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Implementation of an antibiotic checklist increased appropriate antibiotic use in the hospital on Aruba

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SUMMARY

Objectives: No interventions have yet been implemented to improve antibiotic use on Aruba. In the Netherlands, the introduction of an antibiotic checklist resulted in more appropriate antibiotic use in nine hospitals. The aim of this study was to introduce the antibiotic checklist on Aruba, test its effectiveness, and evaluate the possibility of implementing this checklist outside the Netherlands.
Methods: The antibiotic checklist includes seven quality indicators (QIs) that define appropriate antibiotic use. It applies to adult patients with a suspected bacterial infection, treated with intravenous antibiotics. The primary endpoint was the QI sum score, calculated by the patient's sum of performed checklist-items divided by the total number of QIs that applied to that specific patient. Outcomes before and after the introduction of the checklist were compared.
Results: The percentage of patients with a QI sum score $\geq$50% increased significantly during the intervention ($n = 173$) compared to baseline ($n = 150$) (odds ratio 3.67, $p < 0.001$). However, performance did not improve on each individual QI. The checklist was used in 63.3% of the eligible patients.
Conclusions: The introduction of the antibiotic checklist increased appropriate antibiotic use on Aruba. Additional initiatives are necessary for further improvement per QI. These results suggest that the antibiotic checklist could be used internationally.

Introduction

Increasing antimicrobial resistance (AMR) is a threat to public health globally, and tackling this will require cross-sectional action by governments and society (World Health Organization (WHO), 2014; The Review on Antimicrobial Resistance, 2016). The emergence of AMR, together with a steady decline in the development of novel antibiotics, is narrowing down our therapeutic options (Luepke et al., 2017). The consumption of antibiotics is related to the development of AMR (Tacconelli, 2009; Goossens et al., 2005) To curb AMR, it is of great importance that we preserve the current agents by using antibiotics appropriately.

Antibiotic stewardship programmes (ASP) have been introduced in hospitals worldwide to "measure and improve the appropriate use of antibiotic agents by promoting the selection of the optimal antibiotic drug regimen" (Barlam et al., 2016). There are encouraging examples showing beneficial effects, with decreases in resistance rates and costs without an increase in clinical failures (Davey et al., 2017). However, the contents of these programmes and the extent to which ASPs are implemented vary between hospitals and countries (Howard et al., 2015; World Health Organization, 2012). Some European hospitals are worldwide leaders in these developments (Howard et al., 2015). In the Netherlands, for example, the Ministry of Health mandated the commission of a team of infection specialists to drive ASP in each hospital since January 2014. This gives the Netherlands, together with relatively low rates of AMR, a unique position with regard to AMR compared to many countries in the rest of the world. However, no ASP has been introduced on the island Aruba, which is a constituent country of the Netherlands, located in the southern Caribbean Sea.

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Since AMR is a worldwide problem, and the healthcare workers in the hospital on Aruba struggle with high AMR rates compared to many other countries (e.g., the local resistance rate of *Escherichia coli* to trimethoprim–sulfamethoxazole in 2014 was 56% on Aruba compared to 23% in the Netherlands; van den Berg R, oral presentation at the Dutch-Caribbean Mini-symposium on Antimicrobial Stewardship, Oranjestad, Aruba, November 2015), ASP strategies are urgently needed and should be implemented as soon as possible on Aruba.

The present study group recently illustrated that the implementation of an antibiotic checklist resulted in more appropriate antibiotic use in the Netherlands (Van Daalen et al., 2017). This checklist includes generic quality indicators (QIs) that define appropriate antibiotic treatment of bacterial infections in the hospital (Van den Bosch et al., 2015; van den Bosch et al., 2016). Since these QIs were developed by an international expert panel (Van den Bosch et al., 2015), the checklist should be useful internationally; however this must be measured in a different setting. Aruba represents an interesting setting in which to test whether the checklist could gain similar results. On the one hand, there are similarities between Aruba and the Netherlands because of the political relationship, and on the other, Aruba differs in terms of culture, climate, and healthcare system, more closely resembling the countries of the Caribbean and Latin America.

The aims of this project were to start ASP on Aruba with the introduction of the antibiotic checklist, to test its effectiveness, and to evaluate the possibility of implementing this checklist outside the Netherlands.

