Infection (2019) 47:749–760
https://doi.org/10.1007/s15010-019-01298-2

ORIGINAL PAPER

Practices, organisation, and regulatory aspects in advising on antibiotic prescription: the international ESCMID AntibioLegalMap survey

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Received: 25 November 2018 / Accepted: 16 March 2019 / Published online: 22 March 2019

Abstract

Purpose Giving advice about antibiotic prescription through dedicated consultations is a cornerstone of antibiotic stewardship programmes. Our objective was to explore practices, organisation, and regulatory requirements related to antibiotic advising.

Methods We performed an international, exploratory, Internet-based, cross-sectional survey targeting infectious diseases and clinical microbiology specialists. It was disseminated through ESCMID and ESGAP networks.

Results Answers from 830 participants (74 countries, 77% of participants from Europe) were collected. Consultations were mostly given on demand (81%, 619/764), while unsolicited consultations targeting specific conditions (e.g., positive blood culture) were less frequent (66%, 501/764). Consultations usually included indications on diagnostic work-up and follow-up (> 79%). Curbside consultations (i.e., without examining the patient) were reported by 82% (598/733) of respondents, mainly by phone (89%, 531/598). The referring physician was considered authorised not to follow the advice by 57% (383/676). Direct consultations (i.e., after examining the patient) were recorded in the medical file more frequently than curbside consultations (69%, 472/689 vs 35%, 206/592). Concerning legal liability, the majority of respondents considered that it is shared between the adviser and the referring physician, who, however, is considered primarily responsible. The advisers' liability was considered to be lower in cases of curbside and unrecorded consultations. Significant inter-countries and intra-country variability were identified, suggesting that the setting markedly influenced practices.

Conclusion Significant variability exists in the practice of antibiotic advising. This concerns both the organisation of care and how advisers perceive regulatory requirements. These elements must be taken into account when implementing antibiotic stewardship programmes and when training stewards.

Keywords Antibiotic prescribing · Consultation · Antibiotic stewardship · Regulation · Professional liability

Background

Prescribing antibiotics is recognised as a complex task, having important implications at patient and population level. This concerns therapeutic effectiveness and side effects, health care expenditure, and selection of antibiotic resistance [1, 2]. In this context, antibiotic stewardship (ABS) efforts have been increasingly advocated [2, 3]. ABS programmes' implementation relies on ABS teams, made up of professionals with different backgrounds, and in high-income countries usually consisting of at least a medical doctor who is specialist in infectious diseases (ID), a clinical microbiologist (CM), and a pharmacist. ABS team is responsible for

Part of the results of this work has been presented at the ECCMID (European Congress of Clinical Microbiology and Infectious Diseases) 2017, poster number 1227.

Electronic supplementary material The online version of this article (https://doi.org/10.1007/s15010-019-01298-2) contains supplementary material, which is available to authorised users.

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different activities, aiming to promote responsible antibiotic use. One of the most important and frequent task concerns giving advice to prescribers about antibiotic prescription, through dedicated solicited or unsolicited consultations, to promote high-quality, evidence-based antibiotic prescribing [4, 5]. A formal ABS team is not present in all contexts [6], but the majority of ID/CM specialists provide some guidance on infection management to other health care professionals [7].

It has been shown that advice from specialists in infection management can improve the quality and reduce the quantity of (unnecessary) antibiotic prescriptions, having also an impact on some cardinal outcomes, such as mortality, length of hospital stay, re-admission rate, and health care expenditure [7]. Less attention has been paid to describing how this consulting activity is organised in different contexts, how practices may vary, and how professional liability (i.e., legal responsibility related to the professional conduct) is shared between the physician who asks for advice (termed *referring physician*) and the specialist who gives the piece of advice (termed *adviser*). The available literature suggests that these aspects may change significantly in different settings and countries [7].

The provision of high-quality health care cannot simply be considered the result of physicians' competencies and experience. The professional environment where a physician works can deeply influence his propensity and ability to act according to evidence-based practices [8]. Understanding the organisation of consulting activity and its relevant regulations is, therefore, essential.

The aim of this study was to explore practices, organisation, and regulatory dimensions related to advising on antibiotic prescription in different countries. The work described here was part of the AntibioLegalMap project, a large survey which also included a section on the influence of defensive medicine on antibiotic prescribing and advising. The section related to defensive medicine has been reported elsewhere [9].

Methods

AntibioLegalMap was an international cross-sectional exploratory survey endorsed by ESCMID (European Society of Clinical Microbiology and Infectious Diseases) and coordinated by ESGAP (ESCMID Study Group for Antimicrobial stewardshiP). It was addressed to specialists in ID and CM who regularly prescribe antibiotics and/or give advises on antibiotic prescription in the hospital setting. Trainees or other specialists were excluded.

