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Title: The experiences and perspectives of implementing antimicrobial stewardship in five French hospitals: a qualitative study

Author: Anne PEROZZIELLO, Christelle ROUTELOUS, Esmita CHARANI, Alice TRUEL, Gabriel BIRGAND, Yazdan YAZDANPANAHA, François-Xavier LESCURE, Jean-Christophe LUCET, CEFECA study group

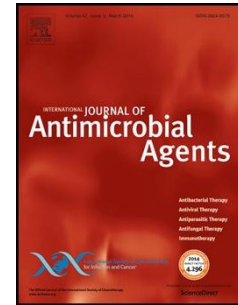
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1 **The experiences and perspectives of implementing antimicrobial stewardship in five**  
2 **French hospitals: a qualitative study**

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4 Anne PEROZZIELLO<sup>1</sup>, Christelle ROUTELOUS<sup>2</sup>, Esmita CHARANI<sup>3</sup>, Alice TRUEL<sup>1</sup>, Gabriel  
5 BIRGAND<sup>4</sup>, Yazdan YAZDANPANA<sup>1,5</sup>, François-Xavier LESCURE<sup>1,5</sup>, Jean-Christophe LUCET<sup>1,6</sup>  
6 and the CEFECA study group<sup>7</sup>.

7 1 IAME, UMR 1137, DeSCID team, Université Paris Diderot, Sorbonne Paris Cité, Paris,  
8 France.

9 2 Institut du Management / EA 7348 MOS Management des organisations en santé  
10 Ecole des hautes études en santé publique, EHESP, Rennes, Sorbonne Paris Cité, Paris,  
11 France.

12 3 NIHR Health Protection Research Unit in Antimicrobial Resistance and Healthcare  
13 Associated Infection, Imperial College London, Department of Medicine, London, UK.

14 4 Health Protection Research Unit in Healthcare Associated Infections and Antimicrobial  
15 Resistance, Imperial College London, London, United Kingdom.

16 5 Service de Maladies Infectieuses et Tropicales, Hôpital Bichat - Claude Bernard, AP-HP,  
17 Paris, France.

18 6 Unité d'Hygiène et de Lutte contre les Infections Nosocomiales (UHLIN), Hôpital Bichat –  
19 Claude Bernard, APHP, Paris France.

20 7 The CEFECA study group: Charles BURDET (INSERM U1137 Paris), Lidia KARDAS (INSERM  
21 U1137, Paris), Raphaël LEPEULE (Hôpital Henri Mondor, AP-HP, Créteil), Philippe LESPRIT  
22 (Hôpital Foch, Suresnes), François L'HERITEAU (CCLIN Paris Nord, Paris), Liem-Binh LUONG  
23 NGUYEN (Hôpital Bichat, AP-HP, Paris), Bruno MOURVILLIER (Hôpital Bichat, AP-HP, Paris,

24 Laetitia VAILLANT (Hôpital Bichat, AP-HP, Paris), Jean-Ralph ZAHAR (Hôpital Avicenne, AP-  
25 HP, Bobigny).

26

27 **Corresponding author:** Anne PEROZZIELLO, IAME, INSERM, DeSCID team. UFR de médecine,  
28 Paris Diderot, Site Xavier Bichat, 16 rue Henri Huchard, 75018 Paris, France. Tél: +33 (0)1 57  
29 27 77 61. Email: [anne.perozziello@aphp.fr](mailto:anne.perozziello@aphp.fr)

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### 33 **Highlights**

- 34 • The implementation of Antimicrobial Stewardship Program (ASP) depends on  
35 organisational, structural and cultural context
- 36 • We conducted a qualitative study based in five large French hospitals, where ASP were  
37 mainly driven by infectious diseases specialists
- 38 • In this context, with lack of appropriate human and information technology resources,  
39 ASP leaders chose adaptive responses and a non-confrontational approach rather than  
40 coercive measures

41

### 42 **Abstract**

43 **Objective:** To describe current antimicrobial stewardship program (ASP) in France, both at  
44 policy level and at local implementation level, and to assess how ASP leaders (ASPL) worked  
45 and prioritised their activities.

46 **Methods:** We conducted a qualitative study based on face-to-face semi-structured  
47 interviews with healthcare professionals responsible for ASP across five French hospitals.  
48 Five infectious disease specialists and one microbiologist were interviewed between April  
49 and June 2016.

