DIAGNOSTICS

BRINGING TOGETHER A FULL RANGE OF SOLUTIONS

Abbott for SARS-CoV-2 serology

May 28th, 2020

Serology tests across the spectrum of testing needs

SEROLOGY TESTS

- Blood tests
- Determine if someone was infected and developed antibodies
- Detect antibodies (e.g., IgM and IgG) found in blood days to weeks after symptoms appear
- Help better understand the virus and support development of treatments and vaccines

Panbio™

RAPID TESTS

- Easy to use at point of care
- 20 µl fingerstick blood sample, venous whole blood, plasma or serum
- • Results: 10–20 minutes

LAB TESTS

- Used on instruments in hospitals and labs
- Throughput up to 100–200 tests per hour
- Time to first result 29 minutes

Alinity® i

ARCHITECT® *i*2000SR

ARCHITECT® *i*1000SR

May 29, 2020

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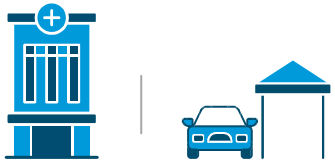
ADD-00070921 | One Abbott for COVID-19 |

NOTE: Test availability varies by country.

Molecular and serology tests expand access to testing across decentralized and centralized settings

DECENTRALIZED TESTING

CENTRALIZED TESTING



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Turnaround time and testing volume

NOTE: Test availability varies by country.

Our solutions have potential to span multiple care settings





	Abbott RealTi*me* *m*2000	Alinity i	ARCHITECT *i*1000SR	ARCHITECT *i*2000SR	Panbio
LOCATION					
Reference Lab	●	●	●	●	
Referral Hospital	●	●	●	●	
Regional Hospital	●	●	●	●	●
District Hospital/Health Post (PCP office)	●	●	●	●	●
First Responders					●
CHANNEL					
Governments, Ministries of Health	●	●	●	●	●
Global Funders, NGOs	●	●	●	●	●
Distributors	●	●	●	●	●
Direct Sales Hospitals and Labs	●	●	●	●	●
Reference Labs	●	●	●	●	●
Pharmacies, Web Sales		●	●	●	●
Employers, Borders		●	●	●	●

NOTE: Test availability varies by country.

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WHO case definitions

Suspect case

A. A patient with acute respiratory illness (fever and at least one sign/symptom of respiratory disease, e.g., cough, shortness of breath), AND a history of travel to or residence in a location reporting community transmission of COVID-19 disease during the 14 days prior to symptom onset;

OR

B. A patient with any acute respiratory illness AND having been in contact with a confirmed or probable COVID-19 case (see definition of contact) in the last 14 days prior to symptom onset;

OR

C. A patient with severe acute respiratory illness (fever and at least one sign/symptom of respiratory disease, e.g., cough, shortness of breath; AND requiring hospitalization) AND in the absence of an alternative diagnosis that fully explains the clinical presentation.

Probable case

A. A suspect case for whom testing for the COVID-19 virus is inconclusive.

OR

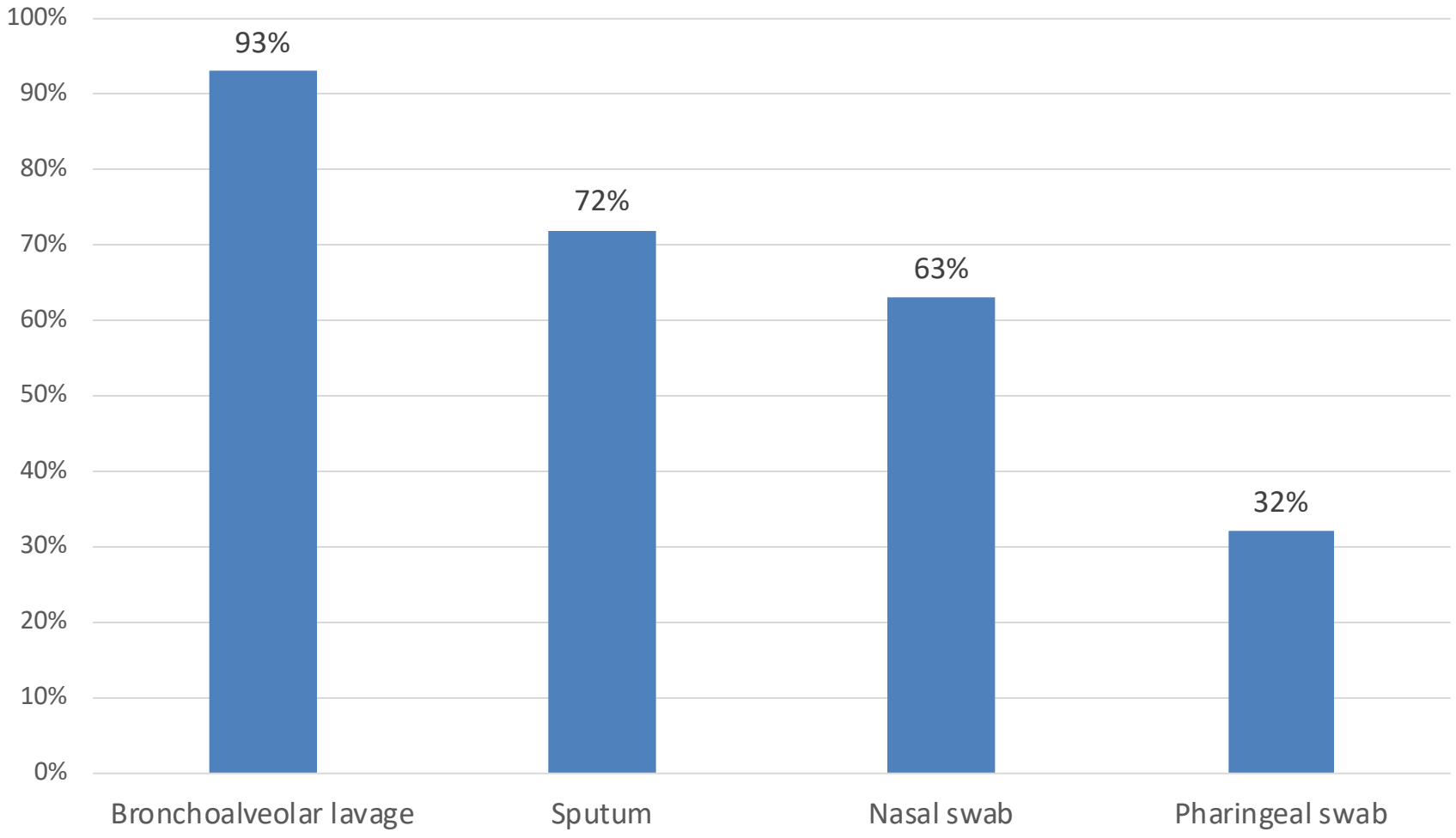
B. A suspect case for whom testing could not be performed for any reason.

Confirmed case

A person with laboratory confirmation of COVID-19 infection, irrespective of clinical signs and symptoms. See laboratory guidance for details: https://www.who.int/emergencies/diseases/novel-coronavirus-2019/technicalguidance/laboratory-guidance

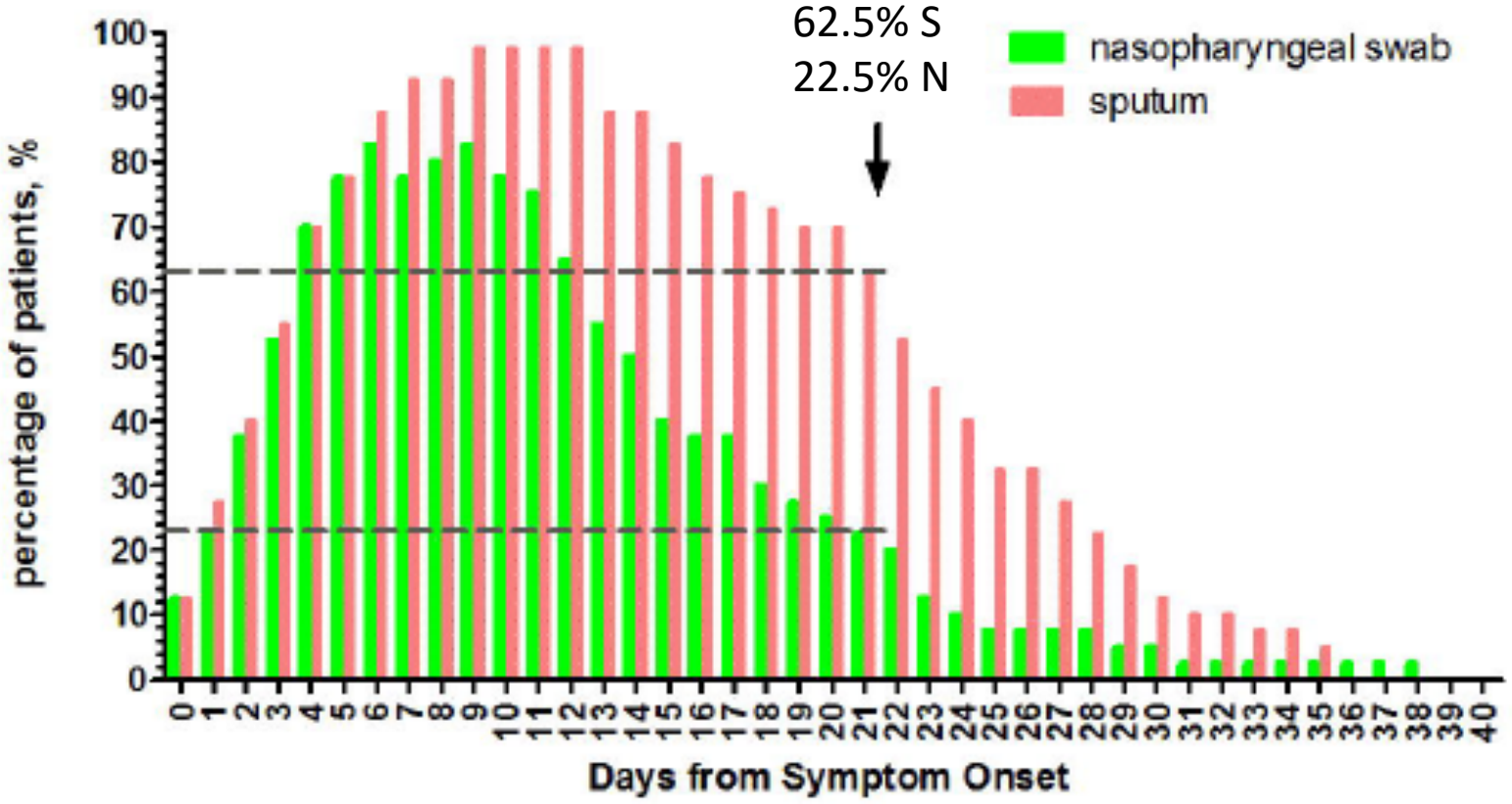
From: Global surveillance for COVID-19 caused by human infection with COVID-19 virus Interim guidance 20 March 2020 WHO-2019-nCoV-SurveillanceGuidance-2020.6-eng.pdf

