10X Essentials

Infectious Disease Diagnostics in the Geisinger Health System

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SUMMARY

Rapid detection of bloodstream infection (PCR)

Choose **RPPCR** (full respiratory panel) for inpatients or immune-compromised and other at risk outpatients.

Choose **ABRP** (Flu/RSV) for outpatients.

Do not order ABRP on inpatients.

Please refer to the respiratory peak season algorithm on page 4.

If you have any questions, please contact the Doctoral Directors, Donna Wolk, Ph.D., D(ABMM) at 570-271-7467 or Raquel Martinez Ph.D., D(ABMM) at 570-214-6587.

Blood Culture Multiplex PCR Panel:

On November 1, 2016, Geisinger Microbiology Laboratories at GWV and GMC will begin to reflexively test all first-time positive aerobic blood culture bottles with a **Multiplex PCR Panel** to aid in the diagnosis and therapy for common agents of bloodstream infections.

Not all microbes that grow in blood cultures are identified by the panel. Genus/species identification and antimicrobial resistance determinants identified are listed on page 5.

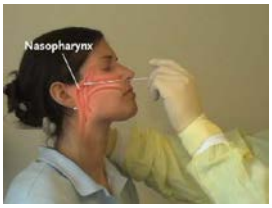
According to policy, Gram stain results from all positive blood cultures will continue to be phoned as critical values. After 11/1/2016, multiplex PCR panel results will be available in EPIC and phoned within 2 to 4 hours of the Gram stain result.

When evaluating patients, results from multiplex PCR must be used in conjunction with other clinical and laboratory findings and correlated with clinical history. **Following PCR results, traditional culture and antimicrobial susceptibility testing will continue to be performed**. PCR is not intended to be used for monitoring response to treatment. Mixed infections, while rare, may be difficult to identify by the panel. Organisms not listed on page 5 will not be identified at all by the panel.

Rare *Staphylococcus* exceptions: Borderline methicillin-resistant *Staphylococcus aureus* and moderately-resistant methicillin-resistant *S. aureus* strains demonstrate reduced susceptibility to beta-lactams by mechanisms other than *mec* genes; these strains are not detected by the panel. The *vanA/B* result is not reported in the absence of *Enterococcus* spp.; therefore, vancomycin-resistant *Staphylococcus aureus* (VRSA) is also not identified by the panel.

Respiratory Pathogen Season is Here!

Effective November 1, 2016, GML sites will offer/perform the following testing scheme for respiratory pathogen detection by Polymerase Chain Reaction (PCR). See page 4. There are only RARE influenza and RSV circulating; the predominant virus is rhinovirus.



REMEMBER:

- **Collect a nasophayngeal (NP) swab**
- **Do NOT collect a nasal swab (lower accuracy)**
- **Place swab in Universal Transport Media (UTM) on wet ice for transport**

"Make it the best." - *A. Geisinger*

GEISINGER
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Pre-Admission and In-patients: Use test code RPPCR (Respiratory Pathogen PCR). RPPCR is performed year round by GMC, GWV, GCMC, GBH, GLH, and GSACH laboratories.
RPPCR can also be ordered for compromised outpatients at the clinician's discretion, but avoid testing RPPCR on the same day as ABRP (see below) to avoid billing complications for your outpatients as some targets overlap.

RPPCR testing includes: adenovirus, coronaviruses: 229E, HKU1, NL63, and OC43, rhinovirus, human metapneumovirus, influenza A (subtypes H1, 2009 H1, and H3), influenza B, parainfluenza virus types 1-4, RSV, *Bordetella pertussis*, *Chlamydophila pneumoniae*, and *Mycoplasma pneumoniae*.

