Position paper

Developing core elements and checklist items for global hospital antimicrobial stewardship programmes: a consensus approach


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ABSTRACT

Objectives: With increasing global interest in hospital antimicrobial stewardship (AMS) programmes, there is a strong demand for core elements of AMS to be clearly defined on the basis of principles of effectiveness and affordability. To date, efforts to identify such core elements have been limited to Europe, Australia, and North America. The aim of this study was to develop a set of core elements and their related checklist items for AMS programmes that should be present in all hospitals worldwide, regardless of resource availability.

Methods: A literature review was performed by searching Medline and relevant websites to retrieve a list of core elements and items that could have global relevance. These core elements and items were evaluated by an international group of AMS experts using a structured modified Delphi consensus procedure, using two-phased online in-depth questionnaires.

Results: The literature review identified seven core elements and their related 29 checklist items from 48 references. Fifteen experts from 13 countries in six continents participated in the consensus procedure. Ultimately, all seven core elements were retained, as well as 28 of the initial checklist items plus one that was newly suggested, all with ≥80% agreement; 20 elements and items were rephrased.

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**Introduction**

Antimicrobial resistance—particularly antibiotic resistance in bacteria—is a global threat, making antimicrobial stewardship (AMS) programmes necessary in all hospitals worldwide [1–3]. A recent review conducted by ESGAP (ESCMID Study Group for Antimicrobial Stewardship) found that many definitions exist for the abbreviation AMS [2]. The authors suggested that it is best to view the collective daily actions within AMS as a strategy, and they proposed the following definition: “Antimicrobial stewardship is a coherent set of actions which promote using antimicrobials in ways that ensure sustainable access to effective therapy for all who need them” [2]. The absence of a universal definition for AMS combined with a lack of international guidance and standards are among the many barriers to the implementation of these programmes globally, especially in low- and middle-income countries [2,4]. In North America, Europe, and Australia, collaborative groups have through a consensual approach identified core elements considered essential for successful AMS programmes [10]. These core elements, often bundled into checklists, offer healthcare providers a pragmatic and measurable means of developing, implementing, and measuring the impact of hospital AMS programmes. Their applicability, contextual relevance, and value in other geographies, cultures, and resource settings—particularly in low- and middle-income countries—have not been previously explored.

Our objective was to identify existing core elements for hospital AMS programmes and to assess their broader global relevance. This was done by undertaking a literature review followed by a structured consensus procedure involving experts.

**Methods**

Our objective was to identify a set of core elements and their related checklist items [6], describing the essential and minimum standards for AMS programmes in hospitals worldwide.

**Group of experts**

The steering committee (CP, FB, ASL, AT, SG, RL) invited 15 experts (all the other co-authors) to participate in this study. Experts from different backgrounds (infectious disease specialists, clinical microbiologists and clinical pharmacists) were selected on the basis of their recognized expertise in AMS across various geographic settings in six continents—North America (2), South America (2), Europe (5), Africa (2), Asia (3), Australia (1)—all having extensive hands-on experience with AMS in low-to middle-income countries, and most of them serving as experts for health authorities and policy-makers on the topic of AMS.

**Literature review and website search**

In August to September 2017, the steering committee (six researchers) performed a narrative literature review of PubMed with the following key words: (antibiotic or antimicrobial) and stewardship and (review or guidelines or standard or core or checklist), in addition to a website search—relevant agencies and organizations such as the WHO or the European Centre for Disease Prevention and Control (ECDC)—to search for existing core elements for hospital AMS programmes. Only reviews, guidance/guidelines and consensus documents were included. Additional references were identified by the 15 experts, with no language restriction (all authors assisted with translation when required). Data were extracted by two junior researchers and double-checked by two senior researchers. On the basis of the final list of references [3–50], the steering committee compiled summary tables (listing all core elements and checklist items found, with their corresponding references), which were made available to the experts. CP and SG developed an initial set of core elements and their related checklist items, to be assessed by the experts, based on the summary tables, selecting the elements and items they thought might be relevant worldwide. A core element was defined as a broad category of actions/a strategy within an AMS programme (e.g., education), whereas checklist items described specific actions/interventions within a specific core element. Several checklist items were then listed under each core element.

**Consensus procedure**

The list of core elements and checklist items based on the literature review and the website search (as well as the detailed summary tables) were presented to the group of 15 experts for a modified Delphi consensus procedure [51]; this consisted of two surveys (first and second rounds). Invitation to participate in the survey was sent by email. A teleconference was organized by the steering committee early in November to explain the objectives and methods to all experts, and to reply to their questions.

