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Executive Summary

The Laboratory Stewardship Committee at Cleveland Clinic is a multidisciplinary team comprised of clinicians, pathologists, administrators, nurses, and other caregivers. This committee focuses on optimizing test utilization at Cleveland Clinic to provide the best possible patient care while reducing costs associated with laboratory testing.

Dr. Anita Reddy and Dr. Gary W. Procop are Co-Chairs of the Committee who guide the team with their complementary skill sets and knowledge gained through years of practice.

The committee’s goals include:

– Decreasing unnecessary phlebotomy to improve patient satisfaction while reducing the likelihood of iatrogenic anemia (and the sequelae thereof).
– Reducing unnecessary daily and duplicate orders.
– Promoting conscientious use of molecular testing.
– Developing and promoting best practices.
– Creating evidence-based guidelines for optimal testing.
– Reducing health care costs through thoughtful and judicious use of resources.

Ongoing efforts within the committee include assisting Cleveland Clinic personnel with preauthorization for laboratory tests—particularly molecular testing—and working alongside the Clinical Advisory Team of Medical Operations to assure appropriate reimbursement for patient care services.
Overview

Since 2011, nine test ordering interventions have been integrated into the Cleveland Clinic practice model. These interventions deter duplicate or largely unnecessary tests (such as unneeded repetitive daily orders), notify providers of duplicate and expensive tests, and guide the use of complex molecular genetic testing.

Order interventions include:

- Hard Stops
- Extended Hard Stops
- Restricted Use
- Once-In-A-Lifetime Test Alert
- Laboratory Genetic Counseling
- 3-Day Stool Culture/O&P Alert
- Regional Smart Alerts
- Blood Culture Order Optimization
- Expensive Test Notifications

In 2019, these interventions resulted in:

- 31,359 prevented unnecessary tests
- $1,058,270 in cost-savings

Since implementation, these interventions have prevented a total of 203,343 unnecessary tests and saved Cleveland Clinic $6,994,412.
## 2019 Complete & Ongoing Projects

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2019 Complete & Ongoing Projects

1. CBC with Differential Same-Day Hard Stop – Complete
Duplicate CBCs with differential have little-to-no value within a 24-hour period. Under the leadership of Drs. Megan Nakashima, Anita Reddy, and Michael Phelan, multiple interventions are in development, including changes to test order presentation, order sets, and the implementation of Hard Stops for select areas*.

*Due to the overwhelming number of override calls, the inpatient Hard Stop initially implemented in May 2019 was halted in July 2019 and changed to a Soft Stop in 2020.

2. Optimization of Azole Level Testing – Complete
Drs. Gary Procop and Anita Reddy worked closely with Dr. Neuner from the Infectious Diseases Pharmacy to improve the assessment of voriconazole levels. Efforts included renaming the order to indicate a pre-dose level and changing the frequency of the lab draw to once to improve the timing of phlebotomy draws to coincide before medication administration.

3. Removal of Candida Antibody – Complete
Dr. Steven Gordon, Chair of Infectious Diseases, requested the construction of elimination of the Candida antibody testing. This accomplishment was made possible through collaboration with Infectious Diseases, Functional Medicine, and others.

This impacts the clinical throughput efficiency in Infectious Diseases Clinics and antimicrobial stewardship initiatives (i.e., decreasing the use of unnecessary anti-fungal agents).

4. Deemed Users Group for Serum Electrophoresis / 3-Week Hard Stop – Complete
Efforts from Drs. Kadkhoda (Immunopathology), Anita Reddy, Christy Samaras, and the Hematology Team enabled the implementation of Extended Hard Stops for serum and urine electrophoresis studies.

Initially, these studies were Hard Stopped if re-ordered within three weeks; now, they are exempt for a deemed-users group that includes research studies and ordering in preparation for outpatient visits.
2019 Complete & Ongoing Projects

5. Outpatient Factor V Testing Algorithm – Complete
Drs. Gary Procop and Kandice Kottke-Marchant created a best practice alert (BPA) to assist providers with appropriately ordering Factor V Leiden and activated protein C (APC) resistance tests. Guidance was deemed useful given the higher cost of Factor V Leiden.

