

Addressing uncertainty: An evidence-based, data-driven, decision matrix for healthcare operations during the COVID-19 pandemic

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Introduction: Uncertainty and continuously changing guidance for COVID-19 response has taken a toll on the mental health of all individuals. Growing uncertainty within a healthcare system can create stress and confusion that may affect patient care. Our objective was to design an evidence-based, data-driven, decision matrix for healthcare operations that adapts COVID-19 mitigation measures in a predictable fashion according to the CDC community risk level and wastewater positivity data.

Methods: A multidisciplinary team reviewed mitigation measures, published and internal data on the value and yield of these measures, and different operational aspects of a major healthcare system that are affected by COVID-19. The team also reviewed publicly available community risk metrics to then create a decision matrix that adjusts mitigation measures and operational aspects in a predictable fashion according to COVID-19 risk in the community.

COVID Guidelines by Risk Level			
	Low	Medium	Substantial to High
CDC Community Transmission Level or Wastewater Positivity Rate (whichever higher)	≤30	5-7 spp.	≥30
System Incident Command Calls	Not required	System calls held once a week	System calls held twice a week
COVID-Negative Patient Encounter PPE	Universal Masking (N95 use optional)	Universal Masking (N95 use optional)	Universal Masking (N95 use optional) Eye Protection (Face shield, goggles)
Staff Non-Patient Encounter PPE (Administration & non-patient care offices, including Corporate offices)	Mask optional for vaccinated, Mask + required for unvaccinated	Universal Masking	Universal Masking
Emergency Department Staff	Universal Masking (N95 use optional)	N95 for all patient encounters Eye Protection (Face shield, goggles)	N95 for all patient encounters Eye Protection (Face shield, goggles)
Facility Screening Questionnaire/Screening Stations (Inclusive of all Staff and Controlled entrances for staff and visitors)	Not required	Required	Required
Controlled Entrances for Staff and Visitors	Not required	Required	Required
Outpatient/Scheduling Triage Questionnaire	Required	Required	Recommended
Dedicated COVID-19 Operating Room or Procedure Areas	Not required	Not required	Recommended
Pre-Procedure Testing	Required only for AGP procedures (48-72 hours prior); exempting patients with up-to-date vaccination at start.	Required only for AGP procedures (48-72 hours prior); Required for vaccinated patients.	Required all procedures (48-72 hours prior); Required for vaccinated patients.
Admission Testing	Not required for up-to-date vaccination status, unless symptomatic.	Mandatory on admission and/or transfer from outside facility + COVID negative upon admission, re-test prior to AGP or if patient becomes symptomatic. + COVID positive, re-test after 90 days from initial positive test or if patient becomes symptomatic.	Mandatory on admission and/or transfer from outside facility + COVID negative upon admission, re-test prior to AGP or if patient becomes symptomatic. + COVID positive, re-test after 90 days from initial positive test or if patient becomes symptomatic.
Visitation	Campus specific pre-COVID guidelines. Visitation for COVID-19 patients remains restricted.	Visiting hours: 10 a.m. to 6 p.m. Restricted Visitor Policy Initiated - Exceptions Below: Adult patients: - 1 visitor (age 18 and over) per patient per day. This same visitor may stay overnight. Pediatric patients (including the Neonatal Intensive Care Unit – NICU): - One parent/guardian visitor per pediatric patient per day. This same visitor may stay overnight. Other Exceptions: - One adult visitor for patients with life-threatening injuries. This same visitor may stay overnight. - One visitor for patients receiving emergent care. (Age restrictions do not apply to visitors under 18 who present in the Emergency Center with a patient. Minors who accompany Emergency Center patients must remain with the patient.) - One adult visitor for patients at the time of discharge following a surgery or procedure. Patients in Isolation: - No visitors are allowed for patients in droplet or airborne isolation, including COVID-19, if the physician determines that visitation may result in transmission of an infectious disease and poses serious risk to community health. - 1 adult visitor (age 18 and over) per day will be allowed for patients in contact and containable isolation; visitor may stay overnight on case-by-case basis. - Visitors may be required to wear additional PPE, if needed, and as directed by the unit staff.	Visiting hours: 10 a.m. to 6 p.m. Restricted Visitor Policy Initiated - Exceptions Below: Adult patients: - One adult visitor (18 and over). This same visitor may stay overnight. Pediatric patients (including the Neonatal Intensive Care Unit – NICU): - One parent/guardian visitor per pediatric patient per day. This same visitor may stay overnight. Other Exceptions: - One adult visitor for patients with life-threatening injuries. This same visitor may stay overnight. - One visitor for patients receiving emergent care. (Age restrictions do not apply to visitors under 18 who present in the Emergency Center with a patient. Minors who accompany Emergency Center patients must remain with the patient.) - One adult visitor for patients at the time of discharge following a surgery or procedure. Patients in Isolation: - No visitors are allowed for patients in droplet or airborne isolation, including COVID-19, if the physician determines that visitation may result in transmission of an infectious disease and poses serious risk to community health.
Patient Masking (Facilities)	Required	Required	Required
Visitor Masking (Facilities)	Required	Required	Required
Enhanced Cleaning (Facilities)	Not required	Enhanced cleaning of common areas in high-risk areas in the hospital	Enhanced cleaning of common areas in high-risk areas and throughout hospital
Signage - Social Distancing	Only present in spaces where eating occurs	Active	Present throughout the hospital
Safe Wait™	Activated	Activated	Activated
In-person Meetings/Events (Facilities)	Meetings must be at or below conference room capacity. Masks are allowed with 6 feet of social distancing. Meetings must be at or below conference room capacity. Masks must be worn by unvaccinated employees without a Shot of Hope sticker, except when eating and maintaining 6 feet of social distancing. Limit breakroom capacity.	Outdoor encouraged If indoors, mask required, social distancing, no food allowed Social distancing - 6 feet observed Limit breakroom capacity	Not allowed - all meetings must be virtual Social distancing - 6 feet observed Limit breakroom capacity
Business Travel	All employees, including those with a COVID-19 vaccine exemption, may conduct domestic business-related travel with VP approval.	All employees, including those with a COVID-19 vaccine exemption, may conduct domestic business-related travel with VP approval.	Not allowed - all non-essential business travel will not be approved
Volunteers	Volunteers may return to work in patient care areas and must follow the same COVID-19 guidelines as employees.	Volunteers may return to work in patient care areas and must follow the same COVID-19 guidelines as employees.	Only essential volunteers. Volunteers must follow the same COVID-19 guidelines as employees.
Vendors	Vendors may be on campus and must follow the same COVID-19 guidelines as employees.	Vendors may be on campus and must follow the same COVID-19 guidelines as employees.	Only essential vendors. Vendors must follow the same COVID-19 guidelines as employees.