Our Culture Is Patient Safety

Why are all viruses tested when there is no antiviral therapy, except for influenza? *Geisinger's focus on patient safety led to a decision in 2009 to invest in identification of airborne and droplet spread respiratory viruses for all incoming patients. The RPPCR test triggers respiratory isolation and prevention of viral spread to other inpatients, many of whom are severely debilitated already. In addition, the RPPCR test results enable faster and more accurate decisions for bed placement and bed management throughout all 7 GHS hospitals. The RPPCR testing program is evidence of Geisinger's commitment to patient safety and infection prevention.*

Why not just use a rapid antigen for testing influenza only?
Due to its inaccuracy, Rapid Influenza Antigen testing is NOT performed in any GML or GRL sites. The Center for Disease Control has deemed most rapid influenza testing inappropriate for patient and have recommended against their use. The rapid flu tests are well-documented to be fraught with false negative and false positive test results. Despite claims in package inserts that boast accuracies of > 90%, these data describe comparisons performed against the much less sensitive viral culture, long abandoned in favor of molecular methods. In actuality, the **sensitivity of these methods compared against current molecular methods ranges from 40-85% and the specificity from 70-80%.**

- Only a few rapid antigen methods are acceptable to CDC.
- GML is a leader in national commitment and responsibility to patients and to the concepts of population health. We provide the most accurate testing available to prevent the spread of disease that occurs with false negative flu testing, and the over-treatment with antivirals that occurs with false positive testing or omission of the RSV target. Because we care for several generations of families, and indeed the population of 44 counties, we are committed to accuracy – no family member should be hospitalized due to influenza that could have been prevented by the use of accurate test method and antiviral therapy. No patient should be subjected to antiviral therapy that will not help them when they do not have the flu.
- **In summary, no GML site offers rapid influenza testing.** To obtain rapid antigen testing, both Geisinger and non-Geisinger clinicians will need to triage patients to Geisinger CareWorks sites - they will offer a CDC-approved rapid influenza test, and will reflex negative samples for complicated patients to GMC for molecular testing via ABRP.

Test code ABRP (FLU A/B and RSV PCR); r**ecommended for most outpatients**
ABRP is available November 1, 2016 – April 30, 2016 (Why is that?):
During the winter months the overwhelming proportion of viruses are identified as influenza and RSV; therefore, offering this test to outpatients during the winter offers a lower cost option for them. RSV continues to be included, because approximately 40% of children and adults, who are suspected of having influenza, actually have RSV. Knowledge of RSV infection in the absence of influenza allows physicians to remove anti-influenza antivirals and minimize antiviral pressure for drug resistance mutations to develop in the GHS population.

As of November 1, 2016, ABRP is now performed at ALL GML Hospital sites (GMC, GWV, GSACH, GBH, GCMC, GLH, GHSH, and GRL Rapid Response Sites (Gray's Woods, Scenery Park, Moshannon Valley, Lewistown, Mount Pleasant, Mount Pocono, Tunkhannock, and Pottsville).

What about Rapid antigen RSV Testing?

As of Nov 3, 2015: *No hospital sites will be performing Rapid RSV antigens due to the superiority of the ABRP for RSV.*

See Respiratory Testing Algorithm on page 4.

2016-2017 Approved Respiratory Pathogen Testing Algorithm
Geisinger Medical Laboratories

Presentation and Collection

Symptoms of Respiratory Virus Infection

1. Collect sample and place it in Universal Transport Media (UTM)
a. For upper respiratory tract samples, a nasopharyngeal swab (NPSWAB) is preferred and is placed in UTM. Note: Nasal swabs may yield inferior results and should be avoided.
b. For lower respiratory tract samples, place 1 mL bronchalveolar lavage (BAL) in UTM immediately.
2. Place UTM on wet ice for transport to laboratory.

1. UTM

2. ICE

Population Served

High Risk/High Morbidity Population
1. Patients being admitted to Hospitals
2. Patients being admitted to Observation Units
3. High-risk Out-patients groups*

Lower Risk Population
1. Out-patients who are in Low Risk Group
2. Emergency Room patients, not being admitted

EPIC Test Order

RESPIRATORY PATHOGEN PCR (Panel)
Test offered year round
Real-time results to GHS ED Dashboards

Flu A/B and RSV (Abbreviated Panel)
Test offered Nov. 1 - April 30 in peak respiratory season at all hospitals and Rapid Response GRL laboratories

GHS Standard

LIS TEST NAME = RPPCR
Molecular testing full panel: adenovirus; coronaviruses 229E, HKU1, NL63, and OC43; rhinovirus; human metapneumovirus; influenza A (subtypes H1, 2009 H1, and H3); influenza B; parainfluenza virus types 1-4; RSV; *Bordetella pertussis; Chlamydophila pneumoniae*; and *Mycoplasma pneumonia*.

