Welcome to the Front Lines of the Fight Against COVID-19

A TOWN HALL CONVERSATION II

We will begin at 11 a.m.
OVERVIEW & AGENDA

• Testing
• Status of Frontline Healthcare Workers
• Treatment
• RT-PCR
• Serology (antibody)
• Rapid Antigen
Coronavirus testing methods

PCR* test to detect presence of virus in body

1. A swab collects a sample from the back of the throat
2. In the lab any viral RNA is separated from other molecules present
3. An enzyme called reverse transcriptase changes the RNA into a strand of DNA
4. In a PCR machine the DNA is duplicated many times so it can be detected with a fluorescent dye

Antibody test to detect immune response to earlier infection

1. A blood sample is taken
2. If the subject has been infected, their blood will contain antibodies to the virus
3. Antibodies are proteins produced by white blood cells that bind to the virus and disable it
4. A positive test indicates that the patient’s immune system has responded to past infection

Nasopharynx: Area where throat meets soft palate

Coronavirus genes are encoded in RNA rather than the DNA used by the human genetic code

*Polymerase chain reaction

Source: https://www.ft.com/content/0faf8e7a-d966-44a5-b4ee-8213841da688
COVID-19 TESTING BY STATE

Test per 1M Population

Number Tested per 1M Population

<table>
<thead>
<tr>
<th>State</th>
<th>Tests per 1M Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>CA</td>
<td>9,590</td>
</tr>
<tr>
<td>AZ</td>
<td>13,206</td>
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<tr>
<td>KS</td>
<td>13,783</td>
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<td>OH</td>
<td>14,429</td>
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<tr>
<td>VA</td>
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<td>CO</td>
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<tr>
<td>MO</td>
<td>15,610</td>
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<tr>
<td>SC</td>
<td>15,634</td>
</tr>
<tr>
<td>TX</td>
<td>16,136</td>
</tr>
<tr>
<td>NC</td>
<td>16,196</td>
</tr>
</tbody>
</table>

🌟 Texas

Data as of May 6, 2020

https://www.worldometers.info/coronavirus/#countries
• Only test approved for diagnosing infection with SARS-CoV-2
• Results are dependent upon sampling technique and viral burden at time sample taken
• Sources for testing include nasopharyngeal swab (most common), sputum, BAL fluid, oropharyngeal swab, nasal swab, saliva
• Best test is RT-PCR on high quality specimen (NPS or lower respiratory)
• There are multiple different RT-PCR assays available currently
• HM uses multiple different RT-PCR assays for SARS-CoV-2 right now
  – Hologic Panther Fusion
  – Cepheid Gene Xpert
  – BioFire
  – HM laboratory developed RT-PCR
• They all perform equally in HM lab (no one is better and results are concordant across platforms)
• We do this due to supply limitations
• We do not have Abbott ID Now
• Test for immune response to SARS-CoV-2
• Median time from onset of symptoms to Ab detection for SARS-CoV-2 is 12 days for IgM and 14 days for IgG
• Many different serologic tests available
• No current standardization or assurance of quality of the various assays
  – Concern for cross reactivity with other coronaviruses (HKU1, NL63, 229E, OC43)
• Two basic types are qualitative and quantitative
• HM approaches:
  – Launching a commercial lateral flow qualitative assay soon
  – Launching a commercial ELISA next
  – Working on a HM laboratory developed ELISA to be released soon - Quantitative
Revisions were made on May 3, 2020 to reflect the following:
• Updated recommendations for testing, specimen collection, and reporting patients and reporting positive test results
• Specification of testing priorities:

**High Priority**
• Hospitalized patients with symptoms
• Healthcare facility workers, workers in congregate living settings, and first responders with symptoms
• Residents in long-term care facilities or other congregate living settings, including prisons and shelters, with symptoms

**Priority**
• Persons with symptoms of potential COVID-19 infection, including: fever, cough, shortness of breath, chills, muscle pain, new loss of taste or smell, vomiting or diarrhea, and/or sore throat
• Persons without symptoms who are prioritized by health departments or clinicians, for any reason, including but not limited to: public health monitoring, sentinel surveillance, or screening of other asymptomatic individuals according to state and local plans

<table>
<thead>
<tr>
<th>Region</th>
<th>Location</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>North</td>
<td>Rayford</td>
<td>25305 Interstate 45 N, Spring, TX 77380</td>
</tr>
<tr>
<td>South West</td>
<td>Riverstone</td>
<td>18717 University Blvd Suite 105, Sugar Land, TX 77479</td>
</tr>
<tr>
<td>Central</td>
<td>Spring Branch</td>
<td>8333 Katy Freeway, Houston, 77024</td>
</tr>
<tr>
<td>North West</td>
<td>Tomball</td>
<td>14211 FM 2920 Suite 110 Tomball, TX 77377</td>
</tr>
<tr>
<td>South East</td>
<td>Friendswood</td>
<td>107 Woodlawn Dr. #101 Friendswood, TX 77546</td>
</tr>
<tr>
<td>East</td>
<td>Mont Belvieu</td>
<td>8608 North, TX-146 Ste. 600, Baytown, TX 77523</td>
</tr>
</tbody>
</table>
STATUS OF HM FRONT LINE HEALTH CARE WORKERS