Results: When COVID-19 rates were low during the pandemic, the yield of temperature and symptom screening was 0.19% people screening out and the yield of pre-procedure testing was 0.17% patients testing positive. Taking that into account, as well as regulatory requirements, published literature and public health guidance, the matrix was created with adaptations for inpatient, outpatient, and long-term care sites.

The decision matrix was then posted online with a qualification that the enterprise COVID-19 status would only change with sustained changes (> 2 weeks) in CDC community risk level or wastewater positivity. The COVID-19 status is inserted in all enterprise communications for operational awareness. The response to the COVID-19 decision matrix was overwhelmingly positive by staff and visitors, with no safety or operational problems in the first month of implementation.

Since implementation of the matrix, adjustments were made. Initially this was due to a quick change from Low to Medium risk levels. After reassigning staff utilized for entry screening stations, allowing more visitors for patients and minimizing requirements of universal PPE, the multidisciplinary team re-reviewed mitigation measures. In addition, despite CDC community risk level increasing, hospitalizations were not substantial.

Adjustments Made Post-Implementation

Low Risk Level –

- Risk Level Activation – Remove CDC Community Risk Level definition; Strict reference to Wastewater Positivity; Increase threshold

Medium & High Risk Levels –

- Matrix Risk Level Activation – Remove CDC Community Risk Level definition; Strict reference to Wastewater Positivity; Increase thresholds
- Incident Command Calls – Remove from matrix; complete as needed
- ED Staff PPE – Drop requirement or recommendation except for universal masking by staff and patients
- Daily Screening – Limit to high-risk patient care areas; include but not limited to ICU, Oncology, Transplant, L&D, Pediatrics
- Visitation – Low risk visitation allowed for Medium risk; Medium risk visitation allowed for High risk; Standardize visitation hours

Discussion: An evidence-based, data-driven, decision matrix provides predictable mitigation measures and operational responses to changes in the COVID-19 community risk levels and alleviates workforce uncertainty. It is important to modify based on evidence-based methods to accommodate the safety of staff, visitors and hospital operations.