SARS-CoV-2 RNA positivity rates by sample type



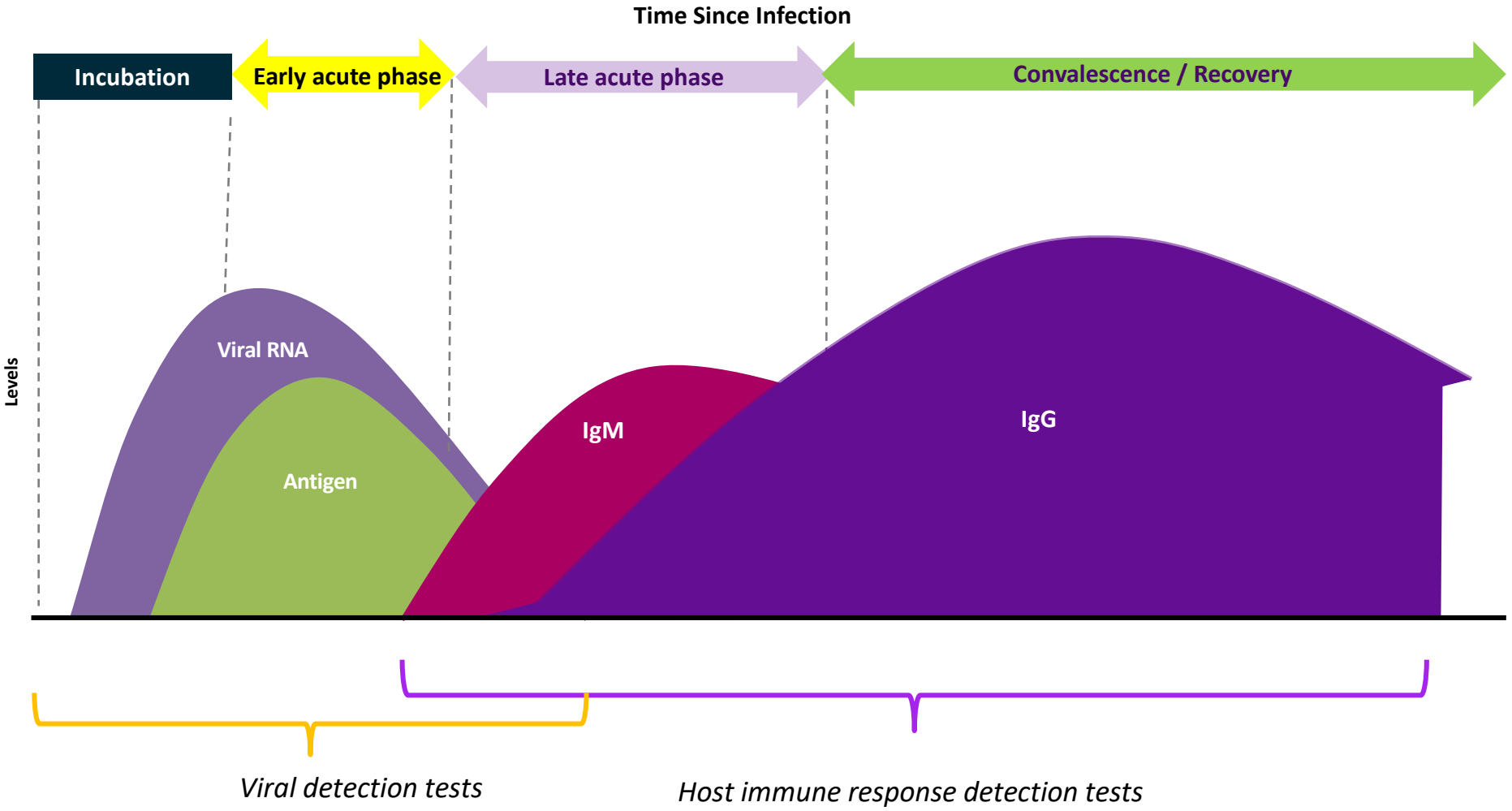
Modified from: W. Wang et al, JAMA. 2020. Published online March 11, 2020. doi:10.1001/jama.2020.3786

SARS-CoV-2 RNA positivity by sample type



From: W. Tan et al, medRxiv preprint doi: https://doi.org/10.1101/2020.03.24.20042382

Viral and host biomarkers in SARS-CoV-2 infection



WHO diagnostic criteria for COVID-19

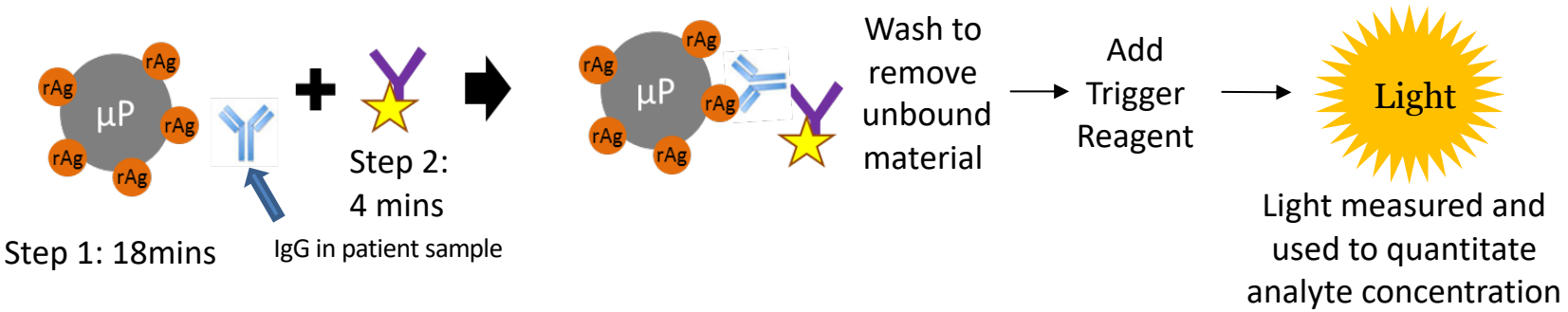
- Serological surveys can aid investigation of an ongoing outbreak and retrospective assessment of the attack rate or extent of an outbreak.
- In cases where NAAT assays are negative and there is a strong epidemiological link to COVID-19 infection, paired serum samples (in the acute and convalescent phase) could support diagnosis once validated serology tests are available. Serum samples can be stored for these purposes.

WHO: Laboratory testing for coronavirus disease (COVID-19) in suspected human cases – Interim guideline. March 19th, 2020

Abbott ARCHITECT SARS-CoV-2 IgG

- The SARS-CoV-2 IgG assay is a chemiluminescent microparticle immunoassay (CMIA) used for the qualitative detection of IgG antibodies to SARS-CoV-2 in human serum and plasma on the ARCHITECT i System.[1]

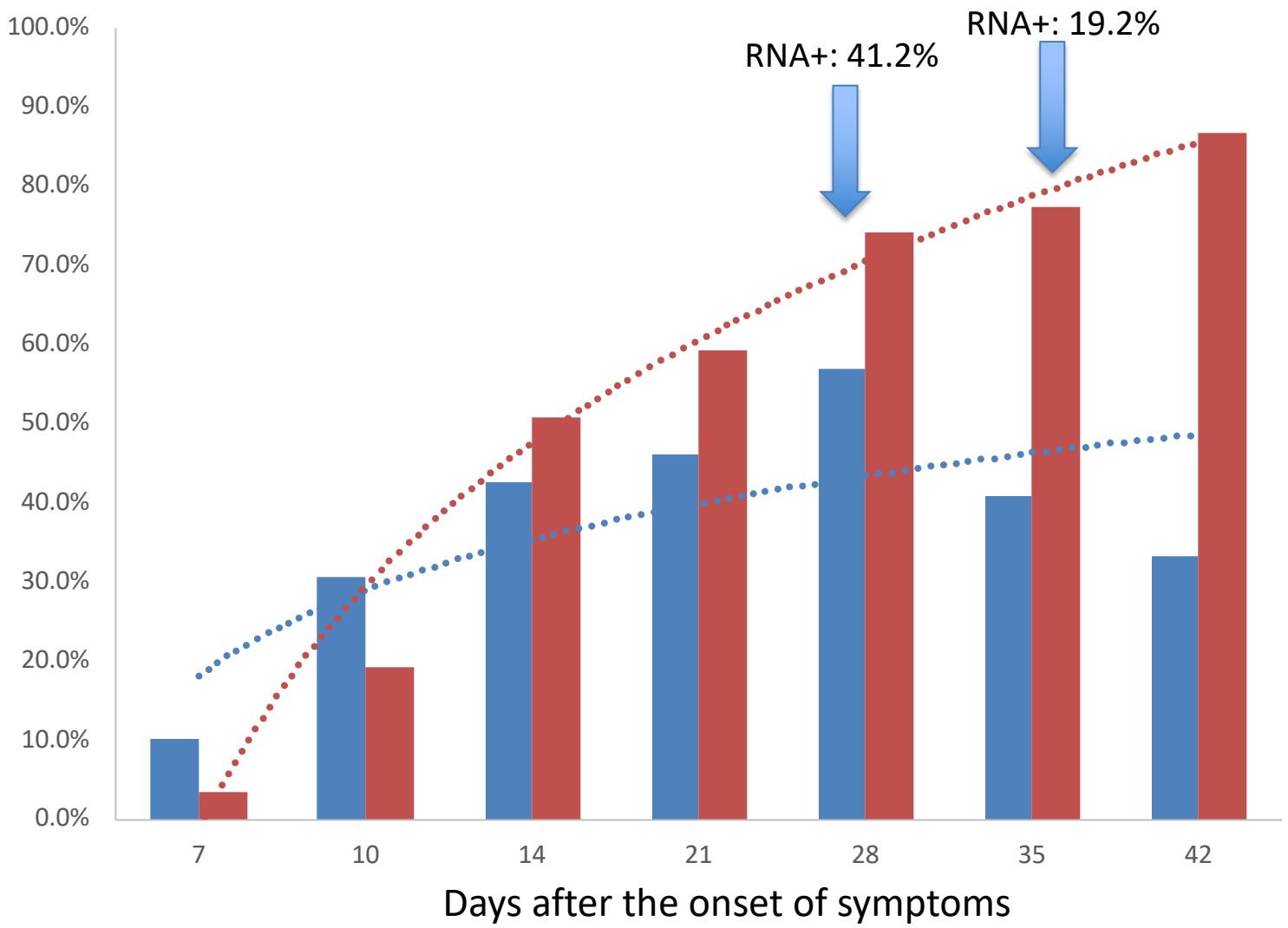
SARS-CoV-2 IgG: 2-step indirect assay[2]



