## The number of COVID-19 confirmed cases, related deaths, and total tests reported for State and County

<table>
<thead>
<tr>
<th>Data Source</th>
<th>Last Updated</th>
<th>COVID-19 cases in Texas</th>
<th>COVID-19 cases in Harris County</th>
<th>COVID-19 related deaths in Texas</th>
<th>COVID-19 related deaths in Harris County</th>
<th>Total tests performed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Texas DSHS *</td>
<td>May 1, 2020, 12:00 PM</td>
<td>29,329</td>
<td>6,356</td>
<td>816</td>
<td>114</td>
<td>351,775 Texas</td>
</tr>
<tr>
<td>2. Johns Hopkins *</td>
<td>May 1, 2020, 7:32 AM</td>
<td>28,728</td>
<td>6,356</td>
<td>812</td>
<td>98</td>
<td>314,790</td>
</tr>
</tbody>
</table>

* DSHS updated the method of reporting COVID-19 cases in Texas on March 24, 2020 to provide the public with more timely information. The DSHS daily case count now includes all cases reported publicly by local health departments around the state.

* Data sources from WHO, CDC, ECDC, NHC, DXY, 1point3acres, Worldometers.info, BNO, state and national government health departments, and local media reports.

* Data represents total tests from private and public labs in Texas and Harris County, unless otherwise stated. N/A = not available

## COVID-19 in the greater Houston area

![Chart showing COVID-19 diagnoses in the greater Houston area](Source: County health authorities, Houston Chronicle reporting)
Please see Children’s Hospital of Philadelphia Policy Lab predictions of country-level cases if re-opening economy. [https://policylab.chop.edu/covid-lab-mapping-covid-19-your-community](https://policylab.chop.edu/covid-lab-mapping-covid-19-your-community)

***FDA Drug Safety Communication April 24th, 2020 [https://www.fda.gov/media/137250/download](https://www.fda.gov/media/137250/download)

- FDA cautions against use of hydroxychloroquine or chloroquine for COVID-19 outside of the hospital setting or a clinical trial due to risk of heart arrhythmias.
- The FDA is aware of reports of serious heart rhythm problems in patients with COVID-19 treated with hydroxychloroquine or chloroquine, often in combination with azithromycin and other QT prolonging medicines
  - Hydroxychloroquine and chloroquine can cause QT interval prolongation and ventricular tachycardia.
  - These risks may increase when these medicines are combined with other medicines known to prolong the QT interval
  - Patients with heart and kidney disease are likely to be at increased risk of these heart problems when receiving these medicines
- Hydroxychloroquine and chloroquine have not been shown to be safe and effective for treating or preventing COVID-19

**Articles:**


**Background:**

- Treatment guidelines are needed to inform physicians on optimal management of COVID-19
  - Will be updated frequently as more information becomes available
- High-risk individuals are identified as persons >65 yrs, those living in nursing homes and long-term care facilities, and/or individuals with poorly controlled hypertension, cardiovascular disease, pulmonary disease, diabetes, obesity, cancer, and kidney disease

**Methods:**

- Panel members are representatives from federal agencies, healthcare and academic organizations, and professional societies
  - Guidelines were made by a working group of panel members with expertise in the field, then reviewed, modified, and voted on by the entire panel
  - Grading system:
    - A-C (A: strong, B: moderate, C: weak recommendation)
    - I-III (I: one or more randomized controlled trials, II: one or more well-designed non-randomized trials or observational cohorts, III: expert opinion)

**Selected Recommendations:**

- General Treatment Recommendations:
  - Panel does not recommend pre-exposure prophylaxis outside a clinical trial (AIII)
  - Panel does not recommend post-exposure prophylaxis outside a clinical trial (AIII)
Panel does not recommend additional lab testing or specific treatment of suspected or confirmed asymptomatic or pre-symptomatic SARS-CoV-2 infection (AII)
- No drug has been confirmed safe or effective for treating COVID-19, and there are insufficient data to recommend for or against the use of any specific antiviral for mild, moderate, severe, or critical illness (AIII)
  - Similarly, there are insufficient data to recommend for or against the use of specific antivirals or immune modulators in pediatric patients (AIII)

• Pregnancy:
  - Currently, CDC recommends temporarily separating newborn infants from mothers who are persons under investigation (PUI) for SARS-CoV-2 or who have COVID-19 because of concern for transmission of SARS-CoV-2 to the infant
  - ACOG, CDC, and AAP support breastfeeding; recommend women intending to breastfeed should express milk with a dedicated pump & practice good hand hygiene before pumping
    - SARS-CoV-2 has not been isolated from breastmilk therefore the risk for transmission from breastmilk is considered nil, while the benefits of breastfeeding are considered to be important.

