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Optimizing the process of blood culture collection

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Background: Blood cultures are essential diagnostic tools to identify pathogens causing bloodstream infections. This identification is necessary to change the antibiotic treatment to pathogen-directed therapy. This streamlining often also leads to intravenous-oral switch. Both steps are important for adequate antibiotic treatment, better patient outcomes, lower hospital costs, and, in the long run, a decrease in antimicrobial resistance.

Based on data of a previous study the idea arose that the process of blood culture collection in our hospital is suboptimal. Several risk analysis models can be used to evaluate difficulties in daily processes in the medical field.

In this project we aimed to illustrate the usefulness of the Bow-Tie diagram and the prospective risk inventory to identify risk factors for not getting an optimal blood culture result, and ultimately to optimise all steps concerning blood culture performance from order until feedback of the laboratory results.

Material/methods: The setting was the emergency department, an internal medicine ward and the clinical laboratory of one university hospital in the Netherlands. The risk analysis consisted of two phases. First we performed direct observations at the departments and held short interviews with healthcare workers involved in the process. A Bow-Tie diagram was used to map all risk factors identified and potentially protective factors (figure 1). Second we performed a prospective risk inventory to determine at which moment in the process the risk factors occurred and which problems were the most urgent. Finally optimization steps were planned and introduced. Our primary outcome was the collection of two sets of blood cultures instead of one.

Results: Figure 1 shows the Bow-Tie diagram. Risk factors were related to sampling, communication or transport. In the prospective risk inventory we identified lack of knowledge and high workload as the

most urgent factors. We updated the protocol, gave clinical lessons to nurses, and performed a test-project with extra staff at the emergency department to lower the workload. These interventions resulted in an increase of 12% of patients in whom two sets of blood cultures instead of one were performed (38% in baseline versus 50% in test-period).

Conclusions: A detailed prospective risk analysis can identify the bottle necks in daily processes in the hospital. Bow-Tie models are useful to gain insight in a process, to map all possible risk factors and protective factors. Prospective risk inventories are helpful to identify the most urgent risks and to create the most fitting solutions. More efforts are needed to optimise the process in our hospital.

Figure 1: Bow-Tie diagram