The questionnaire was developed on the basis of the existing literature by a multidisciplinary panel composed by 5 specialists in ID, a methodologist and public health specialist, and a sociologist. It was an Internet-based questionnaire hosted on SurveyMonkey® (Palo Alto, California, USA), intended for self-administration. A pilot version of the survey was addressed to 9 ABS experts (having cumulative working experience in 12 countries), to test it for clarity, feasibility, and time requirement.

The final questionnaire included 29 questions (in English), divided in 4 parts (Online resource 1):

1. filter questions (questions 1–3), selecting the target population;
2. population's demographic and professional characteristics (questions 4–11);
3. practices, organisation, and regulatory aspects in advising on antibiotic prescription (questions 13–20);
4. defensive medicine in antibiotic prescribing and advising on antibiotic prescription (questions 21–29). The methods and the results of this fourth part have already been described in detail elsewhere [9].

The first 3 parts consisted of multiple choice questions, with the opportunity to add comments where suitable (Online resource 1). The third part focused specifically on the consulting activity, i.e., when the ID/CM specialist gives some advice on antibiotic prescription to a referring physician, concerning a patient who is hospitalised in a ward other than his/her own. For some questions, we further identified two different scenarios: advising after having examined the patient, termed *direct consultation*; advising without having examined the patient (e.g., by phone or discussing with a colleague), termed *curbside consultation*.

Wide dissemination of the survey was achieved via ESCMID and ESGAP websites, newsletters, and social media, and ESGAP Open Virtual Learning Community [10]. Moreover, ESGAP members were invited to disseminate the survey in their professional networks and to send it to their national ID/CM societies for further advertising. At least one reminder was sent in each dissemination channel.

The study was open from June to August 2016. Participation was voluntary and not compensated, and anonymity was guaranteed. Ethical approval was not required due to the nature of the study, involving only health professionals on an anonymous basis.

Results were reported as numbers and percentages.

Statistical analyses were performed using SAS, version 9.4 (SAS Institute Inc, Cary, NC, USA).

Results

We collected answers from 830 participants, coming from 74 countries (Online resource 2). The most represented countries were Germany, United Kingdom, France, Spain, and

Italy. The majority (76.9%, 633/823) of participants came from Europe and 80.9% (666/823) came from high-income countries. Respondents' demographic and professional characteristics are summarised in Table 1. The number of respondents varied from one question to another because of filters and/or non-respondents.

Practice and organisation in consulting on antibiotic prescription

Participants reported consulting on antibiotic treatment for specific patients on demand in 81.0% of cases, (619/764); regularly consulting (i.e., giving unsolicited consultations) on some selected topics such as restricted antibiotics or positive blood cultures in 65.6% (501/764); regularly consulting in some selected wards such as intensive-care units, transplant units, and surgical units in 36.4% (277/764).

When the prescription of an antibiotic was needed as a result of the consultation, the role of the adviser was to directly prescribe the antibiotic in 9.1% (67/735) of cases, whereas, in 90.9% (668/735) of cases, the adviser gave the advice and the referring physician eventually prescribed the antibiotic.

The given advice usually concerned the choice of the antibiotic (89.6%, 608/679); the dose, route of administration, and duration of treatment (90.3%, 613/679); the diagnostic work-up (80.3%, 586/679) and the follow-up (78.9%, 536/679).

Curbside consultations were reported by 81.6% (598/733) of respondents, in different formats: by phone (88.8%, 531/598); by e-mail (26.4%, 158/598); through face-to-face discussion with colleagues (79.1%, 473/598). Analysing the answers from the 12 countries with more than 20 respondents, we found some inter-country variability (Table 2). First of all, in some countries, curbside consultations seemed to be part of the routine activity of almost all ID/CM specialists (e.g., 100% in Sweden and France), whereas, in others, they were not so widespread (e.g., in Turkey or in Italy, where 68.4% and 38.1% of respondents declared not to practice curbside consultations, respectively). Moreover, consulting by phone, which was overall the commonest form of curbside consultation, was reported by a proportion of participants ranging from more than 90% (Austria, France, Norway, Sweden, and UK) to less than 50% (Spain and Turkey).

Regulatory aspects in consulting on antibiotic prescription

According to the respondents, the referring physician was considered formally obliged to follow the advice given by the adviser by 11.1% (75/676) of respondents; authorised not to follow it, but expected to write a note in the medical file to explain the lack of compliance by 27.8% (188/676) of respondents; and completely at liberty to not follow the advice without even needing to document the lack of compliance by 56.7% (383/676) of respondents. The distribution of these different options varied from one country to another (Table 2). For example, more than 70% of respondents from Austria, France, and Slovenia considered the referring physician free to ignore the advice, compared with less than 30% of respondents from Croatia and Norway.

