COVID-19 in 1 Picture

Seeing clinical signals using the open source hGraph visualization

Luca Calzoni, Yalini Senathirajah, Juhan Sonin
hello@hgraph.org
v.02, 14.Apr.20

Disclosures for Juhan Sonin, juhan@mit.edu

Blind-ish Trust

No involvement in investments since 1995

Academic Appointment @ MIT

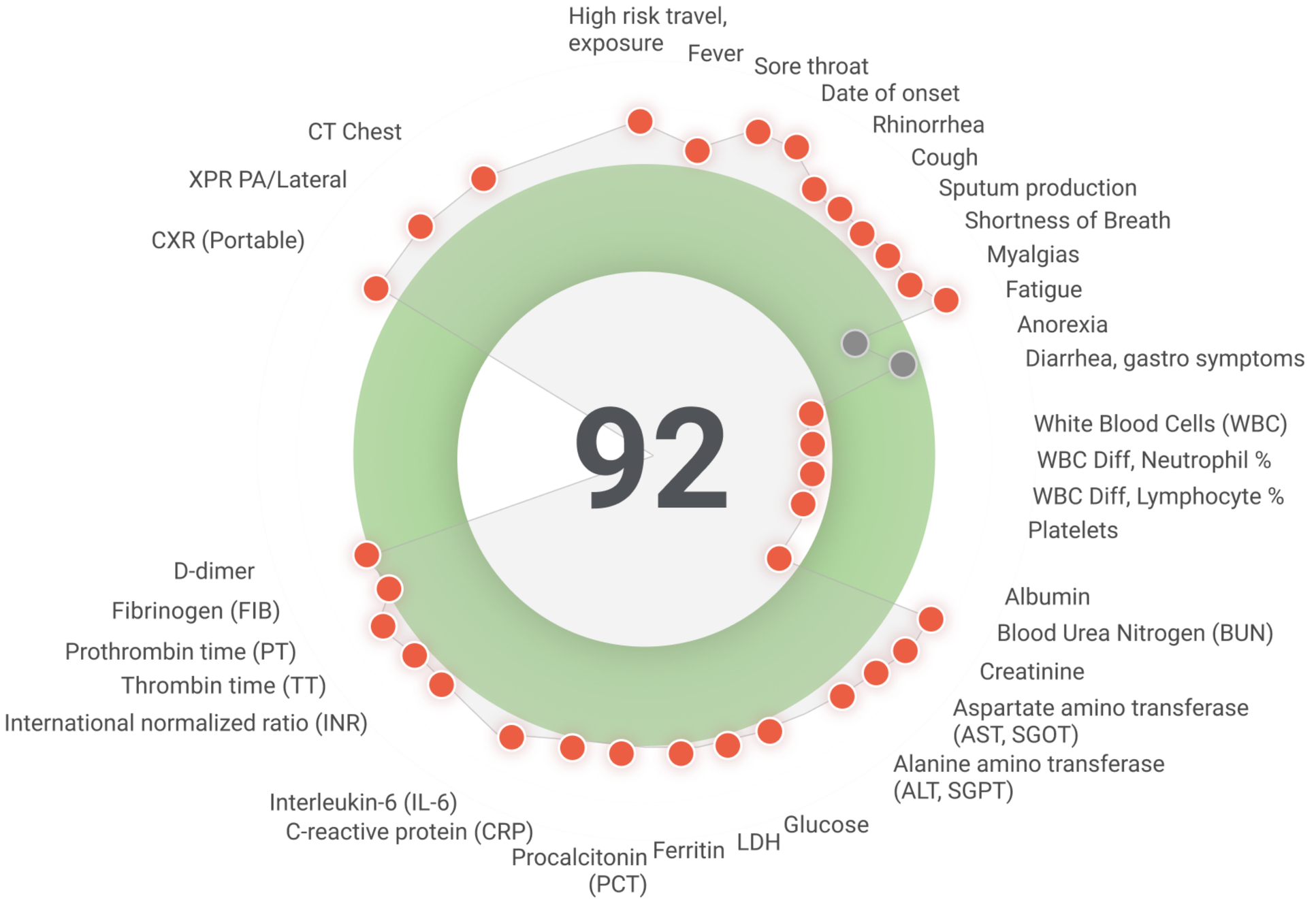
Own $1.8M/yr business (goinvo.com)

