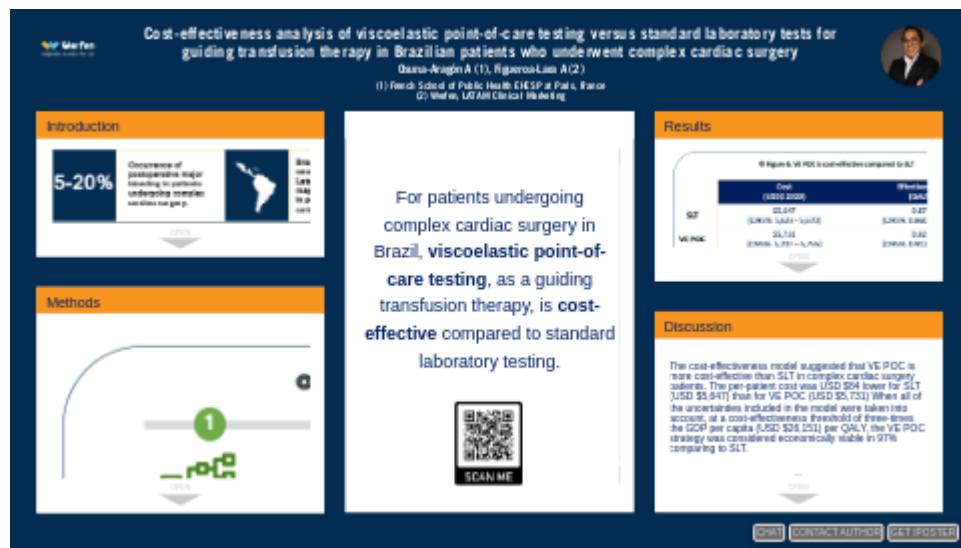


Cost-effectiveness analysis of viscoelastic point-of-care testing versus standard laboratory tests for guiding transfusion therapy in Brazilian patients who underwent complex cardiac surgery



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PRESENTED AT:



INTRODUCTION



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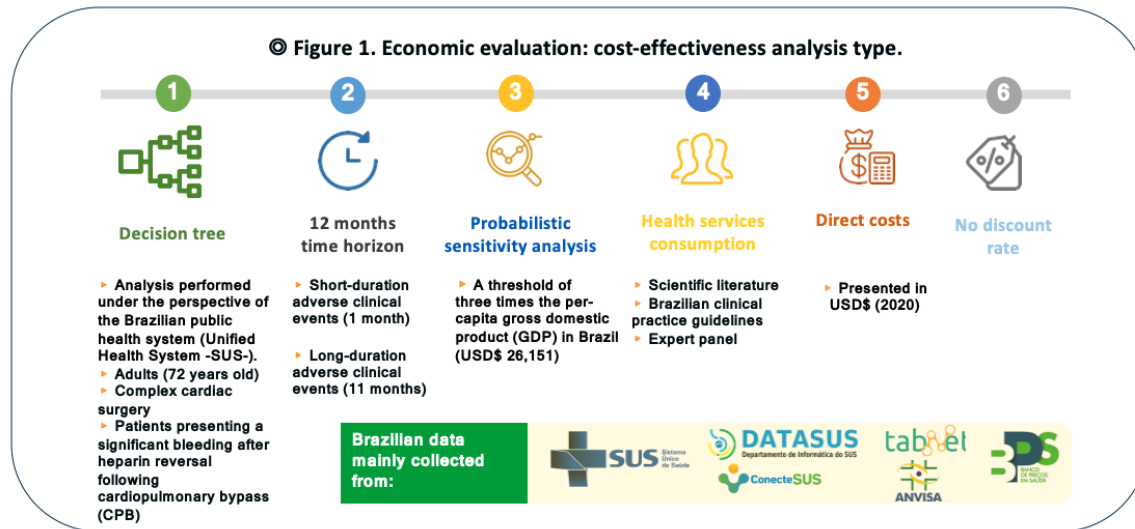
- Transfusion of allogeneic blood components independently increases morbidity, mortality, hospital stay in the intense care unit (ICU) and therefore care costs.
- In Brazil, according to the BYPASS registry (Brazilian Registry of Adult Patients Undergoing Cardiovascular Surgery), it revealed that coronary artery bypass surgery (CABG) with cardiopulmonary bypass (CPB) is the most widely used type of heart surgery followed by valve surgery either isolated or combined and aorta surgeries, with 54.1%, 31.5% and 2% respectively.
- During 2017, Brazil was the leading country in the Latin American region with the highest number of estimated major bleeding episodes per year derived from cardiac surgeries with 8,500 events compared with Mexico and Colombia with 4,470 and 1,820 events respectively.
- There is an identified need to re-focus efforts on strengthening the management of transfusions of allogenic blood components in cardiac surgeries. The idea of moving from “product centered transfusion practice” to “patient blood management (PBM)” have helped bringing a realignment to transfusion practice.