Concerning the need to record the consultation in the medical file, we differentiated direct and curbside consultations. In the case of direct consultations, the advice was usually reported somewhere in the medical file (i.e., it was recorded) by 68.5% (472/689) of respondents, whereas 26.6% (183/689) of respondents recorded it non-consistently, and 1.6% (11/689) never recorded it. In the case of curbside consultations, the advice was usually recorded by 34.8% (206/592) of respondents, non-consistently recorded by 52.4% (310/592), and never recorded by 5.4% (32/592). Inter-country variability was noted here, as well (Table 2): in particular, in some countries (e.g., UK and Italy), curbside consultations were systematically recorded by the majority of participants, similarly to direct consultations.

Finally, we focused on the perceived personal legal liability (i.e., responsibility) when consulting, from the perspective of the advisor (Tables 3, 4). We asked if legal liability mainly lays on the adviser or on the referring physician (or on both of them) for four clinical scenarios: (a) recorded, direct consultation; (b) unrecorded, direct consultation; (c) recorded, curbside consultation; (d) unrecorded, curbside consultation. In all scenarios the majority of respondents reported that legal liability is shared between the adviser and the referring physician, with the latter being primarily responsible. However, the proportion of respondents declaring that they had the full responsibility decreased progressively from 18.5 to 4.1% moving from scenario *a* to scenario *d*. The number of respondents declares not to have any legal responsibility when consulting was higher in scenarios *b* and *d* (13.2% and 26.1%, respectively), i.e., in cases of unrecorded advice.

A considerable proportion of respondents acknowledged that they were unable to answer to this question. This uncertainty was higher in case of unrecorded advice: up to 18.7% of respondents declared to be unable to answer in scenario *d*, and this percentage was higher than 30% in some countries, as in Austria and Croatia (Table 4). Inter- and intra-country variability was observed and is reported in details for the 12 countries with more than 20 respondents in Table 4.

Table 1 Participants' demographic and professional characteristics ($N = 830$)

Characteristic	n/N[a]	Percentage
Daily activity		
Direct antibiotic prescribing	74/830	8.9
Advising on antibiotic prescribing	339/830	40.8
Both	417/830	50.2
Speciality		
Infectious diseases	527/830	63.5
Clinical microbiology	303/830	36.5
Gender		
Female	396/823	48.1
Male	421/823	51.2
Prefer not to say	6/823	0.7
Area of origin: continent		
Europe	633/823	76.9
Africa	36/823	4.4
America	53/823	6.4
Asia	37/823	4.5
Oceania	64/823	7.8
Area of origin (countries with more than 20 participants)		
Australia	34/823	4.1
Austria	30/823	3.6
Croatia	33/823	4.0
France	71/823	8.6
Germany	115/823	13.9
Italy	50/823	6.1
Norway	22/823	2.7
Slovenia	21/823	2.6
Spain	61/823	7.4
Sweden	36/823	4.4
Turkey	24/823	2.9
United Kingdom	78/823	9.5
Age		
≤ 35	70/825	8.5
36–50	410/825	49.7
> 50	345/825	41.8
Years of professional experience after completing the trainee period (as senior doctor)		
≤ 2	72/822	8.8
3–10	272/822	33.1
> 10	478/822	58.2
Work setting		
University public hospital	482/824	58.5
Other public facility	273/824	33.1
Private facility	138/824	16.7
Other/not well specified	34/824	4.1
Employment contract		
Fixed-term contract	207/819	25.3
Permanent employment	612/819	74.7
Presence of an antibiotic stewardship team in the institution		
Yes	600/825	72.7
No	217/825	26.3
Cannot answer	8/825	1

Table 1 (continued)

Characteristic	*n*/*N*[a]	Percentage
Participation in the antibiotic stewardship team		
Yes	516/814	63.4
No	298/814	36.6

[a]Number/total respondents to the question

Discussion

The results of this exploratory international survey provide insight to some key organisational and regulatory aspects of the consulting activity on antibiotic prescriptions performed by ID and CM specialists from a large sample of countries.

Practice and organisation in consulting on antibiotic prescription

We found that consulting on antibiotic treatment on demand remains the most common practice, while systematic unsolicited consultation for specific patients (e.g., those being prescribed restricted antibiotics or with positive blood cultures) or in target wards is less common. High-quality studies showed that systematic evaluation of antibiotic prescriptions by ID physicians can reduce unnecessary antibiotic use [11], particularly when targeting selected wards, for example orthopaedic surgery [12]. Similarly, an increase in the quality of diagnostic pathway and prescription has been shown, particularly when systematic consultations focused on particular clinical scenarios, such as bloodstream infections [13, 14]. Thus, there is still room for improvement, both making consultations more systematic and more targeted. This would also be a strategy to guarantee efficacy despite staff shortage, which is common in many settings even in high-income countries [15].

In the vast majority of cases, the advice included recommendations not only about the antibiotic choice, route, dose, and duration, but also about the diagnostic work-up and follow-up. This result is encouraging, since it refers to a more holistic approach to ABS, which goes beyond the mere prescribing activity to be more effective [16]. This finding is also in line with the practices reported in another recent ESCMID survey on the management of bloodstream infections [17], as well as in two studies of ID practices [18, 19].