50 **Results:** Stewards had dedicated time to perform ASP activities in two university-affiliated  
51 hospitals while in the other hospitals (one university, one general and one semi-private),  
52 ASPLs had to balance these activities with clinical practice. Consequently, they had to adapt  
53 interventions according to their resources (IT or human). Responding to colleagues'  
54 consultation requests formed baseline work. Systematic and pro-active measures allowed  
55 for provision of unsolicited counselling, while direct counselling on wards required  
56 appropriate staffing. ASPL aimed at increasing clinicians' ability to prescribe adequately and  
57 awareness of the unintended consequences of inappropriate use of antibiotics. Thus,  
58 persuasive e.g. education measures were preferred to coercive ones. ASPL faced several

59 challenges in implementing ASP: overcoming physicians' or units' reluctance, and balancing  
60 the influence of medical hierarchy and professional boundaries.

61 **Conclusion:** Beyond resources constraints, ASPLs' conceptions of their work, as well as  
62 contextual and cultural aspects, led them to adopt a persuasive and collaborative approach  
63 of counselling. This is the first qualitative study about ASP in France exploring stewards'  
64 experiences and points of view.

65 **Keywords:** antimicrobial stewardship, antibiotics, antimicrobial resistance, qualitative study.

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## 66 **Introduction**

67 The emergence of multidrug resistant bacteria represents a major public health issue, and is  
68 addressed by many organisations worldwide[1–4]. According to the Centers for Disease  
69 Control and Prevention (CDC), drug-resistant bacteria cause two million illnesses and 23,000  
70 deaths annually. Antibiotic resistance is, through the selection pressure mechanism, a  
71 consequence of misuse and overuse of antimicrobial agents. To tackle this problem, many  
72 international and national recommendations have promoted the implementation of  
73 antimicrobial stewardship programs (ASP) in hospitals over the last two decades[5–10]. In  
74 France, these programs, when they exist, cover a broad range of organisations[11,12]. In the  
75 absence of financial support, each hospital is left to define its own ASP development and  
76 implementation.

77 ASP in France relies upon an antibiotics advisor: a practitioner trained in infectious diseases  
78 (ID) or in antibiotic treatment, working in close cooperation with pharmacists,  
79 microbiologists and infection control practitioners. ASP are most of the time led by ID  
80 specialists. Involvement of hospital microbiologists and pharmacists in clinical activities and  
81 in “bedside care” is limited. Microbiologists and pharmacists provide advice in their fields of  
82 competence and have specific missions. If collaborating, they would form an ASP team.  
83 Institutional committees, such as the Anti-infection Agents Committee (CAI), are in charge of  
84 local antibiotics policy[10].

85 Our study aimed to describe current ASP in 5 French hospitals, both at policy level and at  
86 local implementation level, and to assess how healthcare professionals responsible for ASP  
87 are prioritising their activities. Our objective was to understand how the identified antibiotic  
88 stewardship program leaders (ASPL) perceived their work and duties in 5 healthcare facilities  
89 (HCF), and to discern the factors that influence their strategies and priorities.

## 90 **Methods**

91 This study was part of a larger research project, conducted in randomly selected French  
92 HCFs, aiming at describing ASP in France. To validate the study protocol, we carried out a  
93 test phase in a convenience sample of 5 HCFs: 2 university-affiliated hospitals, 2 general  
94 public hospitals and 1 semi-private hospital. All hospitals are located in Paris or its outskirts.  
95 ASPLs were the referring ASP physician or microbiology specialist formally appointed for the  
96 hospital. In each setting, ASP leaders were identified and were contacted; all agreed to  
97 participate. In April and June 2016, we conducted face-to-face semi-structured interviews  
98 with 6 identified stewards: 5 ID physicians and 1 non-physician microbiologist. In one setting,  
99 ASP leadership was shared by an ID physician and a microbiologist.

100 All interviews were conducted by a researcher (AP), using a semi-structured interview guide,  
101 consisting of open-ended questions to explore participants' views and experiences of  
102 implementing ASP, including their objectives and priorities, perceived barriers and  
103 facilitators to prescribers' uptake, ASP results and prospects. Interview guide is found as  
104 supplementary data. All interviews were de-identified and transcribed verbatim. Those  
105 interviews were analysed independently by AP and by a sociology lecturer (CR), using an  
106 iterative thematic approach[13,14] that resulted in the definition of themes and sub-themes  
107 which yielded an analytic framework, used to compare interviews.

108 Ethical approval was obtained from the Hôpitaux Universitaires – Paris Nord Val-de-Seine  
109 (HUPNVS) ethical committee (n° 16-018) and all participants signed informed consent prior  
110 to the interviews.