- HM conducted surveillance testing for frontline staff, about 150 employees daily
- Testing rotated through frontline units caring for SARS-CoV2 infected patients throughout the system

**Screened Sites:**
- HMH EDs (Main, Kirby, Voss, Pearland)
- HMWB (ICU, ED, NICU)
- HMTW (ICU, ED, exposure areas)
- HMH ICUs (MICU, NICU, CVICU)
- HMSL (ICU, ED, NICU)
- HMW
- HM CCC
- HM HIDU
- Baytown, Clear Lake, HM MICU and NICU
- HMH Acute COVID units (M8, M4)

**Ongoing:**
- Doctor’s Days
SURVEILLANCE RESULTS

• Total Screened to date: **2228**
  • Surveillance arm: 108/1,977 (5.46%)
  • Clinical control arm: 1/84 (1.19%)
  • Administrative control arm: 0/82 (0%)
  • Teacher control arm: 0/85 (0%)

• Total Positive: **109 (4.89%)**

• Doctor’s Day
  – 1st day: 4/30 and 0/80 screened were positive

• Henry Ford Article
  – *We are not Immune, Henry Ford Health says 734 employees positive for COVID-19*
At present no drug has been proven to be safe and effective for treating COVID-19.

There are insufficient data to recommend either for against the use of any antiviral or immunomodulator therapy in patients with COVID-19.

No PrEP is recommended outside of clinical trial.

No PEP is recommended outside of clinical trial.

https://covid19treatmentguidelines.nih.gov/
• Among patients who have been admitted to the hospital with COVID-19, the IDSA guideline panel recommends:
  – Hydroxychloroquine/chloroquine in the context of a clinical trial (knowledge gap)
  – Hydroxychloroquine/chloroquine plus azithromycin only in the context of a clinical trial (knowledge gap)
  – Lopinavir/Ritonavir only in the context of a clinical trial (knowledge gap)
  – Tocilizumab only in the context of a clinical trial (knowledge gap)
  – COVID-19 convalescent plasma in the context of a clinical trial (knowledge gap)

• Among patients who have been admitted to the hospital with Pneumonia due to COVID-19, the IDSA guideline panel recommends against the use of corticosteroids (conditional recommendation, low certainty of evidence)

• Among patients who have been admitted to the hospital with ARDS due to COVID-19, the IDSA guideline panel recommends the use of corticosteroids in the context of a clinical trial (knowledge gap)


• Two additional guidelines on diagnostic testing and infection prevention are under development
COVID-19 SUPPORTIVE CARE

- Prone positioning
- Judicious hydration
- Supplemental oxygen-delayed intubation
Hypothesized Phases of COVID-19 Infection

- **Stage I** (Early Infection)
  - Viral response phase
  - Clinical Symptoms: Mild constitutional symptoms, Fever >99.6°F, Dry Cough, diarrhea, headache
  - Clinical Signs: Lymphopenia, increased prothrombin time, increased D-Dimer and LDH (mild)

- **Stage II** (Pulmonary Phase)
  - IIA
  - IIB
  - Host inflammatory response phase
  - Potential Therapies: Remdesivir, chloroquine, hydroxychloroquine, convalescent plasma transfusions, Reduce immunosuppression

- **Stage III** (Hyperinflammation Phase)
  - ARDS, SIRS/Shock, Cardiac Failure
  - Elevated inflammatory markers (CRP, LDH, IL-6, D-dimer, ferritin)
  - Troponin, NT-proBNP elevation

Potential Therapies:
- Remdesivir, chloroquine, hydroxychloroquine, convalescent plasma transfusions
- Reduce immunosuppression
- Corticosteroids, human immunoglobulin, IL-6 inhibitors, IL-2 inhibitors, JAK inhibitors
HM SARS-COV-2 / COVID-19 TREATMENT ALGORITHM

This is a guidance document only and is not a replacement for clinical judgement in a multidisciplinary collaborative.

Confirmed POSITIVE SARS-COV-2 (COVID-19) PCR

All COVID-19 patients should receive chemical VTE prophylaxis unless contraindicated (guide).

Acute Care

Mild S/Sx
Fever, cough, URI

Moderate S/Sx
SpO2 > 94% NA

Level of Care

Critical Care

Severe S/Sx
SpO2 < 94% RA, RR > 24, O2 req’d, imminent Resp Fail, Shock

Evaluate patient for inclusion in COVID Study Protocols

Remdesivir Study Criteria:
- > 18 years
- PCR test ≤ 4 days of 1st possible test collection at time of study enrollment at HMH
- Radiographic evidence of pulmonary infiltrates
- SpO2 ≤ 94% on room air OR requiring supplemental oxygen
- OR mechanical ventilation and/or extracorporeal membrane oxygenation (ECMO) ≤ 5 days
- ALT or AST ≤ 5x upper limit of normal
- Creatinine clearance > 50 mL/min.
- No disqualifying medications or disqualifying enrollment in a clinical trial
- If the patient meets criteria, contact the on-call study team at: 281-900-7330. See Accessing Remdesivir at HMH on Page 2 for details.

