What antimicrobial stewardship strategies do NHS commissioning organizations implement in primary care in England?

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Objectives: To identify and explore strategies that English NHS commissioning organizations implemented to improve antimicrobial stewardship (AMS) within primary care.

Methods: Questionnaire sent to the medicines management teams (MMTs) of all 209 clinical commissioning groups (CCGs) in England, in 2017.

Results: A total of 89% (187/209) of all English CCGs responded to the questionnaire; 74% of responding CCGs (123/167) had a prescribing incentive/engagement scheme, with MMTs representing 88% (90/102) considering incentive schemes successful or very successful for prioritizing AMS in primary care, especially when linked to prescribing NHS Quality Premium indicators. AMS audits were considered successful or very successful by 91% (126/138) of responding CCGs, as they identify reasons for inappropriate prescribing and opportunities for future improvement. All responding MMTs (169/169 CCGs) reported feeding back local/national antimicrobial prescribing data to the general practices they commission, 85% (142/168) to their CCG/Commissioning Support Unit (CSU) board and only 33% (56/169) to out-of-hours services. Benchmarking prescribing data was reported as a powerful tool to engage practices, facilitating an element of competition and peer pressure.

Conclusions: National antimicrobial resistance improvement schemes, in particular the NHS England Quality Premium, have influenced CCG improvement priorities. Most CCGs now report successful improvement strategies including the use of both local and national antibiotic prescribing data to motivate improvements; these should be continued and extended to out-of-hours providers. As local audit data have helped to identify reasons for inappropriate prescribing and inform improvement planning, all organizations should adopt this strategy and include it in local quality improvement schemes, ensuring performance reporting to organizational board level.

Introduction

In 2017, 81% of antibiotic prescribing occurred in primary care in England. No single or simple strategy will suffice to fully contain the emergence and spread of antimicrobial-resistant infections. In recognition of the national importance of controlling the global antimicrobial resistance (AMR) challenge, since 2015 the NHS in England has included ‘improving antibiotic prescribing in primary care’ as one of its Quality Premium (QP) improvement measures. An NHS QP rewards clinical commissioning groups (CCGs) for improvements in the quality of the services that they commission and for associated improvements in health outcomes. CCGs are clinically led statutory NHS bodies responsible for the planning and commissioning of healthcare services for their local area. Appropriate antimicrobial prescribing is promoted and facilitated by medicines management teams (MMTs). MMTs sit within CCGs or commissioning support units (CSUs) and support one or more CCGs. MMTs are generally teams of pharmacists and pharmacy technicians who work closely with GPs and local health providers to help get the best out of medicines for local people. There are between 5 and 120 GP practices in each CCG.

NICE antimicrobial stewardship (AMS) guidance (NG15) encourages commissioning organizations to develop and implement AMS programmes. Such programmes include: local incentive/reward schemes; guidance for the management of common infections; AMS education/training; benchmarking and feedback of antimicrobial prescribing data; and AMS audits. National resources such as the TARGET (Treat Antibiotics Responsibly, Guidance, Education, Tools) toolkit and Antibiotic Guardian help facilitate these AMS programmes. Primary care commissioners and practitioners have many competing priorities and may find it difficult
to implement the NICE AMS guidance.\textsuperscript{9} To support implementa-
tion of the QP, NHS England and PHE established AMS hubs, PrescQIPP\textsuperscript{10} and Fingertips,\textsuperscript{11} providing open access to antibiotic prescribing and infection data at the CCG and GP practice level, and signposting to resources such as TARGET.\textsuperscript{7}

Our aim was to identify and explore strategies English NHS commissioning organizations have implemented to improve AMS within primary care.