• Critical Care (For complete list of critical care recommendations, please visit their website)
  - Panel recommends norepinephrine as the first-choice vasopressor (AII)
  - Panel recommends dobutamine if persistent hypoperfusion despite adequate fluid loading and vasopressors (BII)
  - For adults with acute respiratory failure, the panel recommends HFNC over NIPPV (BII)
  - For mechanically ventilated adults with ARDS due to COVID-19, the panel recommends low tidal volumes (4-8 mL/kg of predicted body weight) over high tidal volumes (>8 mL/kg of predicted body weight) (AII)
  - For mechanically ventilated adults with refractory hypoxemia despite optimized ventilatory settings, the panel recommends prone ventilation for 12-16 hours per day (BII)
  - Panel recommends against routine use of corticosteroids without ARDS (BIII)

• Antiviral Therapy (Therapies Under Investigation)
  - If hydroxychloroquine or chloroquine is used (insufficient data to recommend for or against at this time), recommend monitoring QTc interval (AIII)
    - Panel does not recommend use of hydroxychloroquine plus azithromycin or lopinavir/ritonavir outside a clinical trial
  - Insufficient clinical data to recommend for or against remdesivir currently

• Other
  - Persons with COVID-19 previously taking ACE inhibitors and ARBs should continue these (AIII)
  - Persons taking NSAIDs for a co-morbid condition should continue these as previously prescribed (AIII)

Conclusions:
- At this time, the NIH states there are insufficient clinical data to recommend either for or against specific antiviral or immune modulator therapies outside of a clinical trial, even for severe clinical disease
  - Recommend against pre- or post-exposure prophylaxis and antiviral treatment in asymptomatic individuals outside a clinical trial

Limitations:
- Guidelines mostly directed to adult patients
Recommendations limited by paucity of randomized, controlled clinical trials in adult population; no clinical trials in pediatric population

- Guidelines expected to be updated based on new data as it becomes available


**Background:**
- Most children with COVID-19 have mild illness
  - For rare severe cases, guidance is needed regarding the antiviral use
- This document is the product of a multicenter review of the literature with expert guidance but is not an official guideline (they refer to https://www.idsociety.org/practice-guideline/covid-19-guideline-treatment-and-management/ for an official guideline)

**Methods:**
- Panel of pediatric infectious disease physicians and pharmacists from 18 centers across the United States & Canada met through teleconferences and responded to surveys
- Four general recommendations were made on the principle of “first do no harm”

**Recommendations:**

**Are antiviral agents indicated for children with COVID-19?**
- Supportive care is the primary treatment recommendation
- If an antiviral is considered, enrollment in a clinical trial or close monitoring with infectious disease consultation is recommended

**What criteria define the pediatric population in whom antivirals may be considered?**
- Outpatient or hospitalized without oxygen (or no increased oxygen need in patients on oxygen at baseline) = supportive care recommended
- To be considered for antiviral therapy, the committee recommends that children have testing-confirmed SARS-CoV-2 infection
  - Rationale = there is significant overlap of clinical, radiographic and laboratory findings between this virus and other viruses in children
  - Rare exception if severe illness and contact with a confirmed case or high local prevalence (this is not defined)
- Antiviral therapy only recommended on a case-by-case basis if severe/critical disease
  - Defined as need for increased respiratory support (lower respiratory tract infection with increased oxygen requirement)
    - Reviewer’s NOTE: if antivirals are used, consideration should be made for initiation early in course of severe/critical disease
  - Not based on radiographic findings alone (given high prevalence of asymptomatic or mildly symptomatic children with abnormal imaging findings)