NOTE: At this time, Remdesivir via the FDA’s Emergency Use Authorization (EUA) is not available for HM.

Consult Infectious Diseases and/or Pulmonology

Risk Factors for Progression

Age ≥ 60
- Radiological progression
- Pre-existing Lung Disease

No Risk Factors

HCO should only be considered based on Risk/Benefit (safety monitoring required).

With ANY Risk Factors:

Assess Inflammatory Lab Bundle
- LGS ≥ 11-45
- Ferritin
- CRP > D-dimer
- Fibrinogen
- PT, aPTT, LDH
- TG

HCO should only be considered based on Risk/Benefit (safety monitoring required).

Consider Tocilizumab if ≥ 2 of the following:
- SpO2 > 90% RA
- ALC ≤ 800
- Ferritin > 1000
- CRP > 24
- D-dimer
- LDH > 24
- If > 90 or ≤ 93 in 24hrs
- IL-6 > 20 or > 10 in 24hrs
- TNF or IL-1 in 24hrs

Notes: see page 2 for considerations prior to initiating modulation

Immune Modulation [see COVID CRS Score page 2]

Consider Tocilizumab or moving to next agent (eg, Anakinra)

Upon admission to ICU:
- Lactate, LFTs, blood cross & type, Troponin, EKG (baseline QTCs)
- Daily: CRP, Ferritin, LDH, LFTs, Mg, Phos, CBC, diff, BMP
- EKG if on multiple agents that prolong QTC

Contact William Musick, PharmD (832-474-4749, wmusick@houstonmethodist.org) with questions and/or updates.

https://hrportal.ehr.com/houstonmethodist/Home/COVID-19-Resources-for-Employees-and-Physicians
### Accessing Remdesivir at HM:
The FDA granted Remdesivir an Emergency Use Authorization (EUA) on 5/1/20. Until Remdesivir becomes available through the EUA program, the **only means for HM patients to receive Remdesivir is through a clinical trial protocol active at HMH/TMC.**

Non-HMH/TMC physicians wanting their patient to receive Remdesivir may consider a patient transfer to HMH/TMC for study enrollment.

Call the Remdesivir on-call study team (281-900-7380) for a remote evaluation of the patient **before transfer request.**

If qualified, the treating physician should coordinate transfer through the **HM Transfer Center (713-441-6804).**

Providers and patients must understand that patient consent and enrollment must occur at HMH/TMC and within 4 days of the positive COVID PCR result. It is **possible that the patient may no longer meet criteria between the time of initial request for transfer and attempt to consent at HMH.**

### COVID Treatment in Pregnancy, Pediatrics and Neonates:
Pregnancy should not, in and of itself, be considered a contraindication for any treatment that would be considered for the non-pregnant COVID-19 patient.


### HM COVID ICU CRS SCORE

<table>
<thead>
<tr>
<th>Clinical Criteria (C)</th>
<th>Score</th>
<th>Inflammatory Markers (IM)</th>
<th>Score</th>
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<tbody>
<tr>
<td>P/F ratio (on PEEP&gt;5)</td>
<td>200-300</td>
<td>0</td>
<td>CRP (&gt;10 mg/dl)</td>
</tr>
<tr>
<td>100-200</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;100</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PEEP &gt;12</td>
<td>1</td>
<td>CRP (&gt;10 mg/dl)</td>
<td>1</td>
</tr>
<tr>
<td>Fever &gt; 100.4 (within past 12 hrs.)</td>
<td>1</td>
<td>Ferritin (&gt;1000 mg/mL)</td>
<td>1</td>
</tr>
<tr>
<td>Cardiovascular</td>
<td></td>
<td>LDH (&gt;350 U/L)</td>
<td>1</td>
</tr>
<tr>
<td>MAP&gt;70</td>
<td>0</td>
<td>D-Dimer (&gt;10 mg/dl)</td>
<td>0.5</td>
</tr>
<tr>
<td>MAP&lt;70 or new pressor requirement</td>
<td>1</td>
<td>Triglycerides (&gt;350 mg/dl)</td>
<td>0.5</td>
</tr>
<tr>
<td>Fibrinogen (&gt;200 mg/dL)</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**SCORING**

- C ≥ 2 + IM ≥ 2
- 18-24 hrs. re-assessment
- No clinical improvement - repeat tocilizumab x1
- 36-48 hrs. re-assessment
- No clinical improvement - escalate to Anakinra + Infliximab
- 60-72 hrs. re-assessment
- Consider investigational interventions

