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REVIEW

Antimicrobial stewardship policy: time to revisit the strategy?

P.-M. Roger[1] · J. Courjon[1] · S. Léotard[2] · C. Déchamp[3] · N. Négrin[4] · M. Vassallo[5] · Réseau d'Infectiologie Paca-Est

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Abstract Recent data indicate that both the overall numbers of antibiotic prescription and the frequency of multidrug-resistant bacteria are increasing significantly. These threatening features are observed, despite national antimicrobial stewardship (AMS) policies aimed at decreasing antibiotic use. AMS should also focus on the initial steps leading to antibiotic prescription. Physicians and their patients should benefit from the structured clinical pathways, the latter being adapted to regional epidemiological data and resources. Continuous evaluation of these predefined clinical paths through a computerized medical dashboard will allow a critical review and finally the optimization of medical practices. These innovative behavioural approaches for clinicians will supply precise information on the relationship among the diagnosis, therapeutics and outcome. This changing environment will carry out the adapted therapeutic procedures, and appropriate antibiotic use will inherently improve.

Recent European and American communications and publications on antimicrobial stewardship (AMS) policy indicate disappointing results overall, as antibiotic consumption is still growing and endemic multi-drug-resistant bacterial strains are now common in both health-care institutions and community settings [1–5]. As a recent example, a multi-centre study performed in the US indicates that less than one third of the patients receiving antibiotic therapy were subjected to an effective antibiotic reassessment before day 5 [4]. Unfortunately, in this study comprising 6, 812 patients, no information was available on clinical outcome. An internet-based survey including 660 responders from five continents showed that AMS practices are diffuse, but, even though heterogeneity was reported, care improvement was significant when AMS was strictly applied [6]. In addition, several studies have previously demonstrated the added value of some of the tools implemented by the specialized teams in AMS [7–11]. Despite these successes, the question remains why so many efforts are still unsuccessful, in spite of the important investments by the AMS teams worldwide.

Failure seems to be related to a number of independent factors, from methodological drawbacks of clinical studies to the necessity of aiming for concerted efforts [9, 12, 13]. Thus, the American CDC launched a panel of adaptations to current AMS policies [12] including behavioural approaches and broader dissemination of the knowledge of the inappropriate use of antibiotics in the medical community at large. Obviously, this important but still limited action is not going to solve the universal problem; thus, additional expertise and suggestions are required to help us to attain better AMS results.

During the last European Congress on Clinical Microbiology and Infectious Diseases in Copenhagen a session on AMS was organized, gathering a panel of physicians and scientists from eight different countries showing that we still have far from optimal antibiotic prescription in hospitals, whatever the country or continent [5, 16–18]. To quote the session speakers,

✉ P.-M. Roger
roger.pm@chu-nice.fr

[1] Infectiologie, Centre Hospitalier Universitaire de Nice, Université de Nice Sophia-Antipolis, Hôpital de l'Archet 1, BP 3079, 06202 Nice, France

[2] Laboratoire de Bactériologie, Centre Hospitalier de Grasse, Grasse, France

[3] Pharmacie, Centre Hospitalier d'Antibes, Antibes, France

[4] Service d'Hygiène Hospitalière, Centre Hospitalier de Grasse, Grasse, France

[5] Service de Médecine Interne et Infectiologie, Centre Hospitalier de Cannes, Cannes, France

it seemed to be a lack interest in the educational efforts of anti-infective drug specialists. In France, despite intensive efforts, antibiotic use is still increasing (more than 10 % over the past 6 years) [18].

Comparing three different institutions in the South-East of France, we reported the dissociation between a functional AMS programme and the quality of antibiotic therapy at bedside [19]. Obviously, clinical experience in AMS indicates that the rationales of antibiotic prescriptions are often associated with a decision process that is quite outside academic concepts, tinged with the fear of an adverse outcome. This is why microbial investigations are not performed or their results are not used. Also, therapeutic reassessment upon application of AMS guidelines is impossible, since the initial prescription is often based on inaccurate medical synthesis.

In fact, the general perspective based on the current literature on AMS is that most of the time, the method of establishing the exact clinical diagnosis, and both the agent causing the infectious disease and its origin, are not provided. In addition, whether the antibiotic prescription is in line with this diagnosis seems even harder to substantiate, and, finally, the correlation between antibiotic prescription and cure versus prolonged infection, or even death, is not often closely considered. These may be the major reasons for the inefficacy of AMS policies in general: the designated target is antibiotic prescription rather than direct patient care. Physicians who prescribed antibiotics feel that this class of drugs is under the surveillance of specialized hospital staff, for whom the goal is to reduce antibiotic consumption, whether for ecological reasons, for cost saving or others. However, general physicians, who clearly outnumber the antibiotic specialists, have to manage patients, for whom antibiotic therapy is only a part of care.

