Patterns of dispensed non-medical prescriber prescriptions for antibiotics in primary care across England: a retrospective analysis

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PATTERNS OF DISPENSED NON-MEDICAL PRESCRIBER PRESCRIPTIONS FOR ANTIBIOTICS IN PRIMARY CARE ACROSS ENGLAND: A RETROSPECTIVE ANALYSIS

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Dispensed non-medical prescriber prescriptions for antibiotics in primary care in England.

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STRUCTURED SYNOPSIS

Objective: To describe the patterns of dispensed non-medical prescriber prescriptions for antibiotics in primary care across England between 2011 and 2015.

Methods: A retrospective analysis of dispensed antibiotic prescriptions, written by non-medical prescribers and medical prescribers between 2011 and 2015 in primary care in England, obtained from the National Health Service Business Services Authority.

Results: Between 2011 and 2015, the numbers of non-medical prescribers (mainly nurses but also pharmacists and small numbers of allied health professionals) in England, who have independent prescribing capability, has risen by over a third to nearly 30,000. Most of these prescribers provide a broad range of services in primary care. The rate of dispensed non-medical prescriber prescriptions for antibiotics over this period has increased, as has the percentage of all primary care antibiotics dispensed that were prescribed by non-medical prescribers, which is currently nearly 8%. The most commonly dispensed NMP antibiotic prescriptions were penicillin, sulfonamides, trimethoprim, macrolides, tetracyclines, and nitrofurantoin.

Conclusion: Increasing numbers of non-medical prescribers are working in primary care in England and managing infections. Antibiotics prescribed by this group align with surveillance reports of antibiotic use in primary care. With the numbers of non-medical prescribers being set to rise further, they form an important group to involve in antimicrobial stewardship efforts.

INTRODUCTION

Over the last decade, legislative authority to prescribe has been extended in a number of countries and is on the policy agenda in many more. [1-3] Appropriately qualified non-medical healthcare professionals (nurses, pharmacists and allied health professionals (AHPs) (hereafter referred to as non-medical prescribers (NMPs)) in a number of countries (including the United Kingdom (UK), the United States, New Zealand, Netherlands, Ireland, Australia, Canada, Sweden), [4-7] have legislative authority to prescribe. Drivers for this role include quicker and more efficient access to medicines, better use of healthcare professionals' knowledge and skills, the need to reduce the workload of doctors and address doctor shortages, and the development of advanced practitioner roles. [4]

As of 2002, changes in legislation enabled any first level registered nurses in the UK, with 3 years qualified experience, to access independent prescribing training typically of 3 to 6-month duration.[8] This contrasts with some countries (e.g. the United States, Canada and Australia), where training to prescribe, also available to registered nurses, is at master's level and is a component of the advanced nurse practitioner programme, usually 2 years in length.[2] In 2006, independent prescribing rights in the UK were extended to include registered pharmacists. [9] Within the last three years registered AHPs (i.e. physiotherapists, podiatrists/chiropodists, radiographers), [10] and optometrists [11] have also been provided with independent prescribing rights. Apart from some restrictions around Controlled Drugs by AHPs, NMPs are able to independently prescribe any medicine within their area of competence. The numbers of these prescribers have steadily increased over the last 5 years. There are currently around 30,000 nurses, 3000 pharmacists and several hundred AHPs with prescribing capability and these numbers are set to rise. [12,13]

Resistance to antibiotics is a major global health problem [14,15] with overuse of antibiotics a key factor. [16,17] Although there is significant scope to improve the prescription of antibiotics in primary care, [18] apart from a retrospective analysis of patterns of primary care antibiotic prescribing by 2414 nurse prescribers

in Scotland, [19] which suggested that nurses do follow best practice guideline, there is no evidence available at a national level in England, on the patterns of antibiotic prescribing by NMPs. Given that the majority of NMPs work in primary care in a variety of roles and frequently prescribe antibiotics for infections, [20,21] it is important that we understand the prescribing behaviour of this group. The aim of this study was to describe the patterns of dispensed NMP prescriptions for antibiotics in primary care across England between 2011 and 2015.

