

Lumeris' COVID-19 Hospitalization Index

Predicting likelihood of hospitalization during the pandemic

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 52 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.

Once people are scored and ranked highest to lowest, we recommend engaging with the people who are in the Top 1% of the list (the number of points that this corresponds to will vary between organizations). If resources are unavailable to proactively engage with the Top 1%, it is ok to engage with fewer (just start at the top of the list and go down). Conversely, if you have resources to engage with more people, our scenario modeling shows that it may be beneficial to proactively engage with the Top 5%, and possibly even more if the proactive service is relatively inexpensive and/or particularly effective.

Table below is the model for the “COVID-19 Hospitalization Index”. 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](#).

Item	Component	HCUP Category	Points
1	Age under 21		-269
2	Age 55 to 64		41
3	Age 65 to 80		79
4	Age over 80		136
5	# ED Visits in Previous Year		26
6	# Hospitalizations in Previous Year		100
7	Abnormal findings without diagnosis	SYM017	4
8	Aplastic anemia	BLD003	32
9	Asthma	RSP009	16
10	Cardiac dysrhythmias	CIR017	30
11	Chronic obstructive pulmonary disease and bronchiectasis	RSP008	146
12	Coronary atherosclerosis and other heart disease	CIR011	57
13	Diabetes mellitus with complication	END003	49
14	Diabetes mellitus	END002	21
15	Essential hypertension	CIR007	41
16	Fluid and electrolyte disorders	END011	56
17	Heart failure	CIR019	72
18	Hepatitis	INF007	47
19	HIV infection	INF006	50
20	Immunity disorders	BLD008	48
21	Implant, device or graft related encounter	FAC009	50
22	Obesity	END009	25
23	Osteoarthritis	MUS006	49
24	Other specified and unspecified liver disease	DIG019	39
25	Respiratory failure; insufficiency; arrest	RSP12	1
26	Secondary malignancies	NEO070	111

* Note: Everyone with diabetes gets 21 points and anyone who has "diabetes with complications" gets an additional 49 points (70 points total).

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 <u>Speedwagon</u>	7/7/1948	507
Petey Cruiser	6/6/1979	42
Paul <u>Molive</u>	2/8/1969	536
Anna <u>Sthesia</u>	5/1/1973	293
Anna Mull	5/11/1967	368
Gail Forcewind	1/22/1997	117

536

Lumeris' COVID-19 Risk of Hospitalization
This risk score calculates a patient's risk for unplanned hospitalization

Points	Metrics
0	Age: 51
200	2 IP hospitalizations
146	COPD
21	Diabetes w/o complications
56	Fluid and electrolyte disorders
41	Essential hypertension
72	Heart failure

In this illustrative population, the Top 1% corresponds to 400 points and therefore it is likely that Paul Molive will likely 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 (see table below with options) 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.

Table below illustrates decentralized and centralized health system resources that can be utilized for outreach.

Additional information about the COVID-19 Hospitalization Index analytics and usage is available in this [Read Me file](#) and [FAQs](#). 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 Hospitalization Index and predictive analytics program and the information described herein is not intended or implied to be a substitute for professional medical advice, diagnosis or treatment.

Model provided under Lumeris' open source license that is available at <https://github.com/Lumeris-Health/Covid/blob/master/LICENSE>

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	Decentralized			Centralized
	System Level	CIN-Level	Independent Physician Level	Systemwide Level
Resources for Outreach	Care managers	Care managers	Varies by practice	Clinical staff
	Case managers	Case managers		Social workers
	Call teams	Call teams		
		Medical assistants		