### Considerations prior to Immune Modulation:
- Assess risk for TB and/or invasive fungal infection
- Assess for pre-existing GI disease (diverticulitis, IBD, etc)
- Monitor hepatic function
- Monitor for anaphylactic and/or infusion reactions
- Discuss with unit pharmacist
- Evaluate for other causes of hypoxemia – fluid status, bacterial co-infection

### SARS-CoV-2/COVID-19 Virus-directed Therapy

<table>
<thead>
<tr>
<th>Agent</th>
<th>Dosing</th>
<th>Selected References &amp; Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydroxychloroquine (HCQ), oral (See QTc monitoring below)</td>
<td>800mg x 1 dose, then 400mg daily x 4d (5d total)</td>
<td><a href="https://bit.ly/3eW1A0E">link</a> <a href="https://bit.ly/2mz2rYh">link</a> <a href="https://bit.ly/3ba5xYy">link</a> <a href="https://bit.ly/20vafyY">link</a></td>
</tr>
<tr>
<td>Lopinavir/ritonavir (LPVr), oral <em>alternative if within 7 days of onset of S/Sx</em></td>
<td>400/100mg BID x 10days</td>
<td><a href="https://bit.ly/2UK5cn7">link</a> <a href="https://bit.ly/2mz2rYh">link</a></td>
</tr>
<tr>
<td>Remdesivir, IV (RDV)</td>
<td>200mg day 1 then 100mg daily x 9days</td>
<td><a href="https://bit.ly/2mz2rYh">link</a> <a href="https://www.fda.gov/media/137564/download">link</a></td>
</tr>
</tbody>
</table>

### Immune Modulating Agents

<table>
<thead>
<tr>
<th>Agent</th>
<th>Dosing</th>
<th>Selected References &amp; Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anakinra, subQ</td>
<td>100mg subQ x 1 dose</td>
<td><a href="https://bit.ly/3eW1A0E">link</a></td>
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<tr>
<td>Infliximab, IV</td>
<td>5 mg/kg x 1 dose</td>
<td><a href="https://bit.ly/3eW1A0E">link</a></td>
</tr>
<tr>
<td>Tocilizumab, IV</td>
<td>400mg (flat dose) x 1 dose</td>
<td><a href="https://bit.ly/3eW1A0E">link</a></td>
</tr>
</tbody>
</table>

- All medications herein constitute off-label prescribing per FDA indications.
- Per HM P&T prescribing of HCQ, RBV, LPVr and Tocilizumab for COVID-19 are RESTRICTED to Infectious Diseases, Pulmonology, and Critical Care providers.
- In the event a patient has improved and is pending discharge, there is NO NEED to complete a full course of any virus-directed medications.

### Guidance for QTc Monitoring in COVID-19 Patients on HCQ

**NOTE: Combined Azithromycin and Hydroxychloroquine are NOT recommended**

- Baseline EKG on all COVID-19 patients if considering HCQ tx
- Reserve daily EKG monitoring for high-risk patients with multiple risk factors
- Female, advanced age, multiple TOc prolonging meds, underlying heart disease, impaired renal/hepatic function, baseline prolonged QTc, bradycardia
- In patients with none of the above risk-factors, telemetry monitoring may be considered appropriate in lieu of daily EKG (risk of technician exposure and/or transmission)
- Consider discontinuation of all non-essential QTc prolonging home medications
- Discontinue daily EKGs upon completion of virus-directed COVID treatment

### General Guidance & Resources:

- **HM Isolation for COVID-19**
- **HM COVID-19 Resources**
- **HM COVID Patient Triage**
- **CDC COVID-19 Resources**
TREATING COVID-19 WITH DRUGS AND ANTIBODIES

Houston Methodist Research Overview

Dirk Sostman MD FACR
Chief Academic Officer
NIAID REMDESIVIR TRIAL

• Prospective, randomized, placebo controlled clinical trial
  – 1063 severe patients at 68 sites
  – Time to recovery 11 days vs 15 (p < 0.001)
  – Mortality rate 8% vs 11.6% (p = 0.059)

• Contrast to unsuccessful trial in China
  – 237 severe patients
  – Time to recovery 21 days vs 23 (NS)
  – Mortality rate 14% vs 13% (NS)
DRUG TREATMENT FOR COVID-19

 Targets cysteine protease and clathrin mediated endocytosis

S-001

Inhibits TMPRSS2
Prevents viral cell entry

Camostat mesylate

Chloroquine
Hydroxychloroquine

Inhibits viral entry and endocytosis by multiple mechanisms as well as host immunomodulatory effects

Tocilizumab
Sarilumab

Binds IL-6 receptor
Prevents IL-6 receptor activation
Inhibits IL-6 signaling

Soluble IL-6 receptor

SARS-CoV-2

Macrophage

ACE2 receptor

TMPRSS2

IL-6

Exocytosis

Assembly

Structural proteins

Translation

RNA synthesis

RNA-dependent RNA polymerase (RdRp)