If the patient is not receiving an anti-thrombotic medication, the new BPA prompts the provider to order APC resistance instead of Factor V Leiden; however, if a patient is on an anti-thrombotic medication, the BPA will prompt to order Factor V Leiden.

6. Preauthorization of High-Cost Tests – Ongoing
Members of the Laboratory Stewardship team met with Finance and Revenue Cycle Management weekly to identify molecular tests for which preauthorization would have the most significant impact on both appropriate use and reimbursement. With help from the Epic team, a process was built that allowed these tests to be preferentially directed to a specific group to facilitate preauthorization.

The work associated with preauthorization resides within Revenue Cycle Management; however, these and similar efforts promote Laboratory Stewardship best practices by ensuring the appropriateness of testing and the recovery of costs spent per test.

7. Care Path Review – As needed
Evaluation of Pathology & Laboratory Medicine (PLMI) components of Cleveland Clinic Care Paths has slowed due to limited implementation activity. In the future, the Laboratory Stewardship Committee will review Care Path components targeted for implementation.

8. Order Set Review – As needed
The Laboratory Stewardship Committee continues to review order sets associated with Care Paths—as well as inpatient processes—to ensure appropriate laboratory testing and frequency.
2019 Complete & Ongoing Projects

9. STAT Project – Incomplete/On hold
Currently, STAT orders reflect the performance of STAT testing, STAT collection, or both. The STAT project centers around how these items can be identified and clarified in Epic, as some tests cannot be performed on a STAT basis.

10. CONABO Duplicate Hard Stop – Incomplete
The request for interventions concerning eliminating duplicate Confirm Blood Type (CONABO) requests from Transfusion Medicine remains on the CSO/ITD/PLMI work list, and is expected to be completed in 2020.

Ongoing Process & Quality Improvement Projects – Ongoing
Members of the Laboratory Stewardship Committee are also involved in several process and quality improvement projects. Although these do not always warrant full tracking of the impact—financial or otherwise—they each are projects that make improvements at the Cleveland Clinic.

Several of these projects remain in progress. They include but are not limited to: ongoing review of the validity of requests to add tests to the PLMI test menu, attendance at the Test Development Steering Committee, and determination of optimal testing strategies for neonatal cytomegalovirus (CMV) testing and point-of-care HIV testing.
Launched in 2011, the Hard Stop Alert is now a part of Cleveland Clinic culture.

This clinical decision support tool (CDST) notifies providers who attempt to order a test on the Hard Stop list. Tests that trigger a Hard Stop Alert include those that should not be repeated within 24 hours and constitutional/germline genetic tests.

If a provider attempts to order a test on the Hard Stop list, an alert will appear to notify the provider. To prevent duplicate testing, the Hard Stop will display previous test results.

A user cannot electronically bypass a Hard Stop; however, if the duplicate test is necessary for patient care, the ordering provider may contact Client Services to receive a code to override the intervention.

In 2019, the alert fired **3,683 times**.

- **140 (3.8%) override requests** resulted in a test performed, demonstrating a **96% success rate**.

- **3,543 unnecessary duplicate tests** were prevented for a **total savings of $49,510**.
Since 2011, Hard Stop alerts have prevented 41,717 unnecessary tests for a total savings of $628,255.
The Restricted Use initiative limits the ordering of molecular genetic tests to providers for whom these tests are a routine part of their practice.

This Initiative intends to decrease the use of unnecessary molecular genetic testing and to improve the care of patients tested. Therefore, these tests are restricted to “deemed users” (e.g., pediatric neurology).

Inpatient genetic testing is restricted to the Medical Genetics Service. If a provider believes that a molecular genetic test is required for an inpatient, a Medical Genetics consult is required before the test can be ordered.

Although the number of tests prevented is low, the cost per test is high, which has resulted in substantial savings.

In 2019, 46 unnecessary molecular genetic tests were avoided for a total savings of $44,430.
Since late 2011, the Restricted Use initiative has prevented 647 unnecessary molecular tests for a total savings of $1,184,648.
2019 Updates

Laboratory Genetic Counseling

Utilizing genetic counselors within the laboratory is a proven laboratory stewardship strategy.

Cleveland Clinic’s laboratory genetic counselors review genetic test orders—including clinical indications—before testing occurs. These highly-knowledgeable individuals participate in the sign-out of complex genetic test results (e.g., chromosomal microarray analysis and next-generation sequencing) and provide pre-analytic value through test selection guidance and triage.