111

112 **Results**

113 Participants' hospitals and ASP details are presented in table 1. Four hospitals were  
114 university-affiliated and one was a semi-private hospital. In all hospitals, the identified ASPL  
115 was an ID specialist, coupled with a microbiologist in one. In 2 hospitals, stewards were full-  
116 time dedicated to ASP activities. Microbiology department was involved in ASP activities in  
117 all settings, while pharmacists were engaged in 3 hospitals. All hospitals had similar baseline  
118 interventions: guidelines on antimicrobial use and management of infectious diseases (local  
119 guidelines in 4 hospitals), clinical disease- or speciality-based protocols, and controls or  
120 restrictions of sensitive antibiotics, notably carbapenems, third-generation cephalosporins,  
121 linezolid or daptomycin. Hospitals all had a dedicated phone number for physicians to call  
122 the ASPL. They did not hold consultations after working hours but on-call microbiologists  
123 usually took over and provided some advice in the absence of ASPL. Except in one hospital,  
124 ASP in its current form started recently (Table 1). However, antibiotic counselling existed  
125 previously in the 4 other hospitals in a less formal configuration and with less developed  
126 interventions.

127 We conducted interviews with 6 ASPLs, who had a median of 9.5 years of practice (range, 1-  
128 15 years). Interviews lasted on average 40 minutes (range, 28-62 mns).

129 The interviews showed several main themes. Physicians' quotations are found in Table 2  
130 [reference TX.X].

131

132 Baseline ASP work: response to demands and systematic measures

133 ASP often lack of human resources, as the programs were financially self-supported, with 3  
134 teams without dedicated time to ASP activities. Consequently, ASPLs had to adapt their  
135 activities accordingly, and to prioritise their interventions [T1.1].



136 Response to solicited consultations from their colleagues from other specialities was  
137 described as the main part of participants' work. Being available and prompt in responding  
138 to their colleagues' demands were considered as a valuable asset, but ASPLs underlined their  
139 difficulties to respond to a growing demand, especially when they took on counselling  
140 besides their clinical work [T1.2].

141 ASP members also developed systematic interventions, where counselling is initiated by the  
142 stewards, based on laboratory results (e.g. positive blood cultures or multidrug resistant  
143 bacteria), alerts from pharmacists (e.g. controls of antibiotics prescriptions or restricted  
144 antibiotics), or other measures such as systematic control of treatment reassessment at day  
145 3. Using this information, ASPLs contacted prescribers to discuss the clinical situation, and to  
146 offer their help to define treatment or diagnostic strategies. Stewards judged this approach  
147 as "interventionist" as they provide counselling without physicians' request. When ASPLs did  
148 not have dedicated time, they gave priority to remote counselling to contact physicians, over  
149 the phone or with notes in medical files, while bedside consultations were restricted to  
150 complex cases. In the other two HCFs, where ASPLs were dedicated full-time to the ASP,  
151 they chose a more direct and transverse approach: they did rounds in wards, met with  
152 physicians, examined patients, or joined staff meetings. They also had more time to provide  
153 "bedside teaching" to junior doctors. This approach, based on routine counselling, helps to  
154 build cooperative habits between ASPL and ward physicians.

155

#### 156 ASPL' approach of counselling: empathic, collaborative and persuasive

157 Stewards focused more on increasing physicians' capacity to prescribe adequately than on  
158 restricting them in their practices. Participants pointed out that their role was not to control  
159 all antibiotic prescriptions: *"It's not my job to control all antibiotic prescriptions"*. They did

160 not want to be seen as the “antibiotics police”, inspecting their colleagues’ practices: *“I can’t*  
161 *verify all antibiotic prescriptions; we can focus on certain units but we must be careful not to*  
162 *discriminate or stigmatise people”*.

163 ASPLs relied on educating and raising physicians’ awareness of the importance of  
164 appropriate antimicrobials use and resistance mechanisms to foster new prescribing habits,  
165 especially among junior doctors. Every interaction was seen as an opportunity to transfer  
166 knowledge around clinical situations [T2.1]. ASPLs were convinced that discussion and direct  
167 observation are an essential component of junior doctors’ training. Participating in staff  
168 meetings with clinicians provide opportunities to discuss directly with physicians, share  
169 experience and get the message across about appropriate use of antibiotics [T2.2].

170 Conversely, coercive measures were not regarded as a solution to promote appropriate  
171 antimicrobials use. In two hospitals, prescriptions of several antibiotics were “restricted”  
172 through software used to prescribe. However, ASPLs were convinced that physicians can ‘get  
173 round’ these restrictions [T2.3].