Assay components
Magnetic microparticles coated with recombinant SARS-CoV-2 nucleocapsid antigen
Acridinium labeled human anti-IgG

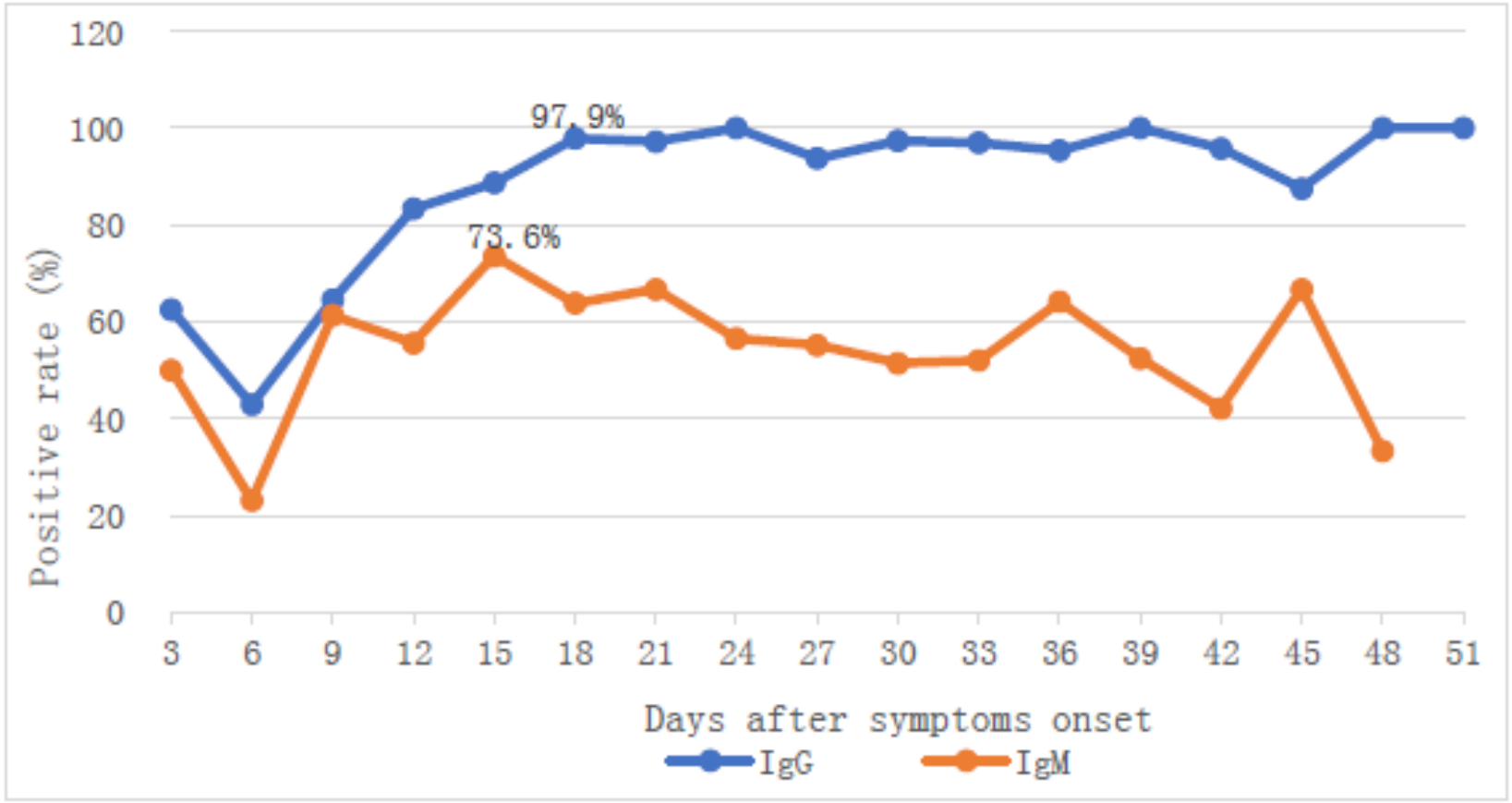
1. Abbott ARCHITECT SARS-CoV-2 IgG Instructions for Use.
2. Data on file at Abbott Diagnostics

Positivity for IgM and IgG antibodies to SARS-CoV-2 in 67 patients



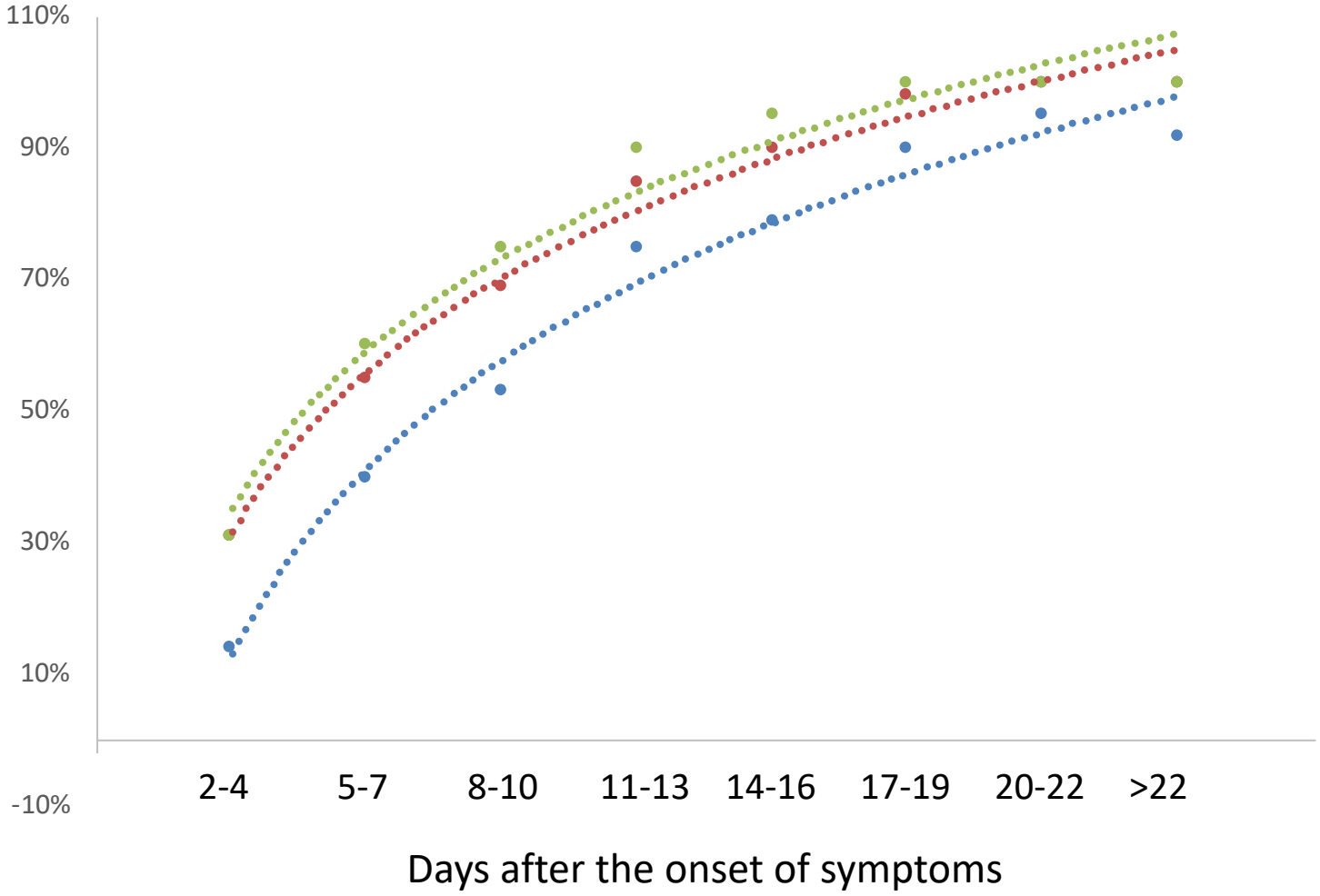
Data from: W. Tan et al, medRxiv preprint doi: https://doi.org/10.1101/2020.03.24.20042382

