enable more detailed guidance for physicians and may increase antiviral prescribing if delay in presenting to GPs is a factor contributing to low antiviral use. Treatment guidelines could be reviewed to clarify which patients should be treated with antivirals when it is not possible to initiate treatment within 72 hours of rash onset.

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