Methods

This research is part of a larger work programme to identify and describe AMS strategies in primary care in England. The learning will provide data for both national and local healthcare organizations, to inform interventions to optimize antimicrobial prescribing within the UK's five-year action plan for AMR (2019–24)\textsuperscript{3} and the NHS Long Term Plan.\textsuperscript{12}

Design

Qualitative interviews were first undertaken with MMT AMS leads, representing CCGs with a range of antimicrobial prescribing, based on 2016 data. Interview findings informed development of a questionnaire, which was cascaded to MMTs via email.

The AMS implementation questionnaire (Appendix S1, available as Supplementary data at JAC-AMR Online) comprised both open and closed questions and explored MMTs’ local implementation and views of the success of:

- the NHS QP for AMR
- benchmarking and feedback of antimicrobial prescribing data to general practices, out-of-hours (OOH) services and the CCG/CSU board
- AMS audits of community antibiotic prescribing
- locally developed incentive/reward schemes to encourage AMS
- Chief Medical Officer’s (CMO’s) letter: behavioural intervention where the most senior doctor in the government wrote to CCGs with higher antibiotic prescribing rates\textsuperscript{13}
- barriers and facilitators to AMS
- other AMS initiatives and resources

Setting

Commissioning organizations for English primary care, including both CCGs and CSUs.

Participants

In 2016, the heads of medicines management responsible for all 209 CCGs were contacted and asked to nominate a staff member who would be able to discuss antimicrobial prescribing in their geographical area (AMS lead, usually a pharmacist). A subset of these individuals were invited to participate in qualitative interviews and all were electronically mailed the study questionnaire later. The methodology has been described in full elsewhere.\textsuperscript{14}

Ethics

This study was registered with the PHE Research Support and Governance Office (RSGO) and approved by the PHE Research Ethics and Governance Group (REGG) (R&D Reference: R&D 277) and the Health Research Association (HRA) (IRAS project ID: 213816; REC reference: 16/HRA/4152). All participants gave informed consent for interviews to be recorded and transcribed and for anonymized quotes to be used in publications. Questionnaire responses were anonymized before analysis.

Results

Qualitative interviews to inform questionnaire development

Eleven medicines management AMS leads participated in interviews. See Appendix S2 for example quotes from the qualitative interviews.

Questionnaire responses

Overall, medicines management AMS leads representing 89% (187/209) of all English CCGs responded to the questionnaire. Of these, 90% (169/187) provided responses to the benchmarking and feedback of antimicrobial prescribing data section; 89% (167/187) to both the audit and incentive schemes sections; and 89% (166/187) to the barriers and facilitators section. Not all respondents answered all questions; therefore, results are represented as a percentage of CCGs that responded to each question. See Appendix S3 for a full breakdown of responses.

Success of the QP in supporting AMS in primary care

AMS leads commented in free-text questions that the AMR QP provided a structural focus to their organization and highlighted the importance of AMS at the senior management level.

‘Including in the Quality Premium means that senior (non-clinical) managers take notice and don’t prioritise other workload instead.’ (CCG-82—Questionnaire)

The financial incentive attached to achieving QP indicators was reported as the main driving factor for prioritization and implementation of AMS initiatives (n = 23).

‘In the current difficult financial climate anything that will bring funding into a CCG will be prioritised.’ (CSU—Questionnaire)

Although the national QP was important, AMS leads commented that it did not necessarily motivate GP staff to become engaged as the funding goes to the CCG rather than directly to general practices; therefore, many GPs would be unaware of the QP (n = 25).

‘Some practices won’t engage too much as the funding comes into the CCG if we achieve targets rather than straight to GPs.’ (CCG-101—Questionnaire)

Success of benchmarking and feedback of antimicrobial prescribing data in supporting AMS in primary care

All responding MMTs (169/169 CCGs) reported feeding back local/national antimicrobial prescribing data to the general practices they commission; only 33% (56/169 CCGs) fed back to OOH services. A total of 85% (142/168) of CCGs reported feeding this data upward to their CCG/CSU board. Reasons for not feeding upwards included: AMS not being a concern as the CCG had usage lower than the national average; data not requested by the board; and data already shared at senior meetings.
Sources of antimicrobial prescribing data
Interfaces for accessing antimicrobial prescribing data, reported by MMTs, were:

