

## Impact of the COVID-19 pandemic on community antibiotic prescribing in Scotland

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**Background:** Following concerns about increased antibiotic use during the COVID-19 pandemic, trends in community antibiotic prescriptions in Scotland were evaluated.

**Methods:** The primary care prescription electronic messaging system used in GP practices with NHS contracts provided near real-time data analysis of national data. The main outcome measures were the weekly number of prescriptions for antibiotics generated by prescribers in GP practices in 2020 compared with 2019.

**Results:** At end of Week 12 2020 (22 March), after a sharp increase, the number of prescriptions commonly used for respiratory infections was 44% higher than the corresponding week in 2019. The number of prescriptions for respiratory antibiotics reduced through April and May 2020, with 34% fewer prescriptions issued by end of Week 22 (31 May) than in the corresponding week in 2019. Reductions were pronounced in all age groups but particularly apparent for prescriptions for children aged 0–4 years. These data were compared with weekly prescriptions for a selection of non-respiratory antibiotics and no difference was seen between 2020 and 2019.

**Conclusions:** Trends in antibiotic prescription data show that after an initial surge, and following ‘lockdown’ in Scotland, the total number of prescriptions for antibiotics commonly used for respiratory infections fell. We believe this is the first published national evaluation of the impact of COVID-19 on community use of antibiotics. Further analysis of national data is planned to provide a greater understanding of the reasons behind these trends.

### Introduction

Coronavirus disease 2019 (COVID-19) was first recognized in the UK in February 2020, with the first case in Scotland diagnosed on 1 March 2020.<sup>1</sup> COVID-19 is a viral illness caused by SARS-CoV2 infection and bacterial super-infection is uncommon.<sup>2</sup> In the majority of individuals, it is a mild, self-limiting infection which can be managed via self-care.<sup>3</sup> However, some patients may be referred to community healthcare settings for assessment of symptoms, treatments and onward admission if clinically necessary. Overlapping clinical presentations may make bacterial respiratory tract infection (RTI) difficult to differentiate from COVID-19, particularly in those with chronic respiratory conditions. This has led to concerns about potential inappropriate overuse of antibiotics in patients with COVID-19 symptoms with resultant adverse effects and development of antimicrobial resistance (AMR).

In Scotland, the Scottish Antimicrobial Prescribing Group (SAPG)<sup>4</sup> has led the implementation of a national antimicrobial stewardship programme (ASP) since 2008 to optimize prescribing across all health and care settings. At the core of the ASP coordinated by SAPG and delivered in collaboration with primary care teams is work to reduce the population’s unnecessary exposure to antibiotics in two main areas. Firstly, antibiotics should not be used for self-limiting infections such as sore throats and coughs in otherwise fit and healthy people, and secondly when antibiotics are needed, the right antibiotic, at the right dose for the right duration, should be used. National data shows these have been successful with antibiotic prescribing rates in the community at their lowest level on record.<sup>5</sup>

In Scotland, most antibiotic prescribing takes place within the GP practice setting.<sup>5</sup> In Scotland when a clinician generates a prescription using the GP practice operating system at the point

the paper prescription is printed there is a simultaneous production of an electronic message that contains the prescription details. These electronic prescription messages are held within the Prescribing Information System (PIS),<sup>6</sup> a database of medicines prescribed and dispensed in the community in Scotland held by NHS National Services Scotland. A separate national database is used for hospital medicines. GP prescribing data represents the majority (88% in 2018) of primary care antibiotic use in Scotland.<sup>5</sup> Antibiotics may also be supplied via out-of-hours centres (OOH), community pharmacies and by non-medical prescribers. During the pandemic antibiotics were also supplied via COVID-19 Assessment Centres (CACs) which opened from 23 March 2020.

Telephone triage of patients with respiratory symptoms was introduced in Scotland from mid-March 2020 with initial advice to self-isolate and face-to-face or telephone/video consultations in community-based CACs or in hospital based emergency assessment areas if symptoms worsened.<sup>3</sup> Antibiotics in the context of COVID-19 were recommended for those with suspected exacerbations of COPD with purulent sputum or concern regarding presence of bacterial pneumonia. In the CACs, standard 5 day treatment packs of doxycycline, amoxicillin and clarithromycin were available if required.

