



Singapore Healthcare Management 2022

Standardising Covid-19 Test Results for Fast & Accurate Interpretation

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1. The Problem

Lab reports are traditionally read and interpreted by clinicians / lab specialists. During the Covid-19 pandemic, lab results and its interpretation were made by many non-clinically trained personnel for management and operational purposes. There was a challenge to ensure interpretation consistency for patient safety and for timeliness to right site patients as part of downstream public health action.

2. The Solution

Standardise the result display with a Covid-19 Indicator to minimise ambiguity in interpretation, to allow the indicators to be easily understood by non-specialists so that swift action can be taken.

3. Method

IHiS developed an algorithm to parse the test results. To generate an appropriate Covid-19 indicator, the algorithm examined the following three fields in a result:

- Lab Item Details
- Lab Test Numeric Value
- Lab Results Status



While this algorithm worked for most test results, there were instances where the algorithm would fail. This was due to confounding text patterns in the test results.

Hence, IHiS further developed a lab exclusion criteria to exclude confounding text patterns that interfered with the algorithm's ability to generate the correct Covid-19 indicators.

Examples of confounding text patterns are those that start and end with certain pre-identified texts, such as "Results from SARS-CoV-2 IgG antibody testing should not be used as" and "please contact the laboratory for further action", or "initially positive for SARS-CoV-2, but this could not be confirmed on repeat testing".

Patient Name	Patient ID	Date Of Birth	Postal Code	Lab Code Classification	Results
██████████	██████████	██████████		PCR	UNABLE TO CLASSIFY, PLEASE REVIEW
Swab Location / Patient Address		Abnormal	Message Time		
		No	15-Jan-2021 04:25:29 PM		
Lab Test Status		Lab Accession No	Lab Item Description		
Final Results		101403480	SARS-CoV-2 (COVID-19 agent) PCR		
Lab Item Details					
Specimen Source:		Respiratory			
Specimen Site:		Nose and pharyngeal (combined)			
Sample Description:					
None					
Culture Result:		MOLECULAR TESTING (PCR) RESULT			
Result Status:					
This is a preliminary result of a positive blood culture.					
Formal culture and antibiotic susceptibility results are not yet available.					
SARS-CoV-2 result:		Not detected			
Comment:					
SARS-CoV-2 testing was performed in NPHL and result data entry performed in Changi General Hospital.					
For further information on the COVID-19 test parameters, please refer to NPHL.					
Test Status:		Complete			

4. Results

The improved algorithm, together with the ability to detect relevant keywords and text patterns found in the lab inclusion criteria*, was able to sort 61 result values and text patterns sent by more than 20 labs into the following Covid-19 indicators.

Staff handling the test results need not read through all the text, which could be lengthy, in order to interpret it. Instead, they need only refer to the indicators. This greatly reduces the time spent by the staff handling the results. For serology results, the Covid-19 indicators are presented with the Immunoglobulins (IgG or IgM or both) and Antigen Proteins (Anti-Spike or Anti-Nucleocapsid) information.

*The inclusion criteria was developed in consultation with MOH's Communicable Disease Division.

Result contains	Covid-19 Indicator
DETECTED, POSITIVE	Positive
NOT DETECTED, NOT POSITIVE, NEGATIVE	Negative
PRESUMPTIVE POSITIVE, PRESUMPTIVE POS, PRESUMP POS	Presumptive Positive
PRELIM POSITIVE, PENDING REVIEW, PRELIM POS, WEAKLY POSITIVE, WEAK POSITIVE, INDETERMINATE, INCONCLUSIVE, INHIBITORY, EQUIVOCAL, INVALID, FOR RE-EVALUATION	Re-evaluation of Result
SAMPLE REJECTED, NO SPECIMEN, NOT TESTED, REJECTED, SAMPLE REJECTION	Sample Rejected
<see Appendix C, Conditions for Cancelled Results>	Cancelled
<otherwise>	Unable to classify, Please Review

In cases where no keyword or inconsistent keywords are present in the text pattern, the indicator "Unable to Classify, Please Review" is displayed.

The Covid-19 indicators are also colour-coded to facilitate identification.



These indicators are displayed prominently in HealthHub, Covid-19 Test Repository, the National Electronic Health Record, and the Patient Risk Profile Portal to assist healthcare providers, operations personnel and citizens to clearly understand their results. The algorithm was continuously updated with live data along the way to reduce the number of unclassified results.

5. Conclusion

The Covid-19 indicators standardise the interpretation of the diverse test results into an easily readable format. This allows staff, especially non-clinical ones, to be able to quickly and accurately interpret the results and perform the required public health actions.