Memorial Hermann COVID-19 Risk Matrix (Hospital)	Risk Level: Medium
Wastewater Positivity Rate	Wastewater positivity 26-40% (sustained for two weeks)
COVID-Negative Patient Encounter PPE	Universal masking (KN95 use optional)
Staff Non-Clinical Area PPE (clinical area defined as patient care unit and immediate waiting area)	Universal masking
Emergency Department Staff	Universal masking (N95 use optional); eye protection (face shield, goggles) recommended when caring for patients with respiratory symptoms/illness
Facility Screening Questionnaire/Screening Stations (including all staff and visitors)	Not required. Post signage in high-risk units (including but not limited to ICU, Oncology, Transplant, Labor & Delivery, Children's Hospital) advising symptomatic individuals not to enter.
Controlled Entrances for Staff and Visitors	Optional
Outpatient/Scheduling Triage Questionnaire	Required
Dedicated COVID-19 Operating Room or Procedure Areas	Not required
Pre-Procedure Testing	Required for all AGP procedures (5 days prior*) for all patients, including up-to-date vaccinated. Recommended for all procedures. *Care team may choose to retest the morning of the procedure.
Admission Testing	<ul style="list-style-type: none"> • Mandatory on admission and/or transfer from outside facility. • If COVID negative upon admission, re-test prior to AGP or if patient becomes symptomatic. • If COVID positive, re-test after 90 days from initial positive test or if patient becomes symptomatic.
Visitation	Campus specific pre-COVID-19 guidelines. Visitation for COVID-19 patients remains restricted. Please consult with your leadership for location-specific visitation guidelines.
Patient & Visitor Masking	Required
Enhanced Cleaning	Enhanced cleaning of common areas in high-risk areas in the hospital
Signage - Social Distancing	Present in all conference rooms, lobbies, elevators and break rooms
Safe Wait™	Activated
In-person Meetings/Events	<ul style="list-style-type: none"> • Outdoors encouraged. • If indoors, masks required; social distancing of 6 ft.; no food allowed. • Limit breakroom capacity
Business Travel	Employees, including those with a COVID-19 vaccine exemption, may conduct domestic business-related travel with VP approval.
Volunteers	Volunteers may work in patient care areas and must follow the same COVID-19 guidelines as employees.
Vendors	Vendors may be on campus and must follow the same COVID-19 guidelines as employees.

Memorial Hermann COVID-19 Risk Matrix (Hospital)	Risk Level: High
Wastewater Positivity Rate	Wastewater positivity > 40% (sustained for two weeks)
COVID-Negative Patient Encounter PPE	Universal masking (KN95 use optional); Eye protection (face shield, goggles)
Staff Non-Clinical Area PPE (clinical area defined as patient care unit and immediate waiting area)	Universal masking
Emergency Department Staff	N95 and eye protection (Face shield, goggles) for all patient encounters
Facility Screening Questionnaire/Screening Stations (including all staff and visitors)	Not required. Post signage in high-risk units (including but not limited to ICU, Oncology, Transplant, Labor & Delivery, Children's Hospital) advising symptomatic individuals not to enter.
Controlled Entrances for Staff and Visitors	Optional
Outpatient/Scheduling Triage Questionnaire	Required
Dedicated COVID-19 Operating Room or Procedure Areas	Recommended
Pre-Procedure Testing	Required for all AGP procedures (5 days prior*) for all patients, including up-to-date vaccinated. Recommended for all procedures. *Care team may choose to retest the morning of the procedure.
Admission Testing	<ul style="list-style-type: none"> • Mandatory on admission and/or transfer from outside facility. • If COVID negative upon admission, re-test prior to AGP or if patient becomes symptomatic. • If COVID positive, re-test after 90 days from initial positive test or if patient becomes symptomatic.
Visitation	System-wide visiting hours: 8 a.m. to 8 p.m. Campus specific pre-COVID-19 guidelines. Visitation for COVID-19 patients remains restricted. Please consult with your leadership for location-specific visitation guidelines.
Patient & Visitor Masking	Required
Enhanced Cleaning	Enhanced cleaning of common high-risk areas and throughout hospital
Signage - Social Distancing	Present throughout the hospital
Safe Wait™	Activated
In-person Meetings/Events	<ul style="list-style-type: none"> • In-person meetings not allowed; virtual meetings only • Limit breakroom capacity
Business Travel	Employees, including those with a COVID-19 vaccine exemption, may conduct domestic business-related travel with VP approval.
Volunteers	Volunteers may work in patient care areas and must follow the same COVID-19 guidelines as employees.
Vendors	Vendors may be on campus and must follow the same COVID-19 guidelines as employees.

References

1. Centers for Disease Control and Prevention. (n.d.). *Coronavirus disease 2019 (covid-19)*. Centers for Disease Control and Prevention. Retrieved September 20, 2022, from <https://www.cdc.gov/coronavirus/2019-nCoV/index.html>
2. Centers for Disease Control and Prevention. (n.d.). *Covid-19 by County*. Centers for Disease Control and Prevention. Retrieved September 20, 2022, from <https://www.cdc.gov/coronavirus/2019-nCoV/your-health/covid-by-county.html>
3. City of Houston sars-COV-2 wastewater monitoring dashboard. CoV. (n.d.). Retrieved September 20, 2022, from <https://covidwtp.spatialstudieslab.org/>
4. Eddy DM. Variations in physician practice: the role of uncertainty. *Health Aff (Millwood)* 1984; 3: 74–89
5. Schwarze ML and Taylor LJ. Managing Uncertainty — Harnessing the Power of Scenario Planning. *N Engl J Med* 2017; 377: 206–208

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