Trends in the detection of SARS-CoV-2 IgM & IgG



From: Q. Hu et al, medRxiv preprint doi: https://doi.org/10.1101/2020.04.20.20065953

Positivity rates for IgM and IgG antibodies to SARS-CoV-2 in 285 patients with COVID-19 Blue=IgM; Red=IgG; Green= IgM and/or IgG



Modified from: Q-X. Long et al, Nat Medicine 2020; https://doi.org/10.1038/s41591-020-0897-1

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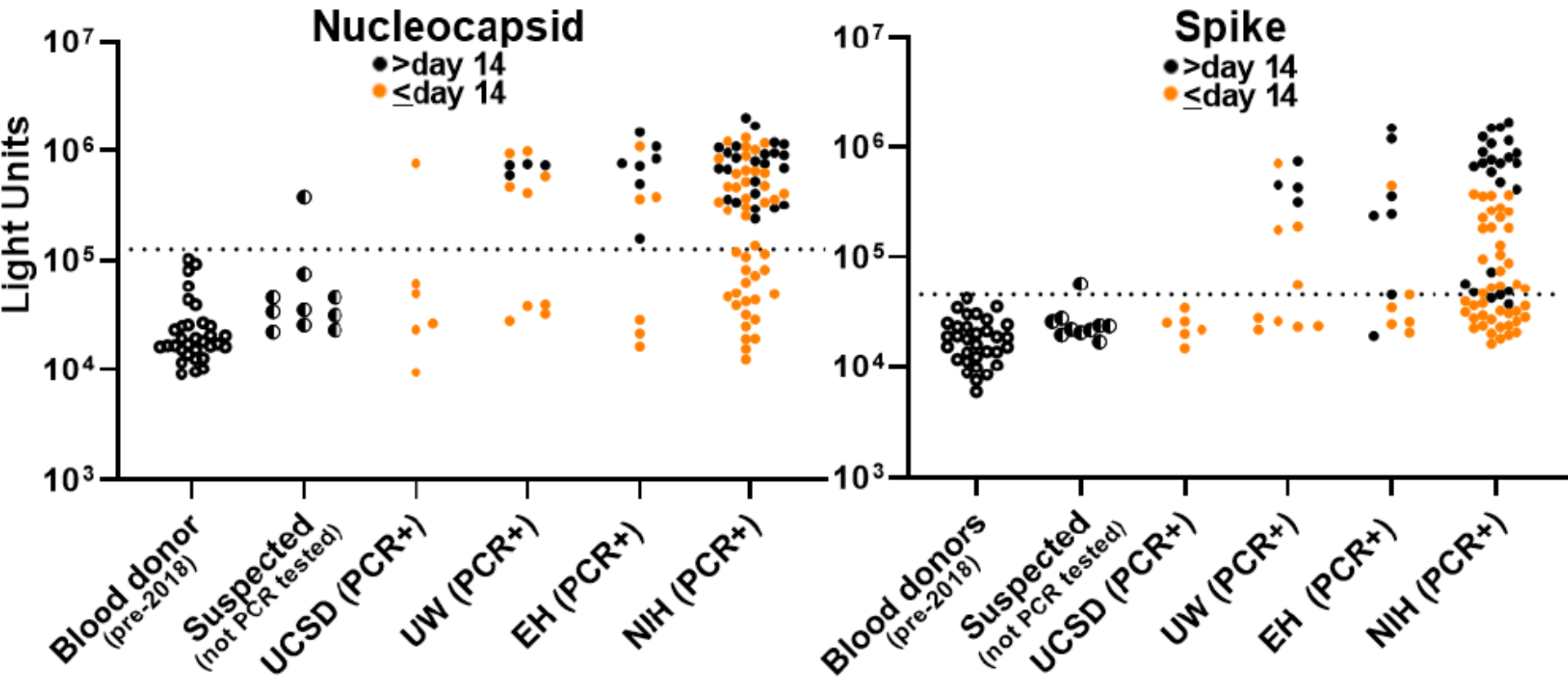
Detection of SARS-CoV-2 antibodies to N or S antigens



From: F. Burbelo et al, medXriv 2020. doi: https://doi.org/10.1101/2020.04.20.20071423

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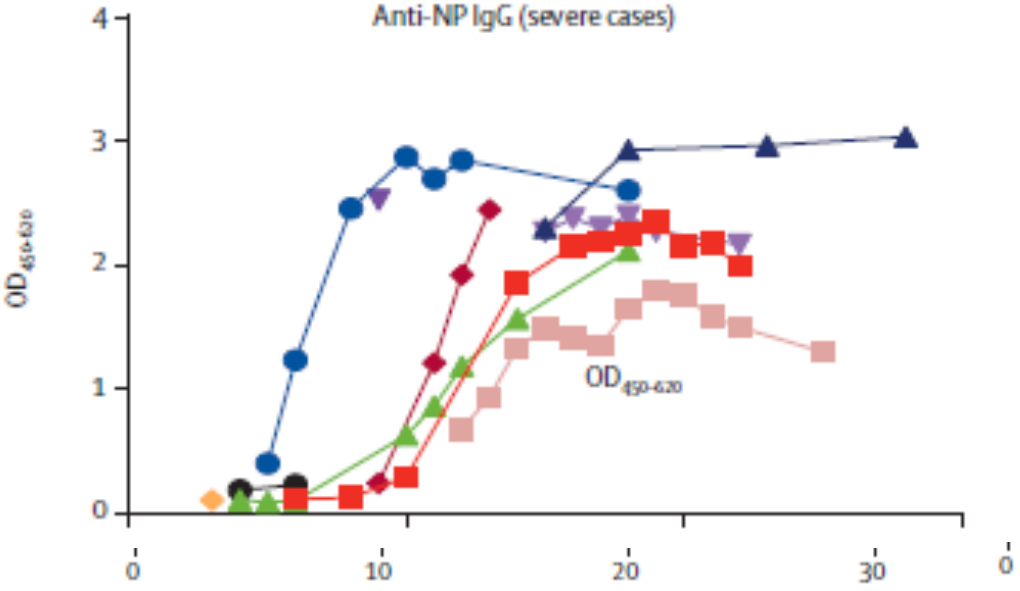
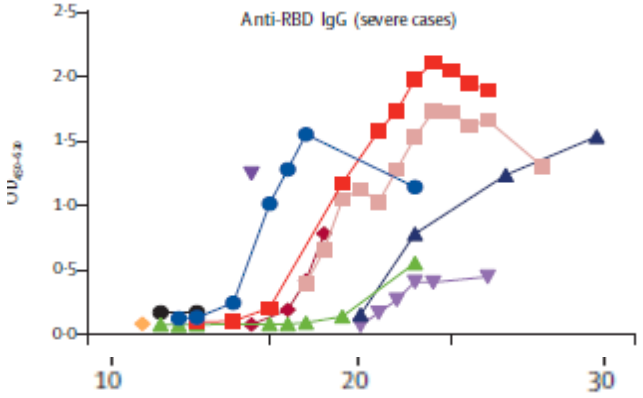
SARS-CoV-2 IgG positivity – NP vs. RBD





From: K.K-W. To et al, Lancet Infect Dis 2020; https://doi.org/10.1016/S1473-3099(20)30196-1

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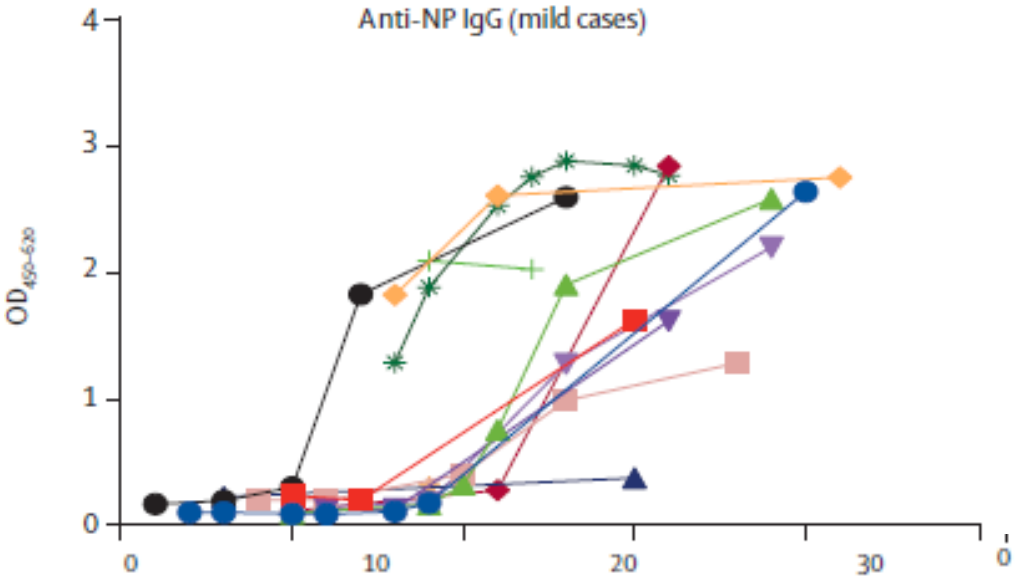