OBJECTIVE

The objective of the present study is to assess the cost-effectiveness of viscoelastic point-of-care testing (VE POC) vs standard laboratory testing (SLT) for guiding transfusion therapy in Brazilian patients who underwent complex cardiac surgery in terms of quality adjusted life years (QALY).

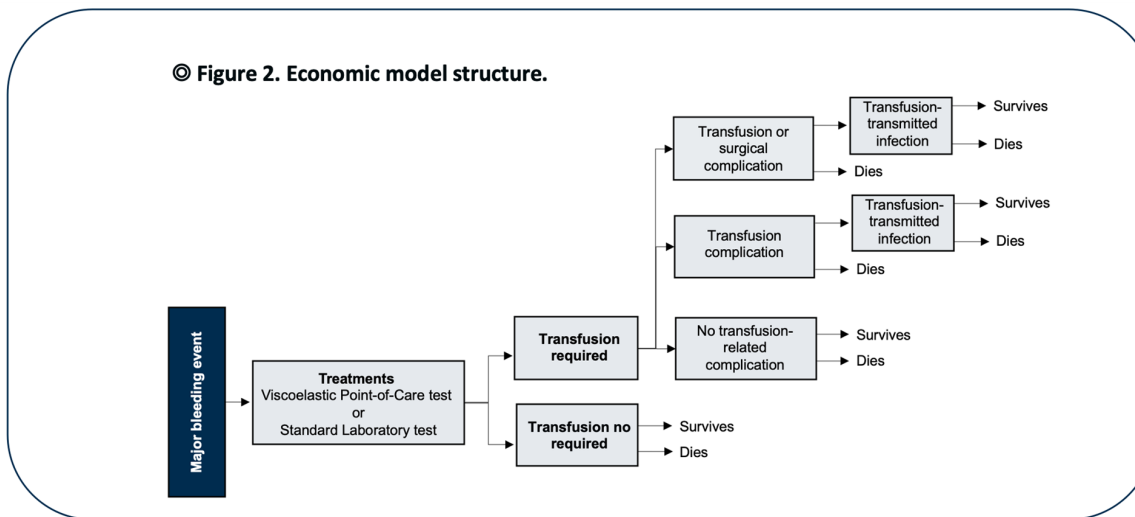
METHODS

© Figure 1. Economic evaluation: cost-effectiveness analysis type.

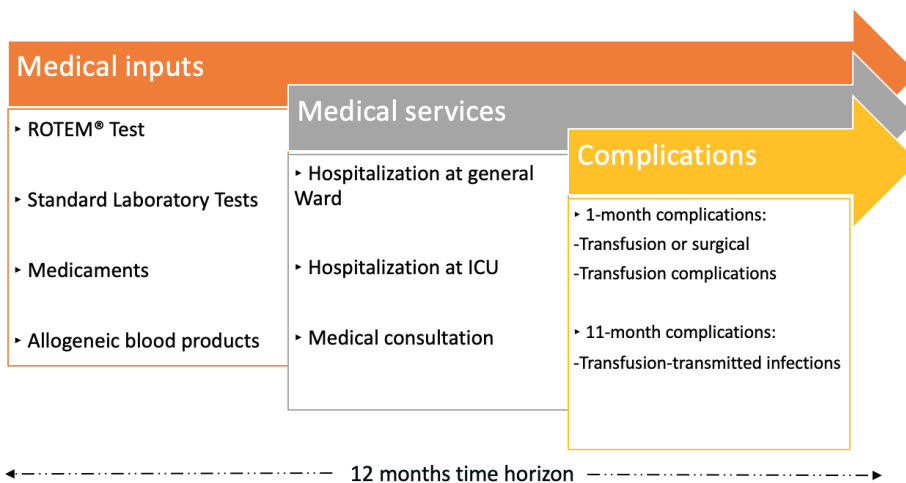


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© Figure 2. Economic model structure.



