

# Finding Rona

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UB|MD

INTERNAL MEDICINE  
PRIMARY & SPECIALTY CARE

# Disclosure

- I have no actual or potential conflict(s) of interest in relation to this presentation.

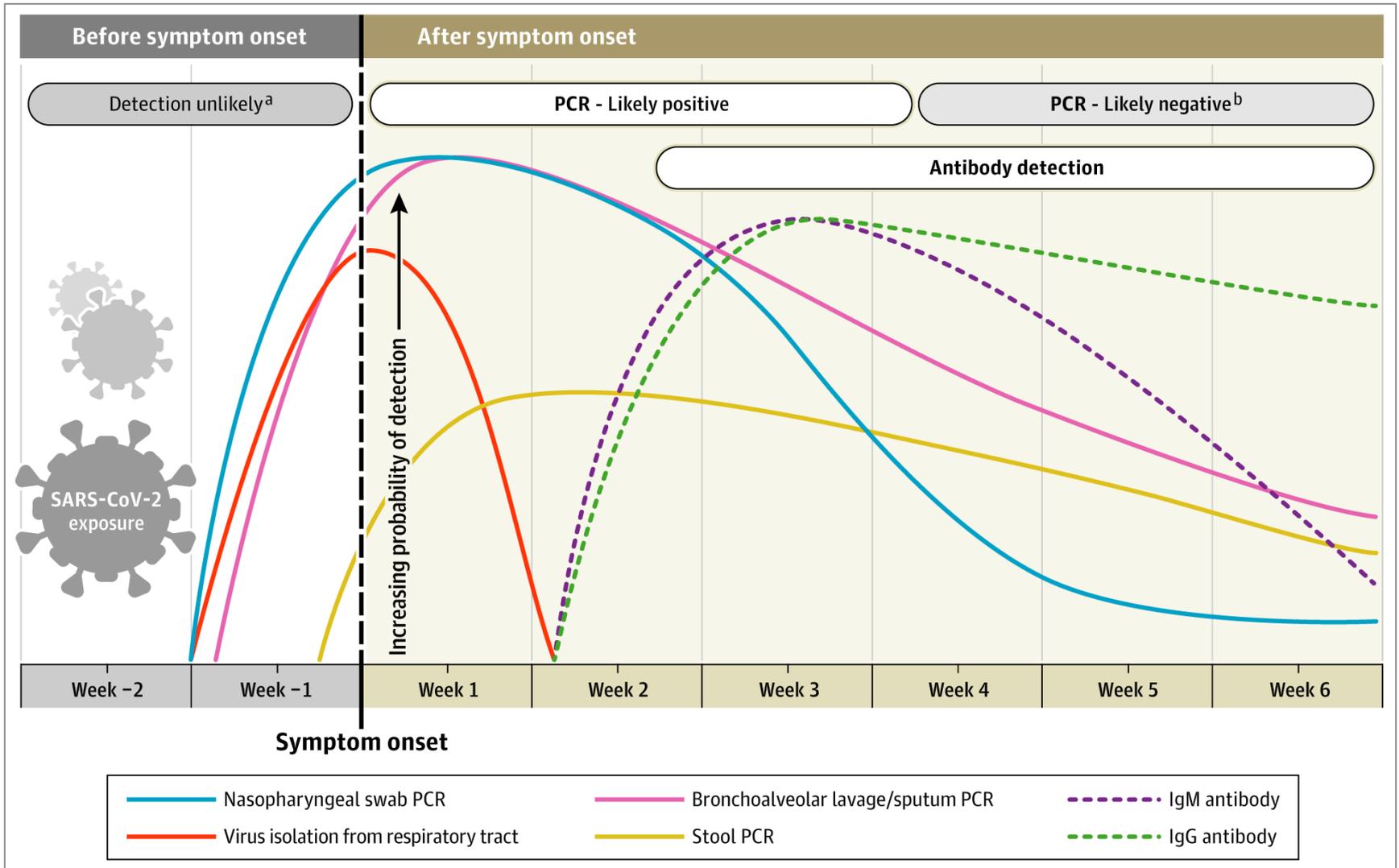
# COVID-19

- SARS-CoV-2
  - Closely related to SARS-CoV
  - ~30k bases
  - 15 genes
- Spread primarily by respiratory droplets
- Some environmental persistence