174 ASPLs tried to be understanding while providing counselling. For instance, when a prescriber  
175 disagreed with their advice or recommendations, rather than being authoritarian, ASPL  
176 chose to discuss the situation with the ward clinician. Stewards preferred negotiation to  
177 confrontation [T3.1]. However, in order to maintain good relations with their colleagues,  
178 they admitted conceding non-compliant prescriptions in some cases, so as not to  
179 compromise future requests [T3.2].

180 AS were cautious not to put physicians in a difficult or uncomfortable position. Instead, as  
181 clinicians themselves, they empathised: they understood physicians’ anxiety, their  
182 willingness to provide appropriate care to their patients, and the inherent responsibility  
183 [T3.3].

184 Stewards' attitude was also considered decisive for ASP interventions: they did not consider  
185 themselves as the "experts" and the "ones who know" [T4.1]. They respected their peers'  
186 work and clinical judgement: *"I'm not going to interfere in their work; at some point, you  
187 have to understand and trust them"*.

188

#### 189 Tailored interventions to adapt to units and physicians' needs and expectations

190 AS adapted their interventions to units' context and organisation, often described by  
191 departments: medical, surgical, and intensive care units (ICU). They considered the medical  
192 environment of the patient when prioritising their interventions [T5.1]. For instance, in  
193 medical wards, physicians would have considered clinical aspects, requested complementary  
194 exams, and would describe accurately the situation to the AS when asking for advice. While  
195 in surgery wards, AS preferred to go and examine the patient, or to discuss with the non-  
196 medical staff, as surgeons spend most of their time in the operating room and are not too  
197 comfortable with medical aspects of patient care. AS considered that usually, there was no  
198 need to go to or focus on ICU units, as physicians there were as knowledgeable and capable  
199 as them to deal with infectious situations. These wards were not a priority of ASP  
200 interventions: *"we are not going to progress by being picky with ID or ICU physicians, they  
201 are well-informed"*.

202 One other asset of ASPLs strategies was to adapt their responses to clinicians' demands.

203 Their inputs varied according to what physicians expected from them. We identified three  
204 levels of involvement:

205 **Help physicians in the decision making process:** ASPLs have specific knowledge in ID and  
206 microbiology. One of their roles was to help or to comfort clinicians in their decision,  
207 while promoting appropriate antibiotic use. This was the most frequent reason for

208 physicians' calls. In those situations, prescribers seemed to follow easily stewards'  
209 recommendations as they conceded that ID specialists had more advanced knowledge  
210 regarding bacteriology and antibiotics properties [T5.2].

211 **Reduce physician's uncertainty:** When they faced a complex case, ward physicians  
212 sought ID specialists' expertise to overcome their own limits or doubts. ASPLs'  
213 recommendations and guidance reassured the physician in charge. Stewards were not  
214 directly in charge of the patient so they could help the physician by giving an "external"  
215 opinion. One way for ID specialists to respond to physicians' uncertainty was to engage  
216 their own responsibility in the decision, e.g. written recommendations in patient's chart  
217 [T5.3].

218 **Delegation of responsibility:** In some cases, prescribers delegated antibiotics prescribing  
219 and infectious situations management to the stewards. This was more frequent in  
220 surgery wards, where surgeons accepted to share medical care of their patients with  
221 other physicians. Delegation was a pragmatic solution that benefit to both parties,  
222 improving patients' care and optimising antibiotics prescribing. However, this was not a  
223 path all participants wanted to take, as it requires time and results in blurred boundaries  
224 between physicians and ASPLs' tasks and responsibilities [T5.4].

225

#### 226 ASP challenges

227 Several challenges were reported. ASPLs' interventions were driven by physicians' demands:  
228 they sought ID specialists' expertise and their updated knowledge to adapt antibiotic  
229 therapy to bacteriological results or clinical situation, but less often to discuss diagnostic  
230 strategies [T6.1]. They were not always inclined to involve stewards in patient care. ASPLs

231 wished they had been solicited more often for their clinical skills and knowledge, and to be  
232 sometimes confused with microbiologists or considered as “antibiogram interpreters”.

233 The physician in charge of the patient care remains the person legally responsible for the  
234 patient. The ASPLs had to respect clinical jurisdiction over patient: they made advisory  
235 recommendations, but did not interfere with physicians’ ultimate decisions regarding their  
236 patients [T6.2]: *“The physician in charge makes the choice, I only provide advice”*.

237 As a result, in all hospitals, ASPLs did not have access to certain units that did not solicit  
238 them and were not receptive to unsolicited advice. Moreover, the participants in this study  
239 did not report any strategies to overcome reluctance from individual physicians or from  
240 entire units.