**Does presence of any underlying medical condition or characteristic warrant different criteria for antiviral use based on increased risk of COVID-19 related morbidity or mortality?**
- No data available currently for specific risk factors in children
- Proposed risk factors include:
  - Based on adult COVID-19 risk factors: cardiovascular disease, pulmonary disease, diabetes, cancer, obesity (though these are not confirmed risk factors in children)
  - Based on historical experience with children & outcomes with other severe viral illnesses = immunocompromised (especially T cell deficiencies; at least may cause prolonged viral shedding) and young infants <1 yr (though this has not been shown
as a specific risk factor to date with COVID-19; young age alone may not be enough of a risk factor for severe illness)

**What agents are preferred if antiviral therapy is offered to children with COVID-19?**

- Recommend remdesivir, preferably as part of a clinical trial (available to pediatric patients through compassionate use through Gilead Scientific [https://rdvcu.gilead.com/]
  - Dosing provided in the tables of this article
- At the time of publication, the panel recommended hydroxychloroquine if a child did not qualify for remdesivir (with close monitoring) or while awaiting the delivery from the manufacturer
  - Did NOT recommend the combination of hydroxychloroquine and azithromycin
  - Reviewer’s NOTE: This recommendation was released BEFORE the publication of recent articles which have found concerning outcomes with hydroxychloroquine
- Divided recommendation about lopinavir-ritonavir. Recommends against lopinavir-ritonavir and ribavirin combination.

**Conclusions:**

- Most children with COVID-19 have mild illness, and supportive care is recommended for all children
- Anti-viral therapy should be considered for children testing positive for the SARS-CoV-2 with severe or critical illness after weighing risks and benefits
  - If an antiviral is used, the panel recommends remdesivir
    - Reviewers’ NOTE: this document considers use of remdesivir in severe cases of COVID-19; in general, the efficacy of antivirals is greater when used early in the course of the illness. No data is available on the efficacy of remdesivir in children or in adults treated early in the course of illness.
  - At the time of publication, the panel recommended that hydroxychloroquine could be considered for patients who are not candidates for remdesivir or when remdesivir is not available
    - Reviewers’ NOTE: This recommendation is no longer supported by recent publications – at TCH we would NOT recommend empiric use of hydroxychloroquine for treatment of COVID-19 in children
- Antivirals should preferably be used as part of a clinical trial if available

**Limitations:**

- Not a formal systematic review (given limited pediatric literature)
- New data continues to emerge regarding antivirals in adults
  - Specifically, new data have been published that demonstrate a concern that patients treated with hydroxychloroquine may have worse outcomes
- Did not use GRADE methodology

**Additional Resources:**


Background:
- Myocardial injury with ST-segment elevation has been observed in patients with coronavirus disease 2019 (Covid-19)

Methods:
- Inclusion criteria: patients with confirmed COVID-19 who had ST-segment elevation on EKG
- Patients included from six New York hospitals
- COVID-19 patients with nonobstructive disease on coronary angiography or normal wall motion of echocardiogram without angiography were presumed to have noncoronary myocardial injury

Results:
- Case series included 18 patients with COVID-19 who had ST-segment elevation indicating possible acute infarction
- Eight patients were found to have a myocardial infarction and ten were found to have noncoronary myocardial infarction.
  - Patient demographics: median age 63 years old, 83% male, 50% Hispanic.
  - Risk factors: 65% hypertension, 35% diabetes mellitus, 18% had a history of coronary artery disease, 6% smoking.
  - Presenting signs and symptoms: 83% Cough and shortness of breath, 72% fever, 33% chest pain.
  - Events: 67% required intubation, 39% developed shock, 11% cardiac arrest.
  - EKG finding: 78% focal ST elevation, 22% diffuse ST elevation, 17% anterior, 44% inferior, 50% lateral.
  - Echo finding: 53% low ejection fraction, 47% normal ejection fraction, 35% regional wall-motion abnormality.
  - Coronary angiography: 9/18 patients underwent coronary angiography, 67% (6/9) found to have obstructive coronary artery disease, 56% (5/9) underwent percutaneous coronary intervention.
  - Outcomes: 13 (72%) patients died in the hospital (four with myocardial infarction and nine with noncoronary myocardial injury).

