G. Chapman
07.04.20

What is the probability that this patient, who presents to a UK hospital, has Covid-19? And how do we minimise transmission within the hospital?

Goal:
Assist front-line physicians during the Covid-19 pandemic by providing an estimated probability of Covid-19 in those who present to UK A&E departments. Develop further into how best to “cohort” patients during this pandemic to minimise transmission within the hospital.

Background:
UK hospitals are increasingly managing patients with SARS-CoV2 infection. Patients with suspected or confirmed Covid-19 are often cared for on specific "cohort" wards. Real clinical experience of Covid-19, given it is a novel disease, is currently in its infancy. Using available data to assist clinical decision-making during this early phase may help facilitate optimal management.

Method:
Further detail at: www.CovidCalculatorUK.org/methods.html
Using the method described by Prof. Sackett in the JAMA rational clinical examination series (PMID: 1573753). Base principle: Post-test odds = Pre-test odds x Likelihood ratio

Pre-test odds estimated through number of positive tests in preceding 72-hour period divided by the number of ED attendances per day in recent weeks (from Gov.UK). This generates an approximation of the daily prevalence of Covid-19 in the A&E presenter population. Likelihood ratios calculated by comparing historical attributes of Covid-19 negative UK A&E presenters (from published studies) and comparing them to presenting attributes in Covid-19 positive patients presenting to hospital (available from Chinese publications, largest of which is Guan et al. 2020 PMID: 32109013, UK data is currently unpublished). Given the delay from swabbing to gaining results and reporting to Gov.UK the model projects the estimated prevalence forwards by 48 hours.

Model translated into user-friendly online calculator which uses the following inputs: geographical region, fever, cough, chest x-ray abnormality, $\%O_2$ inhaled, white cell count or lymphocyte count, chest CT scan abnormality and Covid-19 swab result. Options: “positive”/“negative”/“not done” for each input.
http://www.CovidCalculatorUK.org/

The calculator then provides an estimate of an individual patient’s probability of being Covid-19 positive.

Results:
Operational version of the calculator is online with an explanation of methods and a disclaimer. It is updated with the daily regional Gov.UK data.