The availability of e-messaging data provided an opportunity to evaluate weekly trends in antibiotic prescribing during the COVID-19 pandemic (March–May 2020) and compare this with trends for the same period in 2019. The focus was mainly on antibiotics recommended in local guidelines for RTIs but data on antibiotics for non-respiratory infections (non-RTIs) were also evaluated to provide information about changes in healthcare utilization that may have influenced prescribing practice.

## Methods

Data on e-messages on antibiotics prescribed in general practice were obtained from PIS for prescriptions issued by 921 GP practices in Scotland for the period Week 8 2020 (ending 22 February 2020) to Week 22 2020 (ending 31 May 2020) and for the corresponding weeks in 2019.

Weekly data for e-prescriptions were analysed using Microsoft Excel and charts created showing weekly number of items for respiratory antibiotics in 2019 and 2020.

The measure of interest was weekly (week defined as Monday to Sunday) number of prescriptions generated for respiratory antibiotics (amoxicillin, azithromycin, clarithromycin, co-amoxiclav and doxycycline) and for a selection of non-respiratory antibiotics (flucloxacillin, metronidazole, nitrofurantoin and trimethoprim). Data were analysed for total RTI and individual antibiotics, total non-RTI and individual antibiotics. Data were also analysed by patient age groups (0–4, 5–14, 15–59, 60–74, ≥75 years).

## Results

The number of total prescriptions for RTI peaked in late March at 37 052, 44% higher than the corresponding week in 2019. Increases were seen for all respiratory antibiotics and across all age groups but were highest in those aged 15–59 years and 60–74 years (Table 1).

There was a sharp increase in prescriptions for antibiotics primarily used for respiratory infections in March 2020 starting after Week 9 (ending 1 March 2020); these prescriptions peaked in Week 12 (ending 22 March 2020) and returned to a similar level to

2019 by Week 14 (ending 5 April 2020). Following this peak, the total number of prescriptions reduced to a level below that in 2019. By the final week in May 2020 there were 7109 (34%) fewer prescriptions than in corresponding week in 2019 (Figure 1). The reduction was driven by reductions in: amoxicillin (5151 items, 50% fewer); clarithromycin (1016, 37% fewer); and doxycycline (998, 19% fewer). These reductions were pronounced in all age groups but in use in children aged 0–4 years accounted for the greatest reduction (741, 68% fewer) by population age band (Table 1). Trends were evaluated at a regional level and found to be similar both for total respiratory antibiotic use and individual respiratory antibiotic use across all NHS board areas.

## Discussion

We believe this is the first published national evaluation of the impact of COVID-19 on community use of antibiotics. Following a sharp rise in March 2020 the number of prescriptions, primarily for respiratory infections, fell by 34% compared with the corresponding week in 2019. We suggest the peak was due to ‘just in case’ prescriptions, particularly for anticipatory care in patients with chronic lung conditions as lockdown was introduced as the greatest increases were seen with doxycycline and also moderate increases in amoxicillin and clarithromycin.