Conclusions/Limitations:
- Poor prognosis was found in patients with COVID-19 presenting with ST-segment elevations.
- All 18 patients had elevated d-dimer levels
- Myocardial injury in patients with COVID-19 could be due to plaque rupture, cytokine storm, hypoxic injury, coronary spasm, microthrombi, or direct endothelial and vascular injury.
- This is a small case series with high variability in presentation and a high prevalence of nonobstructive disease.


Background:
• Kidney-transplant recipients appear to be at particularly high risk for critical illness due to COVID-19

Methods:
• Case series from Montefiore Medical Center
• Includes adult kidney transplant recipients who tested positive for COVID-19 between March 16 – April 1, 2020.

Results:
• Thirty-six patients were included in this case series
  o Demographics: 72% males, median age 60 years old, 39% black, 42% Hispanic.
  o Transplant: 75% deceased-donor kidney
  o Risk factors: 94% hypertension, 69% diabetes mellitus, 36% historic or current smokers, 17% has heart disease
  o Immunosuppressants: 97% were taking tacrolimus, 94% were taking prednisone, 86% were taking mycophenolate
  o Presenting signs and symptoms: Fever 58%, cough 53%, dyspnea 44%, myalgias 36%, diarrhea 22%.
    • 79% lymphopenia, 43% thrombocytopenia
  o Hospitalization: 22% (8/36) were monitored at home, 78% were hospitalized.
  o Events: 39% (11/36) required mechanical ventilation, 21% received renal replacement therapy.
  o Outcomes (at 21 days follow-up): 28% of patients had died, 64% of those who were intubated died. Two patients who were monitored at home died – both had received anti-thymocyte globulin within the previous 5 weeks. *43% remained in the hospital at end point
  o COVID-19 treatment:
    • 86% had withdrawal of an antimetabolite
    • 21% had withdrawal of tacrolimus
    • Hydroxychloroquine: 24 patients (86%)
    • Leronlimab: 6 patients (21%)
    • Tocilizumab: 2 patients (7%)
    • High-dose glucocorticoids: 2 patients (7%)

Conclusion/Limitations:
• Compared to other series, patients had less fever, lower CD3, CD4, and CD8 cell counts, and a more rapid clinical progression compared to the general population.
• These results showed very high early mortality among kidney-transplant recipients with COVID-19.
• The low cell counts of CD3, CD4, and CD8 indirectly supports the need to decrease doses of immunosuppression in patients with COVID-19, especially in the setting of recent ATG administration.
• Limitations: small, case-series

Additional Resources:


COVID19 Literature Review Newsletter Volume #15
Pediatric Infectious Disease Fellow: Denise Francisco, MD
Faculty: Jill Weatherhead, MD
May 1st, 2020


- Patients who received remdesivir had 31% faster tiem to recovery than those who received placebo (median time to recovery was 11 days vs 15 days)
- Results suggest potential survivor benefit (mortality rate 8% remdesivir vs 11.6% placebo, p=0.059)

Articles:


**Background:** There are currently no antiviral therapies with proven effectiveness in treating severely ill patients with COVID-19
- Remdesivir (GS-5734): prodrug of an adenosine analogue with broad antiviral spectrum and has shown *in vitro* efficacy against SARS-CoV-2

**Methods:** randomized, placebo-control, double-blind trial assessing remdesivir effectiveness and safety
- 10 hospitals in Wuhan, Hubei, China, between Feb 6th-March 12th, 2020
- Inclusion: age > 18 years old, severe COVID-19 +RT-PCR, within 12 days of symptom onset
- Exclusion: pregnancy, breast feeding, hepatic cirrhosis, ALT/AST > 5x ULN, severe renal impairment (GFR < 30 or need for dialysis)
  - *the use of other treatments including lopinavir-ritonavir, interferon, steroids was permitted*
- Randomization: 2:1 to remdesivir to placebo, stratified according to level of respiratory support, 30 patient permuted block randomization sequence
- Primary Clinical Endpoint: time to clinical improvement within 28 days

