

Doctors' perceptions of antimicrobial resistance in the Northern West Bank, Palestine: a qualitative study

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Objectives: In the West Bank, antimicrobial resistance (AMR) is increasingly and alarmingly common. Efforts are being made to introduce antimicrobial stewardship programmes (ASPs). This study explores doctors' perceptions of AMR and context-specific barriers and facilitators to ASPs at a critical point in national ASP development.

Methods: Semi-structured interviews were conducted with 22 doctors working in primary healthcare, government and non-governmental hospitals in Nablus in 2019. Two researchers thematically analysed the data.

Results: Participants recognized antibiotic resistance as a major threat to health. Few felt that doctors were well informed about ASPs; many had not heard of them. However, there was willingness to expand and begin new education programmes. Barriers and facilitators to ASPs included: (i) doctors were perceived to 'misuse' antibiotics, lack awareness, favour short-term outcomes, and externalize blame; (ii) patients reportedly treat antibiotics 'like analgesia' with high expectations of doctors; (iii) resource limitations make ASPs and infection control difficult—a lack of drugs, laboratory services, infectious disease specialists, and research to develop local guidelines; and (iv) top-down policy is recommended to restrict access to antibiotics without a prescription, but should be coupled with support, collaboration and community action.

Conclusions: Doctors' appreciation of the severity of the issue, and willingness for the expansion of existing programmes targeted at their own prescribing practices, provides a strong foundation for successful ASPs. A top-down approach to prevent inappropriate antibiotic prescribing is welcomed by participating doctors. If financial and resource limitations could be addressed, a continued multifaceted approach may enable physician, pharmacist and patient behaviours to change.

Introduction

Antimicrobial resistance (AMR) is a significant international threat to health.¹ Rising numbers of resistant pathogens risk taking us into a 'post-antibiotic era' where common infections will be untreatable, leading to increased mortality and morbidity, longer treatment time and higher costs.²⁻⁵ The dramatic effect of modern travel on the spread of infectious diseases, as demonstrated by the COVID-19 pandemic,⁶ reveals AMR is a truly global concern. Without action in every community the threat will remain.

Interventions to improve prescribing practices (Material S1, available as Supplementary data at JAC-AMR Online¹) are widely encouraged, including by the WHO. Global efforts by the WHO include the Global Action Plan to support national antimicrobial

stewardship programmes (ASPs), the 'Access, Watch, Reserve' (AWaRe) antibiotic classification and target setting for 'watch' antibiotic use, and the more recent AWaRe prescribing guidance book.^{7,8} A 2017 Cochrane Review showed antibiotic policy could lead to improved prescribing practices⁹ and, to date, 100 countries have developed ASPs, including Palestine.^{10,11} Across low- and middle-income countries (LMICs), where there can be significant human and financial resource challenges, ASP implementation success has varied due to a variety of barriers to and facilitators of their implementation.¹²⁻¹⁵

Behaviour change, aligning with the Health-Belief Model, must consider patient and prescriber perceptions of the threat.¹⁶ Hence, understanding doctors' thoughts in specific health-system and cultural contexts, could help identify facilitators and barriers to

ASPs and ensure context-specific programme success.¹⁵ Globally, doctors are aware of antibiotic resistance as a threat and the majority of prescribers in LMICs feel that ASPs benefit both prescribers and patients.¹⁷⁻²² Despite this, there has been ever-increasing prescribing of antibiotics from the WHO 'watch' list in LMICs in recent years.²³ Some evidence suggests responsibility is being attributed to 'others', e.g. other individuals, countries or healthcare settings.²⁴⁻²⁶ One systematic review highlighted that in LMICs, low resources framed the clinicians' prescribing decisions in the context of uncertainty and higher risk due to poorer microbiology and infection control services.¹⁷

One LMIC attempting to implement antimicrobial stewardship (AMS) alongside pre-existing infection control programmes is Palestine.²⁷ Health indicators in the West Bank are good, with life expectancy at 73.9 years and communicable disease making up only 2.5% of deaths.¹¹ However, hospital-acquired infections and antibiotic resistance are increasingly common, posing serious public health risks.²⁸⁻³⁵

Cross-sectional studies in both Palestine and neighbouring Jordan and Lebanon reveal that patients' awareness of AMR is generally low with a culture of self-medication.³⁶⁻³⁸ Over-the-counter (OTC) prescribing of antibiotics is common in the West Bank; 60% of pharmacists report supplying antibiotics on demand, in spite of Ministry of Health (MoH) regulations that state a patient must have a prescription.^{11,39} Furthermore, a Gaza study revealed that in MoH facilities under a third of doctors knew of the existence of infection prevention and control (IPC) protocols and observed infection control practices were poor.⁴⁰

In Palestine, quantitative 'knowledge, attitudes and perceptions' (KAP) studies report United Nations Relief and Works Agency (UNRWA) and hospital doctors' knowledge of antibiotic prescribing is generally good.^{41,42} Conversely, KAP studies of primary care physicians in the north of the West Bank and of hospital physicians in the south both recommend that further AMS educational initiatives are needed.^{43,44} Most hospital doctors in a 2016 study agreed there was a high rate of antibiotic overuse, need for education and need for local guidelines to be developed.⁴²

To our knowledge, this study is the first qualitative investigation into doctors' perceptions of antibiotic resistance in Palestine and will therefore supplement existing quantitative literature to urgently inform ongoing and future ASPs in the region. Our research questions were: (i) how serious is the threat of antibiotic resistance perceived to be by doctors? (ii) what are the key challenges to good AMS in the West Bank, Palestine? and (iii) what are the potential solutions most suited to the region?

Methods

Setting

Palestinian healthcare is delivered by: MoH (government); private, UNRWA and military organizations; and non-governmental organizations (NGOs). The study was conducted in Nablus, in the north of the West Bank (population of 431 584).⁴⁵ Study sites included two government hospitals, a non-profit teaching hospital, and three of the five MoH primary healthcare clinics in the area. It included primary, secondary and tertiary centres (in all of which patients can seek consultation directly or by referral).⁴⁶

Study design

Qualitative semi-structured interviews were conducted across 4 weeks in Spring 2018 to enable in-depth exploration of Palestinian doctors' perceptions. Interviews allowed doctors to speak independently about their perception.⁴⁷

Sampling

Purposive sampling was employed to illustrate a range of perspectives—primary healthcare doctors, specialists, medical residents and surgeons—across study sites in hospitals and the community. This methodological choice was informed by existing ASPs in Palestine prior to 2020, e.g. a 2017 United States Agency for International Development

(USAID)-funded AMS project, having mainly focused on hospital-based strategies and IPC, yet with evidence showing that 80%–95% of antimicrobial prescribing in LMICs was in ambulatory care.⁴⁸ This enabled an 'information-rich' selection of participants to explore the variation between cadres of clinicians seen in the literature.^{39,49} Any doctor working in one of the participating institutions was eligible. Participants were excluded if junior, so not yet able to prescribe medications.