# Diagnosics

- Viral culture
- Antigen testing
- Molecular testing
  - Polymerase chain reaction (PCR)
  - Loop-mediated isothermal amplification (LAMP)
- Serology
  - Enzyme linked immunosorbent assay (ELISA)
  - Immunochemical (“lateral flow”)

# Diagnostic Time Course



# Major Caveats

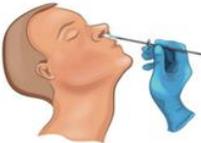
- All current tests are available *via* FDA EUA (emergency use authorization) only
- ***Clinical*** sensitivity/specificity are unknown
  - Comparisons are done *in vitro*
  - PPV/NPV change with prevalence
  - (Other fully approved “microbe” PCR tests are generally 90–95% sensitive & specific)
- Tests used in studies are variable
  - Often homebrews, other unapproved tests

# The Specimens

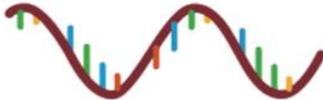
- Respiratory tract
  - NP, mid–turbinate; OP, expectorated
  - Bronchial or other “deep” lung
  - Proper technic, flocked swab & VTM
- Stool – ? Value, validation
- Blood
  - Serum for ELISA
  - Fingertstick for NYSDOH ELISA & lateral flow tests

# Diagnostic qRT-PCR

a) sample collection



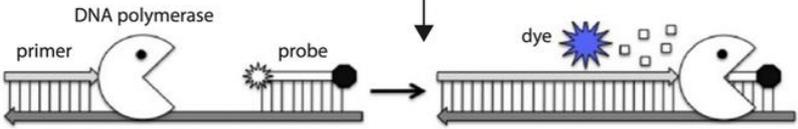
b) RNA extraction



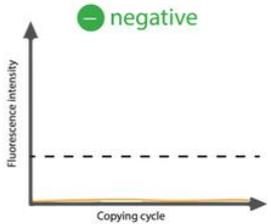
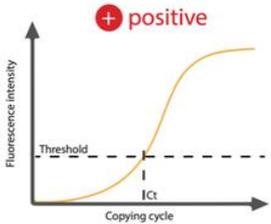
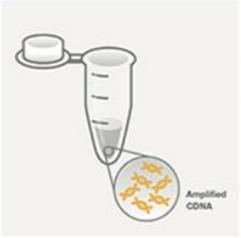
c) Reverse transcription



