The Budget Impact of Procalcitonin-Guided Antibiotic Stewardship for Patients with Suspected Sepsis in Belgium

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Objective:

Antimicrobial resistance (AMR) has been declared one of the greatest threats to public health[1]. It has been estimated that AMR leads to 530 deaths with a financial burden of 24 million (Mio) € annually in Belgium, which is estimated to reach up to 785 Mio € annually by 2050[2]. Procalcitonin (PCT) testing can help reduce the antibiotic consumption in the intensive care unit (ICU) for patients with suspected sepsis[3].

The aim of this study was to compare the health and budget impact of PCT-guided antibiotic stewardship versus the standard of care for patients with suspected sepsis in the ICU in Belgium.

Methods:

A decision analytic tree was developed (Figure 1) to model the cost and health outcomes of PCT-guided antibiotic stewardship for patients with suspected sepsis. The study considered a one-year time horizon, and was conducted from a Belgian health care sector perspective.

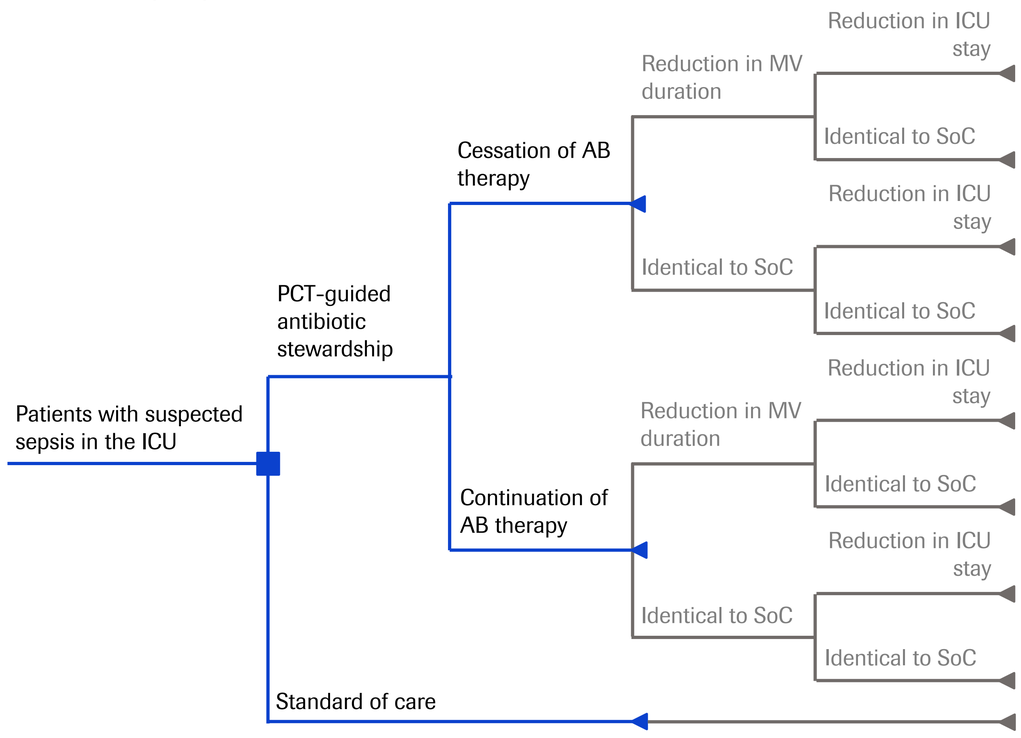

Figure 1: Decision tree illustrating the two alternative treatment strategies. The base-case analysis is presented in blue, and the scenario analysis is represented by the grey branches. *ICU, intensive care unit; PCT, procalcitonin; AB, antibiotic; MV, mechanical ventilation; SoC, standard of care.*

A systematic literature search, an expert survey with local clinical experts, and national database searches were conducted to obtain model input parameters. Main outcomes were total budget impact per patient, number of AMR infections, and cost per antibiotic day avoided. Next to the base-case analysis, a scenario analysis was performed to investigate the budget impact when including parameters for reduction in ICU length of stay and mechanical ventilation. In order to evaluate the impact of parameter uncertainty on the source data, a deterministic sensitivity analyses was performed.

Results:

Based on model predictions, PCT-guided antibiotic stewardship could reduce the number of antibiotic days by 66,868 (Figure 1), resulting in 1.98 Mio € savings towards antibiotic treatment.

	SoC	PCT	Difference
Healthcare impact, per year			
AB days	301,884	234,016	-67,868
AB resistant cases	3,326	3,070	-256
Costs categories, per patient, per year, €*			
PCT tests	0	87	87
Antibiotics	248	192	-56
AMR (due to prolonged hospital stay)	383	355	-30
Total cost difference	-	-	1.92
Budget impact, per year, €* (35,516 patients per year)			
Health care perspective	-	-	68,220

Table 1: Expected results. Healthcare impact. *AB, antibiotic; AMR, antimicrobial resistance; PCT, procalcitonin; SoC, standard of care.*

AMR cases could decrease by 7.7% (6.1% vs 9.2%) in the PCT-guided setting compared with standard of care setting. The base-case budget impact suggests an investment of 1.90 € per patient, which would result in a total budget impact of 68,220 € when all patients are considered. The base-case sensitivity analysis (Figure 2) showed that the main drivers of the result can alter potential cost savings.