Working directly with ordering providers, genetic counselors ensure that the provider’s ordered test is the most appropriate option for the patient, and may suggest alternative approaches to consider if necessary.

Jacquelyn Riley, MS, LGC, is the Lead Genetic Counselor in RT-PLMI. Ms. Riley and Dr. Gary Procop have played significant roles in establishing preauthorization for molecular genetic tests. Made in conjunction with the Clinical Systems Office, new programming was developed to alert Revenue Cycle Management to submit insurance preauthorization requests. Although a notable achievement, there is still much work to do in the area of preauthorization.

In 2019, 541 genetic tests were changed or canceled, resulting in a cost savings of $278,713.
Since 2011, Laboratory Genetic Counselors have prevented 2,147 unnecessary tests for a total savings of $2,263,795.

Over the past year, cost-savings per intervention have gone down slightly, as interventions are occurring on less expensive tests.
04 Regional Smart Alerts

2019 Updates

Smart Alerts allow for the flexibility necessary in certain practice settings.

Hard Stops are not optimal for Cleveland Clinic’s Regional Hospitals for several reasons, such as provider mix and incomplete provider use of order entry. A thorough investigation determined that a bypassable duplicate order notification is the most effective solution in these settings.

A Smart Alert soft stop appears when a provider attempts to order a duplicate test within a specified time-frame. Similar to a Hard Stop, this alert displays previous test information if available. However, although they are discouraged from proceeding with a duplicate test, providers can independently override the Smart Alert from their workstation without assistance.

The development of Smart Alerts expands the best practices and cost-savings initiatives achieved through Hard Stop Alerts implemented on Main Campus to regional locations.

In 2019, Smart Alerts deterred 9,596 unnecessary duplicate tests, yielding a cost savings of $67,287.

- Because they are bypassable, Smart Alerts were only 42.6% effective in stopping duplicate orders.

- In comparison, Hard Stop Alerts were 92.3% effective.
Since 2013, Smart Alerts have prevented 46,017 unnecessary duplicate tests for a total savings of $355,186.
Expensive Test Notifications alert a provider when a test costs $500 or more to perform.

With the ever-growing list of activities involved in patient care, providers are occasionally unaware of costs associated with the services that they recommend. By informing them of the price at the time of ordering, providers can evaluate other diagnostic approaches and engage the patient in discussions about their options, since insurance may not fully cover these costs.

Following tests that exceed <$500, notifications are categorized in $1,000 increments (>$1,000, >$2,000, etc.). The implementation of this intervention is described in Volume 149, Issue 7 of the *American Journal of Clinical Pathology*, published in June 2018 (doi: 10.1093/ajcp/aqy021).

In 2019, **460 expensive tests** were avoided for a total **cost savings of $365,585**.
Extended Time Hard Stop

Extended Time Hard Stops activate if a provider places a duplicate test order within a specified time-frame.

Multiple areas and Institutes—including Quality, Infectious Diseases, Infection Prevention, Internal Medicine, and Endocrinology—assisted in creating extended hard stops for C. difficile PCR (7 days) and hemoglobin A1c (30 days).

Several additions have been made to the Extended Hard Stop list, including molecular hematopathology tests, serum and urine protein electrophoresis (21 days), and the respiratory pathogen panel (14 days).

In 2019, 13,437 unnecessary duplicate tests were prevented for a total cost savings of $68,794.

Since November 2014, 64,794 duplicate tests have been avoided and saved $343,933.
Once-In-A-Lifetime Test Alert

The results of constitutional genetic tests do not change, meaning that these types of tests only need to be performed once in a patient’s life.

Since its implementation in 2015, the Once-In-A-Lifetime (OIAL) intervention stops constitutional genetic tests that are unnecessarily re-ordered and informs the provider that the test has already been performed.

If necessary for patient care, the provider can circumvent this intervention by calling Client Services for an override code.

In 2019, 330 OIAL tests were prevented for a total cost savings of $28,057.

Since August 2013, 1,551 OIAL tests were prevented and saved $186,206.
Inpatient Stool Culture/O&P Alert

There is substantial evidence regarding the near-uselessness of routine stool cultures and ova & parasite (O&P) exams for patients that develop diarrhea after three days of hospitalization.