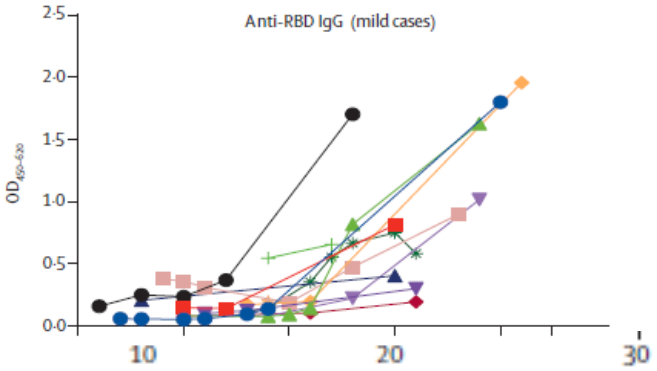

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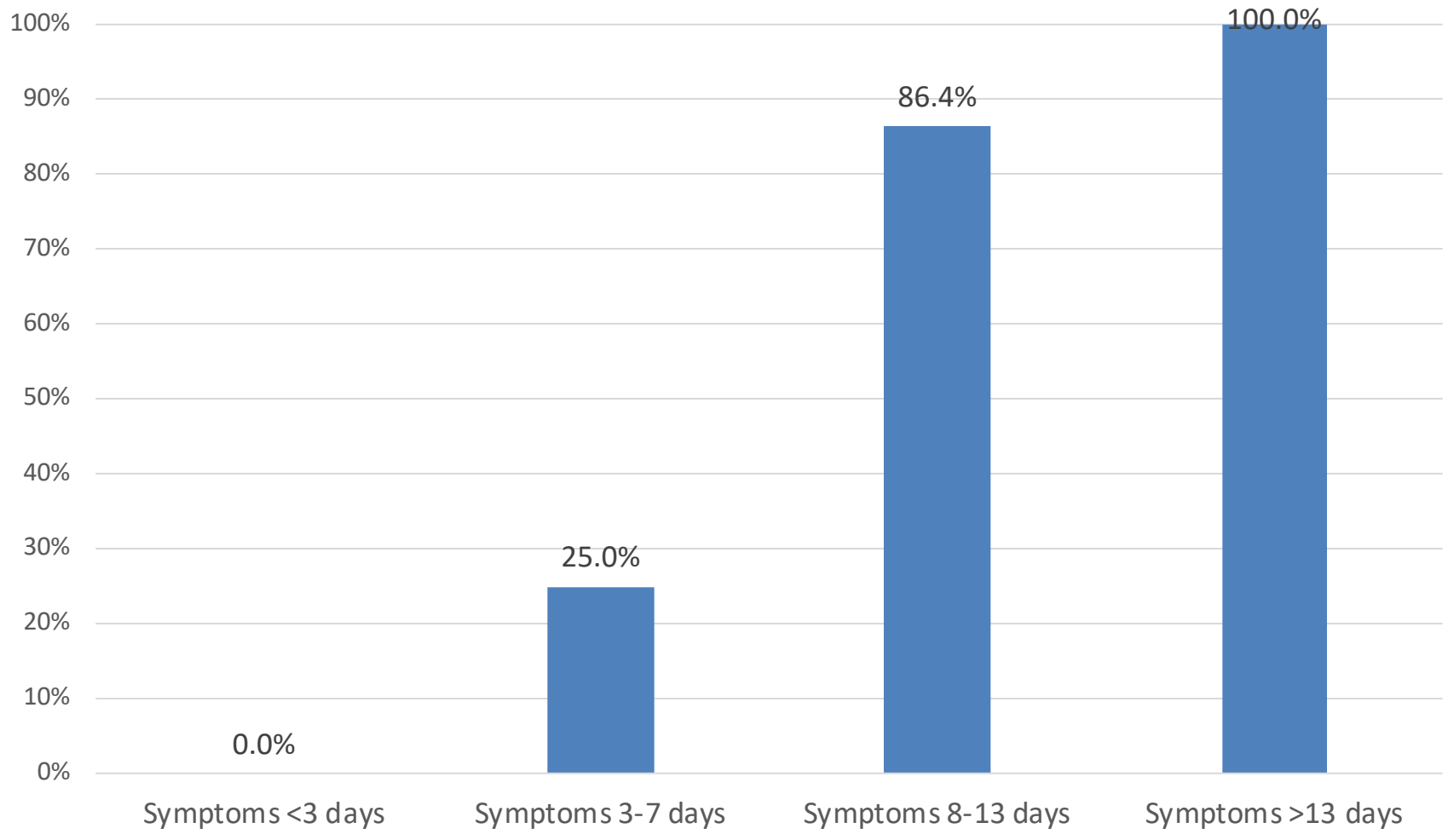
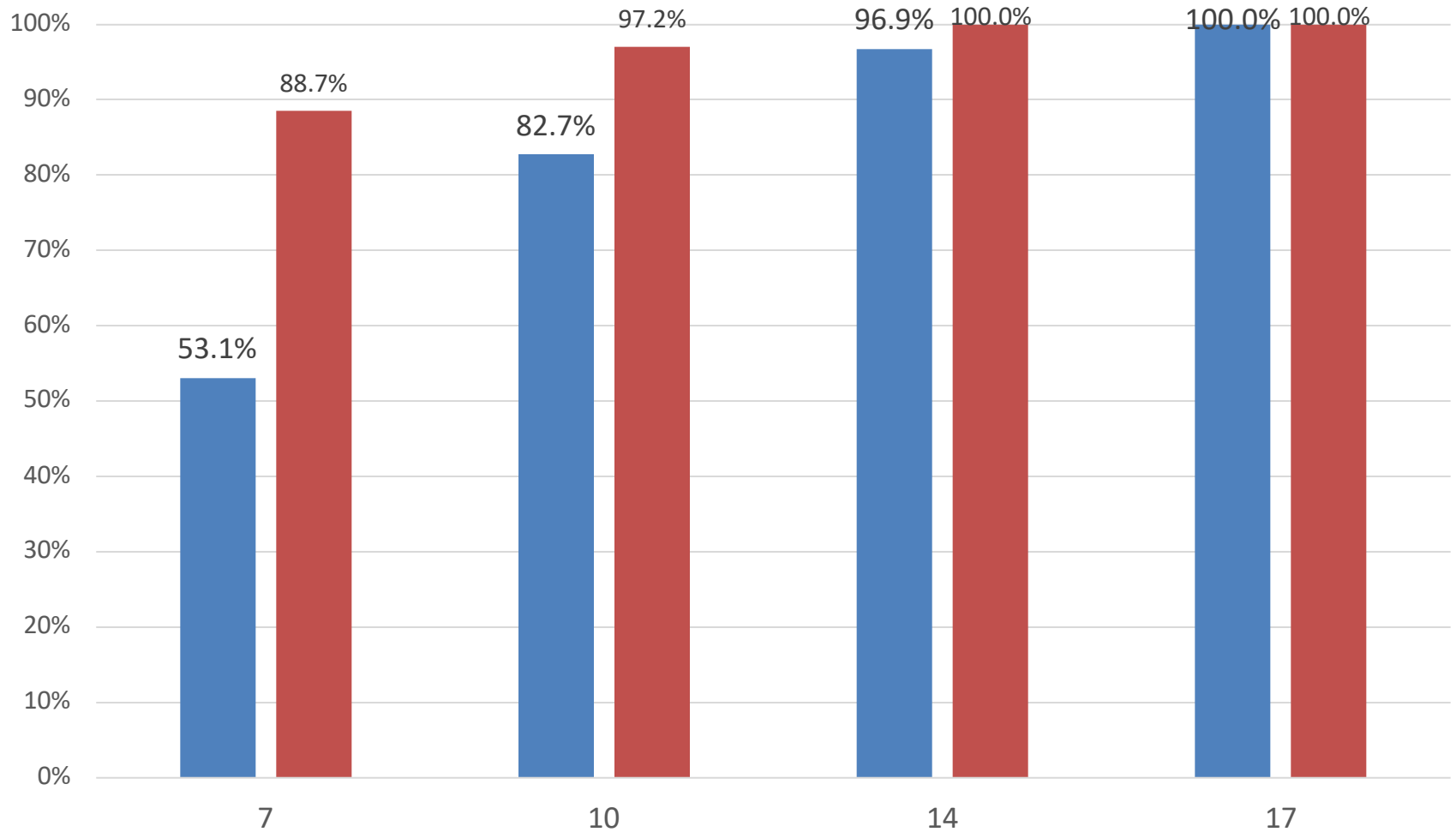
ARCHITECT SARS-CoV-2 IgG – positive agreement



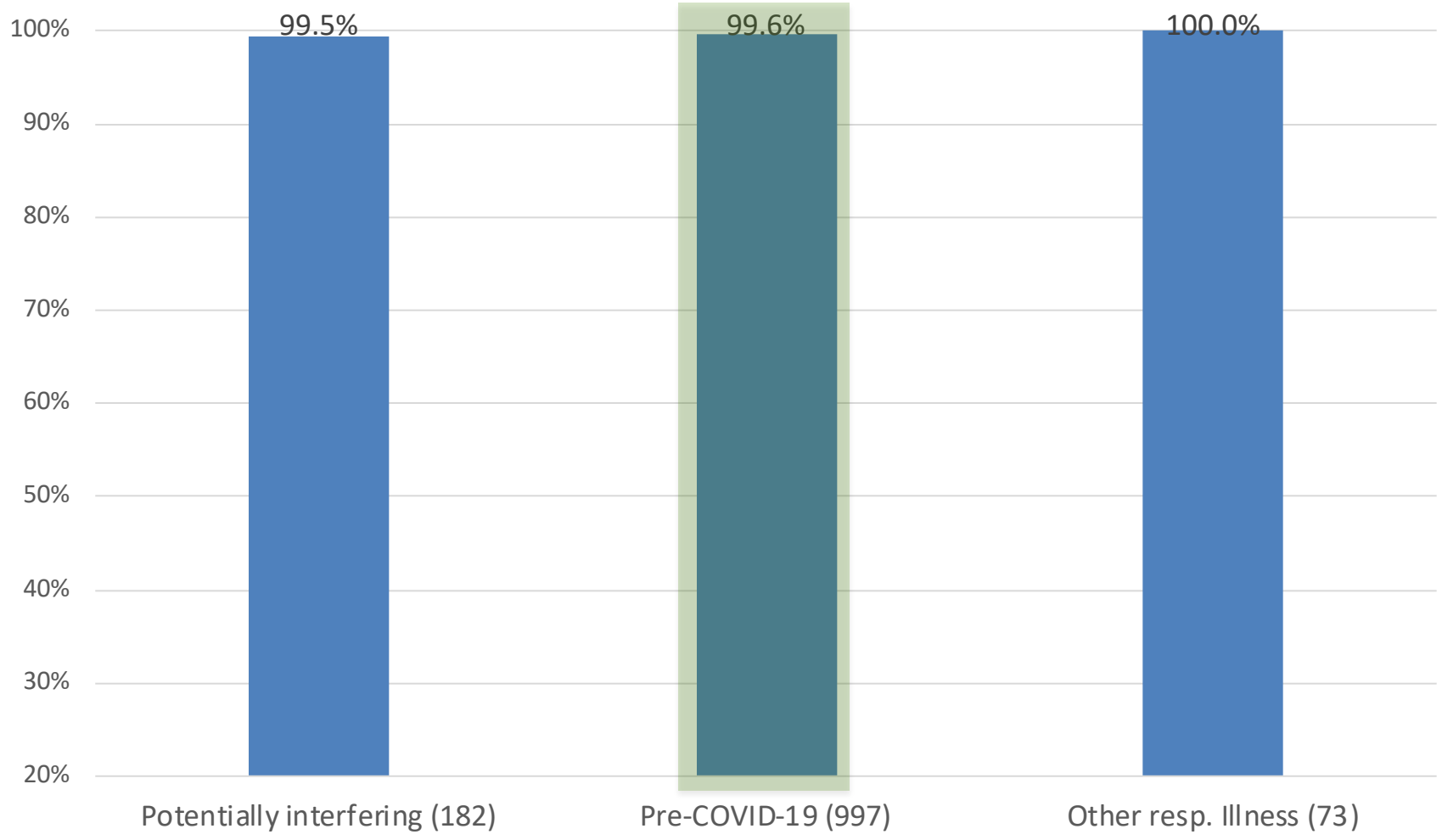
Data from ARCHITECT SARS-CoV-2 IgG package insert