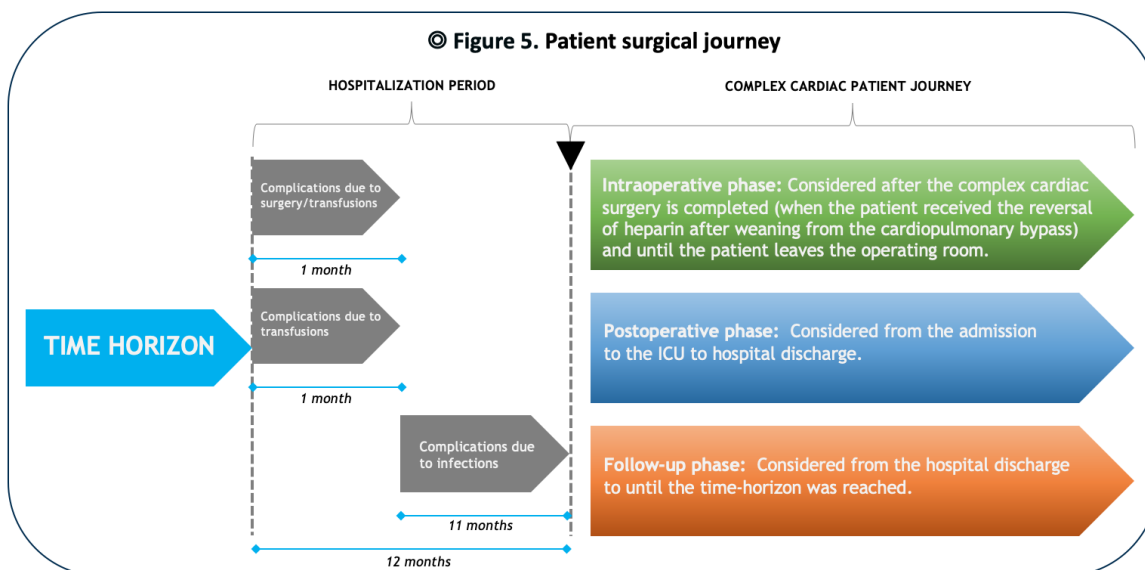
© Figure 3. Input cost: includes all relevant medical inputs + costing of relevant clinical events.



© Figure 4. Description of the adverse clinical events considered in the model.

Related to transfusion or surgical (1-month duration)	Related to transfusion (1-month duration)	Related to infections (11-months duration)
• Myocardial infarction • Acute renal dysfunction • Septicemia • Stroke • Deep vein thrombosis • Pulmonary embolism • Wound complication • Bleed-requiring operation • Post-operative confusion	• Haemolytic transfusion reaction • Transfusion related acute lung injury • Transfusion associated circulatory overload • Transfusion related vs host disease • Post-transfusion purpura • Pulmonary embolism • Incorrect blood component • Febrile reaction	• Bacterial contamination • Hepatitis A • Hepatitis B • Hepatitis C • HIV • Human t-lymphotropic virus 1 • Malaria • Chagas

© Figure 5. Patient surgical journey



For patients undergoing complex cardiac surgery in Brazil, **viscoelastic point-of-care testing**, as a guiding transfusion therapy, is **cost-effective** compared to standard laboratory testing.



RESULTS

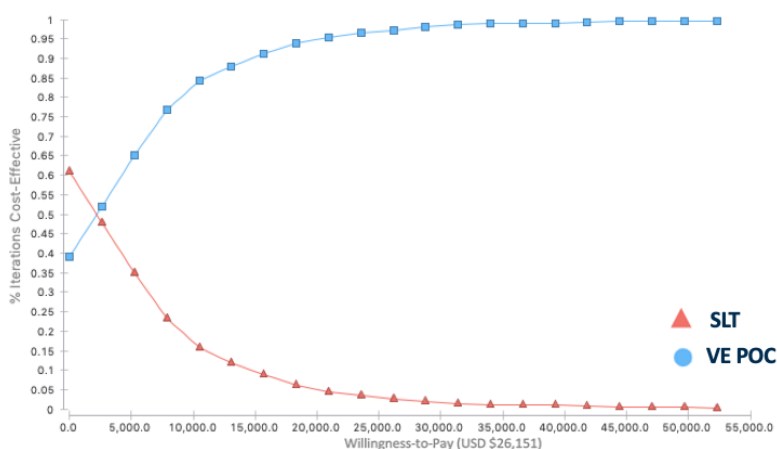
© Figure 6. VE POC is cost-effective compared to SLT

	Cost (USD\$ 2020)	Effectiveness (QALY)
SLT	\$5,647 (CI95%: 5,623 - 5,670)	0.87 (CI95%: 0.860 - 0.871)
VE POC	\$5,731 (CI95%: 5,707 - 5,755)	0.92 (CI95%: 0.912 - 0.922)