Curbside consultations are known to be a common practice [20]. The literature shows conflicting results on the impact of curbside consultation as compared to direct consultation [21, 22], suggesting that curbside consultation can be a double-edged sword. On one hand, curbside consultations have been associated with increased consulting activity and enhanced collaboration among physicians [23], but, on the other hand, they can also account for a significant amount of unrecognised work, both in terms of time and remuneration [24]. Moreover, curbside consultations are often complex, requiring a high level of competence [24], and are prone to communication errors, sometimes, having a negative impact on the quality of advising [25]. Our study showed that curbside consultations are not equally accepted and performed in all countries, particularly concerning the practice of phone consultation (Table 2). To the best of our knowledge, these inter-country differences have not been investigated before. Further studies are required to understand if these variations are mainly motivated by organisational, workload, regulatory, or cultural factors, and to assess the impact of curbside consultations on the quality of patient management in different contexts and countries. This is particularly interesting also because curbside consultations have been increasingly used in recent years in the form of telemedicine, to connect small, peripheral facilities with bigger institutions, both in high- and low-to-middle-income settings [26, 27].

Regulatory aspects in consulting on antibiotic prescription

Overall, when analysing data about perception/knowledge of regulatory aspects, we identified significant inter-country variability.

In some countries (e.g., in Austria, France, and Slovenia), the referring physician was mostly considered free not to comply with the advice given by the adviser, in case of disagreement, while, in other countries (e.g., in Croatia, Norway, and UK), this was mostly perceived as an inappropriate practice. In some countries, the consultation is usually recorded somewhere in the medical file by the vast majority of respondents (e.g., in Italy and the UK), whereas, in others, this practice is less frequent (e.g., in France, Spain, and Norway). Overall, curbside consultations were recorded by only a minority of respondents.

When exploring the respondent's perception/knowledge on how the liability is shared between the adviser and the referring physician, the majority of participants reported that overall the responsibility lays principally on the referring physician. Curbside consultations, as well as unrecorded advices, were mostly considered to be associated with less liability, suggesting that they are considered mostly as "informal" consultation in real life practice (Tables 3, 4).

Table 2 Regulatory requirements

	Germany (115/823, 13.9%)	United Kingdom (78/823, 9.5%)	France (71/823, 8.6%)	Spain (61/823, 7.4%)	Italy (50/823, 6.1%)	Sweden (36/823, 4.4%)	Australia (34/823, 4.1%)	Croatia (33/823, 4.0%)	Austria (30/823, 3.4%)	Turkey (24/823, 2.9%)	Norway (22/823, 2.7%)	Slovenia (21/823, 2.5%)
Are consultations on antibiotic prescription without direct patient examination (curbside consultations) usually accepted and practiced in your institution?[a]												
Yes, by telephone	75/99 (75.8%)	69/74 (93.2%)	64/65 (98.5%)	28/58 (48.3%)	23/42 (54.8%)	33/33 (100.0%)	26/32 (81.3%)	16/26 (61.5%)	23/25 (92.0%)	7/19 (36.8%)	19/21 (90.6%)	17/20 (85.0%)
Yes, by e-mail	23/99 (23.2%)	53/74 (71.6%)	35/65 (53.8%)	3/58 (5.2%)	5/42 (11.9%)	1/33 (3.0%)	5/32 (15.6%)	3/26 (11.5%)	3/25 (12.0%)	0/19 (0.0%)	1/21 (4.8%)	0/20 (0.0%)
Yes, in the form of face-to-face discussion with other physicians	71/99 (71.7%)	66/74 (89.2%)	55/65 (84.6%)	42/58 (72.4%)	17/42 (40.5%)	25/33 (75.8%)	22/32 (38.8%)	10/26 (38.5%)	15/25 (60.0%)	5/19 (26.3%)	12/21 (57.1%)	11/20 (55.0%)
Usually not accepted	13/99 (13.1%)	1/74 (1.4%)	0/65 (0%)	11/58 (19%)	16/42 (38.1%)	0/33 (0.0%)	3/32 (9.4%)	7/26 (26.9%)	5/25 (20%)	13/19 (68.4%)	1/21 (4.8%)	2/20 (10.0%)
If a consultation on antibiotic prescription with direct patient examination is performed at your institution by an antibiotic expert, the recommendation will usually be												
Recorded somewhere in the medical record	55/92 (59.8%)	60/68 (88.2%)	38/63 (60.3%)	33/57 (57.9%)	42/47 (89.4%)	22/33 (66.7%)	25/31 (80.6%)	10/22 (45.5%)	16/23 (69.6%)	12/21 (57.2%)	12/20 (60.0%)	13/16 (81.3%)
Sometimes recorded and sometimes not recorded, depending on the situation	29/92 (31.5%)	8/68 (11.8%)	25/63 (39.7%)	23/57 (40.3%)	5/47 (10.6%)	10/33 (30.3%)	4/31 (12.9%)	9/22 (40.9%)	4/23 (17.4%)	5/21 (23.8%)	8/20 (40.0%)	3/16 (18.7%)
Not recorded anyway in the medical record	3/92 (3.3%)	0/68 (0%)	0/63 (0%)	0/57 (0%)	0/47 (0%)	0/33 (0.0%)	0/31 (0.0%)	2/22 (9.1%)	0/23 (0.0%)	0/21 (0.0%)	0/20 (0.0%)	0/16 (0.0%)
Unable to answer	5/92 (5.4%)	0/68 (0%)	0/63 (0%)	1/57 (1.8%)	0/47 (0%)	1/33 (3.0%)	2/31 (6.5%)	1/22 (4.5%)	3/23 (13.0%)	4/21 (19.0%)	0/20 (0.0%)	0/16 (0.0%)