Recruitment

Participants were identified by the principal investigator visiting the study sites, consulting with senior staff on eligibility. Potential participants were given information both verbally and written (Material S2), and were asked to complete a demographics sheet (Material S3) following written consent (Material S4). Verbal consent was confirmed on the audio recordings.

Data collection: semi-structured interviews

Interviews took place face-to-face, in English, at a time/place convenient to the participant, normally a private room at the clinical site. A translator was present, if required, to assist. Interviews were audio-recorded using 'Easy Voice Recorder' software on password-protected mobile devices (which met ethics requirements). The interviewers—the principal investigator (L.G.) or a trained peer (A.W.)—worked in parallel to complete data collection within the time frame available. A semi-structured topic guide explored prescribing practices, perceptions of the impact of antibiotic resistance, contributing factors, existing ASPs and potential solutions (Material S5). The topic guide was informed by the research questions themselves, the WHO Global Action Plan and the issues with AMR and ASPs in the region identified from existing (mainly quantitative) literature.^{36,37,41-44} An information card was available with the WHO definition of AMS and 'the five steps', to overcome any lack of recognition of the ASPs (Material S1). Participants had the freedom to lead discussion.⁵⁰ A pilot interview was run to address interview misdirection.^{51,52}

Transcription and data analysis

All interviews were transcribed by L.G. verbatim. For the single interview where translation was necessary, only the English component was transcribed. Thematic content analysis following Braun and Clarke's 'six steps' determined analysis, with coding in part informed by the Health Belief Model.^{16,50} Familiarization occurred during the interview, transcription and on review of the dataset. Analysis was an iterative process; data saturation in each study location helped determine when recruitment should end. Analytical triangulation took place with S.B., who independently coded transcripts. Transcripts were repeatedly reviewed and re-coded to ensure the results reflected the data.⁵³

Ethics

Clearance was granted by the Institutional Review Board at An Najah University. Permission was also granted by the Palestinian MoH and directors of each participating site.

Results

Demographic characteristics

Twenty-two participants were recruited to include a range of age, speciality (surgery, medicine or primary care), training level (resident, consultant or director) and location (primary healthcare centres, government hospital or private hospital) (Table 1). Interview length range was 12–30 min.

Themes

Analysis of the transcripts generated five key themes that were partially informed by Becker's Health Belief Model (including severity, barriers and facilitators/benefits).¹⁶ Firstly, (Theme 1), doctors see antibiotic resistance as a serious threat to their practice and the future of healthcare. The remaining four themes

described the barriers and facilitators to good AMS in Palestine: doctors (Theme 2); patients (Theme 3); resources (Theme 4); and system factors (Theme 5) (summarized in Table 2).

Theme 1: AMR as a current and future threat—‘I worry about this’ (Figure 1)

All participants felt AMR is a major problem. Over half (12) considered it a worldwide issue; 11 added that it was worse in Palestine, with 2 clarifying it is worse in the developing world because of resource constraints (Figure 1, Extract 2). Many first-hand experiences of limited treatment options and poor patient outcomes due to resistant organisms were described by both primary healthcare and hospital doctors (5 hospital, 1 community) (Figure 1: Extract 5). Fifteen participants described the organizational and financial implications for the health system. Most (15) expressed fear of what future medical practice may be like without antibiotics, seeing consequences for their patients (Figure 1, Extracts 4 and 5).

Theme 2: Doctors’ prescribing practices—‘misuse and abuse’ (Figure 2)

Nearly all (21) participants believed the ‘misuse and abuse’ of antibiotics can lead to antibiotic resistance. Participants expanded on ‘misuse’ by doctors in hospitals, including inappropriate doses and durations of treatment, and misdiagnosis of viral infections (Figure 2, Extract 1).

Three doctors were unaware of the existence of any programmes to tackle antibiotic resistance in Palestine, and most (20) thought doctors lack knowledge about AMR. Twelve specifically mentioned doctors’ poor adherence to infection control measures (Figure 2, Extract 2).

Four participants, in hospitals and primary healthcare, explained that often doctors want to satisfy the patients and impress them, sometimes leading to use of inappropriately strong/broad-spectrum agents (Figure 2, Extract 5). Three suggested that the desire to ‘satisfy’ patients is greater in the private sector (Figure 2, Extract 6).

Participants felt a facilitator of good prescribing practices would be to continue and expand existing ASPs, e.g. more lectures and workshops. Specifically, four mentioned that ASPs had not reached primary healthcare; nine suggested that doctors in primary health centres be included in future programmes (Figure 2, Extract 4). Seven hospital doctors attributed misuse of antibiotics to doctors in the community (Figure 2, Extract 3).

Theme 3: The patients and pharmacists—‘the culture’ (Figure 3)

Participants described difficulties managing patients’ antibiotic demands and high expectations of doctors—based on limited subject awareness (Figure 3, Extract 1). Poor completion of treatment courses and home ‘stockpiling’ of antibiotics were recalled by two participants (Figure 3, Extract 2). The majority (18) saw patient education (e.g. through social media) as key to preventing antibiotic resistance (Figure 3, Extract 3); four working in the community were already trying to educate patients in their clinics (Figure 3, Extract 4).

Access to OTC antibiotics bought from pharmacies without a prescription was one of the most significant barriers to good AMS (17 participants). Many believed this was unique to

Table 1. Participant characteristics (N=22)

Variable	n (%)
Gender	
Male	11 (50)
Female	11 (50)
Institution	
Government hospital	7 (32)
Non-governmental hospital	8 (36)
Primary care clinic	7 (32)
Expertise in antibiotic resistance^a	
Yes	11 (50)
No	11 (50)
Level of training	
GP ^b	4 (18)
Resident (including Family Medicine)	6 (27)
Consultant	12 (55)
Specialty	
Medicine	8 (36)
Surgery ^c	6 (27)
Primary healthcare	8 (36)
Years working as a doctor	
<5	5 (23)
5–10	7 (32)
11–15	6 (27)
>15	3 (14)
Missing	1 (5)
How often prescribes antibiotics per day?	
>10 times a day	2 (9)
1–10 times a day	14 (61)
Only once a day	5 (22)
Only once a week	1 (4)

^aExpertise considered as any qualification/course attendance/committee position evidenced by the participant.