Methods

Study design and setting

A prospective cohort trial was conducted between August 1, 2015 and January 15, 2016. The antibiotic checklist was introduced on November 15, 2015. Three periods were distinguished: a baseline period (from August 1 to October 1, 2015), a transition period (from October 1 to November 15, 2015), and an intervention period (from November 15, 2015 to January 15, 2016). The outcomes before (baseline) and after (intervention) introduction of the checklist were compared. During the transition period, implementation activities were started and no data were collected.

The antibiotic checklist was introduced at the Dr. Horacio E. Oduber Hospitaal (HOH), which is the only hospital on Aruba. It has a capacity of 288 beds. Each ward participated in the project, except the intensive care unit (ICU) and the paediatric department, as the QIs included in the checklist do not apply to these patient populations (Van den Bosch et al., 2015).

The Medical Research Involving Human Subjects Acts did not apply to this study (Van Daalen et al., 2017). Since the study involved a quality improvement intervention with negligible risk of harming patients, individual informed consent was waived. The board of directors approved the study protocol.

Participants

Eligible patients were hospitalized adults (≥18 years old), or adults in the emergency department (ED) who were admitted to a participating ward, with a suspected community-acquired and/or hospital-acquired bacterial infection, treated with intravenous (IV) antibiotics.

For the baseline period, eligible patients were identified using a list that was generated by the local pharmacist from the computerized medication ordering system of all patients treated with IV antibiotics between August 1, 2015 and October 1, 2015. Two exclusion rounds were performed. In the first exclusion round, the information on the pharmacist's list was used to exclude all patients younger than 18 years of age, those with IV antibiotic treatment started in the ICU, and those receiving cefazolin as a sole treatment (standard prophylaxis in the hospital). After exclusion round 1, every second patient on the list was selected and their case notes collected. The case notes were used for exclusion round 2, in which patients who had a hospital stay of less than 24 h, had been given other antibiotics as prophylaxis, who had been treated for less than 24 h, or who had started an oral antibiotic were excluded. The remaining patients were included in the baseline group.

Eligible patients admitted between November 15, 2015 and January 15, 2016 were considered as the intervention group. All eligible patients with a partly completed or totally completed checklist were included; a selection of patients without a checklist was also selected to investigate whether the implementation strategies had a positive effect on the awareness of appropriate antibiotic use, even though a checklist was not completed. To select this last group of patients, the pharmacist's list of all patients treated with IV antibiotics was again used. The patients were selected in the same manner as for the baseline measurement, but every third patient on the list was selected instead of every second patient.

Intervention: the antibiotic checklist

The antibiotic checklist was developed in a previous Dutch study (Van Daalen et al., 2016). It is intended to be a supporting tool for physicians to improve the quality of their antibiotic regimens. The checklist includes seven generic QIs that define appropriate antibiotic use in the treatment of bacterial infections in the hospital (Van den Bosch et al., 2015; van den Bosch et al., 2016). The checklist is divided into two bundles. The first bundle (five items) has to be completed at the time IV antibiotics are prescribed. The second bundle (two items) has to be used during the course of treatment, at the latest after 72 h of treatment. Due to the preference of the local infectious diseases (ID) specialists in Aruba, the Dutch checklist was adjusted slightly for the item 'adherence with local guidelines'. The option 'no, according to other guidelines' was replaced with the option 'no, in consultation with the ID specialist'. The antibiotic checklist used in Aruba is presented in Figure 1.

Procedure

During the baseline period, only data collection was performed; no interventions were implemented at this time. During the transition period, a kick-off symposium was organized to introduce the antibiotic checklist to the physicians working in the hospital. Education was provided during the symposium on antimicrobial resistance and the importance of all steps of appropriate antibiotic use, as summarized in the checklist items. In addition, the areas for improvement in current antibiotic use practices in the hospital were explained by presenting the data from the baseline period. The intervention period started after the symposium. The checklists were displayed in printed form in the doctors' rooms, and materials to remind healthcare providers of the checklists, such as laminated pocket versions and posters, were distributed. Physicians working on participating wards were asked to complete the checklists for all eligible patients during the intervention period. When the first bundle had been completed in the ED, the checklist was taken to the ward with the patient. During the intervention period, local study coordinators (AL, JK) gave additional clinical lessons on appropriate antibiotic use and promoted checklist use by face-to-face prompting.