MATERIALS AND METHODS

A Freedom of Information (FOI) request was submitted to the National Health Service Business Services Authority (NHSBSA) by MC. The NHSBSA Prescription Service provides prescribing information to prescribers and managing organisations within the National Health Service (NHS) in England. The following information was requested:

a) the total amount of all antibiotics (British National Formulary (BNF) chapter 5.1) prescribed nationally;
b) the total amount of all BNF prescribing by NMPs nationally;
c) monthly dispensing data of all antibiotics (BNF chapter 5.1) written by NMPs at Primary Care level and dispensed in the community for a period of five years from January 2011 to December 2015;
d) the total amount of all antibiotics (BNF chapter 5.1) prescribed at practice level data for four Clinical Commissioning Groups (CCG) (urban CCGs of Central Manchester and Lewisham and rural CCGs of Cumbria and Gloucestershire).

We sought advice and clarification from the Cardiff University Ethics Committee and the NHSBSA which both confirmed that ethical approval for the study was not required as the data are anonymous and readily available in the public domain from the NHSBSA.

Prescribing data presented in this paper were derived from FP10 prescription forms written by prescribers in primary care. FP10 prescription forms are NHS prescription forms used by specific groups of prescribers in England, including medical and NMPs and NHS dentists. Data at primary care level contained information on type of NMP and prescription details (name, strength, formulation, quantity and cost of medicine). Data at practice level contained information on type of NMP, total amount of antibiotics prescribed, and practice setting details.

Descriptive analyses were undertaken, with dispensed prescriptions reported per quarter and standardised using mid-year population estimates (obtained from the Office for National Statistics (ONS)) and number of NMPs (obtained from the Department of Health (DoH)). Results are presented overall, by type of NMP, and by class of antibiotic.

RESULTS

Number of NMPs in primary care across England

Between January 2011 and December 2015, the numbers of NMPs rose by 38.5% (absolute increase from 21,545 to 29,836). Most of these prescribers were nurses (88% in 2011 rising to 89.8% in 2015), some were pharmacists (6.9% rising to 9.9%) and a few were AHPs (2.1% rising to 3.3%) (see Figure 1). During this time period, over 98 million prescriptions items dispensed were written by NMPs (Table 1), and the numbers of these prescriptions steadily increased year upon year. There was an 18.1% relative increase in the rate of all dispensed prescriptions items written per 100,000 person days per NMP between 2011 and 2015 (i.e. from 0.0038 in January to March 2011 to 0.0045 in October to December 2015).

Total number of antibiotics dispensed, and dispensed prescriptions written by NMPs

The total number of dispensed antibiotic prescriptions, issued by medical and NMPs between 2011 and 2015 was over 186 million (Table 1). The rate of all antibiotics dispensed per 100,000 person-days by medical and NMPs decreased from 212.2 in January 2011 to 183.5 in December 2015, with peaks observed during the January to March quarters each year. 6.5% (i.e. over 12 million prescriptions items and representing 12.3% of all NMP prescriptions) (Table 1) of these prescriptions were written by NMPs.

The rate per 100,000 person-days per NMP demonstrated a 14.4% relative decrease over this time period.

The percentage of all dispensed NMP prescriptions for antibiotics decreased from 14.3% in January to March 2011 to 10.3% in October to December 2015 (a 27.5% relative decrease). This decrease was steady, with peaks observed during the January to March quarter. Conversely, the percentage of all primary care antibiotic dispensed that were prescribed by NMPs steadily increased from 5.6% to 7.6% (a 37.1% relative increase). Practice level data identified that the numbers of NMPs working within CCGs

varied. As well as working in general practice, these NMPs worked in a variety of settings and provided a broad range of services (including community services, continence service, lymphoedema services, substance misuse services, palliative care, intermediate care, and out-of-hours services) across CCGs.