Since its implementation in 2014, this initiative prevents the ordering of stool cultures and/or O&P exams placed after three days of a patient’s hospitalization.

If necessary for patient care, the provider can circumvent this intervention by calling Client Services for an override code.

In 2019, **357 unnecessary stool cultures / O&P exams** were prevented for a total **cost savings of $11,163**.

Since 2014, **1,505 unnecessary tests** were prevented and **saved $47,958**.
Collaboration across Cleveland Clinic resulted in noteworthy cost-savings and quality improvement for blood cultures.

Initially, ICU Management raised the issue of potentially-excessive blood cultures. An investigation disclosed that the test naming convention was likely contributing to inappropriate over-utilization.

Consensus between ICU, Infectious Diseases, and Clinical Microbiology led to changes made to ensure optimal blood sampling for culture. Additionally, the initial issue of potential over-utilization was addressed with a best practice alert that fires when a blood culture has already been performed. Providers can override this soft stop at the point of order entry.

We are particularly proud of this intervention, as what began as a project to address potential utilization issues eventually developed into a quality improvement project.

In 2019, 1,751 unnecessary blood cultures were avoided for a cost savings of $21,152.

Since late 2017, 4,122 unnecessary blood cultures were prevented and saved $49,791.
2019 Financial Summary

2019 Prevented Tests: **31,359**

- Hard Stops: 3,543
- Restricted Use: 46
- Laboratory Genetic Counseling: 541
- Regional Smart Alerts: 9,596
- Expensive Test Notifications: 460
- Extended Hard Stops: 13,437
- Once-In-A-Lifetime Test Alert: 330
- Stool Culture / O&P Alert: 357
- Blood Culture Optimization: 1,751
- Factor V APC BPA: 101
- Removal of Candida Ab: 1,197

2019 Cost Savings: **$1,058,270**

- Hard Stops: $49,510
- Restricted Use: $44,430
- Laboratory Genetic Counseling: $278,713
- Regional Smart Alerts: $67,287
- Expensive Test Notifications: $68,794
- Extended Hard Stops: $365,585
- Once-In-A-Lifetime Test Alert: $28,057
- Stool Culture / O&P Alert: $11,163
- Blood Culture Optimization: $21,152
- Factor V APC BPA: $3,879
- Removal of Candida Ab: $119,700
Accumulated Totals

2011 – 2019 Total Prevented Tests: **203,343**

- Hard Stops
- Restricted Use
- Laboratory Genetic Counseling
- Regional Smart Alerts
- Expensive Test Notifications
- Extended Hard Stops
- Once-In-A-Lifetime Test Alert
- Stool Culture / O&P Alert
- Blood Culture Optimization
- Factor V/APC BPA
- Removal of Candida Ab

2011 – 2019 Total Cost Savings: **$6,994,212**

- Hard Stops
- Restricted Use
- Laboratory Genetic Counseling
- Regional Smart Alerts
- Expensive Test Notifications
- Extended Hard Stops
- Once-In-A-Lifetime Test Alert
- Stool Culture / O&P Alert
- Blood Culture Optimization
- Factor V/APC BPA
- Removal of Candida Ab
2020 Goals

1. Align soft stop alerts in the Regional Hospitals.

2. Implement order entry questions for Celiac panels to limit insurance denials.

3. Develop a soft stop for CBC with differential orders.

4. Remove Pertussis and Legionella Ab testing, which are not clinically useful.


6. Develop a respiratory pathogen panel (RPP) hard stop for inpatient settings.

7. Obtain the project management support to continue these initiatives.

8. Renew discussion regarding reference laboratory test utilization work with Cleveland Clinic Laboratories.

9. Create a charter for the Laboratory Test Stewardship Committee.

10. Identify additional tests that may be added to existing interventions.

11. Work with CSO and Revenue Cycle Management to address preauthorization issues for molecular testing.

12. Continue participation with the Patient-centered Laboratory Utilization Guidance Services (PLUGS) network.

13. Continue as a member of the National Committee of Laboratory Stewardship.

14. Review Cleveland Clinic Care Paths.

15. Quantify cost savings associated with each of the interventions.

16. Promote the learning of best practices among our trainees through collaboration with partners in education and elsewhere.
Peer-Reviewed Manuscripts, Documents and Chapters