Medicine is primarily about a dialogue between the physician and the patient. The latter is now considered an actor in the framework of current AMS policies [12, 15]. The main product of this discussion is a diagnosis and its related treatment plan, which includes adequate antibiotic prescription. Therefore, a policy aimed at decreasing antibiotic misuse should also focus on the dialogue with the patient and all diagnostic data available. This combination should really shape the antibiotic prescription.

What is the precise function of the non-specialized physician regarding antibiotic prescription? First, he/she does not know in exquisite detail what is really happening to the patient, but first wants to resolve his/her own doubts as to the most appropriate treatment modality, sometimes based on a blend of stress and impatience. A good example might be the prescription of an antibiotic for respiratory infection where the physician does not know if it is bronchitis or (mild) pneumonia. The antibiotic therapy will generally be prescribed for the most severe scenario, and sometimes the prescriber will be tempted to deliver "a large amount of antibiotics" to fight the infection. One other example here is surgery- and health care-associated infection. In these cases, many prescribers do not follow any specific strategy. Thus, the question might not be how to educate prescribers in AMS practices [14], but rather how to build a logical and efficient strategy with the prescribers for the better treatment of infectious diseases.

Strategies in the infectious disease care should cover at least two important and inter-related factors: the timing of the outcome and the appropriate use of technical services and human resources within the health system.

Time-dependent outcome relates to the fact that not all infections worsen at the same speed. The prescribers should realize that antibiotics are not usually an emergency prescription, and that inadequate antibiotic prescriptions postpone the correct diagnosis and are a source of adverse events. For instance bronchitis is more frequent than pneumonia and as antibiotic use should be associated with a favourable evolution, the prescriber is reassured in his or her therapeutic decision.

The time dependence of the outcome of an infection also refers to the severity, which should be appreciated by all physicians and its assessment should be based on clinical examination. In a curious way, in this field of therapeutic evaluation two opposing situations are described in the current literature. In the community, it seems there seem to be only mild infections, which globally do not need antibiotic treatment. In hospital, and in the intensive care unit in particular, de-escalation is proposed as a standard of care. However, in real life, severe infections may be observed in the community and non-infectious fevers or mild infections may arise in intensive care units. The lack of severity supports the idea that fewer antibiotics might lead to a better (safer) outcome. Several studies have indicated that the application of smaller amounts or less potent antibiotics performs in exactly the same way as "a large dose of antibiotics" [20–22]. As early as 10 years ago, we reported that direct discussions between intensive care physicians and the infectious disease' specialists allowed for an alternative diagnosis in 33 % of the patients, a full antibiotic stop for more than one fourth of the patients, whatever the severity of the disease (median SAPS II score >40), and without alteration of the prognosis and outcome [21]. Recently, an association between de-escalation of antibiotic therapy in patients presenting with severe infections and a lower rate of mortality has been confirmed [22].

The good use of technical services and human resources in the health care system implies that the antibiotic prescribers should recognize to which clinical pathways their patients belong. Some studies using these approaches have shown improvement in survival rates [23–25]. The clinical pathways have to be determined consensually at the institutional level, considering that the latter may be unique to each organization. Thus, the best strategy for applying internal resources must be described by the prescribers, together with the AMS team, adapting the national or international guidelines to local

epidemiological data and resources. The pathways have to start from diagnostic arguments, including severity criteria, to microbiological investigations (including sampling methodology, and how to use them for therapeutic purposes to optimize laboratory resource utilization), antibiotic treatment and a secondary prevention perspective.

The next step will be to constitute a continuous evaluation of the predetermined clinical pathways, because making a choice requires the evaluation of clinical impact. We have built our own computerized medical dashboard that allows the permanent measurement of clinical diagnosis, concomitant and timely microbiological result assessments and the