Dispensed prescriptions for antibiotics written by NMPs

The majority of dispensed NMP prescriptions for antibiotics were written by nurses, and the rate at which they were dispensed, decreased over time from 28.79 at the beginning of 2011 to 26.22 by the end of 2015. Peaks were observed during the January to March quarter. This decrease was also evident in the overall rate of dispensed NMP prescriptions for antibiotics. Dispensed AHP prescriptions for antibiotics did occur, but only infrequently. Dispensed pharmacist's prescriptions for antibiotics increased from 0.83 per prescriber in January 2011 to 4.08 in October 2015. No seasonal trends were observed for pharmacists or AHPs (Table 1).

Types of antibiotics dispensed

Penicillins were the most commonly dispensed antibiotic prescribed by NMPs (see Table 2), although the rate at which these prescriptions were dispensed, decreased over time from 16.4 at the beginning of 2011 to 13.6 at the end of 2015 (a 16.9% relative decrease) (Figure 2). Peaks were observed during January to March quarters. The four next most commonly dispensed NMP antibiotics prescriptions, categorised according to BNF chapter 5.1 anti-bacterial subsections, were sulfonamides and trimethoprim (these were mostly dispensed trimethoprim prescriptions), macrolides, tetracyclines, and nitrofurantoin (which was categorised under the BNF class of "urinary tract infections") (see Table 2). Trimethoprim dispensing decreased over time by 9.4%, macrolides decreased by 15.3%, whereas tetracyclines increased by 20.8% and nitrofurantoin by 119.4%. Peaks were observed for trimethoprim and nitrofurantoin during the October to December quarter, whereas peaks were observed during the January to March quarter for macrolides and tetracyclines (see Figure 3).

DISCUSSION

Although surveillance data of antibiotic use in England is available[22] this data does not differentiate between medical and NMPs. This is the first study to describe the patterns of dispensed NMP prescriptions for antibiotics in primary care across England. Between 2011-2015, the numbers of NMPs in England who have independent prescribing capability has risen by over a third to nearly 30,000. The majority of these prescribers practice in primary care and provide a broad range of services. The rate of dispensed NMP prescriptions for antibiotics over this period has increased, as has the percentage of all primary care antibiotic dispensed that were prescribed by NMPs. The most commonly dispensed NMP antibiotic prescriptions were penicillin, sulfonamide and trimethoprim, macrolide, tetracycline, and nitrofurantoin.

The findings of this work confirm that NMPs are an increasing contributory influence to total antibiotic prescribing in primary care. This is in-line with national evaluations of NMPs in England in which

infections have been identified as a treatment area in which high numbers prescribe medicines, [21,23] and for which growing numbers report they intend to do so.[23] Most of these prescriptions were written by nurses. This is unsurprising given that greater numbers of nurses (the largest NHS workforce in England [24]), as compared to pharmacists and AHPs, are qualified to prescribe. Furthermore, nurses were the first group of non-medical healthcare professionals to be granted prescribing rights,[8] and have been prescribing antibiotics independently in primary care for over 15 years.[25] Given how health services are set to change, [12,13]and the key roles nurses will play within these services, [12,13] these numbers will only increase.

Our findings align with a retrospective analysis of patterns of primary care antibiotic prescribing by nurse prescribers in Scotland which indicated an increase in the volume of antibiotic prescribing by nurses.[19] In-line with findings of national research, [21,23, 26] practice level data suggest that non-medical prescribing has been implemented inconsistently across CCGs, and NMPs work in a broad range of services and roles and prescribe antibiotics. This may account for the differing rates of antibiotic prescribing by NMPs that have been reported previously.[19] Recognising which settings and services these relatively new groups of prescriber's work is important if we are to provide them with appropriate support in their choice and use of antibiotics, and optimise prescribing practice.

In-line with guidance for the treatment of minor infections, [27] narrow spectrum antibiotics (penicillins, macrolides, tetracyclines) were the most frequently dispensed NMP prescriptions for antibiotics. Although not reporting specifically on NMPs, this has also been observed in surveillance reports of antibiotic use in primary care[22] and aligns with findings of nurse prescribers in Scotland.

Our data does not enable us to make any judgement on the appropriateness of prescribing by NMPs and more information is required to establish whether these prescribers are prescribing appropriately.