- NHS BSA ePACT website\textsuperscript{15} (87%; 145/167 responding CCGs)
- PrescQIPP AMS hub\textsuperscript{10} (57%; 95/167 responding CCGs)
- NHS BSA Information Service Portal\textsuperscript{16} (39%; 65/167 responding CCGs)
- PHE portal (Fingertips)\textsuperscript{11} (37%; 61/167 responding CCGs)
- CSU reporting (25%; 42/167 responding CCGs)
- OpenPrescribing\textsuperscript{17} (8%; 14/167 responding CCGs)

MMTs representing 25 CCGs reported using ‘other’ sources to obtain their prescribing data, such as in-house or local analysts, and directly from GP clinical systems.

Feeding back antimicrobial prescribing data to primary care practitioners
Of those that responded, 94% (159/169) fed back data aligned with national AMS initiatives, such as the CCG QP and Improvement Assessment Framework.\textsuperscript{18} Ninety-nine percent (168/169) fed back GP practice-level data; 86% (145/169) CCG-level data; and 23% (39/169) individual prescriber-level data. Eighty-five percent (144/169) reported feeding back both GP- and CCG-level data.

Frequency of feeding back antimicrobial prescribing data to primary care practitioners
MMTs representing 91% of responding CCGs (152/167) reported feeding back antimicrobial prescribing data to primary care practitioners at least quarterly and 44% (74/167) monthly. Fourteen percent (24/167) reported feeding back antimicrobial prescribing data differently to antibiotic prescribing outliers. This was generally more frequently than the norm; one reported:

‘We work with outliers on a targeted approach so use more detailed data when required, especially to send well done messaging!’ (CCG-87—Questionnaire)

Benchmarking
Eighty-seven percent of CCGs (146/168) that completed the benchmarking question reported feeding back local benchmarking data against the national average; 78% (112/144) reported that this was successful (51%; 73/144) or very successful (27%; 39/144) at prioritizing AMS activity for these healthcare staff (Figure 1).

In free-text responses, benchmarking prescribing data was mentioned as a very powerful tool to engage practices (n = 9) as no one wants to be an outlier, facilitating an element of competition and peer pressure (n = 26), encouraging practitioners to start asking questions about their own prescribing of antimicrobials

![Figure 1. Success of AMS initiatives in supporting AMS in primary care (n = 187).](image)
and managing of patients, and resulting in more appropriate prescribing behaviour \((n = 28)\).

‘It generates questions within practices and across the wider health economy. It also generates competition between practices. I’m frequently asked to drill down further from practice level data to prescriber level data. Practices then use this as a tool to challenge individual prescribers prescribing practice - it’s used as an educational tool to promote learning.’ (CCG-85—Questionnaire)

‘Having this data available regularly keeps AMS on ‘the agenda’. I believe GPs are inundated and it is important to keep AMS in the consciousness of GP practice staff.’ (CCG-77—Questionnaire)

Seventy-eight percent of responding CCGs \((101/129)\) reported that monitoring and feeding back primary care antimicrobial prescribing data to the CCG/CSU board was successful \((44\%; 57/129)\) or very successful \((34\%; 44/129)\) for prioritizing AMS. AMS leads commented that the prescribing data: ensures there is a constant priority and focus on AMS \((n = 20)\); facilitates monitoring \((n = 4)\); can demonstrate a change in prescribing \((n = 7)\); and is important for forward planning \((n = 7)\).