ARCHITECT SARS-CoV-2 IgG positivity compared to PCR positivity (blue) and days after onset (red)



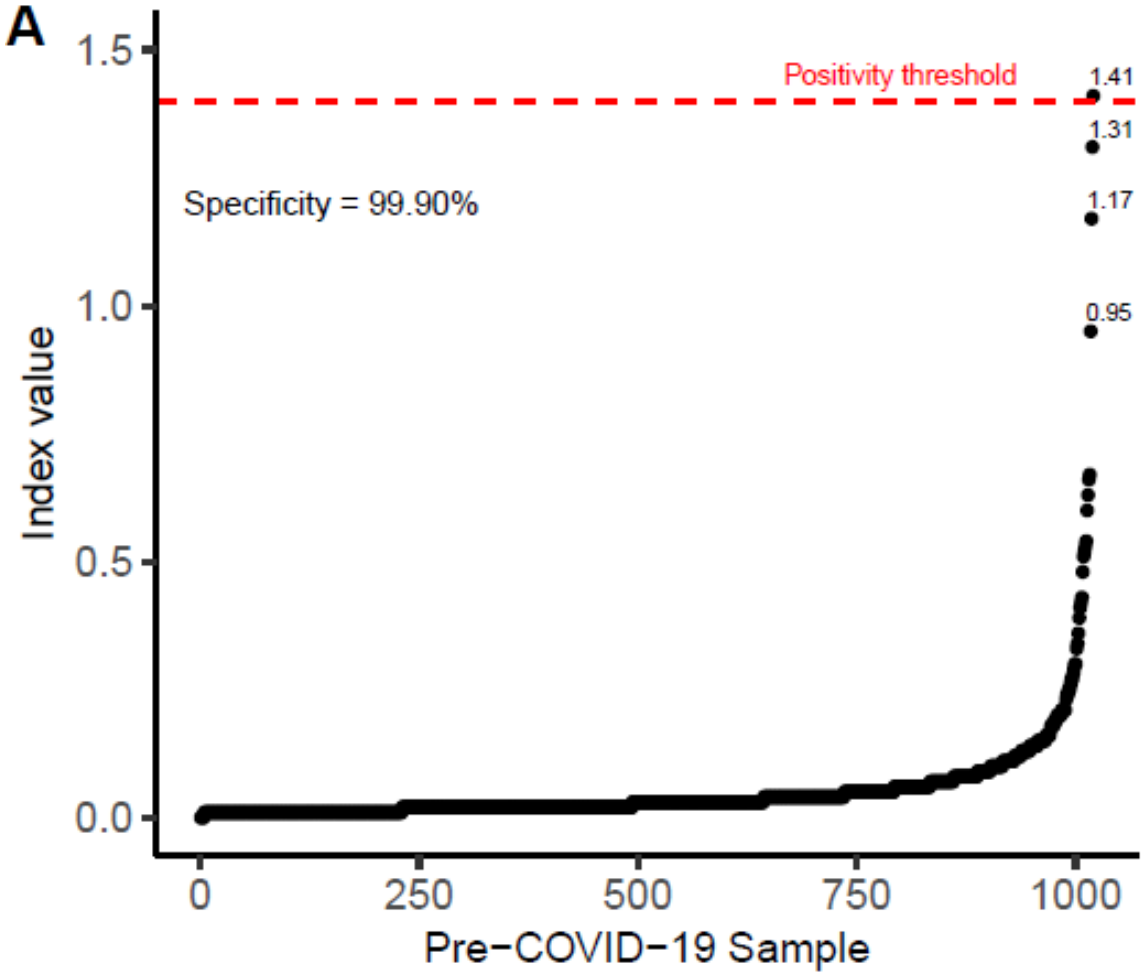
From: A. Bryan et al, medRxiv preprint doi: https://doi.org/10.1101/2020.04.27.20082362

ARCHITECT SARS-CoV-2 IgG – specificity and negative agreement



Data from ARCHITECT SARS-CoV-2 package insert

Specificity on 1,020 pre-COVID specimens



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The importance of being specific

- No ’confirmation’ available for any SARS-CoV-2 serological assay
- The positive predictive value (PPV) depends on the *specificity* and the *prevalence;* the lower the latter, the lower the PPV

- Example: 100,000 individuals, 3% prevalence
  - Assay with 95% specificity: 3,000 true positives, 4,850 false positives **PPV= 38.2% (2 FP for each TP)**
  - Assay with 99% specificity: 3,000 true positives, 970 false positives, **PPV= 75.6% (1 FP for each 3 TP)**
  - Assay with 99.5% specificity: 3,000 true positives, 485 false positives, **PPV= 86.1% (1 FP for each 6 TP)**

  - ***Population prevalence 1.79%, specificity 99.9%[1], PPV 94.7%***

1- Data from: A. Bryan et al, J Clin Microbiol2020 aop ; PPV estrapolated from the prevalence and specificity data

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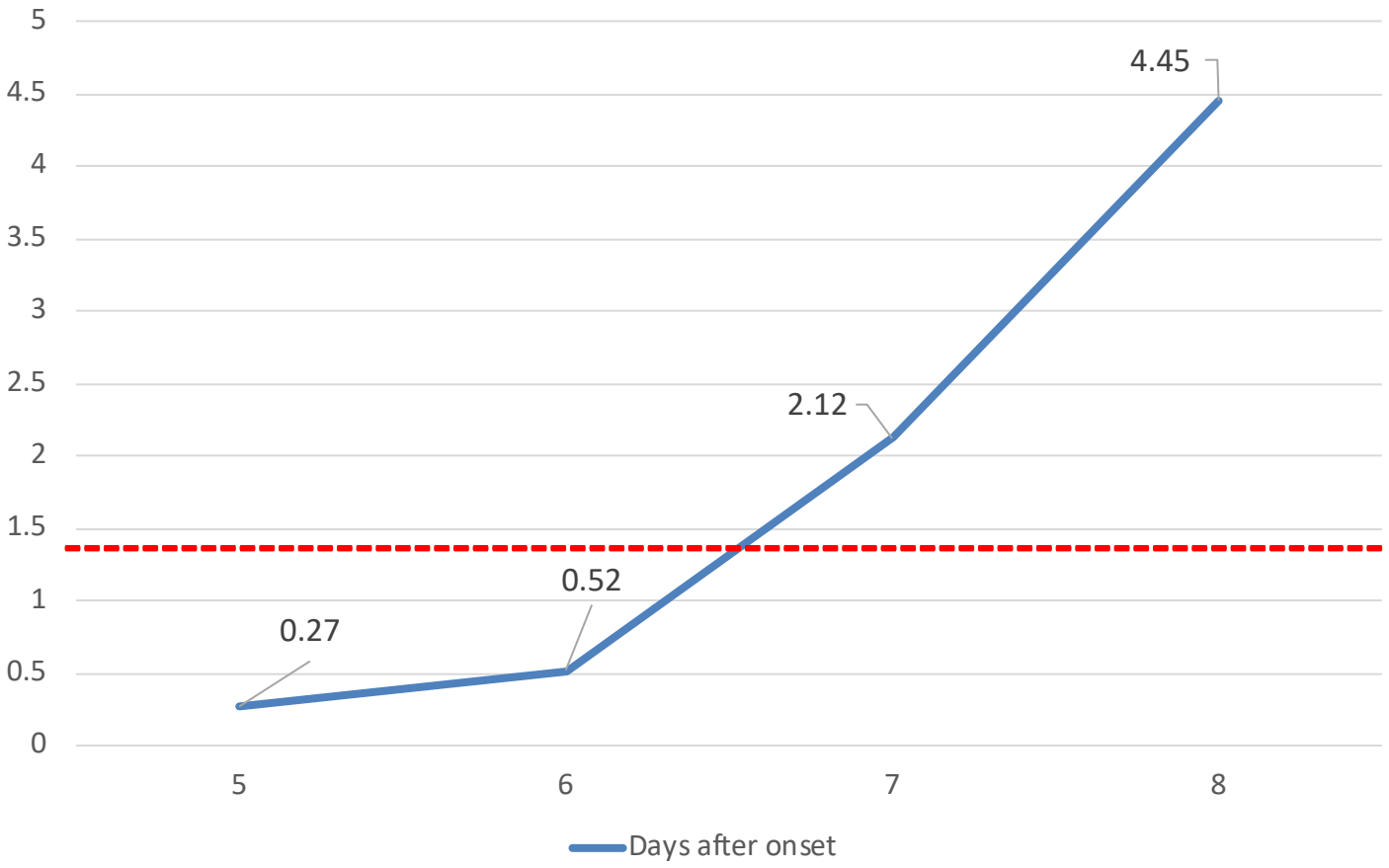
ARCHITECT SARS-CoV-2 IgG – serial bleeds