Performing laboratories: GMC, GWV, GCMC, GLH, GBH, and GSACH

LIS TEST NAME= ABRP
Molecular testing abbreviated panel: influenza A influenza B, RSV.

Performing Hospital Laboratories: GMC, GWV, GCMC, GLH, GBH, GSACH, and GHSH.

GRL Rapid Response Sites
Gray's Woods, Scenery Park, Moshannon Valley, Lewistown, Mount Pleasant, Mount Pocono, Tunkhannock, *and Pottsville*

For questions, please contact Microbiology Analytical Specialists: Barbara Heiter, B.S., MT(ASCP) at 570-214-4294, or Francis Tomashefski, B.S., MT(ASCP) at 570-271-6185 or Doctoral directors at Pager 8600.

***Note: Exceptions to algorithm can occur after a laboratory waiver is received (call pager 8600)**
During May 1- Oct 31: There is a rare chance of detecting influenza or RSV; for diagnostic purposes, the full molecular panel is standard.
Rapid RSV antigen testing is not performed within GHS.
Geisinger Careworks will offer rapid influenza antigen and back up negative samples for high risk groups by molecular methods, as warranted.

*** Groups at high risk for influenza complications**
Children <2 years* and Adults ≥65 years of age
Persons with chronic pulmonary (including asthma), cardiovascular (except hypertension), renal, hepatic, hematologic (including sickle cell disease), metabolic (including diabetes mellitus), neurologic, neuromuscular, and neurodevelopmental disorders (including disorders of the brain, spinal cord, peripheral nerve and muscle such as cerebral palsy, epilepsy, stroke, intellectual disability [mental retardation], moderate to severe developmental delay, muscular dystrophy, or spinal cord injury)Immunosuppression (including immunosuppression caused by medications or by human immunodeficiency virus)
Women who are pregnant or postpartum (within two weeks after delivery)
Children <19 years of age and receiving long-term aspirin therapy
Native Americans and Alaskan Natives
Morbidly obese (body mass index [BMI] ≥40 for adults or BMI >2.33 standard deviations above the mean for children)
Residents of nursing homes and other chronic care facilities*
Although all children <5 years of age are considered to be at higher risk for complications of influenza, the highest risk is for those <2 years of age, with the highest hospitalization and death rates among infants <6 months of age.
Adapted from: Influenza Division, National Center for Immunization and Respiratory Diseases, CDC. Prevention and control of seasonal influenza with vaccines. MMWR Recomm Rep 2013; 62:1.

Resp Flow diag Nov thru Apr.vsd. 12/30/2013, rev 2/5/14; rev 11/07/14, rev 11.01.15, rev 10/13/2016

Blood Culture Multiplex PCR Panel

Gram Positive Cocci:

- Common *Staphylococcus* spp., including specific differentiation of *S. aureus* and identification of MRSA via *mecA* gene target, and cross reaction with *mecC*
- Common Streptococci, with specific differentiation of *Streptococcus agalactiae*, *Streptococcus pneumoniae* (with exception of serotype 11), and *Streptococcus pyogenes*
- Common *Enterococcus* spp., including identification of VRE via *vanA/B* targets

Gram Positive Bacilli: *Listeria monocytogenes*

Yeast: *Candida albicans*, *C. glabrata*, *C. krusei*, *C. parapsilosis*, and *C. tropicalis*

Gram Negative Cocci: *Neisseria meningitidis* (encapsulated, except variants with *ctrA* gene)

Gram Negative Bacilli:

- *Acinetobacter baumannii*
- *Pseudomonas aeruginosa*
- *Haemophilus influenzae*
- Common *Enterobacteriaceae* (including specific differentiation of the *Enterobacter cloacae* complex, *Escherichia coli*, *Klebsiella oxytoca*, *K. pneumoniae*, most *Proteus* spp., and *Serratia marcescens*)

Genetic determinants of resistance:

- Methicillin (*mecA*)
- Vancomycin (*vanA* and *vanB,* and cross reactions with *vanM*)
- Carbapenems (bla_{KPC})