However, the overall decrease in rate of dispensed NMP prescriptions for antibiotics, the most frequently prescribed antibiotics being narrow spectrum with small numbers of dispensed NMP prescriptions for broad spectrum antibiotics (recommended when antibiotics are necessary, but reserved to treat resistant disease[27]), suggests that these prescribers are following government recommendations for self-limiting minor infections. The rise in dispensed NMP prescriptions for nitrofurantoin might be explained by national infection guidelines from 2014 recommending its use in the treatment of community urinary tract infections (UTI). Given the rising numbers of NMPs and their increasing contributory influence to total antibiotic prescribing in primary care, it is important that this group are involved in antimicrobial stewardship activities.

Much existing research has focused upon trying to understand why general practitioners (GPs) prescribe antibiotics for RTIs however, if we are to design interventions to target the prescribing behaviour of the growing numbers of NMPs, further research is required to establish a better understanding of the influences on the prescribing behaviour of these prescribers including similarities and differences in experiences, challenges and management strategies.

Study Limitations

The data analysed only included data for NMP prescriptions dispensed i.e. prescriptions written (but not dispensed) were not included. Therefore, our findings may not reflect the prescribing patterns of NMPs. We were only able to access practice level data from four CCGs and so the range of services provided by these prescribers may not be representative of all CCGs in England. However, these services are in-line with national evidence.[21,23,26] Although our data does tell us the percentage of NMPs prescribing antibiotics, we were unable to determine whether prescribing was appropriate. The data only includes antibiotics prescribed on FP10 prescriptions by NMPs. We do not know if NMPs prescribed antibiotics

on other types of NHS or private prescriptions. However, current evidence suggests that the numbers of private prescriptions written by NMPs are low. [20, 23]

CONCLUSION

Increasing numbers of NMPs are working in primary care in England and managing infections. Antibiotics prescribed by this group aligns with surveillance reports of antibiotic use in primary care. With the numbers of NMPs being set to rise further, they form an important group to involve in antimicrobial stewardship efforts.

FUNDING

This study was carried out as part of our routine work.

TRANSPARENCY DECLARATIONS

Competing interests: All authors have completed the ICMJE uniform disclosure form at www.icmje.org/coi_disclosure.pdf and declare: no support from any organisation for the submitted work, no financial relationships with any organisations that might have an interest in the submitted work in the previous three years, no other relationships or activities that could appear to have influenced the submitted work.

CONTRIBUTORSHIP STATEMENT

MC made a substantial contribution to the conception and design of the work; the acquisition and interpretation of data, and drafting of the work. DG made a substantial contribution to the design of the work, the analysis and interpretation of data, and drafting of the work. RL made a substantial contribution to the design of the work, the interpretation of data, and critically revised drafts of the work. All authors approved the final version to be published and agree to be accountable for all aspects

of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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Table 1: *NMP prescriptions dispensed in primary care in England between January 2011 and December 2015*

NMP type	Total number of NMP prescriptions dispensed in primary care	Total number of NMP antibiotic prescriptions dispensed in primary care	Total number of dispensed antibiotic prescriptions in primary care	% of all NMP dispensed prescriptions for antibiotics	% of all dispensed antibiotics prescribed by NMPs
Overall	98,577,980	12,143,695	186,323,947	12.3	6.52
Nurse	93,102,682	12,077,107		13.0	6.48
Pharmacist	5,454,942	66,332		1.2	0.04
Optometrist	3,846	29		0.8	0.00
Physiotherapist	2,380	141		5.9	0.00
Radiographer	0	0		0.0	0.00
Chiropodist	14,130	86		0.6	0.00