241 Hierarchical influence was another main challenge inherent to ASP interventions. Prescribing  
242 habits are influenced by the practices of peers or superiors. ASPLs’ recommendations  
243 competed sometimes with wards’ practices or senior doctors’ instructions [T6.3]. In case of  
244 discrepancies, AS acknowledged junior doctors’ difficulty to follow their advice, as it would  
245 mean to argue the decision of a superior. In their daily activity, stewards communicated  
246 mostly with junior doctors and residents, as they were the ones present in the ward and who  
247 write the prescriptions. Yet, the lack of direct communication between senior doctors and  
248 ASPLs was considered as an obstacle, as they could not explain their opinion and justify why  
249 they had made such recommendation [T6.4].

250

251 **Discussion**

252 Previous studies described ASP activities in French hospitals[11,12], but to our knowledge,  
253 this is the first qualitative study about ASP ever performed in France.

254 This work suggests that ASPLs had to adapt their interventions to the available resources,  
255 including human and information technology (IT) resources and time dedicated to  
256 counselling activity. Stewardship activities consisted mainly in ID physicians-stewards  
257 counselling colleagues about antibiotic use or infectious diseases management. Systematic  
258 advice based on microbiological results (bacteraemia) or pharmacists' controls depended on  
259 available IT resources and local collaborations. Despite ASP are mandatory and endorsed by  
260 hospital's authorities[15], the support of the hospital governance was somehow  
261 "theoretical" and usually did not ensure appropriate human, financial and IT resources for  
262 ASP teams. Consequently, in the absence of detailed regulatory framework and adequate  
263 resources, ASP organisation and activities were often non-formalised.

264 Beyond these constraints, ASPLs' conceptions of counselling led them to choose a persuasive  
265 and collaborative approach over a more restrictive one. ASP was regarded as "an advisory  
266 service" [16] opposed to a policing body. Participants did not describe their role as  
267 controlling or reviewing all antibiotic prescriptions. Conversely to what is described in the  
268 literature and suggested by international authorities[7,17–19], ASP in our sample included  
269 few restrictive measures, such as prior authorisation or expert approval, therapeutic  
270 substitution or automatic stop orders. Instead, ASP teams gave priority to educative  
271 strategies: formal educational sessions (essentially towards junior doctors) and informal  
272 knowledge transfer through interactions with prescribers. When ASPLs had dedicated time,  
273 they were able to provide bedside teaching. Observations and discussions with ID-specialists  
274 represent an informal form of training for junior or less experienced doctors[20,21].

275 Educational strategies take time but are associated with higher acceptance and long-term  
276 effect.

277 Several reasons may explain why ASP in France are based on persuasive and collaborative  
278 approaches of counselling: 1) lack of resources (IT and human resources) prevents  
279 considering restrictive measures, such pre-authorisation or automatic stop orders. These  
280 restrictive interventions required computerised surveillance and stewards' availabilities to  
281 approve antimicrobial prescriptions ; 2) cultural aspects: according to Hofstede's model of  
282 cultural dimensions, France had a high degree of power distance, indicating a high level of  
283 hierarchy and an unequally distributed power, as well as a high level of individualism[22]. In  
284 this context, collaboration between doctors seems less straightforward and physicians'  
285 clinical autonomy probably stronger. Restricting clinicians in their intentions and actions  
286 would go against this fundamental principle of medical practice and could be considered a  
287 hindrance to their work. Professional hierarchic differences would explain why, despite the  
288 lack of human resources and ID physicians-stewards' difficulties to achieve all ASP  
289 objectives, microbiologists and pharmacists' involvement in antibiotics counselling and other  
290 ASP primary missions may be insufficient.

291 ASPLs also emphasised the necessity of building collegial relationships with wards clinicians.  
292 Several studies concluded that strategies based on delivering technical advice or  
293 disseminating guidelines were not sufficient to improve antibiotics prescribing behaviours.  
294 Conversely, investing in interprofessional relationships and effective collaboration were  
295 identified as a key process for ASP and had more sustainable impact[16,23,24]. ASPLs also  
296 adopted a non-confrontational attitude when providing advice, even when physicians  
297 disagreed with them. This non-judgemental attitude may create a "safe environment" for  
298 physicians and the quality of interactions is essential to ensure further requests from