^bIn Palestine, a doctor can become a primary healthcare physician and be known as a GP after graduation from medical school, without further formal postgraduate training. Family Medicine is a new postgraduate specialty training programme in the West Bank.

^cIncludes obstetrics and gynaecology as surgical specialty.

Table 2. Barriers and facilitators to antibiotic stewardship in Palestine—themes and subthemes

Theme	Barrier subtheme	Facilitator subtheme
Doctors	Misuse and abuse (21) Lack of doctor awareness (19)	Increase doctors' awareness (15) Continue/expand existing programme (14)
Patients	Patient expectations and demands (7) Incomplete courses and stockpiling (7)	Increase public awareness (14) Doctors educating patients (6)
Resources	OTC access (17) Drug shortages (5) Lack of infrastructure and equipment (8) Lack of research (4) Lack of Infectious Disease specialists (4)	More research (5) More guidelines (17) Infectious Disease specialists (5)
System	Lack of guidelines (16) Difficulties in restricting prescribing (10)	Encouragement (3) Cooperation and collaboration (9) Regulation and restrictions (14) Leadership (5)

The number of participants out of 22 who agreed with this theme is shown in parentheses. Bold type indicates that >14/22 participants agreed.

Extract 1 - "It's a global, as I told you, a global problem" (P13 – Community)
 Extract 2 - "...especially that here we are talking about third [developing] country here and we don't have lots of, the full options of antibiotics" (P14 – Hospital)
 Extract 3 - "We face one, one case of bacterial resistance for Colistin... and unfortunately the patient died because there was not other antibiotics that she was able to recover with" (P10 – Hospital)
 Extract 4 - "It will slip out of our hands, and then there will be infections with resistance to all antibiotics and then how can fight it?" (P13 – Community)
 Extract 5 - "I have fear, fear that one time I will find no treatments to treat my patients. This will be catastrophic" (P5 – Hospital)

Figure 1. AMR as a current and future threat.

Extract 1 - "I think it's the overuse of antibiotics, probably most important piece. Also the short duration of use of antibiotics, inappropriate doses, inappropriate prescription" (P10 – hospital)
 Extract 2 - "The attribution [to hand hygiene protocols] its 60 to 70 percent, which is very low, er the target, the international target, its 95 percent" (P6 – hospital)
 Extract 3 - "It's a problem in the, er... the GP, the General Practitioner, yes, writing antibiotic as analgesia." (P4 – hospital)
 Extract 4 - "There is no one talk about this. Maybe in the hospital they talk er here in primary healthcare, no." (P11 – community)
 Extract 5 - "[My colleagues] know information about antibiotics better than me. But er, sometimes they want only to make the people happy and satisfied and so they give antibiotics" (P7 – community)
 Extract 6 – "we [community] don't look so much for satisfaction as [private] doctors" (P7 – Community)

Figure 2. Doctors' prescribing practices.

Extract 1 - *"The mentality of the Palestinian people. They feel sick, they feel if they have fever, they feel that the only medicine that can cure them is the antibiotic"* (P13 – community)

Extract 2 - *"when I was GP, general practitioner, I see patient have concern that antibiotic lost from her refrigerator... to refill! Refill antibiotic, penicillin, amoxicillin."* (P20 – hospital)

Extract 3 - *"television and social media. It's a weak point in our programme. We should do that"* (P21 – hospital)

Extract 4 - *"I say er for the patient if you use this medication for three days only, you are acting like you are giving the bacteria the password of this drug. They er they er understand this plan okay?"* (P9 – community)

Extract 5 - *"Multiple patients came here, "I went to pharmacist who gave me this levofloxacin". And is broad spectrum antibiotic! Why, I don't know..."* (P06 – hospital)

Figure 3. Patients and pharmacists.

Extract 1 - *"We are um seeing many many patients, not less than 120 in one day. So it's not easy to er apply this er programme"* (P8 – community)

Extract 2 - *"We have increasing patients, increasing number, and we are crowded here and sometimes we cannot isolate patients."* (P14 – hospital)

Extract 3 - *"Unfortunately we do not have the um cultures available or the er labs here. So we have to decide according to the clinical presentation"* (P10 – community)

Extract 4 - *"...at early morning I want to prescribe to the small young baby er and I didn't find, I give him a strong one. Yeah it's me, I'm sorry [...] we have this shortage"* (P11 – Community)

Extract 5 - *"We don't have our guideline for Palestine, because we don't know what's the most prevalent bacteria or the most resistant bacteria"* (P1 – hospital)

Extract 6 - *"...we don't have er... clear guideline to follow."* (P13 – community)

Figure 4. Resources.

Palestine because of no regulations (16 participants). However, none were able to suggest how to better control pharmacists selling antibiotics without a prescription. Ten felt existing restrictions are difficult to enforce (Figure 3, Extract 5).

Theme 4: Resources: 'we don't have...' (Figure 4)

Fourteen participants described a resource-limited setting in which good AMS is far more challenging. While programmes have tried to help guide prescribing practices, this was reportedly difficult to follow under pressure (Figure 4, Extract 1).

Three participants added that these pressures, in combination with limited facilities, make infection control difficult (Figure 4, Extract 2). Additionally, seven described limited access to culture and sensitivity testing, explaining this means doctors struggle to know the best antibiotic to prescribe (Figure 4, Extract 3). Even if that decision were simple, five participants recalled drug shortages leading to prescription of inappropriately strong antibiotics (Figure 4, Extract 4).

Among hospital doctors, four stated more infectious disease specialists across the West Bank could help support doctors'

prescribing decisions and ASPs. Two suggested an improvement would be to 'send doctors outside to make specialists'.

Some (four) suggested that lack of specific infectious disease and antibiotics surveillance/research in Palestine made the design of guidelines specific to the region, hospital or specialty difficult (Figure 3, Extract 5). Most (18) felt there was a deficit of guidelines on antibiotic prescribing across primary health centres and in hospitals (Figure 3, Extract 6).

Theme 5: The system: collaboration and 'control' (Figure 5)

All participants supported continued and greater 'restriction' of access to antibiotics and prescribing. Some (11), mainly in hospital, mentioned specifics already in place—including the ban of pharmacists dispensing antibiotics without a prescription from a doctor (Participant 16: 'You need a specialist to prescribe it'). However, most (15) admitted the restrictions were not effective as they were not adhered to, nor enforced (Figure 5, Extract 1).