‘Can be a real wake-up call when your CCG realises they are very high prescribers compared to other areas.’ (CSU-23—Questionnaire)

**Success of audits in supporting AMS in primary care**

AMS audits were reported to be undertaken in 81% \((136/167)\) of responding CCGs: 59% of these \((80/136)\) were undertaken by practice staff and MMTs undertook AMS audits on behalf of half of all CCGs that responded to this question \((50\%; 68/136)\). In free-text responses, it was also mentioned that the practice-based medicines management staff sometimes undertake the AMS audits for the practice \((n = 6)\).

Over the last 2 years, responding MMTs reported that they had promoted/undertaken audits for: urinary tract infections \((66\%; 82/124)\); upper respiratory tract infections \((51\%; 63/124)\); lower respiratory tract infections \((31\%; 39/124)\); and skin infections \((13\%; 16/124)\). Respondents also commented that they undertook audits based on antimicrobial agent rather than condition \((n = 12)\) including: broad-spectrum agents \((n = 26)\); total volume \((n = 25)\); and long-term prophylactic use \((n = 4)\).

MMTs reported discussing audit findings in the GP practices \((89\%; 119/133\) of responding CCGs): 72% of these \((96/133)\) with the prescribers and 46% \((61/133)\) with as many primary care practitioners as possible. Some respondents commented that they send a report for discussion within practice meetings \((n = 6)\).

Approximately half of CCGs that completed the question \((51\%; 68/133)\) reported audit findings to the CCG/CSU, but only 17% \((23/133)\) reported audit findings to the CCG/CSU board.

Over half \((54/102)\) of responding CCGs reported that more than 75% of their practices completed an AMS audit in 2016/17. Free-text responses regarding methods for monitoring audit completion included:

- submission to MMT as part of prescribing incentive scheme or GP quality contract \((n = 49)\)
- the MMT was involved in organizing the audit \((n = 12)\)
- practices were asked to return GP practice-based audit action plans \((n = 6)\)

Ninety-one percent of responding CCGs \((126/138)\) reported that AMS audits were successful \((61\%; 84/138)\) or very successful \((30\%; 42/138)\) in supporting AMS in primary care (Figure 1). Respondents commented that audits show potential avenues for antimicrobial prescribing improvements \((n = 23)\) and allow peer review \((n = 18)\) and self-reflection \((n = 14)\) (Figure 2). However,

![Reasons for audit success at supporting AMS in primary care](image-url)

![Audit issues](image-url)

**Figure 2.** Free-text responses relating to audit.
AMS leads commented that there was sometimes a lack of practice engagement \( (n=10) \) and MMT staff resource to optimize practice audits \( (n=5) \).

**Success of locally developed incentive/reward schemes for general practices in supporting AMS in primary care**

Seventy-four percent \( (123/167) \) of responding CCGs indicated that they had a prescribing incentive and/or engagement scheme, of which antimicrobial prescribing formed a part. Participants noted that incentive schemes were usually linked to prescribing targets associated with the QP indicators \( (n=86) \) and resulted in a practice financial reward, if reached \( (n=59) \).

‘Practices would be given a payment based on the local prescribing incentive scheme if they met the target for the quality premium.’ (CCG-118—Questionnaire)

The main components of the local schemes included: AMS audits \( (46%; 57/123) \); practitioners encouraged to become antibiotic guardians \( (32%; 39/123) \); compulsory AMS/AMR education/learning \( (25%; 31/123) \); and completion of a self-assessment checklist \( (8%; 10/123) \).

Eighty-eight percent \( (90/102) \) of responding CCGs reported incentive/reward schemes as successful \( (51%; 52/102) \) or very successful \( (37%, 38/102) \) at prioritizing AMS activity for primary care practitioners (Figure 1). Respondents commented that financial incentivization works \( (n=20) \) and it raises practitioners’ awareness as it is seen as a priority and a focus \( (n=18) \).

‘Inclusion of any subject in the local incentive scheme ensures it is discussed and prioritised by GP practices. It isn’t merely the financial reward as that is relatively small but it is seen as the CCGs prescribing priorities.’ (CSU-2—Questionnaire)

Sixty-seven percent \( (64/95) \) of responding CCGs reported that over 75% of their practices achieved the targets set in their local AMS incentive/reward scheme.