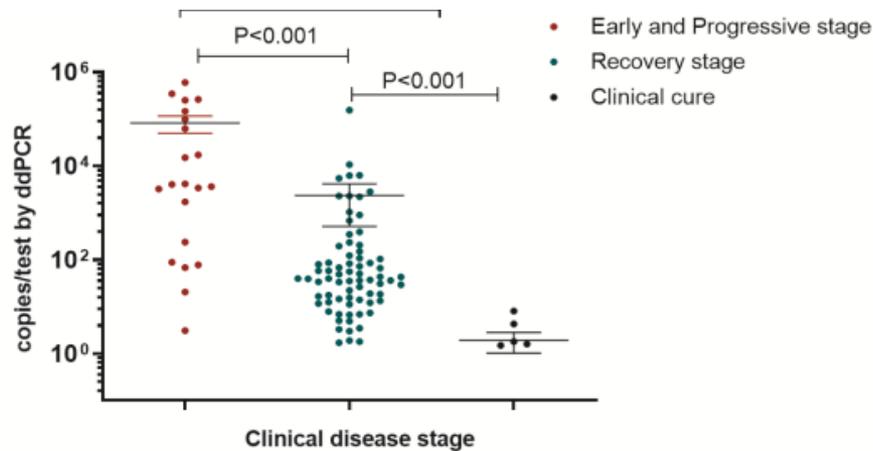
d) RT-PCR amplification



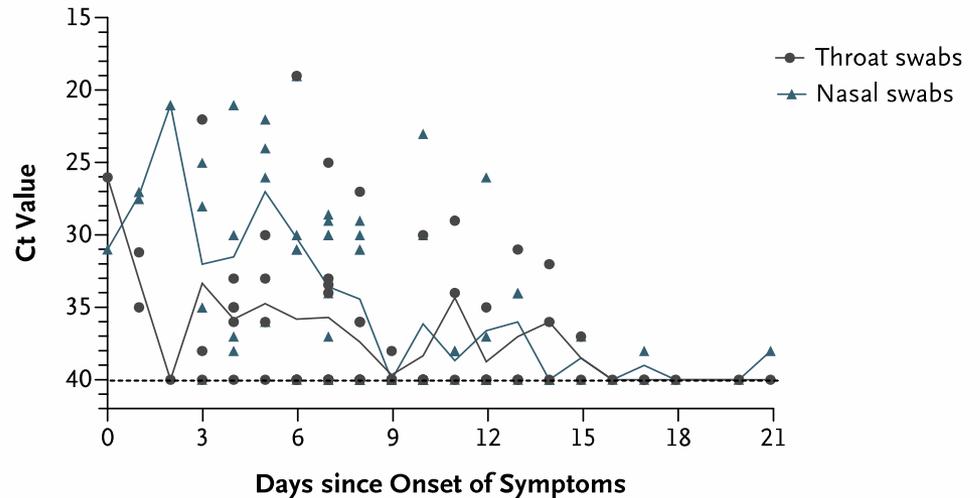
e) Results



# What About the Y-axis?



**C** Aggregated Ct Values



# The Tests

- Conventional PCR: hours
  - Limit of detection (LOD): ~100 copies/ml
  - Reliable if good quality swab early in illness
  - Later in illness, need bronchial/lung specimen
  - “Specificity” is high
- “Rapid” PCR (Cepheid/Biofire): <1 hr
  - LOD: ~250–300 copies/ml
- LAMP (Abbott/Alere ID NOW): ~15 minutes
  - LOD: ~125 copies/ml claimed
  - Worse performance if swab in VTM

# Common Questions

- Repeats?
  - Yes, if suggestive history/symptoms/findings
  - How many??
  - Consider LRT specimen if possible
- Does (+) PCR = infectious?
  - No – PCR amplifies any matching RNA
  - Limited data suggest no infectious virus after 9 days or with high Ct values

# More Questions

- Screening?
  - Hmm...complex...
  - Contacts of (likely) cases
  - 48–72 hrs before (all?) surgery/procedures
  - Return to college?
- Return to work for infected HCW?
  - 2 consecutive (–) >24 hrs apart
- Discontinue precautions for (+) cases?
  - 2 consecutive (–) >24 hrs apart