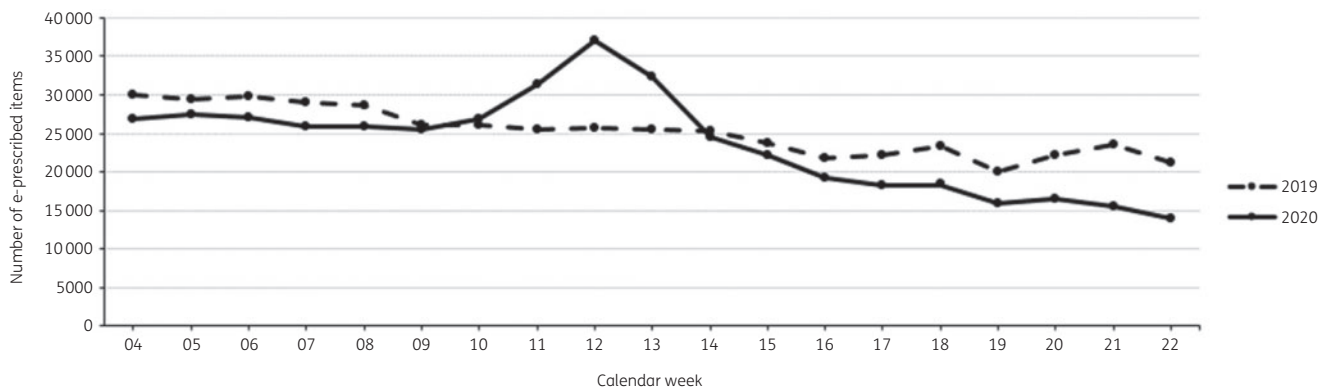
This study suggests that either self-limiting respiratory tract infections were less frequent or that patients were more likely to practice self-care leading to reduced use of antibiotics for these conditions. Other factors that may have influenced reductions in antibiotic use include improved hand hygiene, reduced transmission of infection due to lockdown, patient anxiety and desire to protect the NHS. It is also possible that self-isolation with presumed COVID-19 influenced the reduced number of patients presenting to GP practices, some of whom may have had a bacterial infection. Initially we only evaluated data for RTI antibiotics and suspected that reductions may be due to prioritized face-to-face GP appointments and utilization of telephone or video consultations. However, data for non-RTI showed no change in the number of prescriptions for 2020 compared with 2019, suggesting that GP prioritization was not impacting on patients seeking treatment for infections. We did not evaluate antibiotics provided via community pharmacies, which would be mainly for urinary tract infections.

Although not applicable in NHS Scotland the publication of NICE rapid COVID-19 guidelines<sup>7</sup> on the Healthcare Improvement Scotland website<sup>8</sup> on 3 April 2020 may have had an impact on supporting clinicians not to prescribe antibiotics. However, we are unable to determine if NICE guidance was accessed or followed but the approach in Scotland has always been to follow local antibiotic guidelines. During the pandemic, the key message from SAPG to all clinicians has been to continue to follow routine antibiotic prescribing practice. Amoxicillin and doxycycline are both first-line agents in all health board guidelines for community respiratory infections with the choice in individual patients based on any previous therapy and contraindications. We also suggest that it is possible that as clinicians became increasingly accustomed to COVID-19 presentation they became more confident in not prescribing antibiotics. There may also be improved public understanding about the differences between viral and bacterial infections due to the intensive COVID-19 media and increased use of the NHS inform website for self-care advice. New models of care by GP practices that may

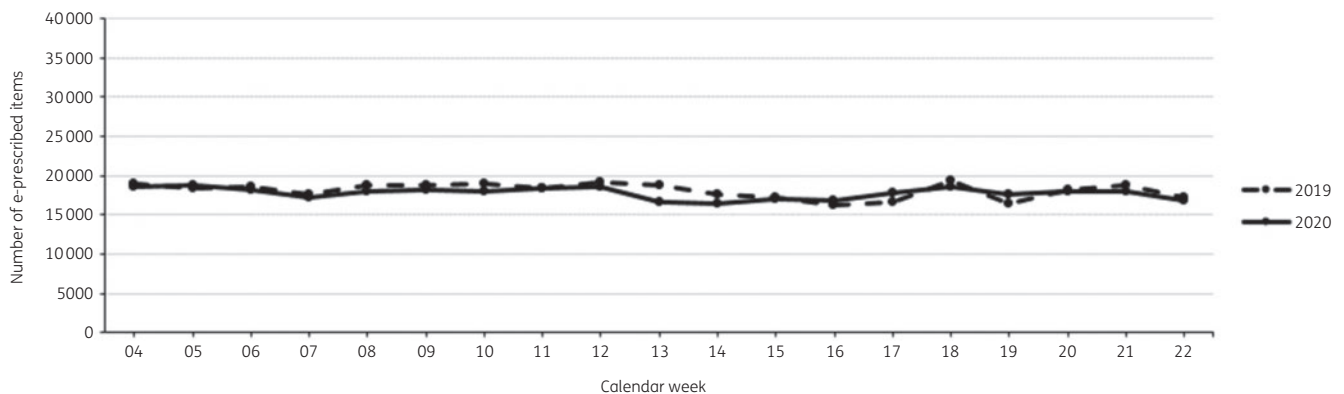
**Table 1.** Difference in antibiotic prescriptions for respiratory tract infections by age group