Table 2 (continued)

	Germany (115/823, 13.9%)	United Kingdom (78/823, 9.5%)	France (71/823, 8.6%)	Spain (61/823, 7.4%)	Italy (50/823, 6.1%)	Sweden (36/823, 4.4%)	Australia (34/823, 4.1%)	Croatia (33/823, 4.0%)	Austria (30/823, 3.4%)	Turkey (24/823, 2.9%)	Norway (22/823, 2.7%)	Slovenia (21/823, 2.5%)
If a consultation on antibiotic prescription without direct patient examination (curbside consultation) is performed at your institution by an antibiotic expert, the recommendation will usually be												
Recorded somewhere in the medical record	33/86 (38.4%)	32/64 (50.0%)	12/65 (18.4%)	11/44 (25.0%)	17/25 (89.4%)	9/34 (26.5%)	10/28 (35.7%)	2/16 (12.5%)	7/22 (31.8%)	2/7 (28.6%)	10/20 (50.0%)	8/19 (42.1%)
Sometimes recorded and sometimes not recorded, depending on the situation	43/86 (50.0%)	31/64 (48.4%)	49/65 (75.4%)	30/44 (68.2%)	8/25 (10.6%)	24/34 (70.6%)	15/28 (53.6%)	11/16 (68.7%)	11/22 (50.0%)	2/7 (28.6%)	10/20 (50.0%)	11/19 (59.9%)
Not recorded anyway in the medical record	8/86 (9.3%)	1/64 (1.6%)	2/65 (3.1%)	1/44 (2.3%)	0/25 (0%)	0/34 (0.0%)	1/28 (3.6%)	3/16 (18.8%)	2/22 (9.1%)	0/7 (0.0%)	0/20 (0.0%)	0/19 (0.0%)
Unable to answer	2/86 (2.3%)	0/68 (0%)	2/65 (3.1%)	2/44 (4.5%)	0/25 (0%)	1/34 (2.9%)	2/28 (7.1%)	0/16 (0.0%)	2/22 (9.1%)	3/7 (42.8%)	0/20 (0.0%)	0/19 (0.0%)
If the ward physicians do not want to comply with the antibiotic expert's advice												
They can ignore the advice	65/98 (66.3%)	26/74 (35.1%)	46/63 (73.8%)	35/52 (67.3%)	21/42 (50.0%)	21/34 (61.8%)	19/31 (61.3%)	7/24 (29.2%)	19/24 (79.1%)	9/16 (56.3%)	4/21 (19.0%)	13/17 (76.5%)
They can ignore the advice, but they should write a note explaining the non-compliance	27/98 (27.6%)	44/74 (59.5%)	7/63 (10.8%)	11/52 (21.2%)	9/42 (21.4%)	7/34 (20.6%)	11/31 (35.5%)	7/24 (29.2%)	1/24 (4.2%)	1/16 (6.2%)	12/21 (57.1%)	1/17 (5.9%)

Table 2 (continued)

	Germany (115/823, 13.9%)	United Kingdom (78/823, 9.5%)	France (71/823, 8.6%)	Spain (61/823, 7.4%)	Italy (50/823, 6.1%)	Sweden (36/823, 4.4%)	Australia (34/823, 4.1%)	Croatia (33/823, 4.0%)	Austria (30/823, 3.4%)	Turkey (24/823, 2.9%)	Norway (22/823, 2.7%)	Slovenia (21/823, 2.5%)
They cannot ignore the advice, this is considered a form of malpractice	3/98 (3.1%)	2/74 (2.7%)	7/63 (10.8%)	4/52 (7.7%)	9/42 (21.4%)	5/34 (14.7%)	0/31 (0.0%)	5/24 (20.8%)	3/24 (12.5%)	5/16 (31.3%)	4/21 (19.0%)	1/17 (5.9%)
Unable to answer	3/98 (3.0%)	2/74 (2.7%)	3/63 (4.6%)	2/52 (3.8%)	3/42 (7.2%)	1/34 (2.9%)	1/31 (3.2%)	5/24 (20.8%)	1/24 (4.2%)	1/16 (6.2%)	1/21 (4.8%)	2/17 (11.8%)