Uncoating

Lopinavir
Darunavir

Inhibits 3-chymotrypsin-like protease

Ribavirin
Remdesivir
Favipiravir

Inhibits viral RdRp

Polypeptides

Proteolysis

Nonstructural proteins

RNA

jama.2020.6019
Published online April 13, 2020.
HOUSTON METHODIST TREATMENT TRIALS

• Remdesivir (Gilead trial)
  – Moderately ill patients: 9 treated / 7 discharged
  – Severely ill patients: 48 treated / 28 discharged

• Other drugs for inpatients
  – Nitric oxide compassionate use: 3 treated
  – Hydroxychloroquine emergency compassionate use: 100 treated

Subject to rapid change
• Cytokine Release Syndrome – immune response modulation
  – Cell therapies (mesenchymal stem cells; CAR-T cells)
  – Monoclonal antibodies (anti-GM-CSF; anti-IL6; anti-C5)

• Outpatient drug trials – keep high risk patients from becoming severely ill
  – Proton pump inhibitors
  – Camostat
  – S-001
  – Nitric oxide

Subject to rapid change
Targets cysteine protease and clathrin mediated endocytosis

Tocilizumab
Sarilumab
Binds IL-6 receptor
Prevents IL-6 receptor activation
Inhibits IL-6 signaling

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Lopinavir
Darunavir
Inhibits 3-chymotrypsin-like protease

Ribavirin
Remdesivir
Favipiravir
Inhibits viral RdRp

RNA synthesis
RNA-dependent RNA polymerase (RdRp)
Nonstructural proteins
Proteolysis
Polypeptides
Translation
Assembly
Structural proteins
Exocytosis

S-001

Targets cysteine protease and clathrin mediated endocytosis

/jama.2020.6019
Published online April 13, 2020.
Targets cysteine protease and clathrin mediated endocytosis

Camostat mesylate

Inhibits TMPRSS2
Prevents viral cell entry

S-001
Antibody treatment for COVID-19

Antibodies bind to the virus and inactivate it ("neutralizing antibodies")

Antigens

Antigen
Antigen-binding site

Virus

Antibody
Convalescent Plasma: “Emergency Vaccination”
68 treated / 44 discharged
ANTIBODY TREATMENT PROJECT: PHASES

1. Emergency use: 4 patients [COMPLETE]
2. First IND: 50 patients [COMPLETE]
   - Severe illness
   - Safe and well tolerated
3. Next IND: 150 patients
   - Moderate illness: 50 patients
     • Confirm safety and compare outcomes to historical cohort
   - Randomized controlled trial
     • Random assignment of treatment / control with outcome measurements
4. Monoclonal antibody development
   - Can be standardized, stored and used like a drug

IND = Investigational New Drug
PHASE 4: MONOCLONAL ANTIBODIES

Development Process of COVID-19 Therapeutic Antibodies

01 Blood sample collection from recovered patients
02 Construction of human antibody gene libraries
03 Selection of therapeutic antibody candidates
04 Selection of final therapeutic antibody by neutralization test
05 Non-Clinical Study
06 Clinical Study
07 Production of therapeutics
PHASE 4: MONOCLONAL ANTIBODIES

1. Treat asymptomatic, high risk people
   a. Positive test for virus
   b. Documented exposure to virus

2. Treat symptomatic patients
   a. Fast acting – goal is to clear virus from blood rapidly
   b. Could be used alone or combined with anti-viral drug
THANK YOU!

• Dr. Salazar & Dr. Musser – Pathology and Genomic Medicine
• Dr. Grimes, Dr. Perez, Dr. Cortes – Infectious Disease & Pharmacy
• Inpatient Treatment Committee – Dr. Chang & many other volunteers
• Critical Care team
• Nursing, Respiratory Therapy
• Academic Office of Clinical Trials – Pauline Todd
• IRB – Dr. Miller, Mary Clancy
• Countless other researchers & support staff
• What is the current situation at Houston Methodist?

• Did stay at home orders and social distancing work and how do I make sense of all of the potentially conflicting data out there?

• Where do we go from here?

• How do we monitor the reopening?

• What are Houston Methodist’s reopening plans?
Houston Methodist COVID-19
Cases by Day

Houston Methodist - COVID-19
Patients by Day

Data as of May 6, 2020
Houston Methodist Current COVID-19 Stats

COVID-19 related patients through Houston Methodist as of May 6, 2020

Key Messages

- Houston Methodist has served 704 COVID-19 related inpatients to date.
- 536 patients have been successfully discharged.

Data as of May 6, 2020 at 10:30 pm
Spread of COVID-19

HOUSTON MSA\(^1\) PROGRESSION – IF IT FOLLOWS A SIMILAR TRAJECTORY TO OTHER REGIONS

Assumed start of epidemic take-off\(^2\): 3/20/2020

Simulation models can suggest higher attack rates due to multiple reoccurrences, adoption of public health measures, accounting for unidentified infections due to restrained testing practices, and modeling for longer durations.

