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Learning Objectives:

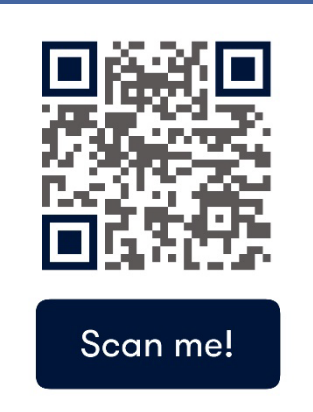
- 1) Discuss the clinical impact of warfarin by examining warfarin therapy’s influence on hospital LOS and blood utilization.
- 2) Describe INR variability on patient outcomes.

Background:

- Oral anticoagulation is a cornerstone of postoperative management in cardiac surgery patients to prevent thromboembolic complications, particularly following bioprosthetic valve replacement (AVR, MVR) and mitral valve repair (MVrep).
- Warfarin remains the preferred agent due to its efficacy, reliable monitoring via INR, and available reversal strategies, all linked to reduced mortality and thromboembolic events (Huang, 2023). While Direct Oral Anticoagulants (DOAC) are favored in other settings for convenience, they remain unsuitable for most cardiac surgery patients due to limited safety data, lack of monitoring, and inadequate reversal options (Langenaeken et al., 2023).
- Our review explores the relationship between LOS and warfarin use, INR elevation, and blood transfusion requirements among cardiac surgery inpatients.

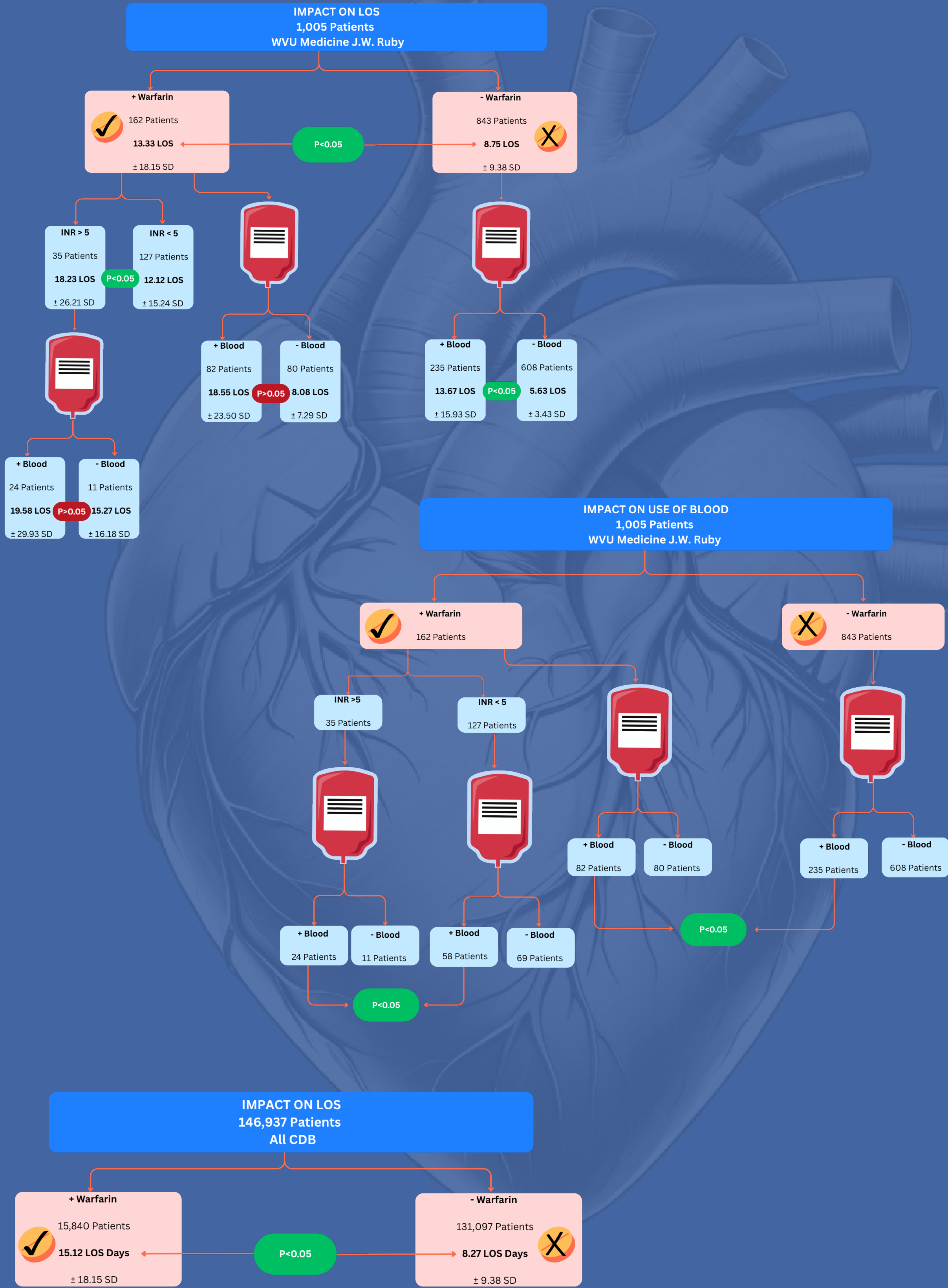
Methods:

- Cardiac surgery patients age 18+ discharged from WVU Medicine in 2024 were identified using the Clinical Data Base (CDB). Patient identification was based on discharge specialty of Cardiothoracic Surgery and Surgery: Cardiac, crossed with relevant Medicare Severity Diagnosis-Related Groups (MS-DRGs).
- Warfarin use was identified via the Clinical Resource Manager (CRM) tool filtered by the Pharmacy resource category, applying resource code 671285.
- Elevated anticoagulation during hospitalization was defined as an INR > 5, utilizing the CRM tool Laboratory resource category.
- Patients receiving blood products were identified using the CRM tool Blood resource category, applying resource codes: 9010, 9011, 9016, 9021, 9022, 9038, 9039, 9040, 9051, 9054, 9056, 9057, and 9058.
- To examine the association across the CDB, Cardiac surgery and warfarin definitions were applied to the full CDB for validation.
- Statistical analysis was completed using log-transformed Student’s t-tests for LOS and Chi-squared tests to compare blood product use between groups.



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Warfarin and Hospital Stay: “A Clot” of Unwanted Time



Results:

- Use of warfarin was associated with a longer LOS in cardiac surgery patients (4.85 days; p<0.05).
- Warfarin use correlated with a higher rate of blood transfusion (p<0.05).
- Blood transfusions alone were linked to longer LOS (8.04 days; p<0.05).
- In patients with INR > 5 who received both warfarin and blood products, LOS was not significantly increased (p>0.05).

Lessons Learned:

- These findings highlight the delicate balance between preventing thromboembolism and managing bleeding risk after surgery.
- Warfarin remains the guideline-recommended therapy for valve surgery patients, as DOACs are not approved in this population due to safety concerns.

Key Takeaways:

- Quality measures must evolve.** Current metrics that flag elevated INR levels as indicator of poor care fail to account for appropriate warfarin use in cardiac surgery patients, particularly following valve procedures where warfarin remains the standard of care.
- Alternative anticoagulants are not supported in this population.** Unlike many other diagnoses, DOACs are contraindicated in mechanical valve patients and lack sufficient evidence in other post-surgical settings, making warfarin the only appropriate option in many cases.
- Cardiac surgery centers should be excluded from warfarin-based quality measures.** These institutions often care for complex patients requiring anticoagulation with warfarin for clinically valid reasons. Centers with higher rate of warfarin use will have longer LOS regardless of INR elevation. Penalizing centers distorts performance data and may disincentivize appropriate care.
- Revised, evidence-based metrics** should incorporate clinical indication, anticoagulant appropriateness, and risk-adjusted outcomes to better minimize unintended consequence of patients receiving contraindicated medications (DOACs).