Patents & personal health data are licensed under open source

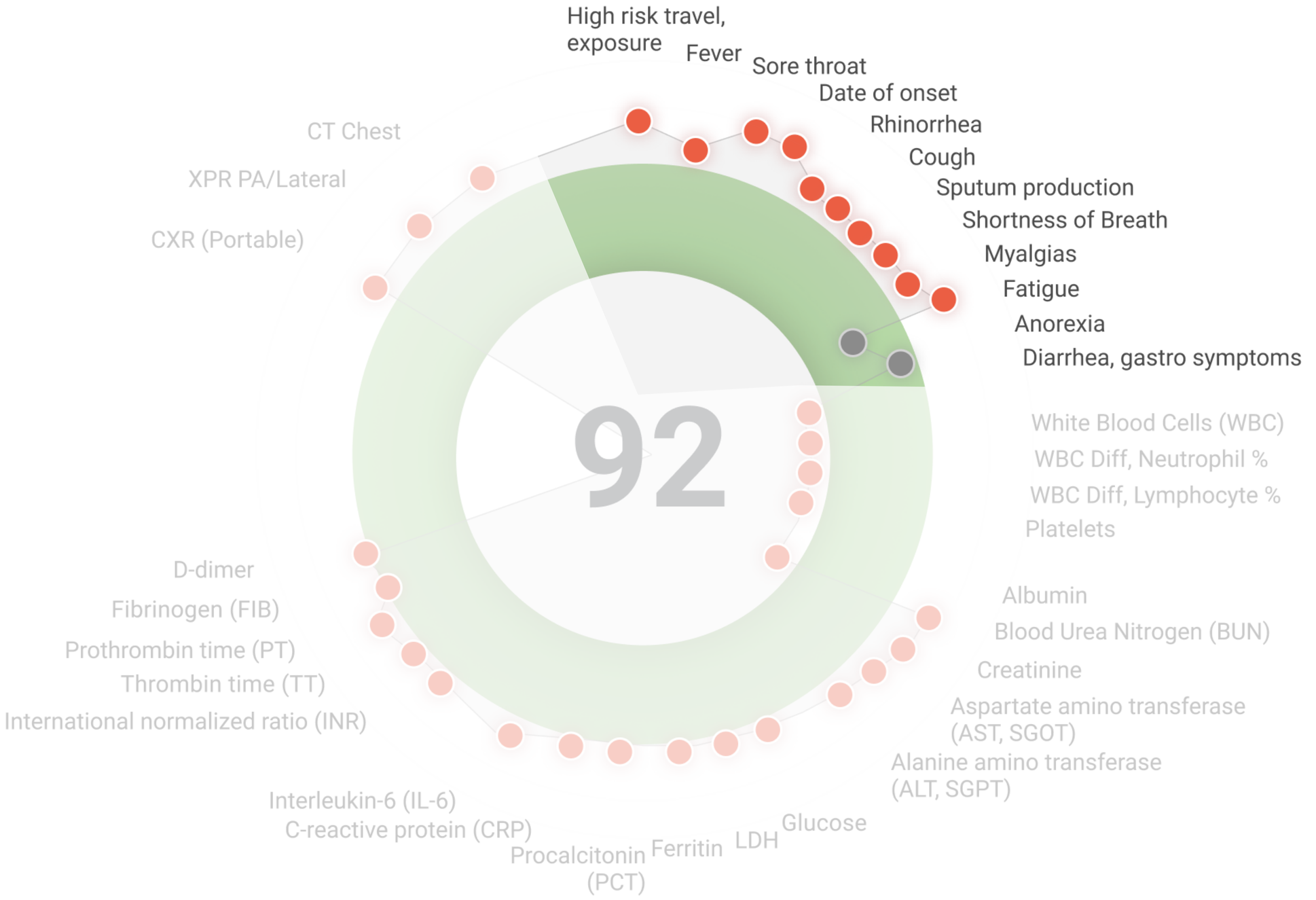
Front-line clinical problem:

How do I review a patient in seconds
to better understand and treat?
… aka make quicker, more accurate decisions?