Estimate of cumulative COVID-19 cases in county based on empirical data, \# of total infections\(^3\) on log scale

COVID-19 cases after epidemic take-off date based on empirical data and simulations (\# of people sick)

<table>
<thead>
<tr>
<th>Days since epidemic takeoff</th>
<th>Actual Houston MSA</th>
<th>Empirical Lombardy</th>
<th>Empirical New York City</th>
<th>Empirical Seattle (King County)</th>
<th>Empirical Wuhan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 10</td>
<td>898</td>
<td>1,099</td>
<td>200</td>
<td>1,099</td>
<td>1,099</td>
</tr>
<tr>
<td>Day 20</td>
<td>3,551</td>
<td>6,478</td>
<td>16,643</td>
<td>14,818</td>
<td>14,818</td>
</tr>
<tr>
<td>Day 30</td>
<td>6,653</td>
<td>15,787</td>
<td>52,783</td>
<td>26,732</td>
<td>26,732</td>
</tr>
<tr>
<td>Day 40</td>
<td>8,676</td>
<td>23,973</td>
<td>92,033</td>
<td>87,202</td>
<td>87,202</td>
</tr>
<tr>
<td>Day 50</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

1. The Houston-The Woodlands-Sugar Land Metropolitan Statistical Area (MSA) contains the following counties: Austin, Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery and Waller.
2. Defined as the first day where cases grew for 4 straight days.
3. Estimates based on Epidemiological curves from other regions applied against county populations; adjusted for demographics for all regions excluding Singapore.


Data as of May 6, 2020
Daily New Positive COVID-19 Cases in Greater Houston

Governor Leaves SAHOs to Counties

Four* Counties Issue SAHO

Brazoria County Issues SAHO

Galveston County Issues SAHO

Governor Issues State-Wide SAHO

Montgomery County Issues SAHO

Data as of May 6, 2020

Retail and Restaurants Reopen in Texas

Governor Eases Restrictions
Houston Methodist COVID-19 Cases by Day

Data as of May 6, 2020
Coronavirus Death Rates May Be Higher Than Reported

Excess deaths are deaths above what is historically expected for this period.

Sources: Overall death data comes from the National Center for Health Statistics, covid-19 death counts come from state health departments and are compiled by The Washington Post, and estimates for expected deaths come from Yale School of Public Health’s Modeling Unit.
United States - Causes of Death in 2017

<table>
<thead>
<tr>
<th>Cause of Death</th>
<th>Annual Crude Death Rate per 100,000 Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>All causes</td>
<td>863.8</td>
</tr>
<tr>
<td>Diseases of heart</td>
<td>198.8</td>
</tr>
<tr>
<td>Malignant neoplasms</td>
<td>183.9</td>
</tr>
<tr>
<td>Accidents (unintentional injury)</td>
<td>52.2</td>
</tr>
<tr>
<td>Chronic lower respiratory diseases</td>
<td>49.2</td>
</tr>
<tr>
<td>Cerebrovascular diseases</td>
<td>44.9</td>
</tr>
<tr>
<td>Alzheimer disease</td>
<td>37.3</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>25.7</td>
</tr>
<tr>
<td><strong>Influenza and pneumonia</strong></td>
<td><strong>17.1</strong></td>
</tr>
<tr>
<td>Nephritis, nephrotic syndrome and nephrosis</td>
<td>15.5</td>
</tr>
<tr>
<td>Intentional self-harm (suicide)</td>
<td>14.5</td>
</tr>
</tbody>
</table>
Nordic Countries Response to COVID-19

Nordic countries’ restrictions on daily life
How the countries’ handling of coronavirus has differed. Some of the restrictions listed below have since been lifted.

- **Open**
- **Some closed**
- **Closed/banned**

### Schools
- **Sweden**: Open
- **Denmark**: Closed
- **Norway**: Closed
- **Finland**: Closed

### Restaurants/bars
- **Sweden**: Open
- **Denmark**: Closed
- **Norway**: Closed
- **Finland**: Closed

### Hair salons
- **Sweden**: Open
- **Denmark**: Closed
- **Norway**: Closed
- **Finland**: Closed

### Large events
- **Sweden**: Open
- **Denmark**: Closed
- **Norway**: Closed
- **Finland**: Closed

[Graphic credits: Sarah Grace Mahanour and Henrik Pettersson, CNN]

Impact of COVID-19 on Nordic Countries

How does Sweden’s Covid-19 death rate compare to other Nordic countries?

Sweden has enforced far fewer restrictions during the pandemic, and has a higher death rate.