**Success of behavioural intervention through letter from CMO in supporting AMS in primary care**

AMS leads representing 131 CCGs reported knowledge of one or more of their practices having received a CMO letter in either January 2016 and/or April 2017 \( (115 \text{ CCGs each year, but not the same ones}) \). However, 40 and 36 CCGs, respectively, did not know whether their practice(s) had received a letter. Although CCGs reported that the CMO letter raised awareness about antibiotic use and encouraged the practices to reflect on their practice prescribing and modify their prescribing behaviour \( (n=27) \), they viewed it as less successful than other initiatives at raising AMS awareness (Figure 1 and Figure 3).

Some AMS leads commented that the prescribing data used to select the high-prescribing practices \( (n=22) \) did not reflect current prescribing behaviour \( (n=14) \) and was skewed by walk-in centres \( (n=2) \).

Some respondents commented that there was an opportunity to improve the impact of the CMO letter, by closer collaboration with local MMTs using the latest prescribing data and local knowledge to select practices.

**Facilitators and barriers for primary care practitioners**

Eighty-four percent \( (124/147) \) of responding CCGs reported that primary care practitioners’ awareness of AMS activities promoted in their CCG was good or excellent, but fewer prioritized AMS \( (68%; n=59) \).

Positive comments about the CMO’s letter

- ‘This approach reiterated that this was not just the CCG who was monitoring and reporting to the practices on their AMS performance - it was a much more significant national concern.’ (CCG-32—Questionnaire)
- ‘Although angered by the letter it spurred the practice to do a deep-dive review of antimicrobial prescribing and peer review.’ (CCG-69; CCG-70; CCG-71—Questionnaire)

Barriers to changing behaviour after receiving the CMO’s letter

- ‘I think it is back to the issue of capacity and prioritisation - some prescribers acknowledge that they prescribe antibiotics when perhaps they shouldn’t due to pressure from patients or due to defensive medicine. Supporting them to move beyond this approach is resource intensive. They may know what they should do but not how to put it into practice.’ (CCG-17; CCG-40; CCG-102; CCG-104—Questionnaire)

Opportunity to improve the impact of the CMO’s letter

- ‘Unfortunately, these letters get sent out without CCGs being aware of this. Quite often it is unclear why practices have been sent letters as the data we have does not suggest they should have been targeted. Our highest prescribing practices often do not receive these letters. As we have not been involved with this process it is hard for us to explain why the practice has received the letter and what they need to do. I therefore think this is unsuccessful as it disengages the practice. If this process was done with the CCG teams I think this would improve the process - we could work together to get the letters to our least engaged/highest prescribing practices and then follow up with an offer of support tailored to meeting the requirements of the letter.’ (CCG-96—Questionnaire)

Figure 3. Free-text responses relating to the CMO’s letter.
98/145 of responding CCGs) or implemented initiatives (61%; 86/140 of responding CCGs).

‘I think that awareness amongst primary care practitioners is good. However, implementation of AMS initiatives without the CCG supporting or taking charge is poor.’ (CCG-32—Questionnaire)

AMS leads were presented with a list of potential barriers for primary care practitioners, collated from the qualitative phase of the study, and asked ‘how big a barrier are the following characteristics for your primary care practitioners?’ (Figure 4). Eighty-three percent (138/166) of responding CCGs perceived that public/patient pressure was a big or very big barrier, with some commenting that over-prescribing in secondary care (n=4) and patients accessing other healthcare to obtain an antibiotic (n=3) exacerbated this (Figure 5).

Sixty-four percent (104/163) of responding CCGs perceived that ‘clinicians don’t want to make the wrong decision and therefore give antibiotics when they are not always needed’ was a big or very big barrier.