Rationales why existing restrictions are not enforceable were varied. One participant alluded to the political landscape

Extract 1 – “there is no..., no proper follow-up from the authorities for [the ban on OTC access to antibiotics]” (P19 – hospital)

Extract 2- “we have a lot of challenges because we are tertiary care hospital. We are receiving er patients who are hospitalised in other hospitals before [who] have a lot of those er resistant strains” (P3 – hospital)

Extract 3 - “So we have another culture....a difficult culture (...) It's not easy. I am trying in my village to do that and I cannot. And there is just one pharmacist and I am just one doctor and I am speaking to him daily – don't give don't give. He is giving. You understand? It is very difficult!” (P21 – hospital)

Extract 4 - “Here the surgeons, the orthopaedic, the paediatrician, the internist – anyone can use antibiotic without any limitation. So, must be directed by a man or a person who can, who knows antibiotic.....” (P16 – hospital)

Extract 5 - “But if all doctors work on the same side and think on the same um point of view that we want to restrict antibiotic use and we want to decrease antibiotic resistance, we will go on to the good and right way.” (P7 – community)

Extract 6 - “we have er WhatsApp group for antibiotic stewardship. If any one of us have a case in this hospital of er question mark culture, or er we interview this culture on the group WhatsApp and we discuss it, yes.” (P21 – hospital)

Extract 7 - “we have the clinical pharmacists here helping us here. We do not have the infectious disease consultant.... Also we have friends, who are outside the country, who are always ready to have a consultations and help us with complicated patients, to help us with the antibiotic.” (P15 – hospital)

Extract 8 - “I feel myself here, in this government clinic, or in this people, that I'm you know, I'm blowing in – you know the balloon, when it has a small hole in it? When you are blowing in a balloon with a small hole, you want to have er... you are trained, but there is many bad people that you can't control. I wish that I can control 100% of people” (P9 - community)

Figure 5. Collaboration and control.

of occupied Palestine: ‘we cannot reach C regions’. Two individuals revealed that the number of referrals to one of the hospitals in Nablus, including from Gaza, means that good AMS needs to be across all institutions to be effective (Figure 5, Extract 2). One doctor clarified cultural difficulties with enforcing regulations, especially in the community and with pharmacists (Figure 5, Extract 3).

Many (15) suggested that a top-down approach from hospital seniors and nationally from the MoH could facilitate behaviour change (Participant 14: ‘We really need something on the national level’). Two participants felt that appointing a senior individual/ team to enforce protocols and direct prescribing practices was merited (Figure 5, Extract 4).

In addition to a top-down approach, 12 doctors believed collaboration and communication between multidisciplinary team members—and nationally from experts at different facilities—could help to encourage further progression of existing ASPs (Figure 5, Extract 5). Collaboration with clinical pharmacists in the hospitals and other doctors internationally through WhatsApp groups were referenced three times, revealing successful ongoing attempts to collaborate (Figure 5, Extracts 6 and 7). As Participant 9 surmised, unless all healthcare professionals and the public are on board with mindful and appropriate antibiotic use, control may never be achieved (Figure 5, Extract 8).

Discussion

Doctors in Nablus unanimously recognized AMR as a challenge to healthcare. Barriers and facilitators to overcoming the challenge, on the other hand, were multilayered. Our study findings supplement existing quantitative research into doctor, pharmacist and patient perceptions (as reported by participants) of antibiotic resistance in Palestine and support the expansion of existing ASPs with greater guidance and enforcement of regulation on prescribing practices and involvement of primary care.^{37,39,42}

Doctors’ concerns about the current and future impact of antibiotic resistance framed their overall willingness to accept expansion of ASPs. This echoes qualitative study findings from other high-income countries (HICs) and LMICs^{17-19,21,22,54} and quantitative data from Palestine.^{42,44} A 2015 global systematic review concluded that antibiotic resistance was commonly attributed by doctors to their patients or even other countries.²⁴ In south Palestine, quantitative data from 2023 suggest that fewer doctors perceived AMR to be a problem in their country than as a worldwide issue⁴⁴, in keeping with data from Indonesia.²⁶ In contrast, doctors in Nablus felt strongly that members of their own profession in Palestine are key contributors through inappropriate prescribing practices, lack of adherence to infection control and poor knowledge of guidelines. This provides a context in which

elements of ASPs targeting doctors—that strategize ‘the individual’s responsibility for prescribing’⁵⁵—may be easily implemented and well received.

However, our participants also revealed that the barriers to the implementation of ASPs in northern Palestine are wide-ranging. Doctors’ descriptions of limited patient knowledge, stockpiling and use of OTC pharmacy antibiotics suggest that even with good medical/pharmacy practices, ASPs in Palestine might also need to address patient factors to be successful (as suggested by the WHO¹). Existing regional data agree: in Lebanon over half of patients thought antibiotics should be taken for a common cold,³⁶ in Jordan, OTC antibiotic use was widespread among Palestinian refugees.³⁷ Furthermore, a cross-sectional study in Palestine previously showed a relationship between poor public understanding of resistance and irrational antibiotic usage.³⁸ However, the suggestion by some doctors that this is in part due to a unique patient culture in Palestine contradicts research showing that public awareness of AMR is low globally.⁵⁶

While participants working in primary healthcare reported already attempting to educate their patients, a more widespread approach to patient education—including social media⁵⁷—is favoured and already features in the 2020–24 MoH national AMS plan.¹¹ Additionally, doctors propose expanding existing ASP workshops in certain hospitals to primary care clinicians. Looking to the future, education of medical students was also identified by participants as a key long-term strategy,⁵⁸ which could be supplemented by the growing new postgraduate Family Medicine training programme that offers new opportunities to develop primary care knowledge of ASPs, and has been shown to give clinicians increased knowledge of AMR.^{43,59}

Patient expectations combined with doctors’ desire to not jeopardize doctor–patient relationships over antibiotic prescribing is well recognized internationally, especially in primary healthcare.^{26,60–62} The desire to ‘impress’ patients was mentioned by some hospital doctors when attributing greater blame to primary healthcare physicians; likewise when primary healthcare doctors described the private sector (although a study in south Palestine refutes any difference in knowledge between the sectors).⁴⁴

Inappropriate prescribing practices were commonly explained by short-term risk–benefit judgement, prioritizing benefit to a single patient over the long-term consequence of AMR. This is not unfamiliar, nor restricted to Palestine, and evidence suggests this happens in both HICs and LMICs;^{15,26} a UK qualitative study found prioritization of patients’ immediate needs was associated with more frequent antibiotic prescriptions.⁶³ An ‘appropriate’ decision about antibiotic resistance can be considered a balance of responsibilities toward different stakeholders: the patient and wider society.⁶⁴ This is harder in low-resource settings like those described by our participants in primary healthcare. A 2019 systematic review agreed that prescribing decisions in low-income countries were shaped by heightened uncertainty and under-resourcing.¹⁷ Lack of access to laboratory testing and local guidelines left many of our participants feeling they had no choice but to prescribe to minimize risk to their patient, despite knowing their illness was likely viral. It has been shown that antibiotics are highly prescribed in LMIC primary care settings worldwide, conceivably for the above reasons.^{48,65}

