Heparin-PF4 Antibody and Argatroban: Interdisciplinary Teamwork to Improve Quality

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INTRODUCTION

Heparin-induced thrombocytopenia (HIT) type II is a clinically significant immune-mediated complication of heparin therapy. Appropriate treatment of HIT type II is critical, yet it is over-diagnosed due to testing in the setting of low pre-test probability.

HIT diagnosis requires two-step testing: PF4 Antibody (HIT Ab) screens for the presence of antibodies capable of causing it and, if positive, a Serotonin Release Assay (SRA) is done to determine if the antibodies are active.

Argatroban is the primary medication utilized to treat HIT, however it is very expensive. Because of the severity of HIT, argatroban must be used while the testing for HIT is being conducted.

Initial situation: HIT Ab testing was performed by manual microtiter ELISA methodology and batched Monday-Friday around noon. This resulted in treatment delays and extensive use of argatroban.

It was hypothesized that if we could reduce the turn-around-time (TAT) of HIT Ab testing, that we could reduce the amount of argatroban that was used because >90% of all HIT Ab tests are negative.

An interdisciplinary Plan-Do-Check-Act (PDCA) quality improvement project between laboratory and pharmacy aimed to improve testing, diagnosis, and subsequent treatment.

This project completed three PDCA cycles to achieved desired goals.

GOALS

Pathology Goal -
- Reduce the TAT of HIT Ab testing by at least 50%

Pharmacy Goal -
- Reduce the argatroban expense by at least 25%

REFERENCES

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RESULTS

PDCA Cycle 1 –
Pathology fully automated HIT Ab testing on the Core Laboratory's automation line to provide reduced test TAT. Pharmacy initiated auto-cancellation of all heparin orders and held the first argatroban dose waiting on HIT Ab result. If HIT Ab was negative, heparin would be reordered and no argatroban was given. If HIT Ab was positive, argatroban would be given pending SRA result.

Initial results from PDCA Cycle 1 identified that while the HIT Ab TAT was drastically decreased from 15.27 hours to 4.54 hours from order. However, argatroban use increased by 17%.

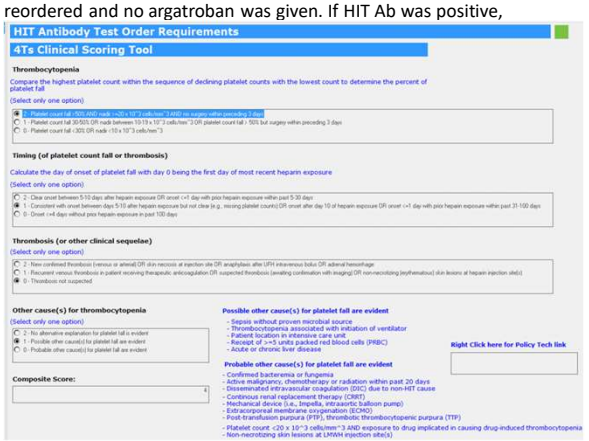
PDCA Cycle 2 –
Pathology reviewed 12 months of HIT Ab test orders, 6 months pre-cycle 1 and 6 months post-cycle 1. Using 4T score HIT risk assessment, 63% were considered "low risk" for HIT. Choosing Wisely recommends not testing patients whose 4T score is 0-3 or "low risk".

Pathology requested IT to program a rule requiring the ordering clinician to calculate the 4T score when ordering a HIT Ab. 4T scores that were >3 (intermediate or high risk) would be allowed and low risk scores would cancel the test. Pathology also reflex ordered SRA referral tests based on positive HIT Ab tests.

PDCA Cycle 3 –
Pathology reviewed 6 months of HIT and SRA orders and identified two additional areas which could be improved upon:
- HIT Ab & SRA sample collection time reduction
- SRA TAT reduction

After working with nursing Clinical Outcomes Managers for critical care areas, Pathology requested a nursing task alert to fire when a HIT Ab or SRA order was placed. Pathology also negotiated a contract with a new reference laboratory for STAT HIT Ab confirmatory testing through a specialized coagulation reference laboratory, Machaon Diagnostics.

Results table depicts the before project measures and the measures after each PDCA cycle. Final reductions after all 3 cycles included a 91.1% reduction in HIT Ab tests performed, a 43.1% reduction in SRA TAT, a 71.2% reduction in argatroban expense, and an 81.3% reduction in HIT Ab TAT.



	Before PDCA Average	After 1st PDCA Cycle				Total Change After 1st Cycle
		1st month	2nd month	3rd month	Average	
HIT Ab Tests	168 tests/mo	151 tests	163 tests	194 tests	169.3 tests	0.8% increase
HIT Ab TAT	15.27 hours	4.61 hours	4.52 hours	4.49 hours	4.54 hours	70.3% reduction
SRA TAT	5.15 days	5.21 days	5.12 days	5.16 days	5.16 days	1.9% increase
Argatroban Cost	$8,311.28	$7,172.70	$11,004.77	$10,693.82	$9,623.76	16% increase

	Before PDCA Average	After 2nd PDCA Cycle				Total Change After 2nd Cycle
		1st month	2nd month	3rd month	Average	
HIT Ab Tests	168 tests/mo	19 tests	30 tests	21 tests	23.3 tests	86.1% reduction
HIT Ab TAT	15.27 hours	3.41 hours	3.82 hours	3.36 hours	3.53 hours	76.9% reduction
SRA TAT	5.15 days	NA†	4.05 days	4.18 days	4.12 days	20.0% reduction
Argatroban Cost	$8,311.28	$0.00	$1,811.60	$3,296.84	$2,702.81	67.5% reduction

	Before PDCA Average	After 3rd PDCA Cycle				Total Change After 3rd Cycle
		1st month	2nd month	3rd month	Average	
HIT Ab Tests	168 tests/mo	12 tests	20 tests	13 tests	15 tests	91.1% reduction
HIT Ab TAT	15.27 hours	4.33 hours	1.64 hours	2.58 hours	2.85 hours	81.3% reduction
SRA TAT	5.15 days	3.60 days	NA†	2.27 days	2.93 days	43.1% reduction
Argatroban Cost	$8,311.28	$3,896.27	$0.00	$899.14	$2,397.71	71.2% reduction

† = No HIT Ab tests were positive, therefore no SRA tests were ordered

CONCLUSIONS

- This project is a clear example of continuing to check quality improvements to ensure the improvement made is still working.
- The Pathology goal of reducing the HIT Ab TAT by at least 50% was achieved and surpassed with an 81.3% overall reduction.
- The Pharmacy goal of reducing argatroban expense by at least 25% was achieved and surpassed with a 71.2% reduction. This was remarkable considering the price of argatroban increased by 15% over the time of the 3 PDCA cycles.
- Interdisciplinary projects such as this highlight how we can work together to improve finances, reduce inefficiencies, and reduce waste.

CLINICAL IMPLICATIONS

There are several clinical implications of this research:
- Ensuring that a 4T score is calculated and appropriate prior to performing a HIT Ab reduces unnecessary testing.
- Automatically discontinuing all heparin products, including heparin flushes, prevents the progression of HIT while under investigation.
- Rapid TAT of HIT Ab can prevent unnecessary use of argatroban, should the screening be negative.
- Reduction in TAT of SRA can reduce argatroban use and overall drug costs.