Figure 1: *Year-by-year number and type of NMPs in England*

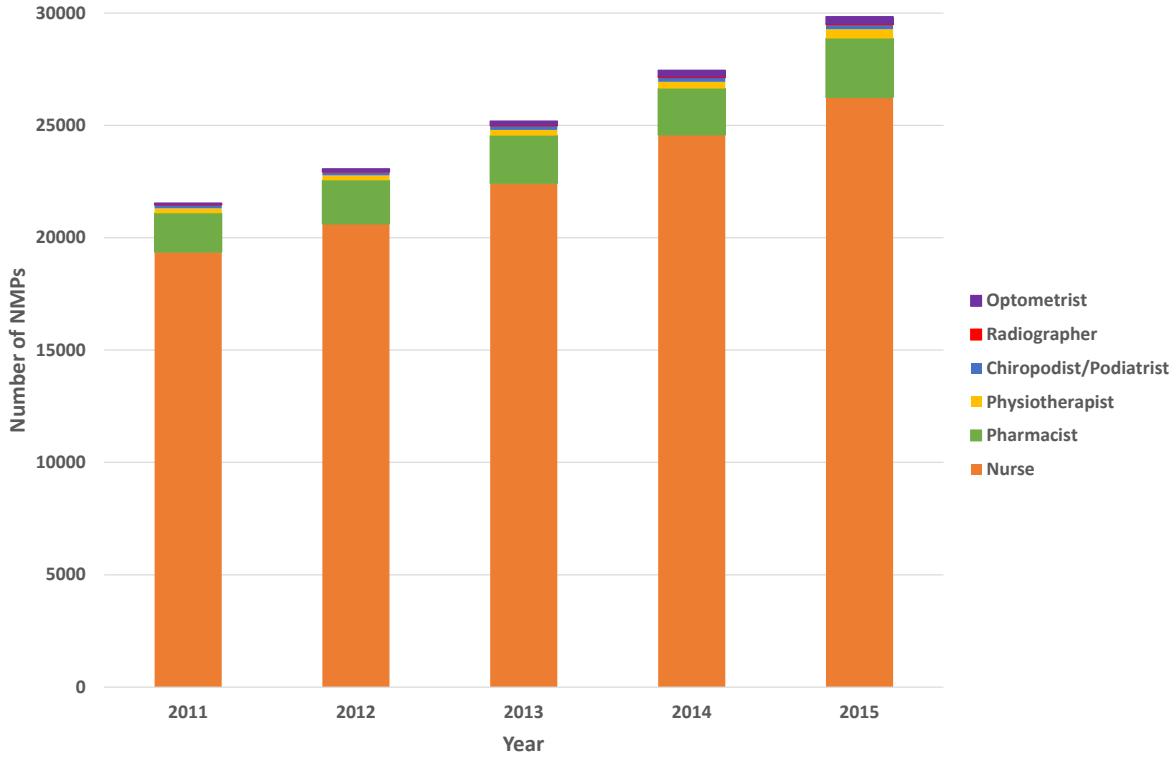

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Table 2: *Antibiotic class and type per NMP*

Antibacterial class	NMP type			
	Nurse	Pharmacist	Physiotherapist	Optometrist
Penicillins	7,243,002	27,042	86	5
Sulfonamides and trimethoprim	1,349,594	8,733	1	0
Macrolides	1,313,933	8,211	11	5
Tetracyclines	883,060	11,590	13	19
Urinary-tract infections (nitrofurantoin)	688,924	5,129	5	0

Figure 2: *Dispensed NMP prescriptions for antibiotics, per NMP by BNF class (all classes)*