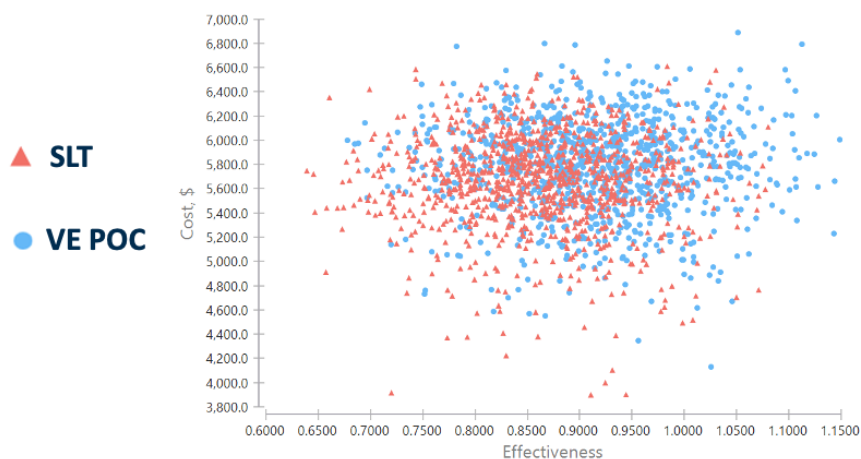
$$\frac{\Delta \text{Cost}}{\Delta \text{QALY}} = \frac{\$5,731 - \$5,647}{0.92 - 0.87} = \frac{\Delta \$84}{\Delta 0.05} = \text{ICER } \$1,628; \text{ cost per QALY}$$

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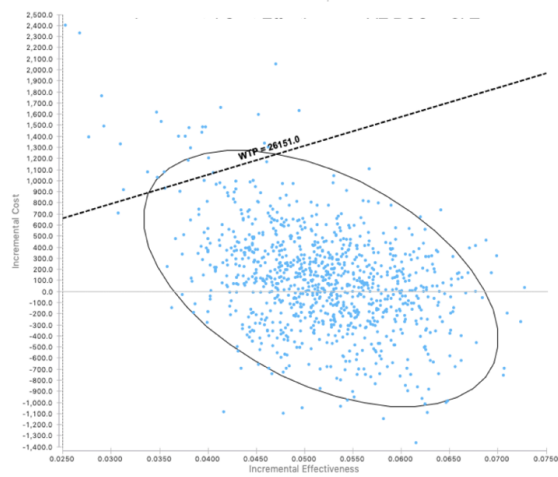
© Figure 7. CEA Acceptability curve



© Figure 8. CEA scatterplot



© Figure 9. Scatterplot of 10,000 iterations of Monte Carlo simulations.



DISCUSSION

The cost-effectiveness model suggested that VE POC is more cost-effective than SLT in complex cardiac surgery patients. The per-patient cost was USD \$84 lower for SLT (USD \$5,647) than for VE POC (USD \$5,731). When all of the uncertainties included in the model were taken into account, at a cost-effectiveness threshold of three-times the GDP per capita (USD \$26,151) per QALY, the VE POC strategy was considered economically viable in 97% comparing to SLT.

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This was the first comprehensive analysis in the Latin-American region with focus on to evaluate the cost-effectiveness of the management of transfusion of allogenic blood components in complex cardiac surgeries.

- **Only two health technology assessments (HTA) have attempted to do this economic evaluation at a greater scale:**
 1. One HTA conducted in Scotland by the National Health Service Quality Improvement (Craig J et al, 2008), evaluated the utilization of the clinical and cost-effectiveness of using thromboelastography and thromboelastometry analysers (TE) compared with SLT and clinical discretion used alone, along with the results, it considered that within the utilization of TE there was a reduction in the number of deaths, complications and infections, and an increase in the number of years lived and the QALYs gained by patients
 2. A second HTA conducted in the England by the National Institute for Health and Care Excellence (NICE) (Whiting P et al, 2015), aimed to assess the clinical effectiveness and cost-effectiveness of viscoelastic (VE) devices to assist with the diagnosis, management and monitoring of haemostasis disorders during and after cardiac surgery, trauma-induced coagulopathy and post-partum haemorrhage (PPH), as a result, it showed that VE testing is cost-saving and more effective than SLT in both patients undergoing cardiac surgery and trauma patients.
- While in both HTAs the claim that the use of VE POC is a dominant alternative compared to SLT is overwhelming, the outcome of our study only resulted to be cost-effective. This distinction could be explained by different reasons, being the cost structure and the type of health system the main factors of the observed variation. For instance, the HTAs considered a different approach in terms of data collection and cost components compared with our study, likewise, even though, principles of universal access and comprehensive coverage are common to both the NHS and the SUS, the in-patient service costs and coverage are substantially different from each other.