<table>
<thead>
<tr>
<th>Country</th>
<th>TOTAL REPORTED DEATHS</th>
<th>DEATHS PER 100K RESIDENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sweden</td>
<td>2,274</td>
<td>22</td>
</tr>
<tr>
<td>Denmark</td>
<td>427</td>
<td>7</td>
</tr>
<tr>
<td>Norway</td>
<td>206</td>
<td>4</td>
</tr>
<tr>
<td>Finland</td>
<td>193</td>
<td>4</td>
</tr>
</tbody>
</table>

Comparison – Deaths per 100,000 Population:
- Harris County: 3
- United States: 21.72
- New York City: 222
- Orleans Parish: 116
- Wayne, MI: 110

How does a society determine the morally and ethically “acceptable” death rate when balanced against economic viability?

## COVID-19 Death Rate by County

<table>
<thead>
<tr>
<th>County</th>
<th>Reported Deaths</th>
<th>Deaths per 100k Residents</th>
<th>Reported Cases</th>
<th>Cases per 100k</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harris</td>
<td>140</td>
<td>3</td>
<td>6,967</td>
<td>143</td>
</tr>
<tr>
<td>Fort Bend</td>
<td>28</td>
<td>4</td>
<td>1,187</td>
<td>134</td>
</tr>
<tr>
<td>Montgomery</td>
<td>15</td>
<td>3</td>
<td>340</td>
<td>97</td>
</tr>
<tr>
<td>Brazoria</td>
<td>7</td>
<td>2</td>
<td>566</td>
<td>138</td>
</tr>
<tr>
<td>Galveston</td>
<td>28</td>
<td>9</td>
<td>648</td>
<td>194</td>
</tr>
<tr>
<td>Liberty</td>
<td>1</td>
<td>1</td>
<td>46</td>
<td>51</td>
</tr>
<tr>
<td>Waller</td>
<td>-</td>
<td>-</td>
<td>33</td>
<td>57</td>
</tr>
<tr>
<td>Chambers</td>
<td>-</td>
<td>-</td>
<td>45</td>
<td>95</td>
</tr>
<tr>
<td>Washington</td>
<td>18</td>
<td>53</td>
<td>147</td>
<td>390</td>
</tr>
</tbody>
</table>

As of May 6, 2020

[https://dshs.texas.gov/coronavirus/](https://dshs.texas.gov/coronavirus/)
COVID-19 Deaths per 100,000 Population

Data as of May 6, 2020

https://coronavirus.jhu.edu/data/mortality
COVID-19 CFR Comparison

COVID-19 Case Fatality Rate by Country

Data as of May 6, 2020
New Cases Announced Each Day

New Reported Cases by Day
As the New York metro area has seen a recent decline in new cases, the number of cases in the rest of the United States has steadily increased.

New York metro area

Rest of the United States

Data as of May 5, 2020

https://www.nytimes.com/2020/05/05/us/coronavirus-deaths-cases-united-states.html
Comparing States Where New Cases Are Increasing, Decreasing, or Staying the Same

Where new cases are increasing
These states have had recent growth in newly reported cases. Scales are adjusted for each state to make the curve more readable.

Where new cases are mostly the same
The growth rate of the virus has appeared to slow in some states with a high number of cases, but a lack of widespread testing may mean that cases are being undercounted.

Where new cases are decreasing

Data as of May 5, 2020
New Cases Reported Each Day

“Whichever scenario the pandemic follows (assuming at least some level of ongoing mitigation measures), we must be prepared for at least another 18 to 24 months of significant COVID-19 activity, with hot spots popping up periodically in diverse geographic areas.”

- 1918-1919 Flu
- 1957-1958 Flu
- 2009-2010 H1N1 Flu
“Except where necessary to provide or obtain essential services or reopened services:

– minimize social gatherings;
– minimize in-person contact with people who are not in the same household;
– people over the age of 65 are strongly encouraged to stay at home as much as possible.”
Governor Abbott’s Executive Orders

Starting May 1, the governor’s order reopens (25% capacity limit):
  – Retail stores and malls
  – Restaurants
  – Movie theaters
  – Museums and libraries

Starting May 8, the governor’s order reopens (with restrictions):
  – Barbershops, hair salons, and nail salons

Starting May 18, the governor’s order reopens:
  – Gyms (with restrictions)
  – Non-essential services by office workers (25% capacity limit)
  – Non-essential manufacturing (25% capacity limit)

• Businesses that cannot open: bars
• Masks are encouraged, but are not mandated
## Proposed Early Warning Monitoring and Mitigation Metrics