Age (years)	Week 12			Week 22		
	number of e-prescribed items		difference in items, 2019 versus 2020, N (%)	number of e-prescribed items		difference in items, 2019 versus 2020, N (%)
	2019	2020		2019	2020	
0–4	2140	2178	+38 (2%)	1085	344	–741 (68%)
5–14	1412	1664	+252 (18%)	948	379	–569 (60%)
15–59	11 387	17 765	+6378 (56%)	9324	6294	–3030 (32%)
60–74	6399	9820	+3421 (53%)	5778	3927	–1851 (32%)
≥75	4341	5602	+1261 (29%)	3949	3047	–902 (23%)

(a) Respiratory tract infections (amoxicillin, azithromycin, clarithromycin, co-amoxiclav, doxycycline)



(b) Non-respiratory infections (flucloxacillin, metronidazole, nitrofurantoin, trimethoprim)



**Figure 1.** Weekly numbers of prescriptions from Week 4 to Week 22. (a) Weekly numbers of prescriptions for respiratory tract infections in 2020 versus 2019 (amoxicillin, azithromycin, clarithromycin, co-amoxiclav, doxycycline). (b) Weekly numbers of prescriptions for non-respiratory infections in 2020 versus 2019 (flucloxacillin, metronidazole, nitrofurantoin, trimethoprim).

continue into the recovery phase of COVID-19 may support sustained reductions in respiratory antibiotics with resultant benefits for antimicrobial resistance. Our data are encouraging as reports of reduced ASP activities have the potential for long-term negative impact on global AMR.<sup>9</sup>

The system in Scotland for seeking advice on infections in the community is via the 111 line triage system followed by referral to either the CAC or to local GP practice for a phone or video call with

a healthcare professional. We cannot exclude the possibility that antibiotics supplied from CACs as pre-labelled packs (not captured in this dataset) accounted for some of the reduction observed. NHS 24 took the vast majority of all calls for any cough, breathlessness or fever. The maximum number of calls daily to the COVID-19-line peaked at around 7000 on 23 March 2020 (Week 13) and referrals to CACs peaked at around 1800 per day on 7 April 2020 (Week 15).<sup>1</sup> Up to 20% of patients required assessment and could

potentially be given antibiotics.<sup>1</sup> The number of COVID-19 confirmed cases peaked on 7 April 2020 (Week 15)<sup>1</sup>. There was a correlation with the peak in prescribing activity with calls to the COVID-19 line but not with referrals to CACs or confirmed cases. In addition, OOH services could e-mail prescriptions to community pharmacies. Informal feedback from clinicians suggests around 20% of those assessed received an antibiotic for respiratory infection and accordingly we do not believe this use significantly impacts on the findings of this study. Data on RTI antibiotics issued by CACs will be analysed in due course.

In common with other conditions some patients may not have sought healthcare advice so there may be an unintended consequence of increased serious complications of RTI presenting to hospital e.g. mastoiditis, quinsy, community-acquired pneumonia. This requires further investigation using existing data linkage within the national data mart to evaluate hospital admission data for these infection codes. It will also be important to monitor trends in AMR to assess the impact of these changes in antibiotic use. To evaluate the reliability of e-messaging data to inform future SAPG work we plan to compare dispensing data and e-messaging data for this time period.

A key strength of the study is that it utilized national data from a robust electronic system which allowed use of near real-time data. However, the data are on e-messages for prescriptions issued and it is impossible to tell if prescriptions were dispensed and antibiotics taken. The national data e-messaging system does not include any handwritten prescriptions generated during home visits, stock orders of antibiotics used initially for some care homes and CACs, community pharmacies, non-medical prescribers and OOH services but these data will be evaluated in due course. A key weakness is that currently no indication is included on prescriptions, so assumptions were made about the infection being treated.

## Conclusions

Trends in antibiotic prescription data show that after an initial surge, and following 'lockdown' in Scotland, the number of prescriptions for those for antibiotics commonly used for respiratory

infections fell. To our knowledge there are no other published studies of this type so we cannot compare with other data at this time. Further analysis of national data is planned to provide a greater understanding of the reasons behind these trends.

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## Transparency declarations

None to declare.

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