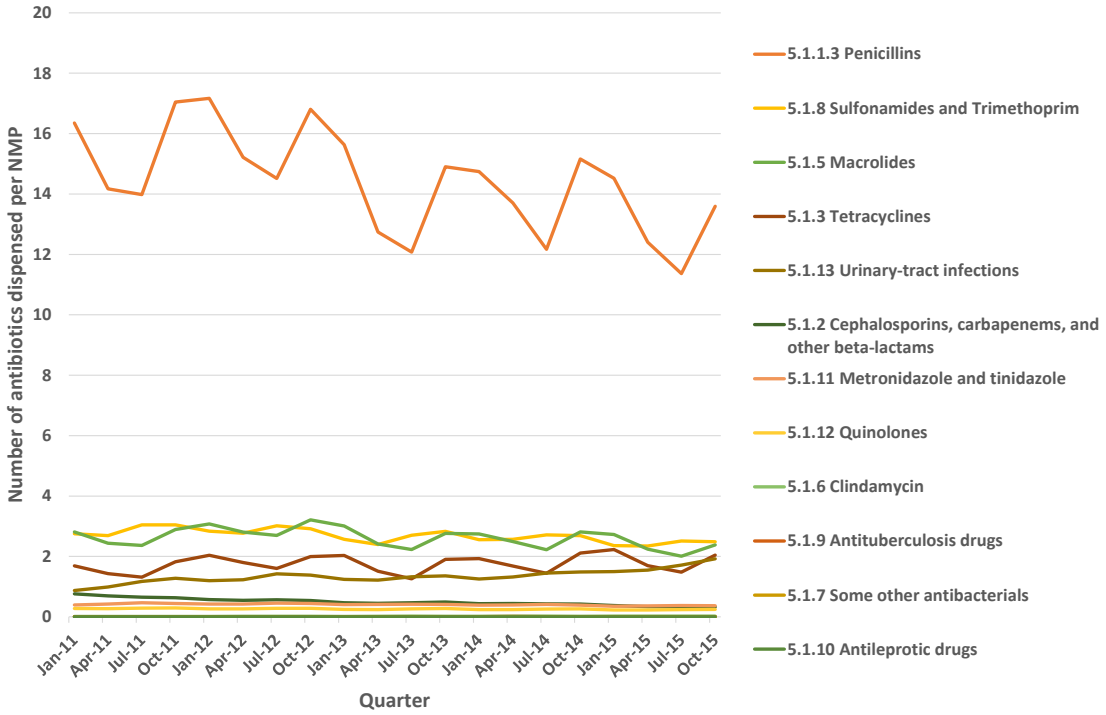

Figure 3: *Rate of dispensed NMP prescriptions for antibiotics, per NMP by BNF class (sulfonamides and trimethoprim, macrolides, tetracyclines, nitrofurantoin, cephalosporins, carbapenems, and other beta-lactams, metronidazole and tinidazole, and quinolones).*

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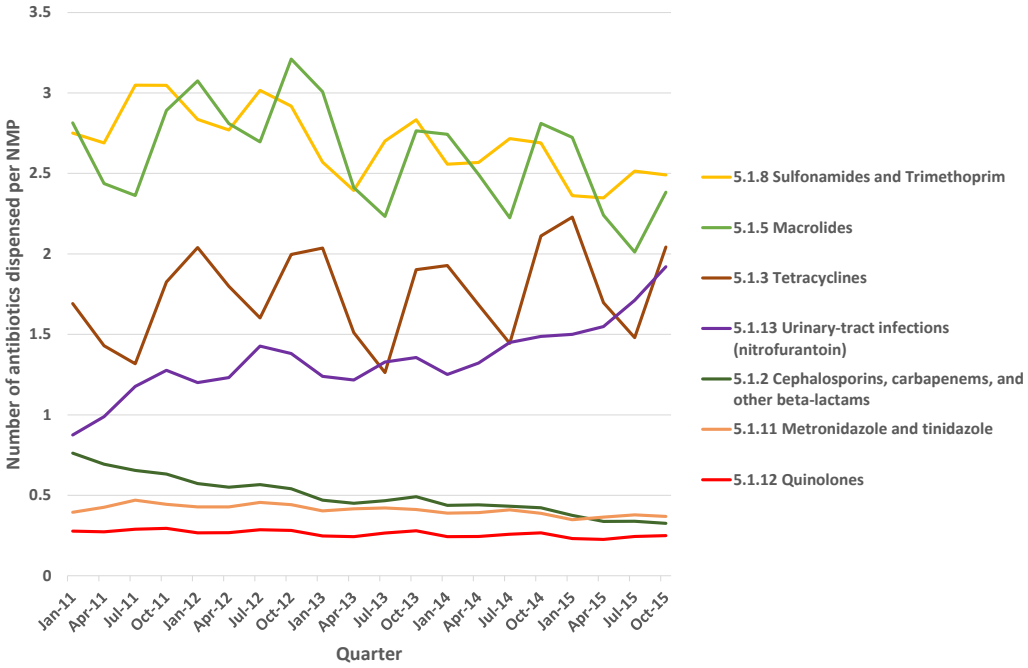

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