Data from ARCHITECT SARS-CoV-2 Instruction for use

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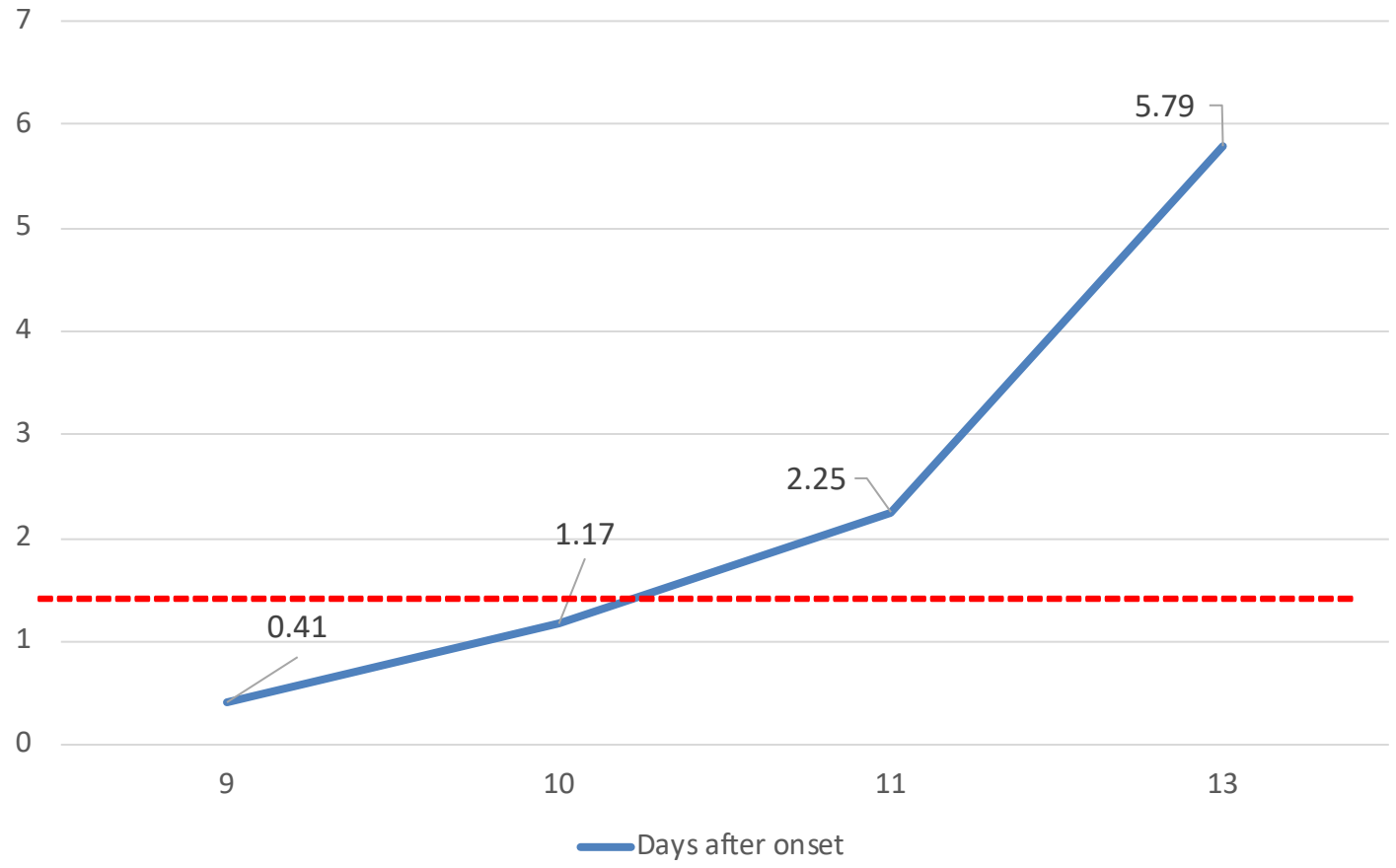
ARCHITECT SARS-CoV-2 IgG – serial bleeds



Data from ARCHITECT SARS-CoV-2 Instruction for use

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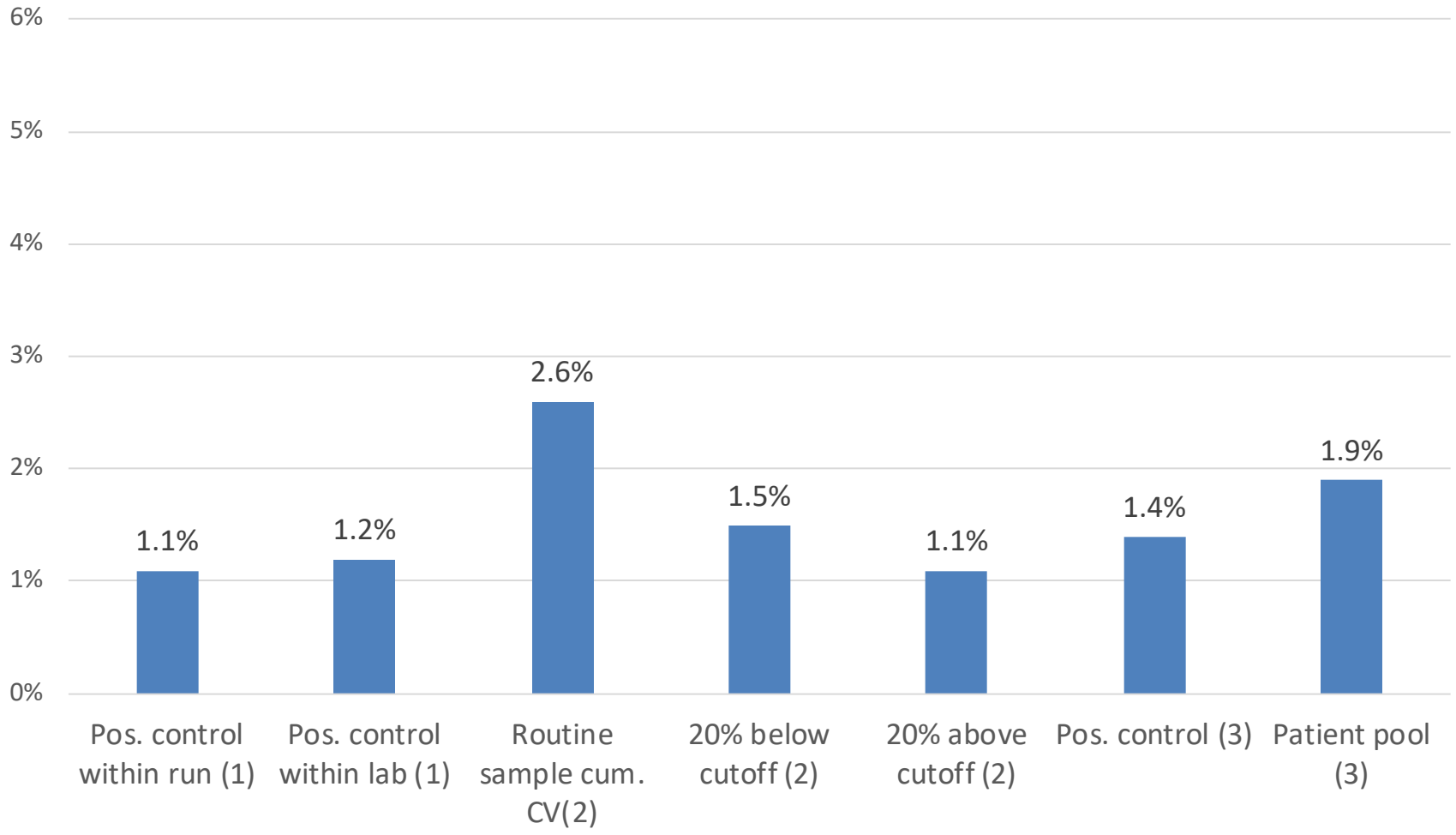
ARCHITECT SARS-CoV-2 IgG - precision



From: (1) -ARCHITECT SARS-CoV-IgG Instruction for use, (2) modified from A. Bryan et al, J Clin Microbiol2020 aop; (3)-M.S. Tang et al, Clin Chem 2020 aop

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Key statements from a recent paper

- Both serial viral load monitoring and antibody response should be considered when making decisions about infection control measures, because viral load seemed to be related inversely to serum antibody response in this study

- Serological diagnosis is important for patients who present late with a very low viral load, below the detection limit of RT-PCR assays

- Serum IgG amounts can rise at the same time or earlier than those of IgM against SARS-CoV-2.