299 physicians[7]. Conversely, Goldstein mentioned the potential disastrous effect of  
300 authoritarian approaches or overruling of physicians' clinical judgement[25].  
301 ASPLs believed that adapting their strategies to the local context increased the efficacy of  
302 their interventions and physicians' uptake. Cortoos underlined the need to differentiate  
303 between specialties when deploying ASP interventions as prescribers were a heterogeneous  
304 population, with different attitudes and expectations[26]. For instance, surgeons shared  
305 more easily decisions regarding patient's medical care. The absence of competition between  
306 surgeons and ASPLs qualification and tasks make makes this type of cooperation easier.  
307 Stewards considered ICU physicians more competent than in other units to manage  
308 antimicrobial, and felt that their input would be more beneficial in other wards. In addition,  
309 ICU physicians may argue patients' severity to justify the use of broad-spectrum antibiotics.  
310 The situation is more complex in medical units where physicians may refrain from involving  
311 ID specialists in patients care. Their reservations could be explained by: the overlap of  
312 medical knowledge and common training among medical specialties, the sense of ownership  
313 of clinical decision-making, the high specialisation of hospital physicians and patients'  
314 specificities (comorbidities, severe conditions)[23,27,28]. Physicians frequently consider they  
315 can manage infectious diseases by themselves, especially the ones within their own  
316 speciality, and sometimes fail to acknowledge the input of a specialist, especially regarding  
317 diagnostic issues.

318 This persuasive and "non-constraining" approach of ASP had its drawbacks and ASPLs had to  
319 face several challenges: to balance the influence of medical hierarchy and professional  
320 boundaries, and to overcome physicians and units' reluctance.

321 In hospitals, ASPLs had a role as consultants on antimicrobial treatments or infections, while  
322 ward physicians are medically and legally in charge of patients. Moreover, Oh explained that



323 in teaching hospitals, the hierarchical structuring of care delivery forms another obstacle for  
324 consultants, as interns and residents receive orders from their superiors which they feel  
325 compelled to carry out[28]. Many studies described how hierarchical influence and  
326 prescribing etiquette weigh on junior and even more experienced doctors, leading them to  
327 adopt usual practices that could not be questioned by their colleagues[29–32]. Several  
328 authors[23,29,30] described the role of senior doctors in knowledge transfer in medicine and  
329 how antibiotic prescribing habits, among other things, are passing from seniors to juniors.  
330 This study questioned ASP strategies targeting interns, and suggested the need to increase  
331 direct communication with attending physicians. ASP interventions could also consider  
332 addressing potentially outdated information or gaps in practising physicians' knowledge[33].  
333 When confronted to reluctant units, participants did not develop strategies to overcome  
334 physicians' resistance. As sometimes newly implemented, ASPLs' priority was first to get  
335 physicians' uptake and confidence. Yet, they need to develop solutions to overcome barriers.  
336 Several strategies could be considered, such as demonstrating positive outcomes in patients  
337 with appropriate antibiotics treatment [24,25,34]. A global policy about antibiotics at the  
338 hospital level, supported by administrative and medical heads would also probably  
339 strengthen ASPL's position and help to overcome units' reluctance. The intervention of a  
340 supra-level body may be necessary, such as antimicrobial committees, and the involvement  
341 of hospital authorities may be required[23,35].

342 Choosing to provide an incentive rather than a more restrictive approach had limitations,  
343 especially to overcome physicians' lack of interest or unwillingness to conform to  
344 recommendations regarding antibiotic prescriptions. This may partly explain the high level of  
345 antibiotic consumptions in French HCFs[36].

346 This study had several limitations: it was based on a small sample of hospitals (5) and  
347 interviews (6), which were not geographically representative of all settings. Furthermore,  
348 this study did not reflect the work and perceptions of all potential members of ASP, such as  
349 microbiologists and pharmacists. This would explain why stewards reported few controls and  
350 restrictive measures, as these tasks usually fall to pharmacists. Our next work will explore all  
351 stewards' roles and perceptions, in a larger sample of hospitals.

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353 **Conclusion**

354 Our findings highlight how ASP had to adapt to organisational, structural and cultural  
355 context. ASP consisted mainly in an ID counselling activity rather than in a stewardship  
356 program, managed by a multidisciplinary team. ASPLs chose adaptive responses and non-  
357 confrontational approach that would make interventions easier to implement and less  
358 subject to opposition from prescribers. ASP policy must be formally endorsed and supported  
359 by hospital administration to overcome acceptance barriers. The lack of appropriate human  
360 and IT resources also affects ASPLs' interventions and limits systematic measures. Current  
361 ASP may not meet their goals aiming at decreasing antimicrobial resistance and use.

