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Surveillance of invasive pneumococcal disease in 30 EU countries: Towards a European system?

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ABSTRACT

In this era of new pneumococcal conjugate vaccines (PCV), we described and compared surveillance of invasive pneumococcal disease (IPD) and PCV policies in 30 European countries to provide guidance for Europe-wide surveillance. We confirmed the heterogeneity of surveillance systems and case definitions across countries but identified elements common to all countries, such as the availability of serotyping and the surveillance of pneumococcal meningitis. PCV impact was monitored in 11/15 countries using it. We propose steps for the monitoring of incidence rates and serotype distribution at EU level, to assess the need to introduce PCV and monitor its impact once introduced.

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1. Introduction

Streptococcus pneumoniae is a major public health problem worldwide, causing a wide spectrum of illness from upper respiratory tract infection to severe invasive disease. Invasive pneumococcal disease (IPD), commonly defined as the isolation of *S. pneumoniae* or the detection of *S. pneumoniae* nucleic acid or antigen from a normally sterile fluid, may present as meningitis, bacteraemic pneumonia, occult bacteraemia, septic shock, and less frequently arthritis and peritonitis.

Ninety-one *S. pneumoniae* serotypes have been identified and their distribution varies by area and over time [1]. The heptavalent pneumococcal conjugate vaccine (PCV7) targets 7 of these serotypes. Its widespread implementation in the United States (US) has led to a rapid and dramatic decrease of IPD caused by vaccine serotypes and a fall of overall incidence [2–4]. This fall has been seen mainly among those vaccinated, but also in non-vaccinated populations due to herd immunity. Despite this impressive impact, several post-licensure studies have described significant rises in non-vaccine serotypes, raising concern that vaccine pressure could lead to the replacement of vaccine types by non-vaccine types [5,6]. PCV7 was licensed in the European Union (EU) in 2001, and new vaccines covering additional serotypes are arriving on the market. Post-vaccine surveillance of IPD is thus facing new challenges: besides monitoring the vaccine impact on the target group, it also needs to assess its effect in non-vaccinated groups (herd immunity), detect any serotype replacement and estimate the impact of introducing new vaccines.

Several studies have shown that IPD incidence rates are difficult to compare across settings, due to two major factors [7–11]. First of all medical practices, and especially blood culturing practices in febrile children, vary considerably and result in differences in detection rates of milder bacteraemia, including those without a focus of infection (or "occult bacteraemia"). Secondly, surveillance methods, case definitions used and resources allocated to surveillance influence the ascertainment of cases and the type of information collected.

As both medical practices and surveillance methods are very heterogeneous across EU countries, a system facilitating collection of comparable data across Europe is highly desirable. In addition, the monitoring of circulating strains and the detection of emerging serotypes at EU level is particularly needed, since serotype rises are reported in EU countries and new vaccines covering additional serotypes are becoming available [12–14]. Comparable data on incidence and serotype distribution may help to compare the impact of the different vaccine schedules in place and will facilitate decision making regarding the introduction of pneumococcal vaccines.

This study aims to provide an overview of the current IPD surveillance systems in EU countries, to identify their strengths and weaknesses, and to propose key elements to be considered when planning a future European surveillance system on invasive pneumococcal disease.

2. Materials and methods

The survey was conducted by the Scientific Institute of Public Health in Brussels.

2.1. Sources of information

Thirty-one countries were included in the survey: 27 EU countries and the 4 EU-associated countries (European Free Trade Association states or EFTA countries), Iceland, Liechtenstein, Norway and Switzerland. The ECDC asked all national health authorities to nominate two individual experts (one epidemiologist and one microbiologist) who are involved in the surveillance of *S. pneumoniae* at national level. Each country nominated two experts, except for Greece (no experts) and Liechtenstein (no microbiology expert). As the United Kingdom (UK) had separate surveillance systems and reference laboratories for England & Wales and for Scotland, it was considered as 2 countries. The country contact points from the DG SANCO funded project "Vaccine European New Integrated Collaboration Effort" (VENICE) were contacted for information on national PCV7 vaccination policies. In total, 31 epidemiology experts, 30 laboratory experts and 31 VENICE representatives were identified and contacted.

Communication with the country experts included web-based questionnaires, personal contact, reminders, and feedback during the survey to improve participation and obtain data validation. Summaries of findings for each country were compiled and sent to each country expert for corrections and validations. Additional information on PCV7 schedules and policies was collected through the EUVAC.NET website and a recently published study [15,16].

2.2. Data collection

Three standardized web-based questionnaires were designed, tested and sent to the corresponding experts. The first questionnaire aimed to uncover the characteristics of the national epidemiological surveillance for IPD (type of surveillance system, case definition, population covered, items reported, data analysis, under-ascertainment, representativeness), as well as additional information that influences surveillance, such as guidelines and clinical practices for blood culturing. If several reporting systems were co-existing, we asked information on the surveillance system that provided estimates of national incidence rates. The second questionnaire covered the pneumococcal surveillance activities conducted at the National Reference Laboratories (NRLs): techniques available, type of isolates received, number and proportion of strains typed, coverage and representativeness of referred strains, and funding of activities. The third questionnaire covered PCV7 vaccination policies and rationale for decision making. As other ECDC-funded projects covered laboratory methods in detail, including External Quality assurance and antibiotic sensitivity of *S. pneumoniae*, these last aspects were not covered in our study. Data collection took place from April to July 2008.

2.3. Analysis

We described and compared surveillance systems by country, with a focus on the comparability of surveillance data. Case definitions were classified as to whether they corresponded to the 2002 European Commission case definition (Comm. Decision 2002/253/EC), or the 2008 definition (Comm. Decisions 2008/426/EC) or neither (Box 1).

Based on the strengths and weaknesses of the surveillance systems identified in the analysis, as well as the comparability of data across countries, we proposed key elements for a future surveillance system for IPD in the EU. Technical guidance was provided by a steering committee constituted of European experts in epidemiology, microbiology and vaccine-preventable diseases.

3. Results

In total, epidemiology and laboratory questionnaires were returned respectively by 30/31 (97%) and 29/30 (97%) of the contacted countries. Luxembourg did not complete the two surveillance questionnaires as their IPD cases and strains are reported or sent to other countries, besides a meningitis surveillance conducted at the main paediatric hospital. Belgium filled in two epidemiological questionnaires as it has two IPD surveillance systems; data