One-fifth (32/164) of respondents perceived that ‘AMR/AMS is not a top priority in primary care’ was a big or very big barrier, commenting that this was due to time, competing messages and other priorities (n=14). Other suggested barriers for primary care practitioners are reported in Appendix S4.

Respondents indicated that practice pharmacists are seen as important facilitators, but MMTs preferred CCG-funded staff as this gave CCGs greater control over their workplans. See Appendix S5 for other facilitators.

Facilitators and barriers for MMTs

Ninety-eight percent of responding CCGs (162/166) reported that their MMTs’ awareness of AMS was good or excellent.

AMS leads were presented with a list of potential barriers for MMTs, collated from the qualitative phase of the study, and asked ‘how big a barrier are the following characteristics for your medicines management team?’ (Figure 6).

In regards to the potential barrier ‘within medicines management, one of our priorities is cost-saving and antimicrobial prescribing is not seen as a huge expense’, 29% (48/164) of responding CCGs reported that it was not a barrier; 15% (24/164) a very small barrier; 18% (29/164) a small barrier; 27% (45/164) a big barrier; and 11% (18/164) a very big barrier.

There were many other barriers for MMTs suggested by respondents that would influence antimicrobial prescribing and AMS (Appendix S6).

All suggested facilitators for AMS, collated from the qualitative phase, were generally rated important or very important (Figure 7). Ninety-five percent (155/164) of responding CCGs reported that a ‘joined up approach between all sectors involved in AMS’ was important or very important.

Sixty-six percent (108/163) of responding CCGs reported that dedicated staff within the MMT who are solely responsible
Barriers for primary care practitioners

‘Our GPs are concerned about A&E prescribing antibiotics for what seem like minor conditions, which then puts pressure on them to also prescribe for minor conditions when the patient next presents for the same problem. They see secondary care as the drivers of increased patient expectations around antibiotics.’ (CCG-84 – Questionnaire)

‘Patients are very aware of how to access healthcare in our area and if they feel they require antibiotics, they will visit other sites to obtain what they want i.e. GP, walk-in centre/urgent care, OOHs, A&E.’ (CCG-67 – Questionnaire)

‘Primary care practitioners are aware but prioritising AMS amongst their other work is not easy with high demand even though evidence is available to support AMS activities leading to lower patient demand.’ (CCG-11; CCG-138 – Questionnaire)

‘They are very busy with other things and there aren’t many of them either practice pharmacists or CCG funded pharmacist, although the latter can be more focussed and effective.’ (CCG-128; CCG-133 – Questionnaire)

‘We do not have practice pharmacists - but can definitely see potential if pharmacist working in practice to increase AMS awareness and help prioritise AMS.’ (CCG-57; CCG-63; CCG-126 – Questionnaire)

Figure 5. Free-text responses relating to AMS barriers for primary care practitioners.

Discussion
Findings suggest that, while awareness of AMS is high, this has not always translated into action. However, our study confirms that the QP has the greatest influence on prioritization of AMS by medicines management staff due to its national focus and financial incentive for CCGs. The antibiotic QP in primary care has been very effective, with an overall 7.3% (2015–17) reduction of antibiotic prescription items across 96% (201/209) of CCGs.19 As the national financial incentive goes to the CCG rather than the GP practices, many CCGs provide local practice incentive schemes, often based on the QP indicators, which facilitated monitoring of resource uptake and increased the priority of AMS for practitioners. Cochrane review findings indicate that financial incentives may be effective for AMS is an important or very important facilitator for AMS (Figure 8).

Other noted barriers related to other roles in primary care included: locums (n = 13); OOHs (n = 3); care homes (n = 3); trainee GPs overprescribing due to inexperience (n = 2); and community pharmacy (n = 1) (Figure 9).