362

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367

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374 committee - n° 16-018

375

376 *Supplementary data:* Interview guide on stewards' work and perceptions

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**Table 1: Hospitals characteristics and ASP details**

Hospital	H1	H2	H3	H4	H5
Number of acute care beds	424	323	423	848	385
<b>ASP organisation</b>					
Existence of ASP (current form)	10 years	6 months	1 year	1.5 years	6 months
Stewards	1 ID specialist 1 bacteriologist	1 ID specialist	3 ID specialists (rotations)	1 ID specialist (senior) 1 resident	2 ID specialists (senior, rotations) 1 resident
Dedicated ASP time (full-time)	No	No	No	Yes	Yes
Microbiology involved*	Yes	Yes	Yes	Yes	Yes
Pharmacy involved*	Yes	No	Yes	No	Yes
<b>ASP measures and interventions</b>					
Dedicated ASP phone number or direct line	Yes	Yes	Yes	Yes	Yes
Mode of consultation	Phone (90%)	50% phone 50% bedside advice	Phone Beside consultations for complex cases	Bedside consultations (80%) Phone for simple questions (20%)	Bedside consultations (70%) Phone for simple questions
Systematic counselling	Laboratory results (daily monitoring) Pharmacists alerts	Controls of treatment reassessment at day 3 Alerts from microbiology and pharmacy	Case reviews based on laboratory results or alerts from pharmacy	Laboratory results (daily monitoring)	Laboratory results (daily monitoring) Alerts from pharmacy
ID on wards	No – or complex cases (ID specialist)	Yes – solicited consultations	Yes - solicited consultations	Yes – routine wards rounds, solicited counselling	Yes – solicited and unsolicited counselling



and staff

and staff

\* Formally involved in ASP team and active in ASP missions

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471 Table 2: Quotes from participants, by key themes

Key themes	Reference in paragraph	Quotes
Baseline AS work [T1]	Prioritising interventions and systematic measures  Because AS time was sometimes constrained, they favoured a “quantitative” approach of counselling (T1.1)	<i>“I’m with the microbiology resident, who is dedicated to the counselling activity, and so we call in systematically all positive blood cultures, but also surgical sample collections, so it’s mainly done over the phone. I sometimes go to the units for complex cases, but we try ... as I don’t work full time for the counselling activity, I only have 2 or 3 hours a day, ... so we tend to provide advice over the phone rather than in person”</i>
	Combining counselling and clinical activity (T1.2)	<i>“Some days, it’s complicated. For instance, I hold consultations on Friday afternoons, and it is a busy time for antibiotic counselling. I have calls from my colleagues during my consults” “I give advice but it is difficult to follow up on the case, to go back 48h later to see if they still need help. I don’t have the time to do that”</i>
Teach rather than control [T2]	Every interaction is the opportunity to transfer or update knowledge  Bedside teaching (T2.1)	<i>“Every time I go to the wards to meet doctors, I explain why we choose this antibiotic; we don’t just say: “You have to prescribe Vancomycin”. We constantly try to teach them, it’s really bedside education”</i>
	Staff meeting (T2.2)	<i>“That’s why I want to organise a staff meeting, because I’m sure that when you have several cases, we discuss them together, and over time we discuss similar clinical cases again and again, and after a while they understand and they change their prescribing habits”</i>
	Coercive methods: physicians can get around restrictions (T2.3)	<i>“I think it’s more important to educate people. Because they will always find a way to prescribe what they want, to bypass the system. They need to understand why they shouldn’t prescribe this antibiotic”.</i>
A comprehensive approach [T3]	In case of disagreement, AS prefer negotiation to confrontation with the physician in charge (T3.1)	<i>“I often discuss with the prescriber “So, we have these options, it’s up to you, you can start with that, and then do that, you choose”. And sometimes, I remind them that I’m not the one in charge of the patient, it’s not my responsibility, so if they are concerned, they can start antibiotics, but I ask them to call me back after 48-72h to reassess the situation”</i>