For the first round (November 2017), the list of core elements and checklist items were converted into an internet-based questionnaire using SurveyMonkey (Palo Alto, CA, USA). Respondents were asked to select all core elements and checklist items they felt were essential worldwide and should be part of AMS programmes in all hospitals and in all countries, using a 'yes/no' option; a 'comments' box was provided for each element/item, including suggestions for rephrasing. Elements and items were (a) selected if agreement was >80% (i.e., >12 experts), (b) held for reassessment during the second round if agreement was between 70% and 79% (11 experts), and (c) rejected if agreement was <70% (fewer than 11 experts). Experts were also asked to suggest new elements and items for further assessment, in addition to rephrasing. Newly suggested elements and items were considered for inclusion in the second round if at least three experts made the same suggestion.

During the second round (December 2017) all previously accepted, newly added, and rephrased elements and items were presented in a second internet-based questionnaire which was sent to all the experts who had participated in the first round. Experts were asked to rate the newly suggested items and the items held for reassessment, as well as to choose the best phrasing when appropriate (the selected phrasing was the one with >50% agreement). A ‘comments’ box for open-ended feedback was available for all elements and items.
Results

Literature review and website search

We identified 48 relevant references (written in Chinese, English, French or Spanish) [3–50] and came up with an initial set of seven core elements and 29 checklist items.

Consensus procedure

All 15 experts participated in the two rounds of the survey. During the first round, all seven core elements were selected, as well as 27 of the 29 checklist items, while one item was held for reassessment, one was rejected, and two additional items were newly suggested by three experts. Rephrasing was suggested for 27 elements/items, and comments were added for 14 of them. During the second round, two out of three items were selected, and the final phrasing was decided upon (newly suggested phrasing was chosen in 20 out of 27 cases). The procedure is summarized in Fig. 1, with the final set of seven core elements and 29 checklist items presented in Boxes 1–7 (Appendix S1) presents the full details of the procedure. The core elements were as follows: senior hospital management leadership towards AMS (Box 1, three checklist items), accountability and responsibilities (Box 2, seven items), available expertise on infection management (Box 3, two items), education and practical training (Box 4, two items), other actions

Box 1
Core element 1: Senior hospital management leadership towards antimicrobial stewardship

Accompanying comment: This section relates to governance of the programme by hospital executives, and specifies how senior hospital management supports the antimicrobial stewardship programme.

Checklist item 1.1:
Has your hospital management formally identified antimicrobial stewardship as a priority objective for the institution and included it in its key performance indicators?

Checklist item 1.2:
Is there dedicated, sustainable and sufficient budgeted financial support for antimicrobial stewardship activities (e.g., support for salary, training, or IT (information technology) support)?

Checklist item 1.3:
Does your hospital follow any (national or international) staffing standards for antimicrobial stewardship activities (e.g. number of full-time equivalent (FTE) per 100 beds for the different members of the antimicrobial stewardship team)?

Accompanying comment: These staffing standards should ideally be set at national level [58]

Box 2
Core element 2: Accountability and responsibilities

Checklist item 2.1:
Does your hospital have a formal/written antimicrobial stewardship programme/strategy accountable for ensuring appropriate antimicrobial use?

Accompanying comment: This should be based on existing national/international guidelines and/or an existing national strategy.

Checklist item 2.2:
Does your hospital have a formal organizational multidisciplinary structure responsible for antimicrobial stewardship (e.g., a committee focused on appropriate antimicrobial use, pharmacy committee, patient safety committee or other relevant structure)?

Accompanying comment: This antimicrobial stewardship committee can be either stand-alone or embedded into another committee structure (e.g., pharmacy committee, patient safety committee or other relevant structure). In all cases, this antimicrobial stewardship committee is explicitly in charge of setting and coordinating the antimicrobial stewardship programme/strategy in its mandate/terms of reference.

Checklist item 2.3:
Is there a healthcare professional identified as a leader for antimicrobial stewardship activities at your hospital and responsible for implementing the programme?

Checklist item 2.4:
Is there a document clearly defining roles, procedures of collaboration and responsibilities of the antimicrobial stewardship team members?

Accompanying comment: We refer here to the core operational team of healthcare professionals (led by the clinical leader) who will implement the antimicrobial stewardship strategy ‘daily on the ground’. This is different from the antimicrobial stewardship committee, which is a larger formal organizational structure (e.g., pharmacy committee, patient safety committee or other relevant structure). In resource-limited settings or small hospitals, although desirable, it is sometimes difficult to have an antimicrobial stewardship team; in that case, the antimicrobial stewardship clinical leader will implement the antimicrobial stewardship programme. The composition of the (usually multidisciplinary) antimicrobial stewardship team is flexible and should be based on existing international recommendations and adapted to the local context.