Detailed data from countries with more than 20 participants. The number of respondents is different from one question to another because of filters and/or non-respondents

[a]The total exceeds 100%, since more than one answer was possible

These findings show a misalignment between the advisers' knowledge about regulations and the existing regulatory requirements, at least in some countries, and this could put these professionals at risk of legal liability. For instance, French regulation [28] states that the consultation should always be recorded, with a clear identification of the patient's and adviser's identity, the date and time of the advice, and the detailed content of the advice. A similar conduct is suggested in the Good Medical Practice guidance in the UK [29]. Moreover, the tendency to consider curbside consultations as "informal" (i.e., unofficial) consultations, implying a reduced liability for the adviser, can be somewhat misleading. The French [28] and USA [30] examples show that different medico-legal issues can exist in curbside consultations, depending on if a patient-physician relationship and a consequent duty of care exist and involve the adviser. This is conditioned by several factors, such as: if the required advice is on a generic clinical dilemma or on a specific issue; if confidential information on the patient is transmitted; if the adviser acts in an established on-call system; if and how the content of the advice is recorded by the referring physician [28, 30]. In view of this complexity, even though curbside consultations are an extremely common practice and they are probably unavoidable in many contexts, some authors recommend trying to avoid them at least in complex or severe situations, and recording the pieces of advice given [30, 31]. Understaffing is frequent [15] and it is indubitably one of the most relevant reasons why curbside consultations are often preferred over direct consultations, which are more time consuming; thus, tackling understaffing may have a direct impact on the quality of health care, reducing the use of curbside consultations.

Finally, concerning the questions on regulatory aspects, we also identified substantial intra-country variability (Table 4), meaning that respondents coming from the same country gave variable answers to the same question. Moreover, many respondents acknowledged they did not know how legal liability is shared between the adviser and the referring physician, particularly in case of unrecorded consultations. These observations could have several explanations: ID/CM specialists might adapt their practices more to the local context, resource availability, specific needs, and habits, than to existing regulation; and/or these infection specialists are not aware of the existing regulation; and/or this regulation is missing or unclear; and/or it varies from one region to another in countries where health care is organised regionally. To the best of our knowledge, these aspects are largely unexplored, at least in the medical literature, and certainly deserve further investigation.

Table 3 Perceived personal legal liability (i.e., responsibility) when consulting on antibiotic prescription, from the perspective of the adviser (consultations in wards/departments other than the prescriber's one)

Studied clinical situations	The adviser has the full responsibility	The adviser shares the responsibility with the referring physician, but the adviser is primary responsible	The adviser shares the responsibility with the referring physician, but the referring physician is primary responsible	The adviser has no responsibility	Unable to answer
Consultation with direct patient examination and with recorded advice	111/599 (18.5%)	123/599 (20.5%)	307/599 (51.3%)	20/599 (3.4%)	38/599 (6.3%)
Consultation with direct patient examination and with unrecorded advice	40/500 (8%)	61/500 (12.2%)	261/500 (52.2%)	66/500 (13.2%)	75/500 (14.4%)
Consultation without direct patient examination (curbside consultation[a]) and with recorded advice	43/633 (6.8%)	88/633 (13.9%)	381/633 (60.2%)	48/633 (7.6%)	73/633 (11.5%)
Consultation without direct patient examination (curbside consultation[a]) and with unrecorded advice	24/589 (4.1%)	32/589 (5.4%)	269/589 (45.7%)	154/589 (26.1%)	110/589 (18.7%)

The number of respondents is different from one question to another because of filters and non-respondents

[a]Curbside consultation: the advice is given without examining the patient (e.g., by phone)

Limitations and conclusions

Our study has several original findings, on a topic that has been largely overlooked so far, despite its obvious impact on ABS programmes and antibiotic consulting, in general. Some limitations need, however, to be acknowledged. The questionnaire was in English, the dissemination passed mainly through ESCMID and ESGAP communication channels, and the participation was voluntary, so the population of respondents is probably not representative of all ID/CM specialists. Due to the dissemination strategy, participation rate cannot be estimated. Moreover, participants came mainly from high-income countries and from Europe, and thus, findings cannot be considered generalizable for low/middle-income countries and extra European countries. Concerning professional liability, we explored only a few simplified scenarios, to increase the clarity of the questionnaire and to reduce time requirement for participating. We appreciate that, in real life situations, they are more complex, with different levels of responsibility (penal, civil, and administrative) and relevant differences related to the setting (public or private facility). Finally, due to the cross-sectional survey design of the study, we present self-reported data, not observed practices.