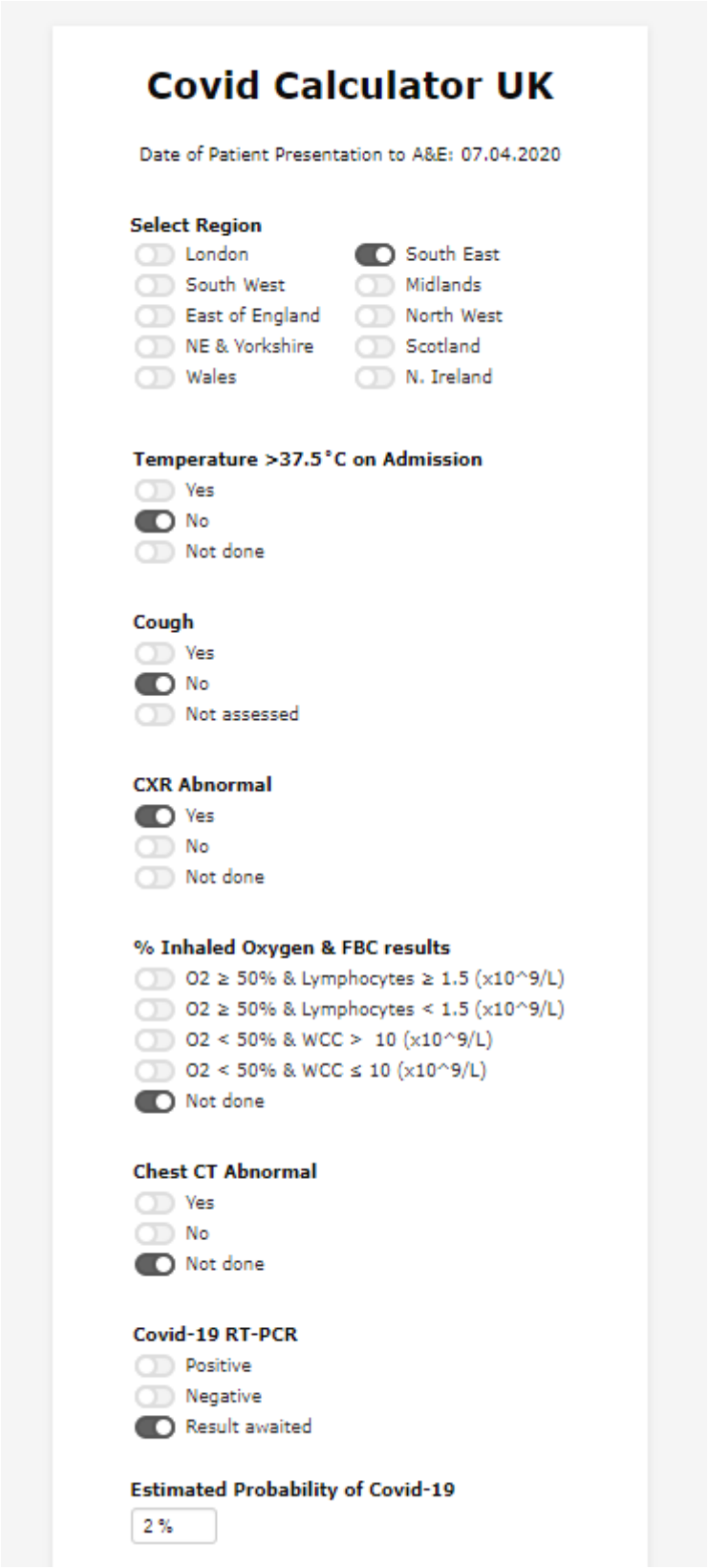
Strengths:
Simple online interface. Based on best available data.
Adds to clinical decision-making when clinical experience is relatively early in development.
Feedback from two Professors of evidence-based medicine has been positive.

Weaknesses:
Data compares different populations.
Each input is an estimate, the output probability may not be accurate. It is not currently validated.
Cognitive dissonance in physicians often leads to disbelief of models in favour of clinical acumen.
Misuse of the calculator (in non-hospital presenters) over-represents prevalence in the population.

Moving Forwards:
1. Validation of calculator output and comparison with acute medical Registrars and Consultants – how does the calculator compare to clinical feeling on the estimated probability of Covid-19.
2. Modelling how to optimally cohort patients of differing probabilities to minimise transmission within the hospital.
3. Incorporate UK population data on Covid-19 presenting features as it becomes available.

G. Chapman
07.04.20

Screenshot from www.CovidCalculatorUK.org



Covid Calculator UK

Date of Patient Presentation to A&E: 07.04.2020

Select Region

- ○ London
- ○ South West
- ○ East of England
- ○ NE & Yorkshire
- ○ Wales
- ● South East
- ○ Midlands
- ○ North West
- ○ Scotland
- ○ N. Ireland

Temperature >37.5˚C on Admission

- ○ Yes
- ● No
- ○ Not done

Cough

- ○ Yes
- ● No
- ○ Not assessed

CXR Abnormal

- ● Yes
- ○ No
- ○ Not done

% Inhaled Oxygen & FBC results

- ○ O2 ≥ 50% & Lymphocytes ≥ 1.5 (x10^9/L)
- ○ O2 ≥ 50% & Lymphocytes < 1.5 (x10^9/L)
- ○ O2 < 50% & WCC > 10 (x10^9/L)
- ○ O2 < 50% & WCC ≤ 10 (x10^9/L)
- ● Not done

Chest CT Abnormal

- ○ Yes
- ○ No
- ● Not done

Covid-19 RT-PCR

- ○ Positive
- ○ Negative
- ● Result awaited

Estimated Probability of Covid-19

2 %