Our participants’ perceptions of AMS remind us that not all prescriber behaviour stems from a position of choice.⁵⁵ Various

resource limitations were directly cited as barriers to good practices. Some were common to those mentioned by international studies—for example; lack of access to microbiology services, consequent lack of antibiograms and established guidelines, and doctors’ high workloads (especially in the community).^{12,15,64,66} Overcrowded hospitals and lack of space to isolate patients were also raised by participants as barriers to good infection control. However, shortages of personal protective equipment (PPE) were not mentioned, in contrast to a study in Gaza.⁴⁰ Drug shortages, as mentioned notably by primary care physicians in our study, were recognized as a worldwide issue at a 2019 WHO meeting.⁶⁷ Health service leaders may need to prioritize consistent supplies of antimicrobial agents to hospital and community settings to facilitate good prescribing practices.

Alongside addressing resource limitations, doctors would welcome a greater ‘top-down’ approach, including regulation, if paired with ‘bottom-up’ collaboration and support—a combination that is often used to facilitate health policy implementation and is a theme identified in a 2024 scoping review of ASP implementation in LMICs.^{15,68–70} They suggest greater monitoring of antibiotic use and stricter legislation, together with better support from guidelines and infectious disease specialists. This aligns with the WHO AWaRe framework of setting targets for antibiotic prescribing while supporting prescribers with guidelines such as the AWaRe antibiotic book.^{8,71,72} Pharmacists in Palestine agree that guidelines for prescribing antibiotics would be welcomed—71% would be happy to have further antibiotic restrictions.³⁹ Surgeons’ adherence to international surgical antibiotic prophylaxis guidelines in the north of the West Bank is low, and our participants agreed there is a clear preference for guidelines tailored to Palestine and even local institutions.⁷³ The MoH has made writing and updating guidelines for antibiotic prescription a key part of its 2020–24 ASP action plan.¹¹ However, our findings suggest that wider dissemination of and research into the acceptability and usability of national guidelines (or even international guidelines such as the WHO AWaRe antibiotic prescribing book in the interim), alongside development of primary healthcare-specific guidelines and local antibiograms, is a priority for doctors.

The barrier to ASPs suggested by participants as possibly worse in or unique to Palestine was OTC access to antibiotics and lack of enforcement of pharmacist antibiotic supplies. It has been shown that OTC access to antibiotics, despite being officially illegal in Palestine, is common, and pharmacists commonly dispense antibiotics on demand.³⁹ Doctors’ perceptions also align with WHO suggestions that sale without prescription is widespread and should form part of ASPs.¹ Participants were generally unable to explain why this was occurring in Palestine despite MoH regulations existing. Future research could address how pharmacist behaviour could be influenced, and whether economic and geopolitical factors might be exacerbating lack of control over pharmacist prescribing practices.

Strengths and limitations

This work is novel, its strength being the qualitative methodology that enabled deeper investigation of participants’ thoughts/feelings. Its local focus on a unique geopolitical environment enables valuable context-specific recommendations to be made but

- **Expand existing ASPs to include primary health care physician education**
- **Develop and publicise existing/new antimicrobial prescribing guidelines for both hospitals and primary healthcare, drawing on WHO AWaRe advice and available international guidelines**
- **Attempt to establish reliable supply chains of antibiotics to both hospitals and primary health centres to avoid drug shortages, and update guidelines accordingly with secondary antibiotic choices.**
- **Expand laboratory testing and research facilities to enable closer monitoring of antimicrobial resistance and help develop guidelines, enabling a system in which clinicians can quickly access microbiological testing to inform antimicrobial prescribing**
- **Encourage individual hospital and local primary health care groups to select individuals to lead ASPs and to collaborate with national programme**
- **Expand ASPs in Palestine to include the education of the public and community pharmacists**
- **Consider further research and discussion (including qualitative) into how to reduce OTC prescribing of antibiotics in Palestine and how might be best to encourage compliance with existing regulations**

Figure 6. Priorities for policymakers in the region reported by doctors.

limits its generalizability. By purposively sampling both hospital and primary health doctors, wide insight has been gained into doctors' priorities for policymakers beyond the hospital-based scope of previous ASPs. However, the choice to include a broad sample of participants has meant that exploration of the differences between hospital and community doctors has been limited. Furthermore, the depth of data is limited by the relatively short interview lengths; interview duration was impacted by the project being a 4 week research elective, and considerations about additional burden on time-stretched participants. Hopefully, future qualitative work could explore community and hospital contrasts and supplement existing evidence of public/pharmacist perceptions, given these results and existing literature suggest many patients are accessing antibiotics without prescriptions in the community.

The principal investigator was impartial (not known to any participants). However, their position in study design, data collection and analysis may have influenced findings. Having been educated about antibiotic stewardship in the UK, the principal investigator may have had preconceived perceptions of ASPs in Palestine and this may have had influence. Measures were taken to reduce researcher bias, including analysis triangulation with another independent researcher/clinician working in Palestine, and a fellow researcher conducting a portion of the interviews.

Conclusions and recommendations

Key recommendations and priorities derived from the findings of this study, interpreted alongside existing regional literature in the discussion above, have been condensed into a series of suggestions for policymakers involved in the future of ASPs in the region

(including the Palestinian MoH and wider healthcare policy actors) in Figure 6. With studies into ASPs rare in the Near and Middle East, this research addresses a gap around doctors' perceptions of the threat of antibiotic resistance in the West Bank and what they think is needed going forward. Doctors' opinions were highly congruent; they agreed on many 'best next steps' and were keen to engage in future programmes. While many were pessimistic about the future, hope was ascribed to the opportunity to collaborate and tackle the issue as a community. In the context of the COVID-19 pandemic and the global increase in inappropriate antibiotic use, there is even greater urgency for action.⁷⁴ By understanding that doctors are amenable to accepting greater regulation enforcement and guidelines (especially in primary care), future policy can seek to reach further and expand on existing ASPs. Whether resources can be found to support any new regulations and guidelines with research, good antibiotic supplies, specialists/clinical pharmacists and wider access to laboratory studies may likely be determining factors in whether significant progress can be made. Future research and policy discussions should approach the issue from these multiple perspectives and seek to capitalize on the significant concern that doctors have expressed for the future of healthcare in a world with rising antibiotic resistance.

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Transparency declarations

The interpretations and conclusions contained in this study are those of the authors alone.