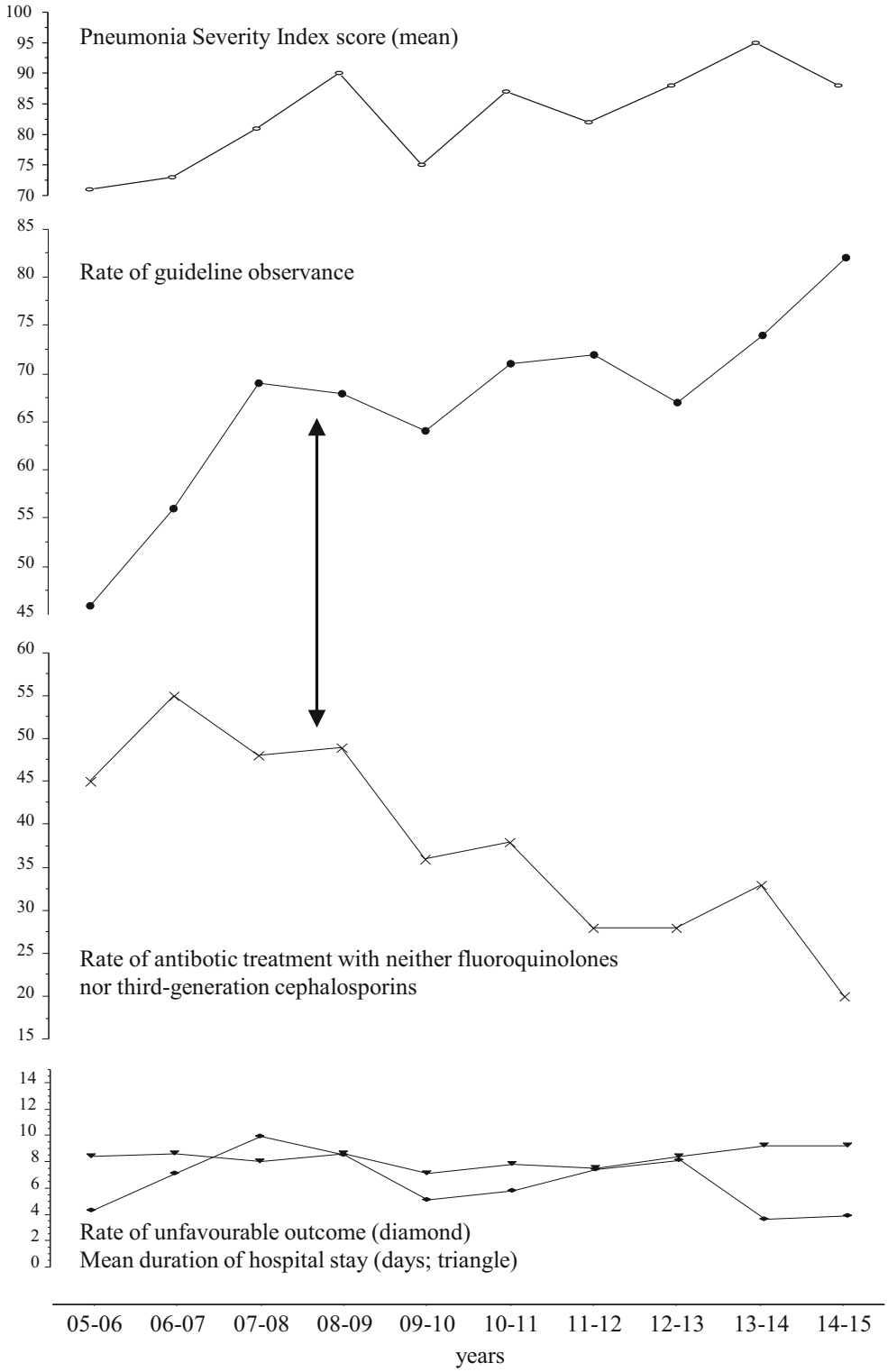

Fig. 1 Analysis of our own medical practices, focusing on community-acquired pneumonia (CAP). Our medical dashboard began in July 2005 and ends in June 2015. A mean of 130 patients with CAP are admitted each year. Our own therapeutic consensus was discussed by the end of 2007, and formally requested (*arrows*) in September 2008 [24]. Physicians have the opportunity to obtain an overview of disease severity, adherence to therapeutic guidelines and the main consequences, unfavourable outcome being defined as the requirement for intensive care after antibiotic initiation in our department or death

verification of therapeutic options [26]. This tool allows us to continuously assess our therapeutic protocols, to show profits (Fig. 1) and to develop them further [27].

In conclusion, we think that if a critical review of their own practices shows a relatively poor correlation between antibiotic prescription and clinical outcome, nearly all clinicians will agree with adapted therapeutic procedures. Therefore, measuring the performance of such structured clinical pathways is a supposedly optimised way of improving patient outcome. The latter should be the main goal of the cooperation between the AMS team and prescribers, and therefore the improvement of antibiotic use will become a collateral profit.

Conflicts of interest The author declares no conflicts of interest.

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