

Cost-Effectiveness of Penicillin Allergy Skin Testing in Methicillin-Sensitive Staphylococcus aureus (MSSA) Bacteremia

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Background

- *Staphylococcus aureus* is a leading cause of bacteremia that is associated with high mortality rates and represents a significant burden to the healthcare system^{1,2}
- Beta-lactams remain the gold standard for treatment of methicillin-sensitive staphylococcus aureus (MSSA) bacteremia due to superior outcomes compared to vancomycin³
- Approximately 9 in 10 patients receiving penicillin skin testing (PST) will be de-labeled of a penicillin allergy and able to receive a beta-lactam antibiotic⁴
- It is estimated only 1% of the general population is truly allergic to penicillin and that less than 10% of patients with penicillin allergy histories who received PST are found to be at risk for an acute allergy⁵

Aims

- Primary aim is to evaluate the cost-effectiveness of penicillin allergy confirmation during acute care admission for methicillin-sensitive staphylococcus aureus (MSSA) bacteremia through a PST service.

Methods

- A decision tree analysis was used to compare a PST intervention in patients with a registered penicillin allergy during an inpatient admission for MSSA bacteremia versus standard of care (No PST) [Figure 1 & Figure 2]
- The model was created from the health sector perspective with a 1-year time horizon
- Patients with a penicillin allergy label were expected to receive vancomycin while patients with no penicillin allergy were expected to receive cefazolin
- Potential inpatient, outpatient, and adverse reaction costs were considered in all arms of the model [Table 1]
- The effects were measured in quality adjusted life years (QALY) and were calculated for patients who were cured, hospitalized, experienced severe adverse events, or died from MSSA infection [Table 1]

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Methods (continued)

Figure 1: Decision Tree Model (Penicillin Allergy Skin Test)

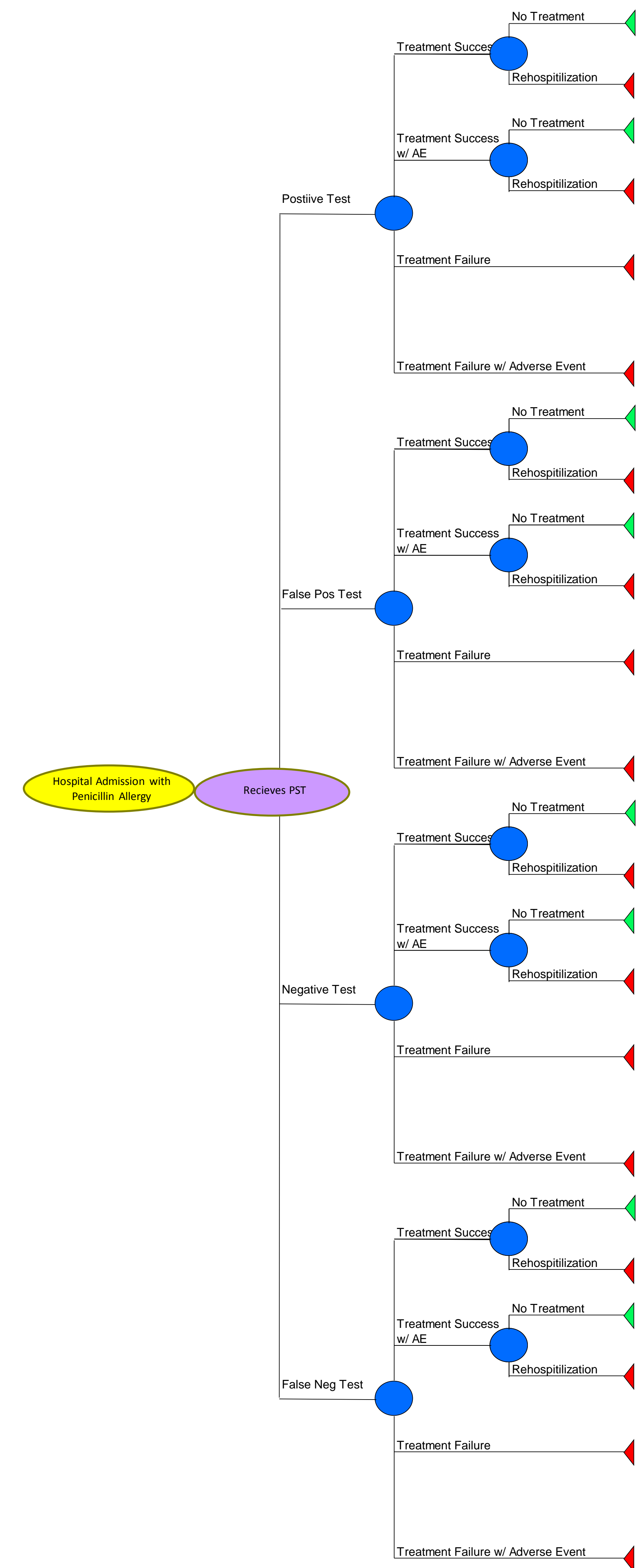
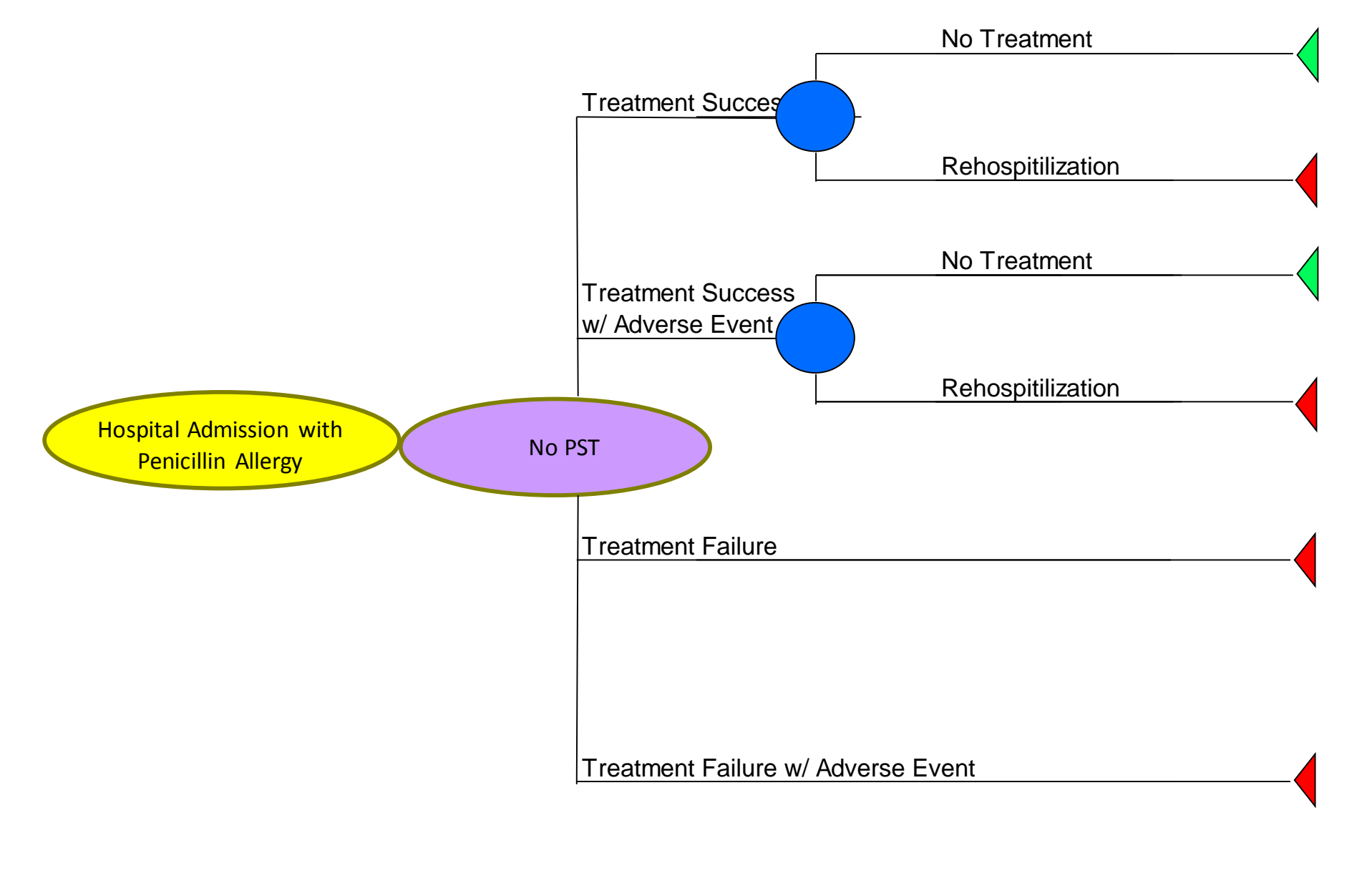