In conclusion, this large international exploratory survey suggests different strategies to strengthen ABS programmes: consulting on antibiotic prescriptions in a more systematic and focused way, via unsolicited consultations; improving recording of consultations; better regulating and clarifying the practice of curbside consultations. Data on the practices reported by ID/CM specialists, as well as their perceptions on where professional liability lays, suggest that curbside and unrecorded consultations are often considered as an "unofficial activity", but this may, sometimes, not be in line with regulatory requirements. It is, therefore, important to train ID/CM specialists, and any member of an ABS team, on these regulatory aspects. Finally, great variability in practices exists and needs to be acknowledged and carefully taken into account when implementing ABS programmes and evaluating their impact in different contexts. Further studies are required to explore in detail the characteristics of consulting activity in different settings, the major determinants of variability in practice, and the overall impact on ABS objectives. Regulations concerning the consulting activity in different countries and settings need to be better described and explained to health care professionals in an understandable way.

Table 4 Perceived personal legal liability (i.e., responsibility) consulting on antibiotic prescription, from the perspective of the adviser (consultations in wards/departments other than the prescriber's one)

		The adviser has the full responsibility	The adviser shares the responsibility with the referring physician, but the adviser is primary responsible	The adviser shares the responsibility with the referring physician, but the referring physician is primary responsible	The adviser has no responsibility	Unable to answer
Consultation with direct patient examination and with recorded advice	DE	6/84 (7.1%)	13/84 (15.5%)	55/84 (65.5%)	8/84 (9.5%)	2/84 (2.4%)
	UK	8/61 (13.1%)	7/61 (11.5%)	42/61 (68.9%)	0/61 (0.0%)	4/61 (6.5%)
	FR	19/60 (31.7%)	22/60 (36.7%)	11/60 (18.3%)	0/60 (0.0%)	8/60 (13.3%)
	ES	13/44 (29.5%)	12/44 (27.3%)	14/44 (31.8%)	0/44 (0.0%)	5/44 (11.4%)
	IT	3/41 (7.3%)	13/41 (31.7%)	20/41 (48.8%)	1/41 (2.4%)	4/41 (9.8%)
	SE	8/32 (25.0%)	15/32 (46.9%)	6/32 (18.7%)	1/32 (3.1%)	2/32 (6.3%)
	AU	4/26 (15.4%)	9/26 (34.6%)	12/26 (46.2%)	0/26 (0.0%)	1/26 (3.8%)
	HR	2/16 (12.5%)	3/16 (18.7%)	8/16 (50.0%)	1/16 (6.3%)	2/16 (12.5%)
	AT	3/16 (18.8%)	1/16 (6.2%)	10/16 (62.5%)	1/16 (6.2%)	1/16 (6.2%)
	TR	7/19 (36.8%)	3/19 (15.8%)	8/19 (42.1%)	0/19 (0.0%)	1/19 (5.3%)
	NO	1/15 (6.7%)	3/15 (20.0%)	10/15 (66.6%)	0/15 (0.0%)	1/15 (6.7%)
	SI	1/15 (3.7%)	5/15 (33.3%)	8/15 (53.3%)	0/15 (0.0%)	1/15 (6.7%)
Consultation with direct patient examination and with unrecorded advice	DE	3/78 (3.8%)	4/78 (5.1%)	46/78 (59.0%)	17/78 (21.8%)	8/78 (10.3%)
	UK	3/45 (6.1%)	8/42 (16.3%)	29/42 (59.2%)	2/42 (4.1%)	7/42 (14.3%)
	FR	7/52 (13.5%)	6/52 (11.4%)	24/52 (46.2%)	3/52 (5.8%)	12/52 (23.1%)
	ES	1/35 (2.9%)	9/35 (25.7%)	15/35 (42.9%)	4/35 (11.4%)	6/35 (17.1%)
	IT	2/29 (6.9%)	2/29 (6.9%)	14/29 (48.3%)	5/29 (17.2%)	6/29 (20.7%)
	SE	3/27 (11.1%)	6/27 (22.2%)	13/27 (48.2%)	1/27 (3.7%)	4/27 (14.8%)
	AU	0/17 (0.0%)	4/17 (23.5%)	8/17 (47.1%)	1/17 (5.9%)	4/17 (23.5%)
	HR	0/16 (0.0%)	0/16 (0.0%)	10/16 (62.5%)	1/16 (6.3%)	5/16 (31.2%)
	AT	0/12 (0.0%)	1/12 (8.3%)	5/12 (41.7%)	2/12 (16.7%)	4/12 (33.3%)
	TR	5/16 (31.3%)	1/16 (6.3%)	5/16 (31.3%)	4/15 (26.7%)	1/16 (6.3%)
	NO	1/15 (6.7%)	3/15 (20.0%)	8/15 (53.3%)	2/15 (13.3%)	1/15 (6.7%)
	SI	1/12 (8.3%)	2/12 (16.7%)	7/12 (58.3%)	1/12 (8.3%)	1/12 (8.3%)
Consultation without direct patient examination (curbside consultation[a]) and with recorded advice	DE	5/96 (5.2%)	8/96 (8.3%)	65/96 (67.7%)	12/96 (12.5%)	6/96 (6.3%)
	UK	2/68 (2.9%)	8/68 (11.8%)	50/68 (73.5%)	1/68 (1.5%)	7/68 (10.3%)
	FR	4/61 (6.6%)	8/61 (13.1%)	32/61 (52.5%)	8/61 (13.1%)	9/61 (14.8%)
	ES	8/49 (16.3%)	9/49 (18.4%)	22/49 (44.9%)	2/49 (4.1%)	8/49 (16.3%)
	IT	1/37 (2.7%)	5/37 (13.5%)	22/37 (59.5%)	3/37 (8.1%)	6/37 (16.2%)
	SE	2/32 (6.3%)	7/32 (21.8%)	19/32 (59.3%)	2/32 (6.3%)	2/32 (6.3%)
	AU	0/30 (0.0%)	7/30 (23.3%)	19/30 (63.3%)	0/30 (0.0%)	4/30 (13.3%)
	HR	1/20 (5.0%)	1/20 (5.0%)	12/20 (60.0%)	1/20 (5.0%)	5/20 (25.0%)
	AT	1/19 (5.3%)	2/19 (10.5%)	11/19 (58.9%)	2/19 (10.5%)	3/19 (15.8%)
	TR	3/14 (21.4%)	4/14 (28.6%)	5/14 (35.7%)	1/14 (7.1%)	1/14 (7.1%)
	NO	0/20 (0.0%)	4/20 (20.0%)	13/20 (65.0%)	0/20 (0.0%)	3/20 (15.0%)
	SI	2/19 (10.5%)	4/19 (21.1%)	10/19 (52.6%)	1/19 (5.3%)	2/19 (10.5%)

