A Health Economic Evaluation of the Impact of Pathogen Reduction Technology on Emerging Pathogens within the Platelet Collection and Transfusion Space
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STUDY REFERENCE

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INTRODUCTION / BACKGROUND

Safety of the blood supply chain has been a topic of concern for decades. The recent COVID19 pandemic has been a catalyst to put the blood safety topic high on the policy making agenda. European authorities are evaluating to mandate pathogen reduction technology for blood platelets collections. COVID19 was not identified as a bloodborne disease but the rapid spread of the virus was eye opening and the vulnerability of a health system in case of an emerging pathogen was substantially demonstrated. Hence the question arises: what the impact of a large installed base of pathogen reduction technology could be to ensure blood safety in case of an unknown emerging pathogen.

OBJECTIVES AND METHODOLOGY

Given the recent COVID-19 outbreak our objective was to assess the role a European installed base of pathogen reduction technology (PRT) could have on controlling the potential devastating impact of future bloodborne emerging pathogens. In specific we wanted to assess its impact within the platelets collection and transfusion environment.

Based on literature review, the characteristics of common bloodborne pathogens (e.g. the basic reproduction number, mortality and morbidity), current blood testing (BT) capabilities (e.g. blood test availability and sensitivity), pathogen reduction levels (e.g. log kill rate) as well as cost information in case of infection, were identified and modelled to assess the potential scenarios from a direct and indirect costs point of view. The assessment was performed for platelets collected within the current EU countries.

As we were evaluating the impact of an unknow emerging pathogen we had to consider 2 assumptions:

- Assumption 1: The emerging pathogen is unknow. The probability of its characteristics to fit within the boundaries of characteristics of known pathogens is higher than the change that the novel pathogen demonstrates characteristics that will deviate from known pathogens.
- Assumption 2: Any of the combinations of characteristics is possible. We cannot predict nature. For instance, incidence rates and response to PRT treatment may vary in any potential combination, though always within the characteristics of existing pathogens.

Based on the literature review and assumptions the model as demonstrated in image 1 was constructed.

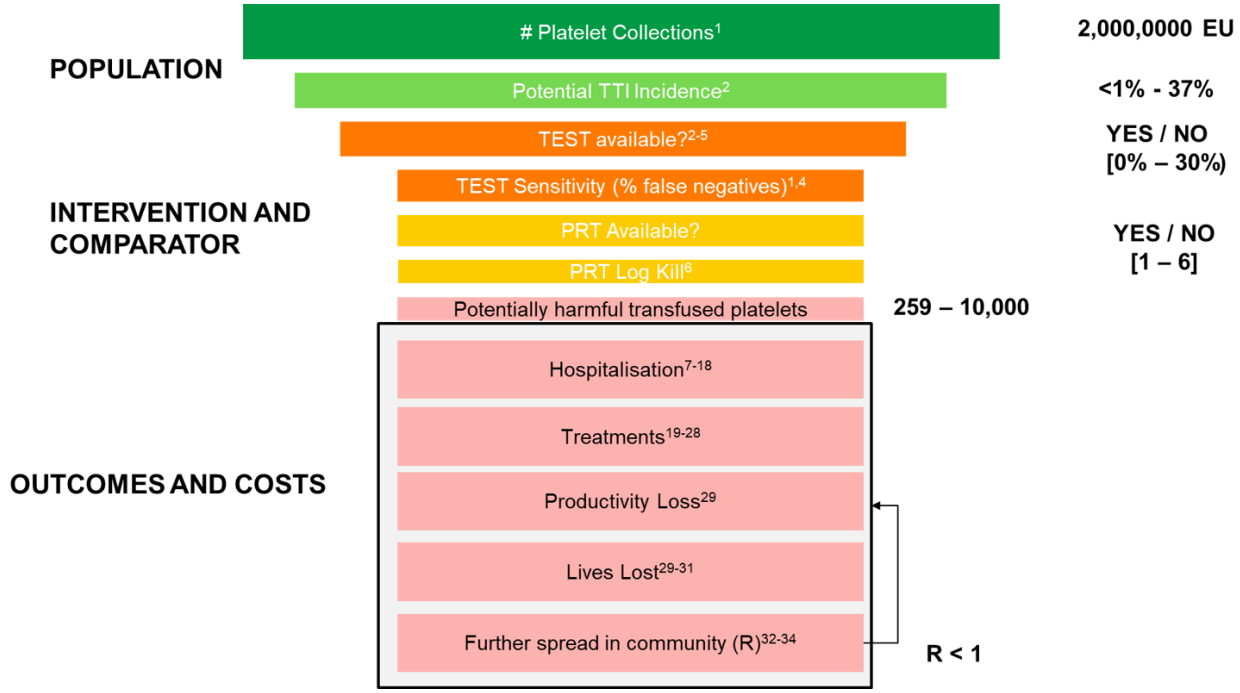

Image 1: PRT Model Structure

		TEST AVAILABLE	
		YES	NO
PRT	YES	Scenario 1	Scenario 2
	NO	Scenario 3	Scenario 4

Image 2: PRT Model Scenarios

RESULTS

Assuming 2 million platelet collections and in case a new pathogen merges for which no sensitive BT is immediately available. PRT could, within the first wave of infections, prevent 3700 infections through blood transfusion and avoid 5700 infections from transfused patients to others. Avoiding these infections would reduce health care expenditures by 165 million euro and save 25.000 days of hospitalization. Up to 2400 lives would be saved which would have an immediate positive economic impact of 123 million euro. Indirectly PRT would save 73000 days of productivity and reduce overall indirect morbidity costs by 24 million euro.

	PRT + TEST	No TEST + PRT	TEST + No PRT	No test No PRT
	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Direct spread community	105	249	92	3,990
Indirect spread of TTI (community -> community)	120	315	119	5,926
Cost of treatment (€)	4,930,923	13,147,573	5,182,318	171,100,033
Cost of hospital stay pp (€)	178,306	107,646	134,324	138,215
Cost of hospital stay total (€)	3,249,957	13,561,013	4,679,050	299,099,121
Standardized death rates per 100,000, results from TTI	131,230	137,346	129,471	124,653
Lives lost	38	187	51	2,510
Cost of Lives Lost (€)	1,915,381	9,360,727	2,574,291	125,516,623
Days Missed at work	59	65	77	65
Days Missed at work (n)	1,422	3,019	1,595	75,031
Cost of a day Missed at work (€)	980	988	998	1,003
Cost of Morbidity (€)	291,744	1,156,958	528,559	24,345,313

Image 3: Results per scenario

CONCLUSIONS

In case of an emerging pathogen for which no highly sensitive DT is directly available, PRT and its known ability to avoid transfusion transmitted infections in platelets, may facilitate substantial economic and societal savings. As we only investigated for platelets, future research that considers plasma collections or red blood cell collections may be relevant. Country differences as well as differences based on the procedure to collect platelets may occur.

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