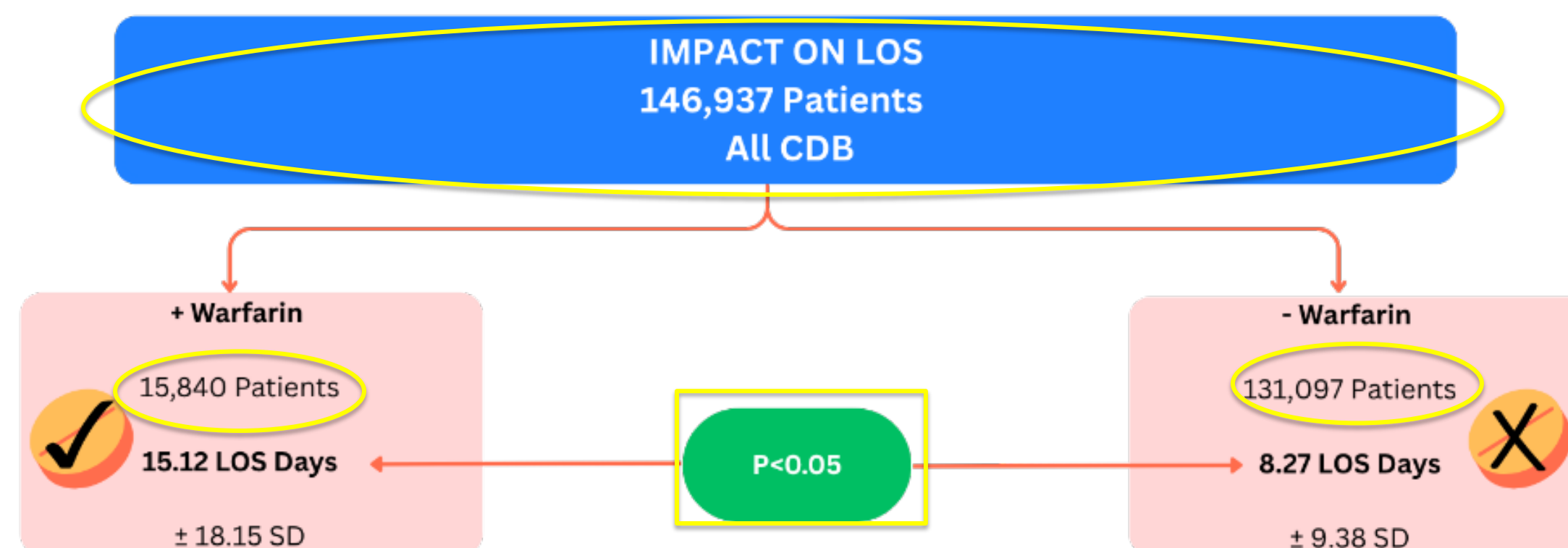
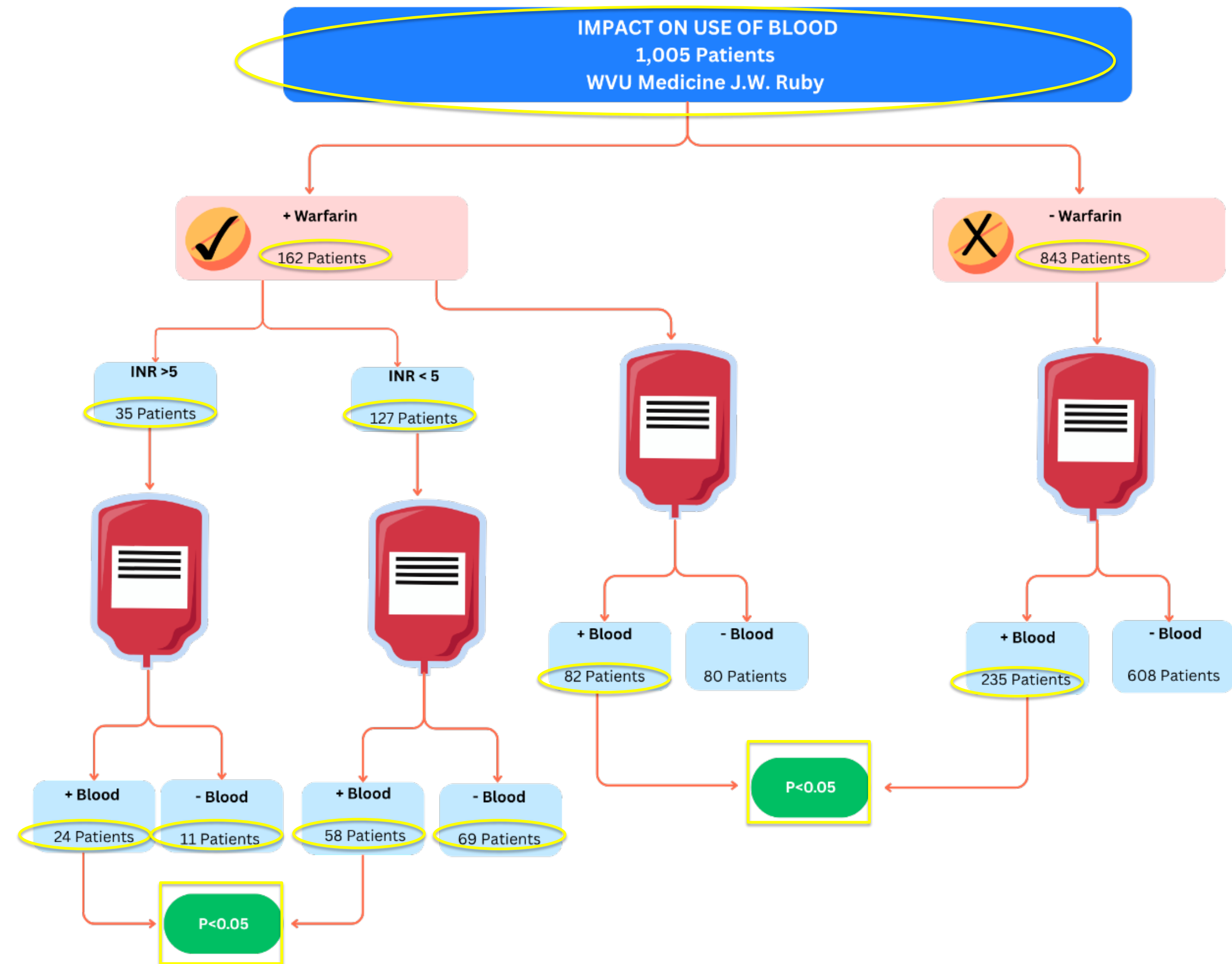
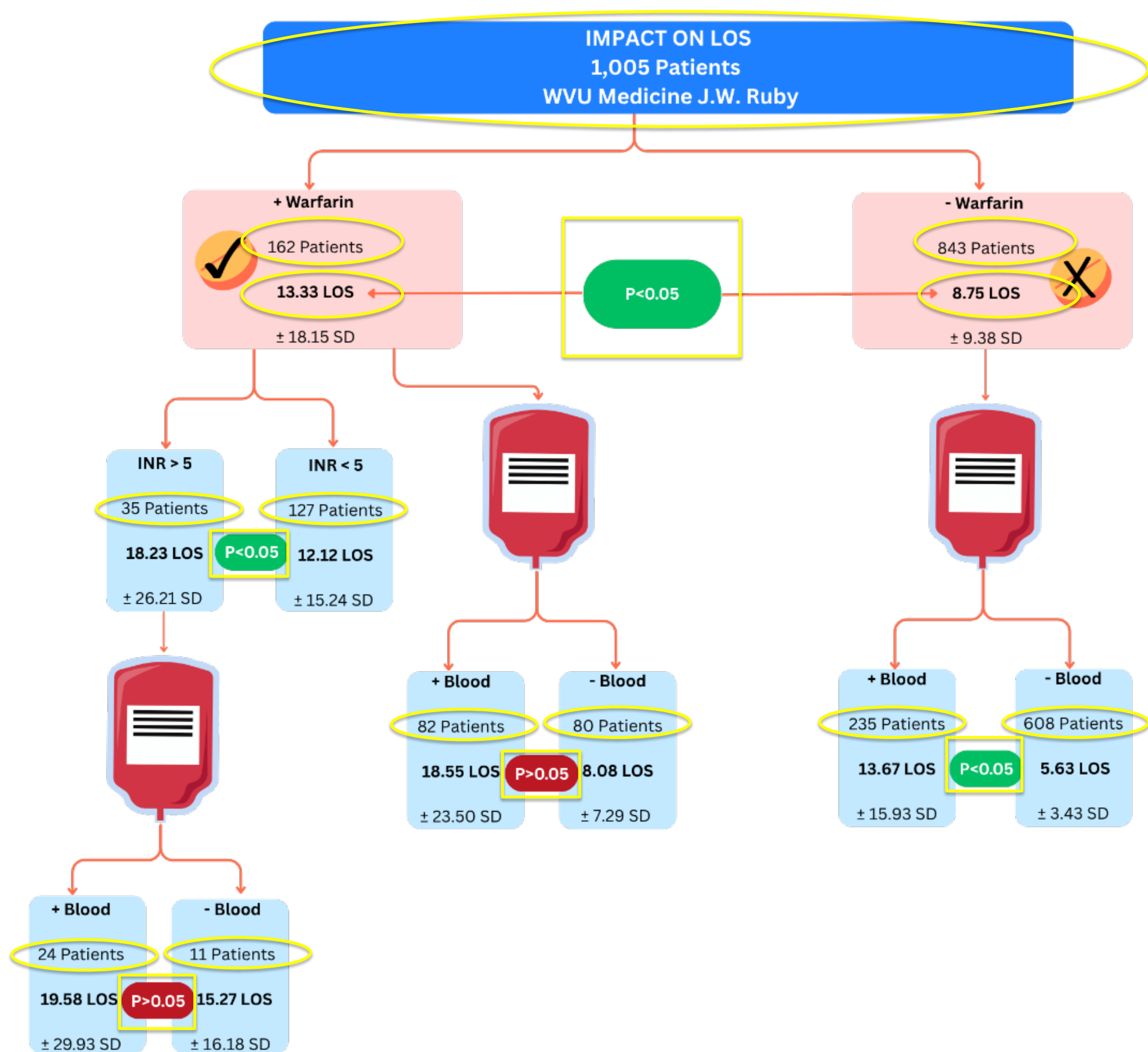
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Key Takeaways

- Balancing clot prevention and bleeding risk after surgery is critical.
- Warfarin remains the guideline-recommended therapy for valve surgery patients.
- DOACs are not approved in this population due to safety concerns.
- Quality measures must evolve.
- Alternative anticoagulants are not supported in this population.
- Cardiac surgery centers should be excluded from warfarin-based quality measures.
- Revised, evidence-based metrics to include
 - Clinical indication
 - Appropriateness of anticoagulant use
 - Risk-adjusted outcomes