Supplementary data

Materials S1 to S5 are available as Supplementary data at JAC-AMR Online.

References

- 1 WHO. Antimicrobial resistance. 2023. <https://www.who.int/news-room/fact-sheets/detail/antibiotic-resistance>
- 2 de Kraker ME, Davey PG, Grundmann H et al. Mortality and hospital stay associated with resistant *Staphylococcus aureus* and *Escherichia coli* bacteremia: estimating the burden of antibiotic resistance in Europe. *PLoS Med* 2011; **8**: e1001104. <https://doi.org/10.1371/journal.pmed.1001104>
- 3 Hofer U. The cost of antimicrobial resistance. *Nat Rev Microbiol* 2019; **17**: 3. <https://doi.org/10.1038/s41579-018-0125-x>
- 4 de Kraker ME, Stewardson AJ, Harbarth S. Will 10 million people die a year due to antimicrobial resistance by 2050? *PLoS Med* 2016; **13**: e1002184. <https://doi.org/10.1371/journal.pmed.1002184>
- 5 Antimicrobial Resistance Collaborators. Global burden of bacterial antimicrobial resistance in 2019: a systematic analysis. *Lancet* 2022; **399**: 629–55. [https://doi.org/10.1016/S0140-6736\(21\)02724-0](https://doi.org/10.1016/S0140-6736(21)02724-0)
- 6 Burns J, Movsisyan A, Stratil JM et al. International travel-related control measures to contain the COVID-19 pandemic: a rapid review. *Cochrane Database Syst Rev* 2021; issue **3**: CD013717. <https://doi.org/10.1002/14651858.CD013717.pub2>
- 7 Sharland M, Pulcini C, Harbarth S et al. Classifying antibiotics in the WHO essential medicines list for optimal use—be AWaRe. *Lancet Infect Dis* 2018; **18**: 18–20. [https://doi.org/10.1016/S1473-3099\(17\)30724-7](https://doi.org/10.1016/S1473-3099(17)30724-7)
- 8 WHO. The WHO AWaRe (Access, Watch, Reserve) antibiotic book. 2022. <https://iris.who.int/bitstream/handle/10665/365135/WHO-MHP-HPS-EML-2022.02-eng.pdf?sequence=1>.
- 9 Davey P, Marwick CA, Scott CL et al. Interventions to improve antibiotic prescribing practices for hospital inpatients. *Cochrane Database Syst Rev* 2017; issue **2**: CD003543. <https://doi.org/10.1002/14651858.CD003543.pub4>
- 10 Global Database for Tracking Antimicrobial Resistance (AMR) Country Self-Assessment Survey (TrACSS). 2023. <https://amrcountryprogress.org/#/visualization-view>.
- 11 State of Palestine Ministry of Health . National Action Plan for Antimicrobial Resistance (2020–2024). 2020. https://cdn.who.int/media/docs/default-source/antimicrobial-resistance/amr-spc-npm/nap-library/palestine-national-action-plan-on-antimicrobial-resistance-2020-2024.pdf?sfvrsn=e245d479_3.
- 12 Godman B, Egwuenu A, Wesangula E et al. Tackling antimicrobial resistance across sub-Saharan Africa: current challenges and implications for the future. *Expert Opin Drug Saf* 2022; **21**: 1089–111. <https://doi.org/10.1080/14740338.2022.2106368>
- 13 Charani E, Mendelson M, Pallett SJC et al. An analysis of existing national action plans for antimicrobial resistance—gaps and opportunities in strategies optimising antibiotic use in human populations. *Lancet Glob Health* 2023; **11**: e466–74. [https://doi.org/10.1016/S2214-109X\(23\)00019-0](https://doi.org/10.1016/S2214-109X(23)00019-0)
- 14 Saleem Z, Godman B, Azhar F et al. Progress on the national action plan of Pakistan on antimicrobial resistance (AMR): a narrative review and the implications. *Expert Rev Anti Infect Ther* 2022; **20**: 71–93. <https://doi.org/10.1080/14787210.2021.1935238>
- 15 Harun MGD, Sumon SA, Hasan I et al. Barriers, facilitators, perceptions and impact of interventions in implementing antimicrobial stewardship programs in hospitals of low-middle and middle countries: a scoping review. *Antimicrob Resist Infect Control* 2024; **13**: 8. <https://doi.org/10.1186/s13756-024-01369-6>
- 16 Janz NK, Becker MH. The Health Belief Model: a decade later. *Health Educ Q* 1984; **11**: 1–47. <https://doi.org/10.1177/109019818401100101>
- 17 Krockow EM, Colman AM, Chattoe-Brown E et al. Balancing the risks to individual and society: a systematic review and synthesis of qualitative research on antibiotic prescribing behaviour in hospitals. *J Hosp Infect* 2019; **101**: 428–39. <https://doi.org/10.1016/j.jhin.2018.08.007>
- 18 Zetts RM, Stoesz A, Garcia AM et al. Primary care physicians' attitudes and perceptions towards antibiotic resistance and outpatient antibiotic stewardship in the USA: a qualitative study. *BMJ Open* 2020; **10**: e034983. <https://doi.org/10.1136/bmjopen-2019-034983>
- 19 Teixeira Rodrigues A, Roque F, Falcão A et al. Understanding physician antibiotic prescribing behaviour: a systematic review of qualitative studies. *Int J Antimicrob Agents* 2013; **41**: 203–12. <https://doi.org/10.1016/j.ijantimicag.2012.09.003>
- 20 Wester CW, Durairaj L, Evans AT et al. Antibiotic resistance: a survey of physician perceptions. *Arch Intern Med* 2002; **162**: 2210–6. <https://doi.org/10.1001/archinte.162.19.2210>
- 21 Thriemer K, Katuala Y, Batoko B et al. Antibiotic prescribing in DR Congo: a knowledge, attitude and practice survey among medical doctors and students. *PLoS One* 2013; **8**: e55495. <https://doi.org/10.1371/journal.pone.0055495>
- 22 García C, Llamocca LP, García K et al. Knowledge, attitudes and practice survey about antimicrobial resistance and prescribing among physicians in a hospital setting in Lima, Peru. *BMC Clin Pharmacol* 2011; **11**: 18. <https://doi.org/10.1186/1472-6904-11-18>
- 23 Klein EY, Milkowska-Shibata M, Tseng KK et al. Assessment of WHO antibiotic consumption and access targets in 76 countries, 2000–15: an analysis of pharmaceutical sales data. *Lancet Infect Dis* 2021; **21**: 107–15. [https://doi.org/10.1016/S1473-3099\(20\)30332-7](https://doi.org/10.1016/S1473-3099(20)30332-7)
- 24 McCullough AR, Rathbone J, Parekh S et al. Not in my backyard: a systematic review of clinicians' knowledge and beliefs about antibiotic resistance. *J Antimicrob Chemother* 2015; **70**: 2465–73. <https://doi.org/10.1093/jac/dkv164>
- 25 Wood F, Phillips C, Brookes-Howell L et al. Primary care clinicians' perceptions of antibiotic resistance: a multi-country qualitative interview study. *J Antimicrob Chemother* 2013; **68**: 237–43. <https://doi.org/10.1093/jac/dks338>
- 26 Limato R, Nelwan EJ, Mudia M et al. Perceptions, views and practices regarding antibiotic prescribing and stewardship among hospital physicians in Jakarta, Indonesia: a questionnaire-based survey. *BMJ Open* 2022; **12**: e054768. <https://doi.org/10.1136/bmjopen-2021-054768>
- 27 Saleem AA, Hindiyeh M, Sabateen AA et al. Embedding quality improvement through a learning collaborative to reduce and sustain hospital-acquired infections in the West Bank. 2017. <http://resistance-control.info/2017/embedding-quality-improvement-through-a-learning-collaborative-to-reduce-and-sustain-hospital-acquired-infections-in-the-west-bank/>.