**Results:**
- 237 people included, 158 in remdesivir and 79 in placebo
- Differences in treatment vs control group: hypertension, diabetes, coronary artery disease as well as higher respiratory rate more frequent in the remdesivir group. Symptomatic for less than 10 days at the time of intervention was more frequent in the placebo group.
- Intention-to-treat: time to clinical improvement median 21 days in remdesivir group vs 23 days in placebo group (adjusted hazard ratio: 1.25 (0.88-1.78)
- 28 days mortality was similar between the two groups (14% in remdesivir vs 13% in placebo group)
- Adverse events: 66% in remdesivir and 64% in placebo group
  - Remdesivir group: constipation, hypoalbuminemia, hypokalemia, anemia, thrombocytopenia, increased total bilirubin

Conclusions/Limitation:
- IV remdesivir did not significantly improve time to clinical improvement or mortality
- Due to outbreak control during study period, insufficient power attained
- Most patients were enrolled late in course of disease, could not adequately assess if early remdesivir treatment would provide clinical benefit
- High rates of corticosteroid use may have influenced viral replication
- Higher rates of hypertension and diabetes in the remdesivir group could have impacted clinical recovery


Background:
- Many countries have instituted quarantine measures for COVID-19 pandemic

Methods:
- Selection criteria: Cohort studies, case-control-studies, case series, time series, interrupted time series, and mathematical modelling studies that focused on COVID-19 and similar coronavirus (like SARS and MERS) were assessed.
- Due to diverse methods of measurement, no meta-analysis was completed only narrative synthesis

Results:
- 29 studies were included (10 modelling studies on COVID-19, four observational studies and 15 modelling studies on SARS and MERS).
- Modeling studies consistently showed a benefit of simulated quarantine measures. For example, quarantine of people exposed to confirmed or suspected cases decreased 44-81% of incident cases and prevented 31-63% of deaths compared to no quarantine.
- Very low certainty evidence
  - Earlier quarantine measures pointed towards greater cost savings
  - Quarantine of travelers from a country with a declared outbreak had a small effect on reducing incidence and deaths
- When models combined quarantine with other preventive measures like school closures, travel restrictions and social distancing – there was a larger effect on the reduction of new cases, transmission and deaths
- Studies on SARS and MERS were consistent with COVID-19 findings

Conclusions/Limitations:
- Quarantine is important in reducing incidence and mortality during the COVID-19 pandemic
- Early implementation of quarantine and combining quarantine with other public health measures is important to ensure effectiveness.
- Due to the diversity of study types, a narrative synthesis was done instead of a meta-analysis
- Analysis limited to modeling studies that make assumptions on current knowledge


**Background:**
- Identification of COVID-19 cases is important for effective disease containment.
- Singapore has attempted to contain spread of COVID-19 through intensive epidemiologic investigations coupled with isolation of cases and quarantine of close contacts

**Methods:**
- January 29th-February 24th, 2020 linked two people with COVID-19 from Wuhan, China to three clusters of COVID-19 cases in Singapore
- Active case-finding and contact tracing were undertaken for all COVID-19 cases in Singapore. Cases were confirmed with RT-PCR testing and if there was a possibility of a patient being a source of disease transmission but recovered from illness, SARS-CoV-2 IgG testing was used to establish a past infection.
- Contact tracing in Singapore: patient with COVID-19 identified, activities were mapped for the 14 days prior to diagnosis and close contacts traced. Contact tracing prior to symptoms onset was done to identify source of exposure
- close contact = prolonged contact within 2 m of the case

**Results:**
- Three clusters of COVID-19, 28 locally transmitted cases were identified. These clusters were from 2 churches and 1 family gathering where a patient from Church A transmitted the infection to the primary case in Church B at a family gathering.

**Conclusions/Limitations:**
- Serological assays helped establish connections between COVID-19 clusters in Singapore which point towards the use of this tool in identifying convalescent cases or people with milder disease who might have been missed by other surveillance methods including RT-PCR.
- Current difficulty with validation of serologic testing

**Additional Resources:**

**Week 5 Newsletter Prepared by:**