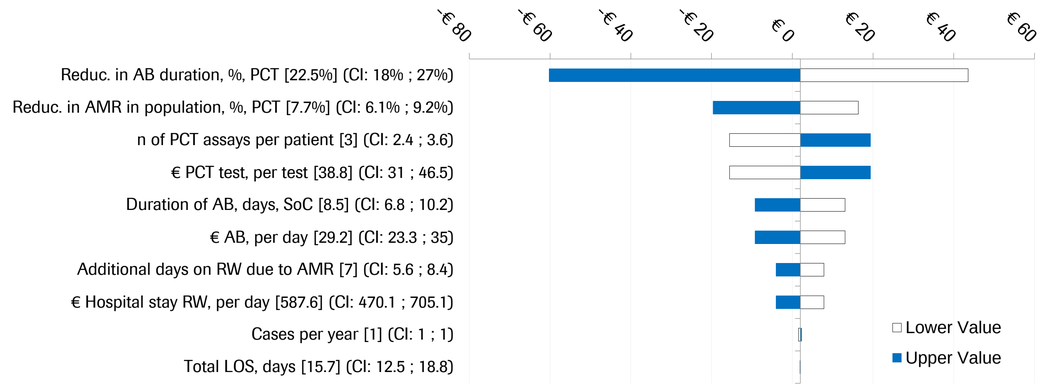

Figure 2: Tornado diagram. Impact of parameter variations on cost results per patient. The tornado diagram illustrates a univariate analysis, where one parameter is altered to the extreme of its range of variability, whilst all other parameters remained unchanged. *Reduc., reduction; AB, antibiotic(s); PCT, procalcitonin; n, number; RI, reimbursed; AMR, antimicrobial resistance; SoC, standard of care; RW, regular ward; ICU, intensive care unit; LOS, length of stay.*

The scenario analysis indicated a saving of 1,405 € per patient, with a reduction of 2 days in the intensive care unit (14.8 days vs 12.8 days), and a reduction of 22.7% (18.1–27.2%) in mechanical ventilation duration. The total budget impact, considering all patients, indicated a saving of 49.92 Mio. € due to PCT testing.

	SoC	PCT	Difference
Costs categories, per patient, per year, €*			
Hospital stay	12,298	11,010	-1,288
Mechanical ventilation	525	406	-119
Base-case analysis			1.92
Total cost difference	-	-	-1,405
Budget impact, per year, Mio €* (35,516 patients per year)			
Health care perspective	-	-	-49.92

Table 2: Scenario analysis results. Including ICU length of stay and mechanical ventilation parameters. *PCT, procalcitonin; SoC, standard of care.*

The associated sensitivity analysis of the scenario (Figure 3) showed that the main driver of the result is the reduction in ICU length of stay due to PCT testing. Furthermore, the sensitivity analysis was shown to be robust in all parameters.

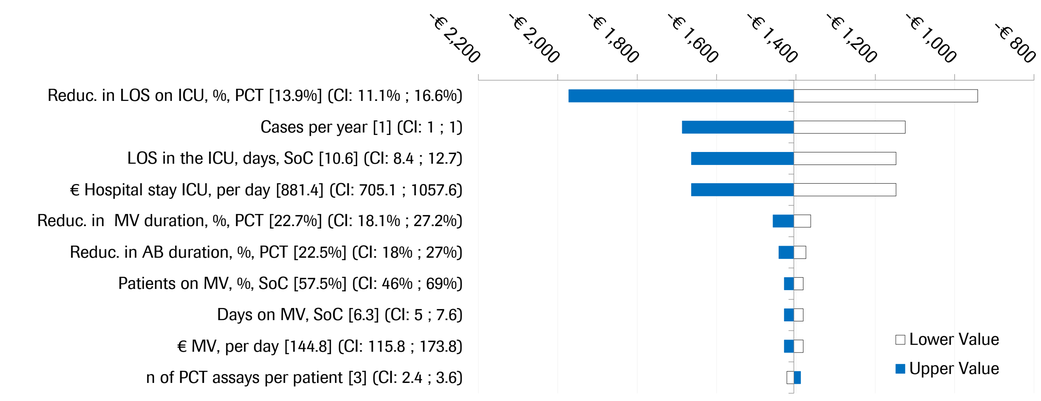

Figure 3: Tornado diagram. Impact of parameter variations on cost results per patient, when including ICU length of stay and mechanical ventilation parame. *LOS, length of stay; ICU, intensive care unit; PCT, procalcitonin; SoC, standard of care; Reduc., reduction; AB, antibiotic(s); MV, mechanical ventilation; n, number.*

Conclusion:

Procalcitonin-guided antibiotic stewardship programs are associated with clinical benefits that positively influence antimicrobial resistance in Belgium. A small investment per patient to implement procalcitonin testing may lead to substantial savings.

References:

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