Figure 6. Respondents’ perceived impact of barriers to AMS for MMTs (n = 187).
in changing healthcare professional behaviours and, in turn, patient outcomes.20

The QP has also had an impact on feedback of antibiotic prescribing data, as QP indicators are now the main focus for reporting. All MMTs reported providing antibiotic prescribing data for general practices, which is promising, as feedback suggests this keeps it on the agenda within the GP setting and motivates outliers to audit their personal prescribing. Feeding back of prescribing data is reported as a benefit, but this is only provided to 33% (56/169) of all OOH providers. It is recommended that accurately collecting and reporting OOH prescribing is explored.

Recent antimicrobial audits were undertaken by most CCGs (81%; 136/167) in the last 2 years (2015–17), which is encouraging, as AMS leads’ feedback indicated that audits were an important catalyst in motivating behaviour change for overprescribers. Audit templates currently exist for a range of conditions;7 however, as findings suggest audits are often undertaken for specific antimicrobials, audit tools to support this should also be produced. The provision of national audit templates could facilitate MMTs and primary care staff to undertake audits and could be promoted for revalidation and for trainee GPs, as these were the least utilized avenues.21

Research suggests that audit feedback, comparison with peers, discussion and action planning are essential for onward behaviour change.22–26 Furthermore, the benefits of audit and feedback measures are most likely to occur for prescribing outliers, when feedback is more intensive27 and when a full audit cycle is undertaken (audit and re-audit).23 Audit training and greater feedback about antimicrobial audit results to the board may increase effectiveness of the strategy.

The CMO letter to practices, providing social norm feedback, substantially reduced antibiotic prescribing at low cost and at national scale.13 Participants suggested that the letter influenced prescribers by indicating that their prescribing is under scrutiny, but would be even more effective if the CMO letter were sent collaboratively with local MMTs, using the most recent prescribing data available.

AMS leads reported that practice pharmacists could be a major facilitator for AMS. Antimicrobial pharmacists have been found to

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**Figure 7.** Respondents’ perceived importance of primary care AMS facilitators (n = 187). **Indicates personal information has been removed.

**Figure 8.** Free-text responses relating to AMS barriers and facilitators for NHS commissioning organizations.
be effective in secondary care and could be used more in the GP setting,
28 to increase awareness and implementation of AMS strategies such as audit and feedback.

Strengths and limitations

MMTs representing 89% (187/209) of all CCGs responded to the research questionnaire; 79% (166/209) completed the questionnaire in full.

MMT AMS leads completed the survey and consequently the responses to questions about barriers and facilitators for primary care practitioners are reported as perceptions. This should be acknowledged as it appeared that patient expectation is still a major barrier; however, this was reported by the AMS leads rather than primary care practitioners themselves. Nonetheless, in free-text comment boxes, respondents took the opportunity to pass on feedback from primary care practitioners.

The qualitative text enriches the data, obtaining a wide range of views, but as respondents did not always comment, it may not be completely generalizable, like the quantitative data.

Recommendations

Successful CCG improvement strategies include the use of both local and national antibiotic prescribing data and continued use should be encouraged, within improvement schemes and extended to OOH services.

As audit data identify reasons for inappropriate prescribing and inform improvement planning, all organizations should adopt this strategy and include audits within local quality improvement schemes, ensuring reporting of performance to the organizational board level. Training provision on effective auditing, emphasizing feedback and discussions with as many staff as possible to support a whole-practice approach, should be considered as there was not a consistent approach.

Local improvement schemes should be encouraged to engage primary care practitioners and act as a means of monitoring uptake of initiatives promoted. Such schemes could include:

- completion of full audit cycle (audit with feedback and re-audit)
- completion of self-assessment checklist
- attendance/completion of AMS education/training with action planning
- use of TARGET leaflets to share with patients, with Read coding to facilitate monitoring and audit, ideally with computer prompts from the clinical systems
- displaying posters and videos in waiting areas

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Supplementary data

Appendices S1–S6 and Reviewer reports 1 and 2 are available as Supplementary data at JAC-AMR Online.
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