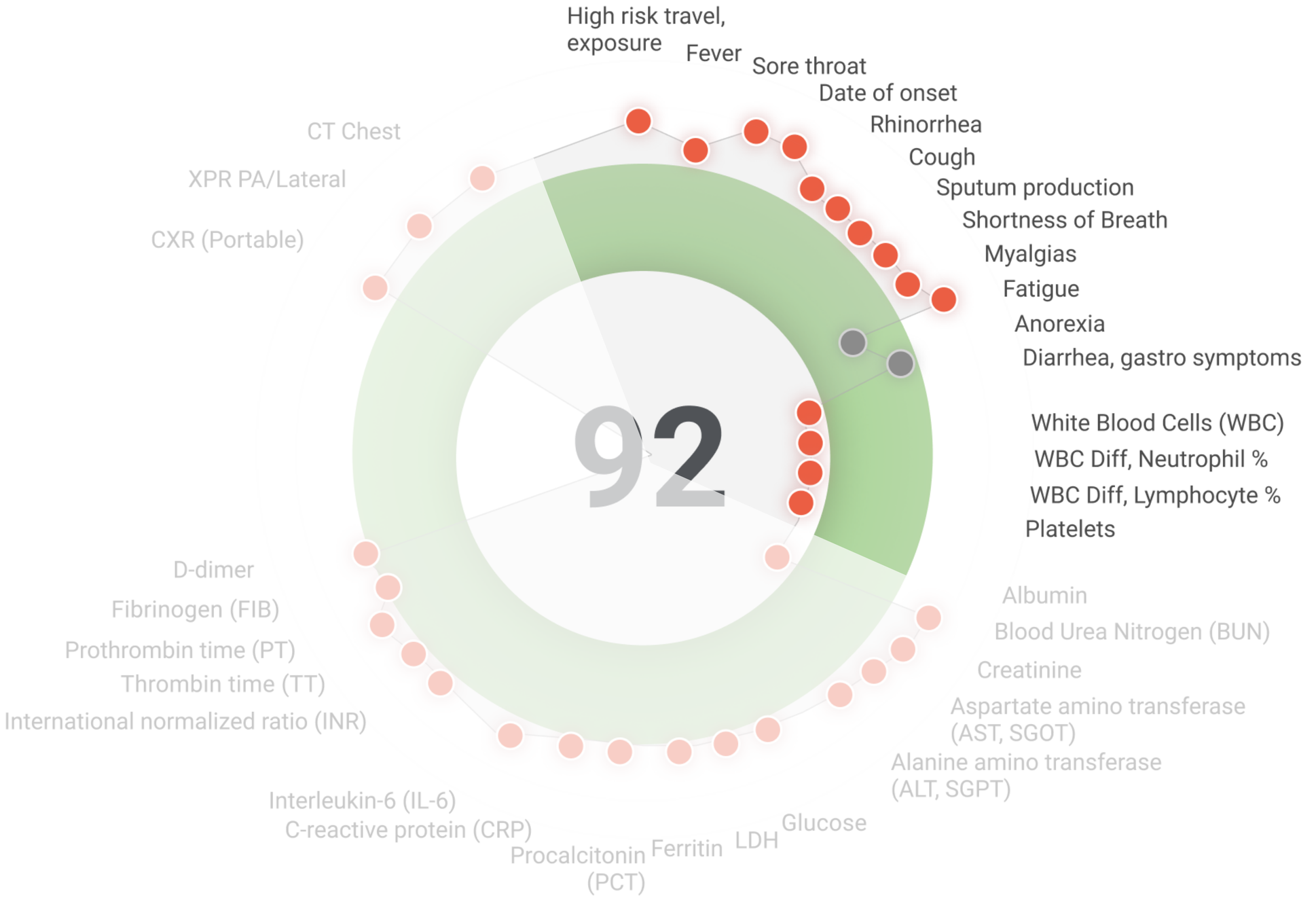
COVID-19 Clinical Signals



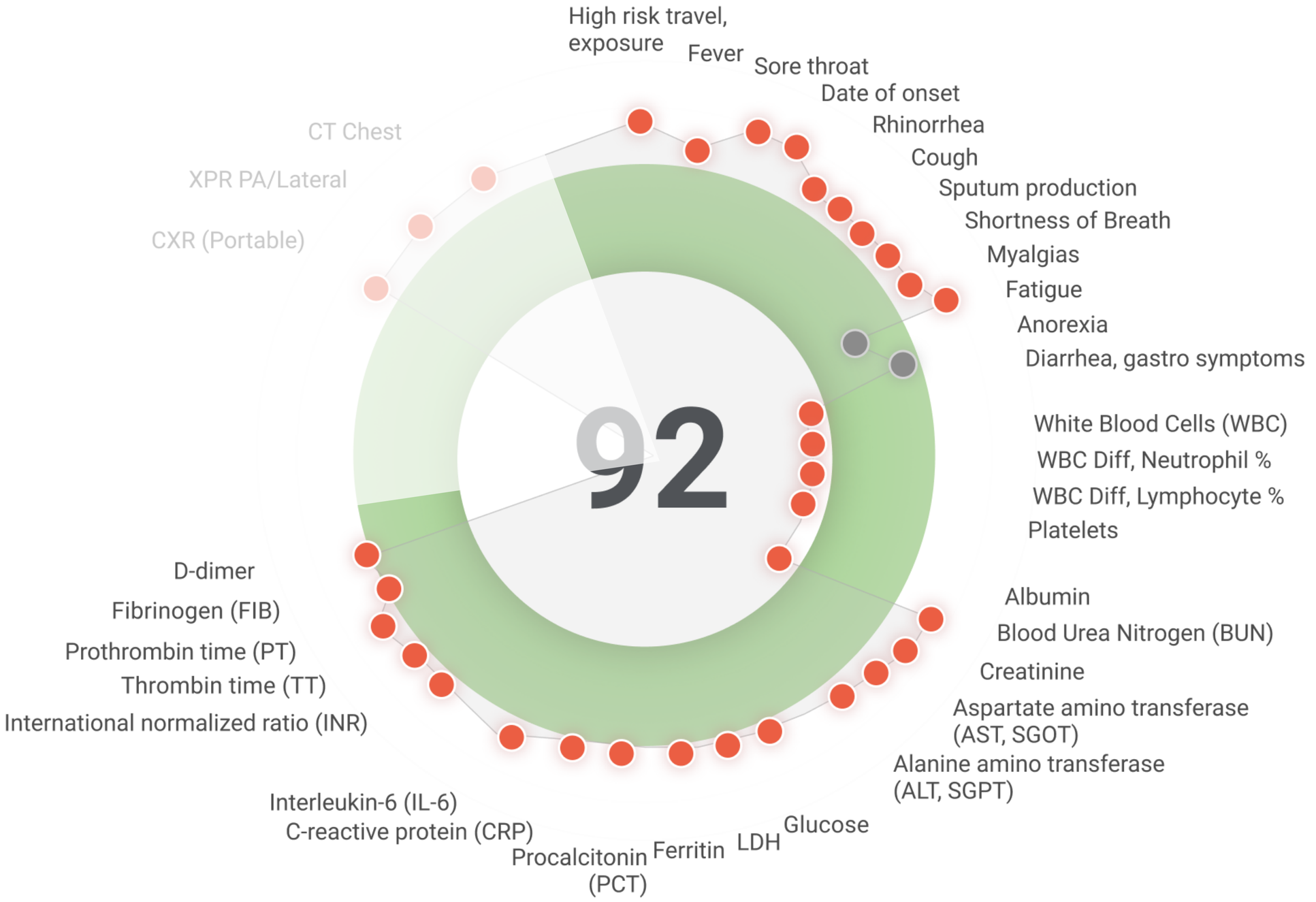
COVID-19 Clinical Signals



COVID-19 Clinical Signals



COVID-19 Clinical Signals



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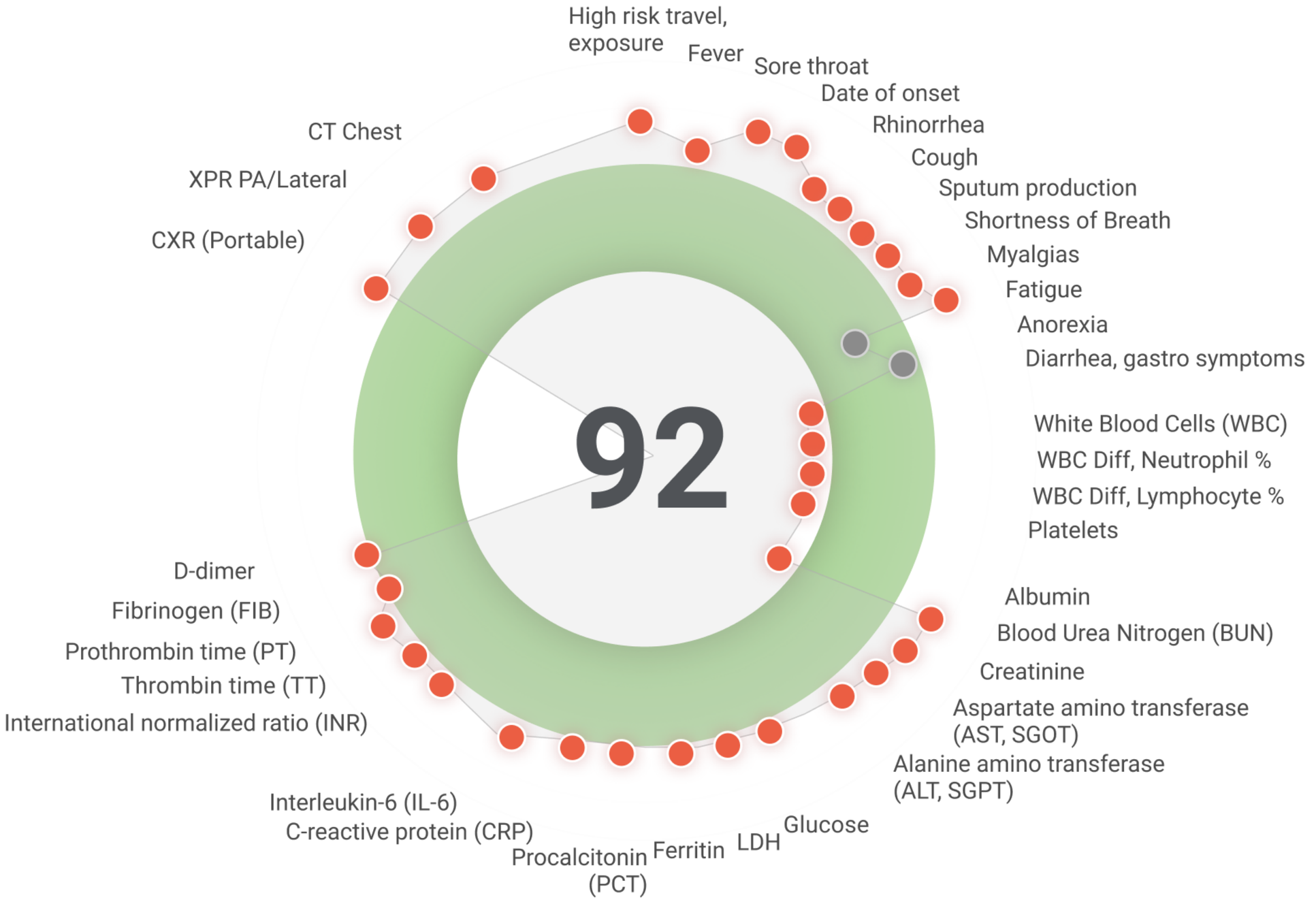

Clinical and Patient Software

hGraph.org

Compelling, standardized visual representation of a patient's health status

Designed to increase awareness of the individual's COVID-19 factors

Licensed under Apache 2.0 open source license

Your health in one picture

Provide, view, share, and understand a holistic view of their health

Based on an individual's health data, identifi es where an individual's COVID-19 health numbers are, and where they should be

hScore

Single aggregated number ranging from 1-100 that represents best knowledge status of an individual's health

