Lumeris' COVID-19 Predictive Analytics

We understand that you, your staff, and your community are under stress during this time and we wish to do our part to help you care for your most vulnerable patients. We know that in some communities, PCPs and clinic staff are being **under-utilized or furloughed**; we see opportunities for those teams to support proactive management to keep people as healthy as possible and at home. This proactive engagement can help reduce constraints on valuable hospital beds and essential medical equipment such as ventilators.

Lumeris' COVID-19 response solution (summarized here) includes our COVID-19 predictive analytics program, and here we provide links to our code repository, and offer the actual COVID-19 predictive model for free within your own EHR. We created and published a simple predictive model that identifies patients at high risk of hospitalization due to existing conditions, who are also at risk for severe disease and death due to coronavirus infection. It can be deployed easily within the EHR and used by staff or be used as the basis for automated outreach campaigns or messaging via a patient portal (for example, MyChart).

This proactive outreach can free up hospital bed capacity: For example, given an organization whose proactive outreach to the predicted highest risk tier (top 1% highest risk) can reduce hospitalizations by 25%, **every 100 people proactively engaged will save 42 bed days/month.**

The model accuracy isn't perfect, but it's better than what we've found published elsewhere. Using the same assumptions as above, we expanded upon a model built from data published March 11 in The Lancet that, if deployed as-is, would save 24 bed days/month. Finally, applying the same outreach assumptions but simply guessing would most likely only save about 3 bed days/month.

Of course proactive outreach driven by our predictive model won't solve the entirety of the COVID-19 crisis, but we are hopeful that there is benefit to freeing up some beds.

Instructions for implementation within your EHR

This algorithm was designed to be easily input into your EHR and surfaced in a number of patient registries and worklists you use to prioritize outreach according to each person's composite risk stratification score. There is a 2-step process to implement this risk algorithm in your EHR, where you create a registry using the table below whereby each person gets points depending on his/her:

1) Age category, and
2) Conditions present in the past 12 months.

We found that people who have about 403 points or more correspond to the Top 1% highest risk group; people who have 201 or more points correspond to the Top 5% highest risk group. **We recommend starting outreach to everyone with 403 points or higher.** When ready, then proceed to the next tier contacting people with 402 points, and so on, down to people with 201 points.

On the next page is a table that contains the "COVID-19 Predictive Model". The table contains the age categories and conditions, and the points to apply to each person, to create the composite risk stratification score. In case it helps, for each condition we also included the HCUP category. This table is also downloadable in Excel here.

Components	Points
Under 20 years old	-76
Age 20 to 64 years old	27
Age 65 and older	46
1 or more ED visits in prior year	8
1 or more IP hospitalization in prior year	45
Abnormal findings without diagnosis in prior year (HCUP CCSR Category: SYM017)	6
Aplastic anemia in prior year (HCUP CCSR Category: BLD003)	1
Chronic obstructive pulmonary disease and bronchiectasis in prior year (HCUP CCSR Category: RSP008)	157
Coronary atherosclerosis and other heart disease in prior year (HCUP CCSR Category: CIR011)	41
Diabetes mellitus with complication in prior year (HCUP CCSR Category: END003)	21
Diabetes mellitus without complication in prior year (HCUP CCSR Category: END002)	42
Essential hypertension in prior year (HCUP CCSR Category: CIR007)	51
Fluid and electrolyte disorders in prior year (HCUP CCSR Category: END011)	46
Heart failure in prior year (HCUP CCSR Category: CIR019)	39
Implant, device or graft related encounter in prior year (HCUP CCSR Category: FAC009)	32
Osteoarthritis in prior year (HCUP CCSR Category: MUS006)	17
Respiratory failure; insufficiency; arrest in prior year (HCUP CCSR Category: RSP012)	4
Secondary malignancies in prior year (HCUP CCSR Category: NEO070)	37

When complete it should look something like the table below with points for each patient. And as an example, it should look like the inset for illustrative patient Paul Molive who is 51 yo, and who in the last 12 months had 3 hospitalizations, and the medical conditions listed below (across a combination of inpatient and outpatient/ambulatory services):

Patient Name	Date of Birth	COVID-19 Risk of Hospitalization
Mario Speedwagon	7/7/1948	507
Petey Cruiser	6/6/1979	42
Paul Molive	2/8/1969	407
Anna Sthesia	5/1/1973	293
Anna Mull	5/11/1967	368
Gail Forcewind	1/22/1997	117

407 — **Lumeris' COVID-19 Risk of Hospitalization**
This risk score calculates a patient's risk for unplanned hospitalization due to COVID-19.

Points	Metrics
27	Age: 51
45	1 or More IP Hospitalization in Prior Year
157	COPD and Bronchiectasis in Prior Year
42	Diabetes Mellitus without Complications in Prior Year
46	Fluid and Electrolyte Disorders in Prior Year
51	Essential Hypertension in Prior Year
39	Heart Failure in Prior Year

Paul Molive has a score of 407 points, and since this person has >403 points, this person is in Top 1% of hospitalization and might benefit from proactive outreach.

Suggestions for outreach

There are several approaches one can take for outreach such as by phone, text, or the patient portal. We have outlined an approach here and we encourage others to share their suggestions on our community wiki here or by emailing info@lumeris.com.

Example: Phone outreach
If the outreach is by phone, a member of your clinical or social work staff can simply start the call conversationally, and after introducing her/himself ask,

1) How are you feeling today?
2) Is there anything we can do to help?
3) How many days of medication do you have left before you need a refill?
4) Are you worried about running out of food?

Through the course of the conversation, they'll want to:

- Determine the current status of existing chronic conditions and address any new problems, and the appropriate level of care associated with those symptoms.
- Learn if the patient has adequate medication quantities and supplies.
- Discuss any barriers that may prevent the patient from maintaining appropriate social/physical distancing, for example, getting groceries.
- Provide emotional or social support.
- Educate the patient on how and when to call the clinic for any problems.

If the outreach is by phone, we recommend scheduling time for a follow-up call. We recommend calls weekly for the next few weeks to see if there is a change in status.

Variations in the above approach can be used if outreach is via other modes such as text messages, letters, telehealth, or the EHR patient portal, or some combination.

Additional information about the COVID-19 predictive analytics, included detailed demographics, and performance data, is available in this Read Me file.

Please feel free to contact us at info@lumeris.com if you have any questions or suggestions or if you want to be added to the list for when we publish updates.

Note: The COVID-19 predictive analytics program and the information described herein is not intended or implied to be a substitute for professional medical advice, diagnosis or treatment.