Table 4 (continued)

		The adviser has the full responsibility	The adviser shares the responsibility with the referring physician, but the adviser is primary responsible	The adviser shares the responsibility with the referring physician, but the referring physician is primary responsible	The adviser has no responsibility	Unable to answer
Consultation without direct patient examination (curbside consultation[a]) and with unrecorded advice	DE	4/88 (4.5%)	2/88 (2.3%)	51/88 (58.0%)	21/88 (23.9%)	10/88 (11.4%)
	UK	0/56 (0.0%)	6/56 (10.7%)	34/56 (60.7%)	8/56 (14.3%)	8/56 (14.3%)
	FR	3/60 (5.0%)	3/60 (5.0%)	19/60 (31.7%)	22/60 (36.7%)	13/60 (21.7%)
	ES	2/45 (4.4%)	2/45 (4.4%)	19/45 (42.2%)	11/45 (24.4%)	11/45 (24.4%)
	IT	2/33 (6.1%)	2/33 (6.1%)	9/33 (27.3%)	9/33 (27.3%)	11/33 (33.3%)
	SE	2/31 (6.5%)	1/31 (3.2%)	17/31 (54.8%)	3/31 (9.7%)	8/31 (25.8%)
	AU	0/27 (0.0%)	1/27 (3.7%)	11/27 (40.7%)	3/27 (11.1%)	12/27 (44.4%)
	HR	0/22 (0.0%)	0/22 (0.0%)	11/22 (50.0%)	4/22 (18.2%)	7/22 (31.8%)
	AT	0/17 (0.0%)	1/17 (5.9%)	8/17 (47.1%)	5/17 (29.4%)	3/17 (17.6%)
	TR	4/15 (26.7%)	1/15 (6.7%)	4/15 (26.7%)	5/15 (33.3%)	1/15 (16.7%)
	NO	0/18 (0.0%)	1/18 (5.6%)	9/18 (50.0%)	6/18 (33.3%)	2/18 (11.1%)
	SI	0/15 (0.0%)	2/15 (13.3%)	8/15 (53.3%)	4/15 (26.7%)	1/15 (6.7%)

Detailed data from countries with more than 20 participants. The number of respondents is different from one question to another because of filters and/or non-respondents

DE Germany, *UK* United Kingdom, *FR* France, *ES* Spain, *IT* Italy, *SE* Sweden, *AU* Australia, *HR* Croatia, *AT* Austria, *TR* Turkey, *NO* Norway, *SI* Slovenia

[a]Curbside consultation: the advice is given without examining the patient (e.g., by phone)

Acknowledgements The authors would like to thank Joëlle Kivits (sociologist, University of Lorraine) for helping in developing the survey.

Funding This study was supported by internal funding.

Data Availability The data sets generated and analysed during the current study are available from the corresponding author on reasonable request.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest related with the topic.

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