<table>
<thead>
<tr>
<th>Monitoring metrics</th>
<th>Warning signals for Houston MSA</th>
<th>Current status</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICU bed occupancy</td>
<td>3-day trend of daily usage greater than 10% of current ICU bed capacity used by COVID-19 positive patients</td>
<td>- &gt;3 day trend of 10% COVID-19 positive occupancy</td>
</tr>
<tr>
<td>Daily new COVID-19 cases</td>
<td>7 consecutive days of &gt;200 new cases and increasing case growth(^1)</td>
<td>- Current 12% COVID-19 positive occupancy</td>
</tr>
<tr>
<td>COVID-19 case growth trend</td>
<td>5-day trend of:</td>
<td>- 0 consecutive days &gt;200 new cases; growth is nearly flat</td>
</tr>
<tr>
<td></td>
<td>• Upward trajectory of documented cases, or</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Upward trajectory of positive tests as a % of total tests</td>
<td></td>
</tr>
<tr>
<td>TMC System equipment &amp; PPE needs</td>
<td>• 300k N95 masks</td>
<td>- Monitoring 0 days of daily case volume growth</td>
</tr>
<tr>
<td></td>
<td>• 20M gloves</td>
<td>- TBD pending complete testing data</td>
</tr>
<tr>
<td></td>
<td>• 1.6M gowns</td>
<td></td>
</tr>
<tr>
<td>COVID-19 testing capacity (daily)</td>
<td>At least 5,000-10,000 PCR tests per day available for hospital patients and healthcare worker surveillance (with &lt;48 hour turnaround)</td>
<td>- 949K N95 masks</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- 31M gloves</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- 3.3M gowns (disposable + reusable)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- 6,609 PCR tests per day (maximum)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- ~2-48 hour turnaround time</td>
</tr>
</tbody>
</table>

\(^1\) Threshold may be adjusted based on availability and capacity of contact tracers.

Note: These warning signals are focused on ICM care of patients and healthcare workers and should be viewed in full context of testing and tracing efforts from public health officials.

\(\text{TMC} \text{ TEXAS MEDICAL CENTER}

"TMC" refers to the group of individual hospitals and institutions that make up Texas Medical Center.

This document is solely intended to share insights and best practices rather than specific recommendations. Individual institution data is shown as reported and has not been independently verified.
DAILY NEW COVID-19 CASES

Greater Houston Area

Monitoring threshold:
7 consecutive days of >200 new cases and increasing growth rate

Current status:
Houston MSA is currently at 0 days of >200 cases, with a flat week-over-week growth rate

TMC: TEXAS MEDICAL CENTER
*"TMC" refers to the group of individual hospitals and institutions that make up Texas Medical Center
Confirmed COVID-19 Lab Tests

Data as of May 6, 2020
Houston Methodist COVID-19 Admissions vs. Discharges

Data as of May 5, 2020
Governor Abbott’s April 27 Executive Order Impact on HM

- Hospitals are required to maintain 15 percent capacity for COVID-19 patients
- All licensed medical professionals can return to work
- At Houston Methodist, all employees and physicians will be expected to wear masks in public and inpatient care spaces
- All patients and essential visitors will be screened and should wear masks when entering our facilities
Trends for EMS Calls During COVID-19 Pandemic
Reduction in US Cardiac Cath Lab STEMI Activations During COVID-19

http://www.onlinejacc.org/content/early/2020/04/07/j.jacc.2020.04.011
COVID-19: Testing Information For Elective Surgeries And Procedures

Your safety is our number one priority. To help minimize risk of the spread of COVID-19, Houston Methodist is implementing the following measures:

• Your physician will determine if your procedure/surgery requires you to be tested for COVID-19
• If testing is required, your physician’s office will provide you information about scheduling your test
• The testing for COVID-19 must be performed at least five business days prior to your surgery/procedure
• It takes five days to get your results and we want to minimize the chances that you get COVID-19 during the time you test until the day of your surgery/procedure

Stay at home and avoid others (especially if you think they are sick) until your scheduled procedure/surgery

If you must go out in public during this time, like a doctor’s appointment, wear a mask and practice proper hand hygiene

• On the day of your testing:

Please wear a mask upon entry and at all times while in the hospital

You will be screened for a fever upon arrival at Houston Methodist

• Receiving your test results:

If you have a positive test result, you will be contacted by the hospital and given proper instructions

Negative results will be displayed in MyChart and/or you will be notified by your physician

Do not travel

If you are in need of groceries or food, we encourage you to use delivery services or have a family/friend pick the items up for you

Please practice social distancing

If you have a fever or if you are ill, you will be redirected to contact your physician for additional guidance or to utilize virtual urgent care
Increase in Telemedicine

Houston Methodist – Physician Organization
Virtual vs. Clinic Visits

Data as of May 5, 2020
Average Number of Outpatient Surgeries per Weekday

Average Weekday Outpatient Surgery Cases

- March 2-6
- March 9-13
- March 16-20
- March 23-27
- March 30 - April 3
- April 6-10
- April 13-17
- April 20-24
- April 27 - May 1
- May 4-5
Best Practices

- Stay Home When Possible
- Work From Home If Possible
- Practice Physical Distancing (6+ feet)
- Wear a Mask in Public
- Exceptional Hand Hygiene
- Minimize Contact in Common Areas (Break Rooms)
THANK YOU FOR ATTENDING OUR TOWN HALL CONVERSATION

To continue the conversation, please reach out to foundation@houstonmethodist.org

Take care and be well