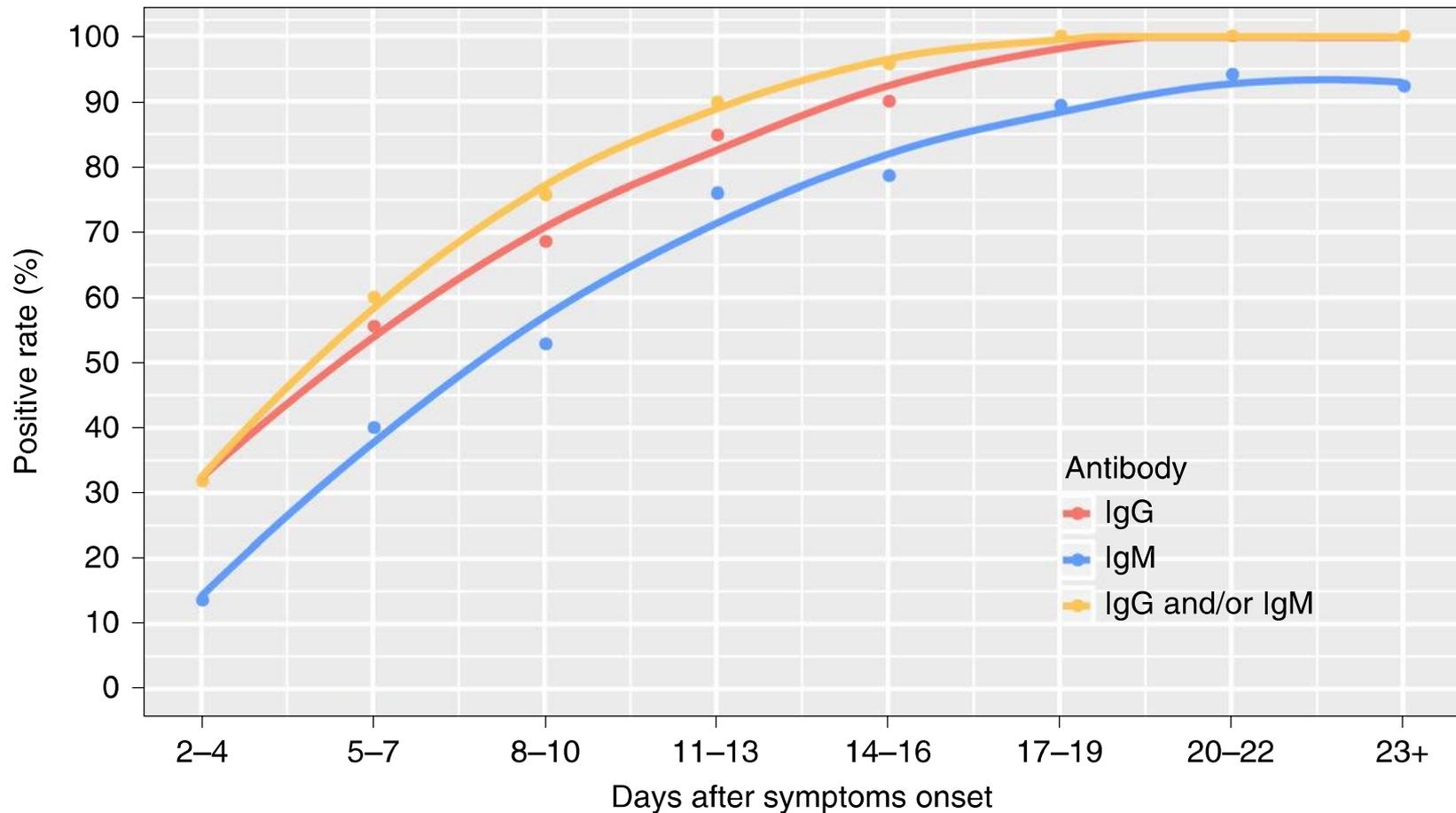
# COVID Cliché

- I know where you're coming from and at the end of the day we have a really solid rapid test that is a real game changer.
- *The LAMP & rapid antigen tests have variable performance outside of early clinical cases (larger amount of virus.)*

# Serology

- Properly validated IgG ELISA
  - Compared to pre-COVID-19 banked serum & known PCR (+) clinical cases
- Abbott Architect SARS-CoV-2 IgG EUA
  - >99% Sensitivity/Specificity >14 days of symptoms
  - Excludes other CoV Abs
  - Positive/negative – no “titer”

# What About the Y-axis?

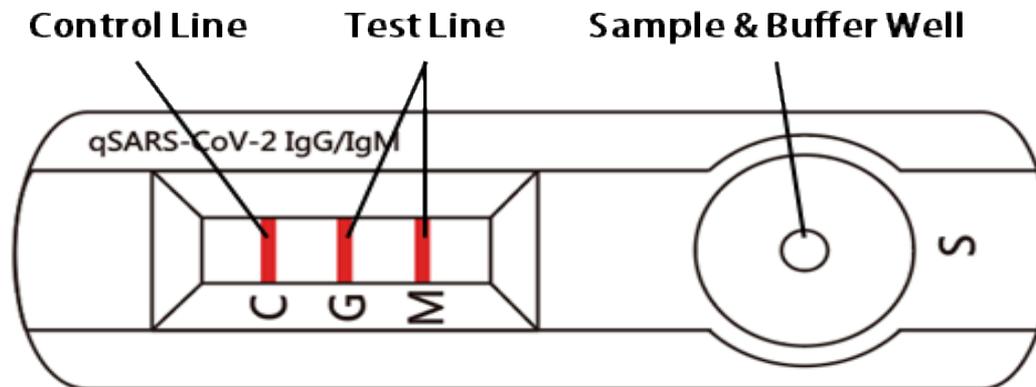


# Use

- Reasonable
  - Determine seroprevalence in a population
  - PCR (–) clinical cases??
  - Screening for plasma donation
- Not Reasonable
  - Lack of infectivity
  - “Immunity Passport”
  - Level and/or duration of protection unknown!

# Lateral Flow Ab Tests

- A few EUA & **MANY** non-EUA on market
  - POOR performance for most
  - Some with PPV  $\leq 50\%$



# References

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