28 Kanapathipillai R, Malou N, Baldwin K et al. Antibiotic resistance in Palestine: an emerging part of a larger crisis. *BMJ* 2018; **363**: k4273. <https://doi.org/10.1136/bmj.k4273>

29 Almasri M, Abu Hasan N, Sabbah N. Macrolide and lincosamide resistance in staphylococcal clinical isolates in Nablus, Palestine. *Turk J Med Sci* 2016; **46**: 1064–70. <https://doi.org/10.3906/sag-1503-121>

30 Kaibni MH, Farraj MA, Adwan K et al. Community-acquired meticillin-resistant *Staphylococcus aureus* in Palestine. *J Med Microbiol* 2009; **58**: 644–7. <https://doi.org/10.1099/jmm.0.007617-0>

31 Tayh G, Ben Sallem R, Ben Yahia H et al. First report of extended-spectrum β -lactamases among clinical isolates of *Klebsiella pneumoniae* in Gaza strip, Palestine. *Microb Drug Resist* 2017; **23**: 169–76. <https://doi.org/10.1089/mdr.2016.0089>

32 Abdoh Q, Kharraz L, Ayoub K et al. *Helicobacter pylori* resistance to antibiotics at the an-Najah National University Hospital: a cross-sectional study. *Lancet* 2018; **391** Suppl 2: S32. [https://doi.org/10.1016/S0140-6736\(18\)30398-2](https://doi.org/10.1016/S0140-6736(18)30398-2)

33 Qamar AKA, Habboub TM, Elmanama AA. Antimicrobial resistance of bacteria isolated at the European Gaza Hospital before and after the Great March of Return protests: a retrospective study. *Lancet* 2022; **399**: S14. [https://doi.org/10.1016/s0140-6736\(22\)01149-7](https://doi.org/10.1016/s0140-6736(22)01149-7)

34 Rabayah R, Alsayed RB, Taha AA et al. Microbial spectrum and drug resistance profile in solid malignancies in a large tertiary hospital from Palestine. *BMC Infect Dis* 2022; **22**: 385. <https://doi.org/10.1186/s12879-022-07375-6>

35 Arman G, Zeyad M, Qindah B et al. Frequency of microbial isolates and pattern of antimicrobial resistance in patients with hematological malignancies: a cross-sectional study from Palestine. *BMC Infect Dis* 2022; **22**: 146. <https://doi.org/10.1186/s12879-022-07114-x>

36 Jamhour A, El-Kheir A, Salameh P et al. Antibiotic knowledge and self-medication practices in a developing country: a cross-sectional study. *Am J Infect Control* 2017; **45**: 384–8. <https://doi.org/10.1016/j.ajic.2016.11.026>

37 Al Baz M, Law MR, Saadeh R. Antibiotics use among Palestine refugees attending UNRWA primary health care centers in Jordan—a cross-sectional study. *Travel Med Infect Dis* 2018; **22**: 25–9. <https://doi.org/10.1016/j.tmaid.2018.02.004>

38 Abu Taha A, Abu-Zaydeh AH, Ardash RA et al. Public knowledge and attitudes regarding the use of antibiotics and resistance: findings from a cross-sectional study among Palestinian adults. *Zoonoses Public Health* 2016; **63**: 449–57. <https://doi.org/10.1111/zph.12249>

39 Al-Halawa DA, Sarama R, Abdeen Z et al. Knowledge, attitudes, and practices relating to antibiotic resistance among pharmacists: a cross-sectional study in the West Bank, Palestine. *Lancet* 2019; **393**: S7. <https://doi.org/10.1186/s12879-022-07955-6>

40 Eljedi A, Dalo S. Compliance with the national Palestinian infection prevention and control protocol at governmental paediatric hospitals in Gaza governorates. *Sultan Qaboos Univ Med J* 2014; **14**: e375–81.

41 Pigelet M, Hababeh M, Khader A et al. The effect of continuity of care on antibiotics prescription for Palestinian refugees in UNRWA health centres: a cross-sectional study. *Lancet* 2018; **391**: S19. [https://doi.org/10.1016/S0140-6736\(18\)30344-1](https://doi.org/10.1016/S0140-6736(18)30344-1)

42 Abu Taha A, Sedda D, Abu Alqarn S. Knowledge, attitudes and practice survey about antimicrobial resistance and prescribing among physicians in governmental hospitals in the north of Palestine. *Palestine Med J* 2019; **4**: 3. <https://doi.org/10.59049/2790-0231.1050>

43 Maraqa B, Nazzal Z, Hamshari S et al. Palestinian physicians' self-reported practice regarding antibiotic use for upper respiratory tract infections in primary healthcare. *Front Med* 2023; **10**: 1139871. <https://doi.org/10.3389/fmed.2023.1139871>

44 Jabbarin H, Nawajah I, Hejaz HA. Knowledge, attitude, awareness, and perceptions among physicians toward antibiotic resistance in hospitals in South Palestine. *Avicenna J Med* 2023; **13**: 49–55. <https://doi.org/10.1055/s-0043-1764374>

45 Palestinian Central Bureau of Statistics. Projected mid-year population for Nablus governorate by locality, 2024. https://www.pcbs.gov.ps/statisticsIndicatorsTables.aspx?lang=en&table_id=698.