	When the situation is sensitive, they avoid conflicts in order to maintain good relations with the unit (T3.2)	<i>"We don't argue, the idea is not to close off from the service. We know our limits, sometimes we try to talk it over but if we feel that they won't agree and the situation can worsen, instead of risking compromising our future collaboration, we give up, yes".</i>
	As clinician themselves, stewards understand the position their colleagues are in (T3.3)	<i>"Very often, a physician faces a patient who is not doing well, who has a fever, and he thinks of an infection, but he doesn't know exactly where the problem is, it takes him time to understand, he has no bacteriological results, the patient is fragile, he is old, and the physician really wants to treat him with antibiotics. And I understand, I was in this situation once, I do understand!"</i>
Stewards' attitudes [T4]	Non authoritative (T4.1)	<i>"It is important to respect our colleagues. I have met stewards who were commanding, but I think it's just ... counterproductive" "I think that what helps, is that they see I'm available, I answer the phone, I come to the ward and look at the situation with them, and that I'm not categorical, I give them advice"</i>
Tailored responses to units and physicians' demands and expectations [T5]	Need to adapt interventions to units' organisation and context (T5.1)	<i>"We need to adapt to units. For instance, the patient's follow-up after I gave recommendations: when the patient is in a surgery unit, I come back every day to check on him, while if the patient is in a medical unit, where I know that the physicians are autonomous, I don't need to go back every day, because I know physicians won't like it and will find it intrusive, and there is no point to do so, so I only go and check on the patient every 3 or 4 days, or once a week to see if everything is ok. But really, we need to adapt to the patient's medical context for the follow-up" "In medical wards, I don't need to go and see the patient; I know my colleagues would have examined the patient and they can explain the situation to me. My colleagues in surgical wards... I go see them"</i>
	To help or comfort physicians in the decision-making process (T5.2)	<i>"They (the wards physicians) expect us to tell them what are the appropriate antibiotics and dosage, and sometimes they don't even know what kind of antibiotics to use. When they have the laboratory results, they also ask sometimes</i>

		<p><i>what to do with them. Our job is also to remind them that a positive specimen should not automatically lead to a treatment”.</i></p> <p><i>“In many cases, they would have prescribed by themselves, but since I’m here, they call and ask for confirmation, sometimes because they have to deal with multidrug-resistant bacteria and they need an alternative treatment to carbapenem, or they may have questions about dosage. Usually, they think of an infection, they want to treat the patient, so they call either to validate with me the indication of the treatment or to discuss molecules, doses, the duration of the treatment”</i></p>
	To address physicians’ uncertainty: AS engage their personal responsibility (T5.3)	<p><i>“It is always easier to have an outside position, to give advice rather than to be the one in charge. When you’re in charge of a patient, you’re always concerned and you want him to get better. So, I think that it is a good thing that another physician gives an opinion, because we are less stressed, we don’t feel this pressure... and there is less culpability because “I performed the intervention, so the infection is my fault”. Of course, I’m also worried when I say: “No, there is no need to treat the wound for now” but I have to put my responsibility on the line”.</i></p>
	Delegation of antibiotics prescription and infectious diseases management (T5.4)	<p><i>“Some surgical units delegate the choice of antibiotic, its duration, but we discuss with them when there are diagnostic issues”</i></p> <p><i>“In some surgical units, we go and see the nurses that tell us which patients are currently being prescribed antibiotics. We do our rounds. Surgeons rely completely on us for antibiotics management”</i></p>
ASP’ limitations	Physicians’ demands (T6.1)	<p><i>“Physicians think they don’t need our help to make a diagnosis but rather to adapt antibiotic treatments, its timing, and its regimen. But I think that we can also have an input, by examining patients, and proposing a differential diagnosis. In some units, physicians tell us “No there is no need for you to examine the patient, if there are positive cultures, I’ll call you”.</i></p> <p><i>“I consider we have an input when making diagnoses, but they (the ward physicians) don’t realise it, and they don’t think about calling us in this regard. They need us when they have specimen results, and they have to choose what drugs to prescribe”</i></p> <p><i>“This unit, they only call when they have a bacteriological issue, because they are</i></p>

		<i>not comfortable, they are not sure, but they make few requests to discuss diagnostic strategies”</i>
Clinical jurisdiction		<i>“I don’t interfere in their work. At some point, you have to trust your colleague the same way they trust you”</i>
	The rule of on-inference prevails (T6.2)	<i>“We try not to be intrusive, I do counselling, I can even say: “If I was you, I would do that”, but I suggest, I don’t give orders! It’s important to keep some distance, and leave the final decision to the prescriber”</i>
Hierarchical influence		<i>“We discuss a lot with residents, because they are the ones present on the ward, and the fellow or the attending, who was not there when we make our recommendations, does not agree with us, and so, the intern is going to follow his superior’s opinion. I think this situation is quite frequent.”</i>
	Junior doctors follow ultimately their supervisor’ instructions (T6.3)	<i>“In 99% of the cases, we discuss with the residents. Not with the attending physicians (...). Afterwards, if the senior says: “Don’t listen to them”, you can be sure that the intern is not going to listen to us! But in reverse, if he says “Ask the AMS team, because they know best, you have to call them”, then the interns will do it willingly”</i>
	Lack of direct communication between AS and attending physicians (T6.4)	<i>“We give advice to the resident, who is going to agree (...). But his superior may have a different opinion, and then he changes the prescription. It happens when we did not talk to the attending directly”.</i>

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