Table 1: Decision Tree Model Inputs

Model Inputs	Base Case	Source
Transition Probabilities		
Positive Skin Test	0.14	7
False Positive Skin Test	0.017	7
False Positive Skin Test	0.02	7
Treatment Success with Cefazolin	0.927	6
Treatment Success with Vancomycin	0.821	6
Adverse Reaction with Cefazolin	0.046	8
Adverse Reaction with Vancomycin	0.052	8
Readmission with Cefazolin	0.091	6
Readmission with Vancomycin	0.188	6
Utilities		
Post-septic episode with no other issue	0.8	9
Disutility for Readmission	-0.008	10,11
Disutility for Adverse Event	-0.01	12,13
Death	0	
Costs		
Penicillin Skin Test Procedure*	\$300.00	14
Inpatient antibiotics with allergy label	\$500.00	15
Inpatient antibiotics with no allergy label	\$200.00	15
Outpatient antibiotics with allergy label	\$53.00	16,19
Outpatient antibiotics with no allergy label	\$38.00	16,19
*Includes kit and labor		
Inpatient medical costs for MSSA	\$7,466.00	17
Outpatient medical costs following MSSA	\$3,385.00	17
Adverse reaction to treatment	\$7,947.00	

Figure 2: Decision Tree Model (Standard of Care)



Results

Table 2: Cost Effectiveness Analysis Results

Treatment Strategy	QALY	Cost (\$)	Incremental cost per QALY gained
Standard of Care	0.66	13,219	DOMINATED*
Penicillin Allergy Skin Test **	0.73	12,559	-

*A dominated strategy is less effective and more costly

**Assumes confirmatory testing on all patients admitted with a self-reported allergy to penicillin

Abbreviations: QALY – quality-adjusted life-year

- Patients who received PST services had a mean yearly cost of \$12,599, mean quality adjusted life years (QALY) of 0.73, and mean cost/QALY of \$17,204 [Table 2]
- Patients who received standard of care (no PST services) had a mean yearly cost of \$13,219, mean quality adjusted life years (QALY) of 0.66, and mean cost/QALY of \$20,028 [Table 2]
- The model produced a final base case incremental cost effectiveness ratio (ICER) of standard of care being dominated by PST services [Table 2]

Conclusions

- Penicillin allergy confirmation through PST services was cost-effective for patients with a reported penicillin allergy admitted for MSSA bacteremia
- Sensitivity analyses could add to the certainty that PST services are cost-effective compared to standard of care
- Additional research to determine potential benefits of PST services beyond one year and in other disease states could further improve the cost-effectiveness of this intervention

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