46 An-Najah National University. An-Najah Hospital. <https://www.najah.edu/en/community/annu-hospital/>.

47 Kvale S. *Doing Interviews*. Sage Publications, 2009.

48 Duffy E, Ritchie S, Metcalfe S et al. Antibacterials dispensed in the community comprise 85%–95% of total human antibacterial consumption. *J Clin Pharm Ther* 2018; **43**: 59–64. <https://doi.org/10.1111/jcpt.12610>

49 Coyne IT. Sampling in qualitative research. Purposeful and theoretical sampling; merging or clear boundaries? *J Adv Nurs* 1997; **26**: 623–30. <https://doi.org/10.1046/j.1365-2648.1997.t01-25-00999.x>

50 Clarke V, Braun V. *Successful Qualitative Research: A Practical Guide for Beginners*. Sage, 2013.

51 Weiss RS. *Learning from Strangers: the Art and Method of Qualitative Interview Studies*, 1st edn. Simon and Schuster, 1995.

52 Finlay L. Negotiating the swamp: the opportunity and challenge of reflexivity in research practice. *Qual Res* 2002; **2**: 209–30. <https://doi.org/10.1177/146879410200200205>

53 Immy H. *Qualitative Research in Health Care*. McGraw-Hill Education (UK), 2005.

54 Pulcini C, Williams F, Molinari N et al. Junior doctors' knowledge and perceptions of antibiotic resistance and prescribing: a survey in France and Scotland. *Clin Microbiol Infect* 2011; **17**: 80–7. <https://doi.org/10.1111/j.1469-0691.2010.03179.x>

55 Chandler CIR. Current accounts of antimicrobial resistance: stabilisation, individualisation and antibiotics as infrastructure. *Palgrave Commun* 2019; **5**: 53. <https://doi.org/10.1057/s41599-019-0263-4>

56 WHO. Antibiotic Resistance: Multi-Country Public Awareness Survey. 2015. https://iris.who.int/bitstream/handle/10665/194460/9789241509817_eng.pdf.

57 Acharya KP, Subedi D. Use of social media as a tool to reduce antibiotic usage: a neglected approach to combat antimicrobial resistance in low and middle income countries. *Front Public Health* 2020; **8**: 558576. <https://doi.org/10.3389/fpubh.2020.558576>

58 Pulcini C, Gyssens IC. How to educate prescribers in antimicrobial stewardship practices. *Virulence* 2013; **4**: 192–202. <https://doi.org/10.4161/viru.23706>

59 Transitional Training Programme (TTP). Family Medicine Palestine. <https://familymedicinepalestine.org/transitional-training-programme>.

60 Butler CC, Rollnick S, Pill R et al. Understanding the culture of prescribing: qualitative study of general practitioners' and patients' perceptions of antibiotics for sore throats. *BMJ* 1998; **317**: 637–42. <https://doi.org/10.1136/bmj.317.7159.637>

61 Lum EPM, Page K, Whitty JA et al. Antibiotic prescribing in primary healthcare: dominant factors and trade-offs in decision-making. *Infect Dis Health* 2018; **23**: 74–86. <https://doi.org/10.1016/j.idh.2017.12.002>

62 Van der Zande MM, Dembinsky M, Aresi G et al. General practitioners' accounts of negotiating antibiotic prescribing decisions with patients: a qualitative study on what influences antibiotic prescribing in low, medium and high prescribing practices. *BMC Fam Pract* 2019; **20**: 172. <https://doi.org/10.1186/s12875-019-1065-x>

63 Wood F, Simpson S, Butler CC. Socially responsible antibiotic choices in primary care: a qualitative study of GPs' decisions to prescribe broad-spectrum and fluoroquinolone antibiotics. *Fam Pract* 2007; **24**: 427–34. <https://doi.org/10.1093/fampra/cmm040>

64 Tarrant C, Krockow EM, Nakkawita WMID et al. Moral and contextual dimensions of “inappropriate” antibiotic prescribing in secondary care: a three-country interview study. *Front Sociol* 2020; **5**: 7. <https://doi.org/10.3389/fsoc.2020.00007>

65 Sulis G, Adam P, Nafade V et al. Antibiotic prescription practices in primary care in low- and middle-income countries: a systematic review and meta-analysis. *PLoS Med* 2020; **17**: e1003139. <https://doi.org/10.1371/journal.pmed.1003139>

66 Pierce J, Apisarnthanarak A, Schellack N et al. Global antimicrobial stewardship with a focus on low- and middle-income countries. *Int J Infect Dis* 2020; **96**: 621–9. <https://doi.org/10.1016/j.ijid.2020.05.126>

67 WHO. Meeting report: antibiotic shortages: magnitude, causes and possible solutions. 2019. <https://www.who.int/publications/i/item/meeting-report-antibiotic-shortages-magnitude-causes-and-possible-solutions>

68 Stewart GL, Manges KA, Ward MM. Empowering sustained patient safety: the benefits of combining top-down and bottom-up approaches. *J Nurs Care Qual* 2015; **30**: 240–6. <https://doi.org/10.1097/NCQ.00000000000000103>

69 Mukamel DB, Haeder SF, Weimer DL. Top-down and bottom-up approaches to health care quality: the impacts of regulation and report cards. *Annu Rev Public Health* 2014; **35**: 477–97. <https://doi.org/10.1146/annurev-publichealth-082313-115826>

70 Birgand G, Castro-Sánchez E, Hansen S et al. Comparison of governance approaches for the control of antimicrobial resistance: analysis of three European countries. *Antimicrob Resist Infect Control* 2018; **7**: 28. <https://doi.org/10.1186/s13756-018-0321-5>

71 Sulis G, Sayood S, Katukoori S et al. Exposure to World Health Organization’s AWaRe antibiotics and isolation of multidrug resistant bacteria: a systematic review and meta-analysis. *Clin Microbiol Infect* 2022; **28**: 1193–202. <https://doi.org/10.1016/j.cmi.2022.03.014>

72 Sharland M, Gandra S, Huttner B et al. Encouraging AWaRe-ness and discouraging inappropriate antibiotic use—the new 2019 Essential Medicines List becomes a global antibiotic stewardship tool. *Lancet Infect Dis* 2019; **19**: 1278–80. [https://doi.org/10.1016/S1473-3099\(19\)30532-8](https://doi.org/10.1016/S1473-3099(19)30532-8)

73 Musmar SMJ, Ba’ba H, Owais A. Adherence to guidelines of antibiotic prophylactic use in surgery: a prospective cohort study in North West Bank, Palestine. *BMC Surg* 2014; **14**: 69. <https://doi.org/10.1186/1471-2482-14-69>

74 Hsu J. How COVID-19 is accelerating the threat of antimicrobial resistance. *BMJ* 2020; **369**: m1983. <https://doi.org/10.1136/bmj.m1983>