Checklist item 2.5:
Are clinicians, other than those part of the antimicrobial stewardship team (e.g. from the ICU, Internal Medicine and Surgery) involved in the antimicrobial stewardship committee?

Checklist item 2.6:
Does the antimicrobial stewardship committee produce regularly (indicate minimum time) a dedicated report which includes e.g. antimicrobial use data and/or prescription improvement initiatives, with time-committed short term and long term measurable goals/targets for optimising antimicrobial use?

Checklist item 2.7:
Is there a document clearly defining the procedures of collaboration of the antimicrobial stewardship team/committee with the infection prevention and control team/committee?

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aiming at responsible antimicrobial use (Box 5, eight items), monitoring and surveillance (Box 6, four items), and reporting and feedback (Box 7, three items).

**Discussion**

Based on a pragmatic literature review and a structured consensus procedure, we developed minimum core elements and checklist items that could be relevant to hospital AMS programmes worldwide. Even though most of these checklist items may not currently exist in most hospitals in low-income countries, we included all of them on the list because our main objective was to identify universally relevant, essential elements and items based on the best available evidence. These seven core elements and their related 29 checklist items could be adapted and adopted locally depending on factors such as clinical setting and resource availability. They provide a baseline of key elements required to start hospital AMS programmes, and could be further modified and used for the purposes of accreditation/certiﬁcation, benchmarking, or scrutiny/performance [52,53]. We were deliberately as generic as possible in the phrasing of elements and items so that countries could adapt them to their own situations: for example, regarding the composition of AMS teams.

When comparing our seven core elements and 29 checklist items with the list developed by the Centers for Disease Control and Prevention (CDC) in the United States, we found that both lists of core elements are very similar in content, even though the phrasing...
Box 7
Core element 7: Reporting and feedback (on a continuous basis)

<table>
<thead>
<tr>
<th>Checklist item 7.1:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does your stewardship programme share hospital-specific reports on the quantity of antimicrobials prescribed/dispensed/purchased with prescribers?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Checklist item 7.2:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does your stewardship programme share facility-specific reports on antibiotic susceptibility rates with prescribers?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Checklist item 7.3:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are results of audits/reviews of the quality/appropriateness of antimicrobial use communicated directly with prescribers?</td>
</tr>
</tbody>
</table>

is different [6]. The CDC also validated seven core elements: leadership commitment, accountability, drug expertise, action, tracking, reporting, and education [6]. The CDC developed a shorter list of 22 related checklist items, 12 of them being quite close to the checklist items we selected. However, our list of 28 checklist items is both more comprehensive and more generic, reflecting our objective of being relevant to any hospital worldwide.

Implementing AMS programmes in hospitals is one aspect of the comprehensive One Health strategy needed to tackle antimicrobial resistance [1]. The importance of having such programmes in the community or primary-care setting that are aligned with hospital programmes cannot be underestimated [53]. Implementing a hospital AMS programme is also not possible without a strong commitment from policy-makers, senior leadership, and national initiatives to guarantee access to good-quality, equitably priced essential antimicrobials [54]. In addition, education for the public and health professionals is a necessary prerequisite to initiating strong and lasting AMS programmes.

Our work has several limitations. We did not conduct a systematic literature review, but we are confident that we have not missed significant references as we have included recent systematic reviews on the topic, and additional references were identified by a large panel of AMS experts with no language restriction [3]. The number of experts involved in the consensus procedure was relatively small, even though the number was close to that in previously published consensus procedures [5,55]. Like all consensus procedures, ours was biased by the opinions of the experts, who all primarily had the perspective of the steward. Experts who serve in administrative roles in health care and thus represent more of the perspective of a hospital might have given different answers.

In conclusion, we propose here an evaluation framework for hospital AMS programmes that could be relevant in both resource-rich and resource-limited contexts. The next step should be to evaluate its value and then its feasibility and measurability in a range of geographic and resource settings, with a broader stakeholder group.

Transparency declaration

There is no conflict of interest to declare for any of the authors. EC is affiliated with the National Institute for Health Research/Health Protection Research Unit (NIHR/HPRU) in Healthcare Associated Infections and Antimicrobial Resistance at Imperial College London in partnership with Public Health England (PHE). SG received a grant from the WISH foundation (http://www.wish-qatar.org) to compensate for his time on this project. However, the funder had no role in the conduct of our research.

The opinions expressed in this article are those of the authors and do not necessarily reflect the views of the Centers for Disease Control and Prevention, the NHS, the NIHR, the Department of Health, or Public Health England.

Appendix A. Supplementary data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.cmi.2018.03.033.

References