Experimental measure correlated with statistical data from open sources

COVID-19 hGraph data elements

by Luca Calzoni, Draft v.01, 2.Apr.20

Selected metrics – Good candidates for visualization using hGraph				
Signs and symptoms				
Sign or symptom:		**Normal values:**	**Suggestive of COVID-19 infection if:**	**Reason for selection:**
Fever (elevated temperature)		97.7–99.5 °F	Elevated	Elevated in 83-99% of hospitalized cases at some point[2,5] (but 56% are afebrile on admission[2,5]).
Labs				
Lab:		**Normal values:**	**Suggestive of COVID-19 infection if:**	**Reason for selection:**
Complete Blood Count (CBC) with differential	**White blood cells (WBC)**	4,500 to 11,000 cells per microliter (cells/mcL)	Low	Low in 30-45% of patients (but elevated in 5% of patients)[2,5].
	Platelets	150,000 to 450,000 platelets/mcL	Low	Low in 12-36% of patients[3,5].
	White blood cell differential: - **Lymphocyte percentage**	20 to 40%	Low	Low in 83% of patients[2,6]. Predicts disease severity[2,6]. Associated with mortality[2].
	White blood cell differential: - **Neutrophil percentage**	40 to 60%	Elevated	Elevated in 38% of patients[2,3]. Predicts disease severity[2].
sive Metabolic Panel (CMP)	**Albumin**	40.0 to 55.0 g/L	Low	Low in 98% of patients[3].
	Blood Urea Nitrogen (BUN)	2.5 to 7.1 mmol/L	Elevated	Elevated in 44% of patients[2].
	Creatinine	0.7 to 1.2 milligrams per deciliter (mg/dL) for males and 0.5 to 1.0 mg/dL for females	Elevated	Elevated in an undetermined percentage of patients[11]. Predicts disease severity[11].
	Alanine amino transferase	29 to 33 units	Elevated	Elevated in 4-53% of patients[2]
	Ferritin	12 to 300 nanograms per milliliter of blood (ng/mL) for males and 12 to 150 ng/mL for females	Elevated	Elevated in an undetermined percentage of patients[2]. Predicts disease severity[2].
	D-dimer	500 ng/mL or less	Elevated	Elevated in an undetermined percentage of patients[4]. Associated with mortality[2]. IL-6 and D-Dimer predict disease severity with 93.3% specificity (tandem testing) and 96.4% sensitivity (parallel testing)[4].
	Interleukin-6 (IL-6)	5-15 pg/ml	Elevated	Elevated in an undetermined percentage of patients[4]. IL-6 and D-Dimer predict disease severity with 93.3% specificity (tandem testing) and 96.4% sensitivity (parallel testing)[4].
	C-reactive protein (CRP)	Less than 10 milligram per liter (mg/L)	Elevated	Elevated in 61-86% of patients[2]. Predicts disease severity[2].
	LDH	140 units per liter (IU/L) to 280 IU/L	Elevated	Elevated in 27-75% of patients[2,11]. Predicts disease severity[2].
	International normalized ratio (INR)	1.1 or below	Elevated	Elevated in an undetermined percentage of patients[2]. Predicts disease severity[2].
	Prothrombin time (PT)	10.5 to 13.5 seconds	Elevated	Elevated in 58% of patients[11] (but low in 30% of patients according to other studies[2,3]).
	Thrombin time (TT)	15 to 19 seconds	Elevated	Elevated in an undetermined percentage of patients[4]. Predicts disease severity[4].
	Fibrinogen (FIB)	150–400 mg/dl	Elevated	Elevated in an undetermined percentage of patients[4]. Predicts disease severity[4].
	Glucose (GLU)	72-99mg/dl	Elevated	Elevated in 51% of patients[3,4]

COVID-19 hGraph target range "algorithms"

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All references on Github

https://github.com/goinvo/hGraph/blob/master/docs/COVID19_hGraph_Assessment.pdf

Sync with C19HCC/ VSAC, LogicalHealth, openEMR definitions

Next steps

COVID-19 hGraph Prototype v.01

…deliver in 2 weeks, using synthetic data

Score model v.01

…need assistance

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