Identifying the Presence and Spread of COVID-19: Screening, Testing, and Contact Tracing

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Objectives

• Screening
  Identify symptoms used for screening patients prior to COVID-19 tests.

• Testing
  Describe available testing options.
  Discuss new testing strategies.

• Contact Tracing
  Categorize benefits and concerns associated with contact tracing.
Screening
Screening Symptomatic Patients

- Some testing facilities are only testing symptomatic patients
  May miss up to 40% of COVID-19+ patients

- Patients with the following symptoms are recommended for testing:
  - New loss of taste or smell
  - Cough
  - Repeated shaking with chills (rigors)
  - Nausea or vomiting
  - Diarrhea
  - Fever
  - Difficulty breathing
  - Muscle pain
  - New onset fatigue
  - Headache

- People who have had close contact with someone with confirmed COVID-19 should also be tested
  Within 6 feet for at least 15 minutes

https://www.baptistonline.org/covid-19/testing-locations
Testing
Available Testing Options - Diagnostic Tests

- Two categories of COVID-19 tests
  - Molecular tests
  - Antigen tests

https://www.fda.gov/consumers/consumer-updates/coronavirus-testing-basics
Molecular Tests

- Most accurate of two diagnostic test types
- Administered mostly through nasal/throat swabs
  Detects viral genetic material (RNA)
- Highly manual process
  RT-PCR: involves hands-on time with each testing sample
  Can take a while to get results
- Over 100 companies have been authorized by the FDA for distribution
  - Provider-administered swab tests
  - At home testing kit (fully autonomous kits are not yet authorized by the FDA)
1. A swab is taken from the nose or the back of the throat and sent to a laboratory.

2. RNA of SARS-CoV-19 is purified and converted into DNA using reverse transcriptase.

3. The PCR duplicates the virus DNA, and the dyes bind to the copied virus DNA.

Problems:
- COVID-19 can move from the upper airways to the lung, so samples come from nose or throat, limiting the amount of pathogen.
- Pathogen does not last many hours, so getting the sample to the lab is critical.
- Contamination or degradation can cause issues.
- Coping with high demand means having enough chemicals, personnel, and time.
Available Testing Options-Diagnostic Tests

• Antigen Test
  Nasal/throat swab
  Faster: Results in an hour or less
  Cheaper: Much less labor intensive
  Higher chance of false negative results

Antibody Tests

- **Finger stick or blood draw**\(^1\)
  Detects antibodies specific for the virus\(^1\)

- **Results given same day or up to 3 days later**\(^1\)

- **Does NOT diagnose active infection**\(^1\)

  Test could also detect cross-reactive antibodies from other coronaviruses\(^1\)

- **A positive antibody test does not mean that a patient is immune from future infection**
  Second infections (with a different strain) have been documented\(^2\)

- **More informative for COVID-19 research**\(^1\)
  Allows insight into the breadth of viral spread

1. **Sample loading**
   Add drop of serum (shown above in yellow) or blood in sample well (S).

2. **Buffer loading**
   Add dilution phosphate saline buffer to sample well.

3. **Sample incubation**
   Capillary action moves sample across lateral flow test.

4. **Antibody-antigen recognition**

5. **COVID-19 antibody detection**
   Sample enters testing well (T) and COVID-19 antibody-antigen complex binds to immobilized anti-human IgG/IgM antibodies.

6. **Control antibody detection**
   Rabbit antibody-gold conjugate binds to immobilized anti-rabbit IgG antibodies.

7. **Interpreting results**
   - **Positive**: one strip each in C well and T well
   - **Negative**: one strip in C well

https://covidtestingproject.org/faq.html
New Testing Strategies-Pooled Testing

- Combines samples during analysis
  Reduces reagent use and time until results

- If a sample comes back negative:
  The entire pool is presumed negative

- If a sample comes back positive:
  The pool of patients is retested individually to find the positive patient within the pool

New Testing Strategies-Saliva Tests

• Sample collection is less invasive than the traditional nasal swab
  Patients can collect the sample at home.

• Early research indicates that saliva tests are as accurate as the nasal swab tests

• Utilizes LAMP technology
  A PCR alternative where all reactions take place at 63C, which does not require as much specialized equipment.

New Testing Strategies- Flu/COVID-19 test

- **Muliplex assay (Flu SC2) testing for SARS-CoV2, Influenza A, and Influenza B simultaneously**
  
  Utilizes the same PCR technology as the traditional nasal swab tests.

- FDA granted emergency use authorization on July 2, 2020

- Distribution of the tests began in August


Contact Tracing
Main Benefit

• Identifies potential exposures
  Allows individuals to be better informed about potential exposure and seek testing
  The health department will contact anyone who was in close contact (within 6 feet for more than 15 minutes) without sharing any names or identifying information
  Individuals are contagious for at least 48 hours prior to symptom onset

• Minimizes the spread of COVID-19

Considerations

• Personal health data potentially shared with employer, insurance, etc.
  All conversations with health departments are confidential

• As more contact tracing moves to a digital format, there is heightened concern about information security.
  Digital tracking technology on smart phones (i.e., tracking/monitoring apps), particularly Bluetooth-enabled devices, could be vulnerable to hacking
  Contact tracers will never ask for information related to money, banking, or credit cards.

Questions?