- The correlation between microneutralization assay titres and anti-NP IgG (R^2=0·99) or anti-RBD IgG (R^2=0·96) was better than those between microneutralization assay titres and anti-NP IgM (R^2=0·88) or anti-RBD IgM (R^2=0·87)

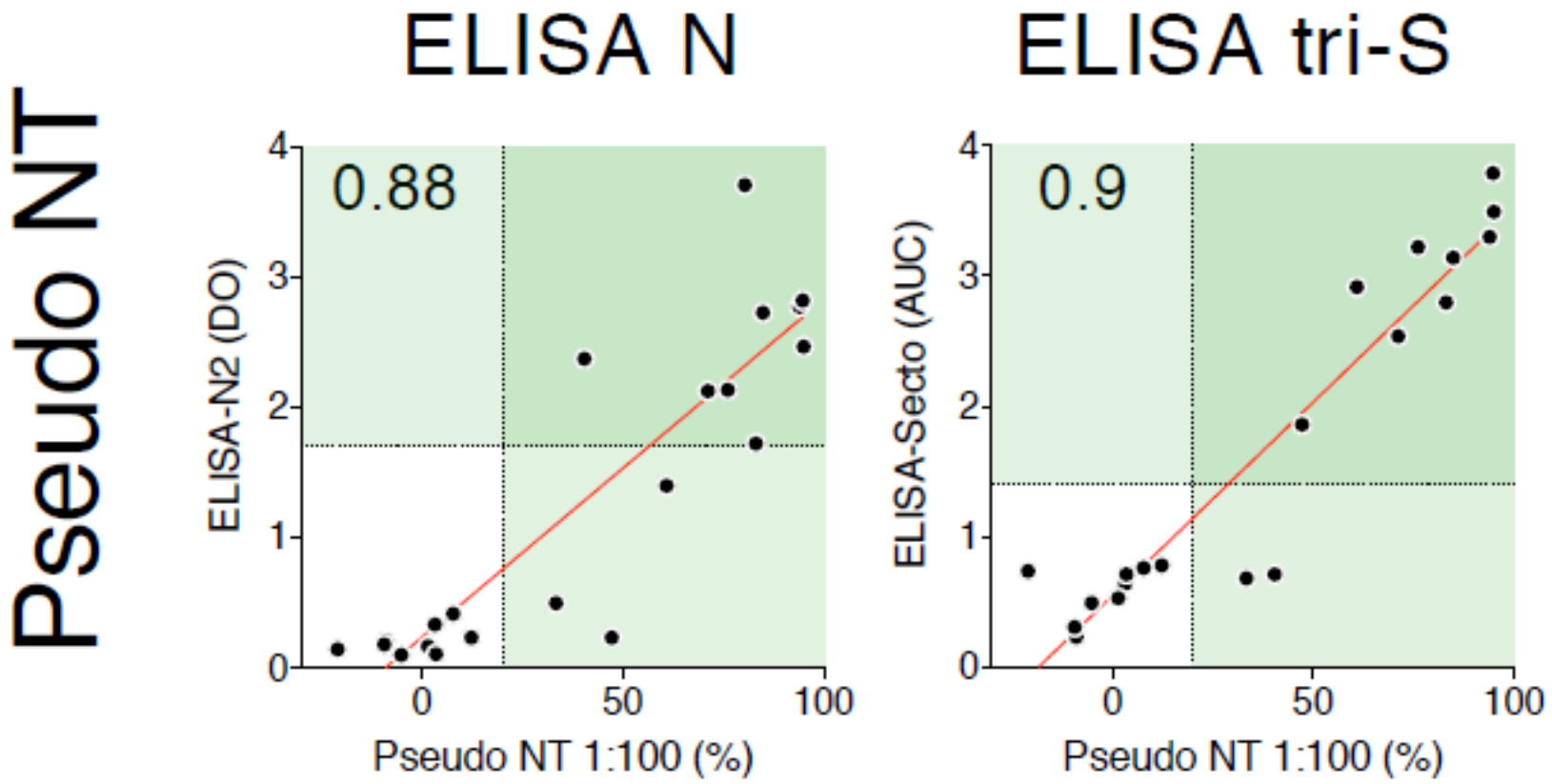
From: K.K-W. To et al, Lancet Infect Dis 2020; https://doi.org/10.1016/S1473-3099(20)30196-1

Correlation between Elisa ratios and PRNT

		In-house ELISAs				
Test, virus	Correlations	S1	N	RBD	S	S1A
$PRNT_{50}$, SARS-CoV-2	Spearman ρ value	0.87	0.94	0.92	0.94	0.93
	2-tailed p value	0.0021	0.0002	0.0005	0.0002	0.0003
	p value summary	≤0.01	≤0.001	≤0.001	≤0.001	≤0.001
$PRNT_{90}$, SARS-CoV-2	Spearman ρ value	0.88	0.88	0.88	0.88	0.88
	2-tailed p value	0.0024	0.0024	0.0024	0.0024	0.0024
	p value summary	≤0.01	≤0.01	≤0.01	≤0.01	≤0.01

From: N.M.A. Okba et al, EmergInfDis2020 aop

Antibody levels & neutralizing activity



From: L. Grzelak et al, medRxiv preprint doi: https://doi.org/10.1101/2020.04.21.20068858

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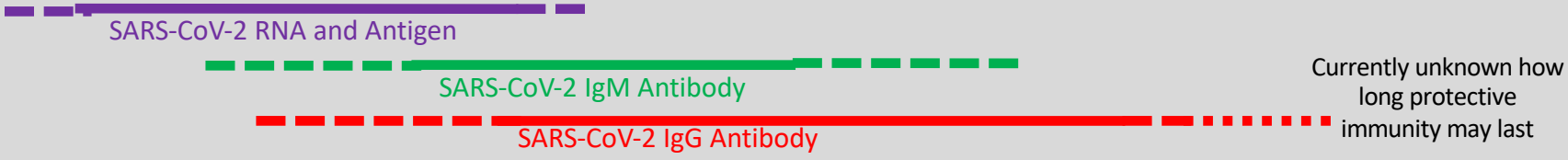
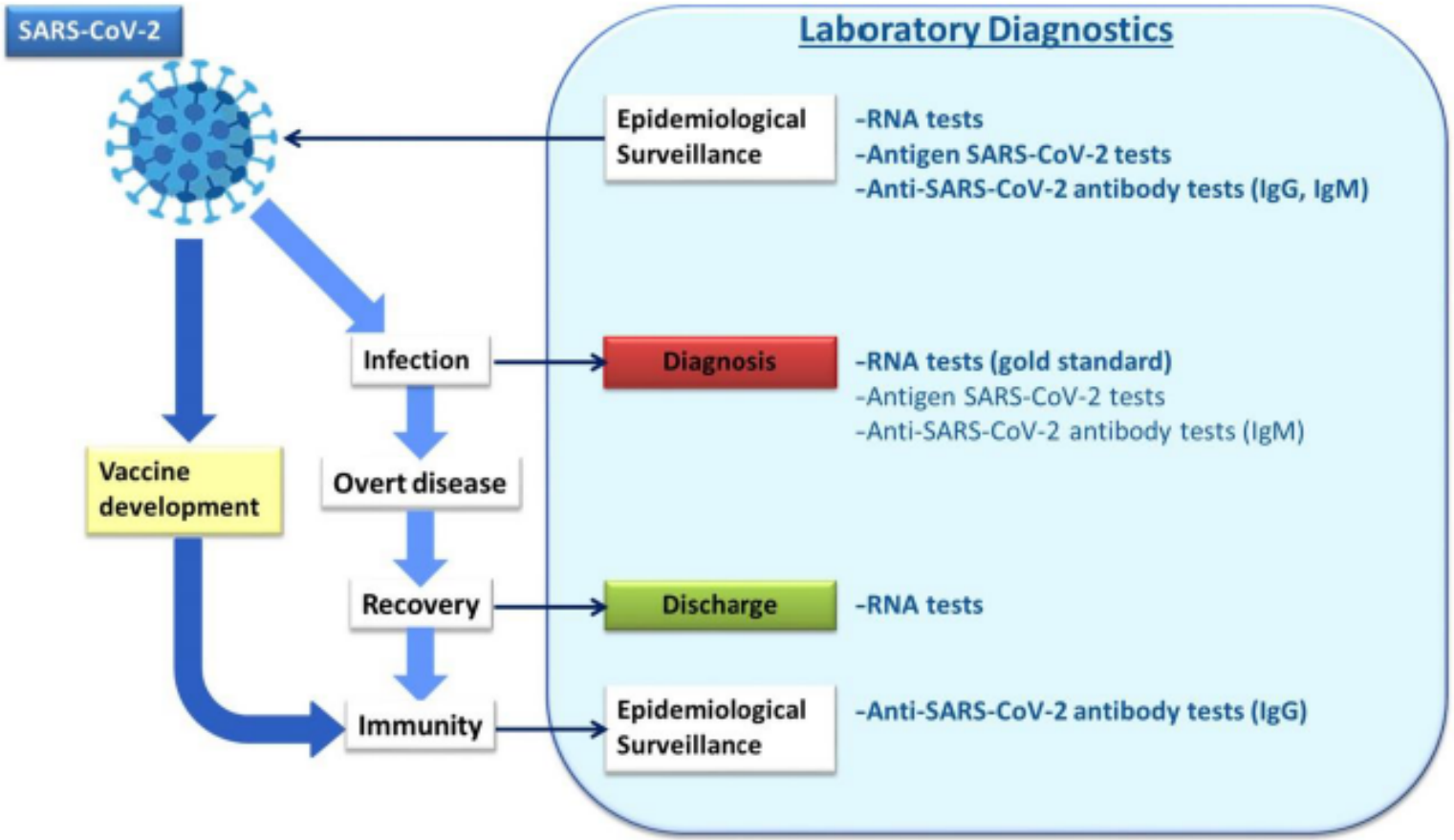
Combination of SARS-CoV-2 diagnostic results



TEST RESULTS*			GENERAL INTERPRETATION**
PCR	IgM	IgG	
+	-	-	Patient may be in the initial period of infection when antibodies are not yet produced or are under the limit of detection
+	+	-	Patient is in the active phase of infection has started to develop an immune response with antibody production
-	+	-	Patient may be in the early stage of infection. PCR result may be false-negative or IgM false positive.
+	+	+	Patient is still in the active phase of the infection, immune response has progressed.
+	-	+	Patient may be in the late stage of infection or has developed a recurrent infection.
-	+	+	Patient may be in the late or recovery stages of infection or PCR false negative
-	-	+	Patient may have recovered or has been infected in the past.

*General representation, not based on actual kit performance.
**Test results must be considered with other clinical data available to the clinician.

Testing in the context of COVID-19 disease



European Commission. Current performance of COVID-19 test methods and devices and proposed performance criteria. April 16th, 2020

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