**Web-based Articles**


2. Hospitals Expand Lab Efforts to Reduce Unnecessary Testing as Industry Moves to Value-Based Care. 360Dx.
   [https://www.360dx.com/clinical-lab-management/hospitals-expand-lab-efforts-reduce-unnecessary-testing-industry-moves-value#.W0T279VKibg](https://www.360dx.com/clinical-lab-management/hospitals-expand-lab-efforts-reduce-unnecessary-testing-industry-moves-value#.W0T279VKibg)


4. The Ultimate Guide for Improving Test Utilization: Introducing CLSI GP49

5. Cleveland Clinic Sets Example for Decreasing Test Volume, Increasing Level of Patient Care. Clinical Lab Products.


7. Preventing Duplicate Laboratory Testing.
   [https://www.physiciansweekly.com/preventing-duplicate-laboratory-testing/](https://www.physiciansweekly.com/preventing-duplicate-laboratory-testing/)


   [https://www.mlo-online.com/home/article/13006611/choosing-wisely-selecting-the-right-test-for-the-right-patient-at-the-right-time](https://www.mlo-online.com/home/article/13006611/choosing-wisely-selecting-the-right-test-for-the-right-patient-at-the-right-time)

    [https://www.patientsafetysolutions.com/docs/March_29_2016_Inappropriate_Lab_Testing.htm](https://www.patientsafetysolutions.com/docs/March_29_2016_Inappropriate_Lab_Testing.htm)


13. Laboratory Stewardship and the Drive to Improve Quality Patient Care Takes Center Stage at ASCP 2019 Annual Meeting in Phoenix. Cision PRWeb.
    [https://www.prweb.com/releases/laboratory_stewardship_and_the_drive_to_improve_quality_patient_care_takes_center_stage_at_ascp_2019_annual_meeting_in_phoenix/prweb16533128.htm](https://www.prweb.com/releases/laboratory_stewardship_and_the_drive_to_improve_quality_patient_care_takes_center_stage_at_ascp_2019_annual_meeting_in_phoenix/prweb16533128.htm)

14. ASCP 2019 – Gary W. Procop, MD, MASCP, on Test Utilization and Laboratory Stewardship.
    [https://www.youtube.com/watch?v=KxCbFZk_pTY](https://www.youtube.com/watch?v=KxCbFZk_pTY)
### 2019 Presentations


3. Procop GW. The Cleveland Clinic Experience in Laboratory Stewardship. Guest Professor, University of Louisville. Louisville, KY. March 27, 2019.


### Honors & Awards


2. 2019 *Choosing Wisely* Champion. Gary W. Procop, MD, MS, M(ASCP)
Acknowledgments

This work results from the tireless efforts, collegial meetings, and great ideas of the Laboratory Stewardship Committee members.

We appreciate the support and guidance of Dr. Robert Wyllie, and the support of Medical Operations, Chief of Staff, and other members of Cleveland Clinic’s senior leadership.

We appreciate the support and guidance from Dr. Brian Rubin and RT-PLMI leadership. Special thanks to Mr. Rob Tuttle for performing the financial analyses and providing wonderful graphs.

We appreciate the support and teamwork brought by Dr. Allison Weathers and the CSO team, particularly the productive and well-managed CSO/RT-PLMI/ITD standing meeting. Dr. Weathers has proven to be a great support and collaborator; her insights and assistance are invaluable.

The Right Test for the Right Patient at the Right Time.
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Cleveland Clinic is a nonprofit, multispecialty academic medical center integrating outpatient and hospital care with research and education for better patient outcomes and experience. More than 4,500 staff physicians and researchers provide services through 20 patient-centered institutes. Cleveland Clinic is a 6,026-bed healthcare system with a main campus in Cleveland, 18 hospitals and over 220 outpatient locations. The health system includes five hospitals in Southeast Florida with more than 1,000 beds, a medical center for brain health in Las Vegas, a sports and executive health center in Toronto and a 364-bed hospital in Abu Dhabi. Cleveland Clinic London, a 184-bed hospital, will open in 2022. Cleveland Clinic is currently ranked as one of the nation's top hospitals by U.S. News & World Report. clevelandclinic.org

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