

Considerations for Assessing Regional Patient Load-Balancing Effects during COVID-19

Surges of COVID-19 cases have overwhelmed hospitals in many areas of the United States. Often, severe patient loads are concentrated on a few facilities in a region. ***Load-balancing***, which may involve prehospital distribution of patients among area healthcare facilities, transferring patients from overwhelmed healthcare facilities to ones with more capacity (space, staffing, and equipment) or moving resources to support an overwhelmed facility, has been advocated to address disproportionate impact on a few facilities. Though prehospital distribution of patients to multiple hospitals to prevent any one facility from becoming overwhelmed is an accepted approach to mass casualty response, distribution of patients from one hospital to another is not as commonly advocated. The COVID-19 Healthcare Resilience Working Group promoted constructs such as the ***Medical Operations Coordination Cell (MOCC)*** to create a regional approach including policies to support these load-balancing operations, particularly through hospital-to-hospital patient transfers.

The MOCC concept and guidance is described in the [Medical Operations Coordination Cells Toolkit](#) and has been discussed on an ASPR TRACIE webinar, [Establishing Medical Operations Coordination Cells \(MOCCs\) for COVID-19](#). The CDC has developed a related document, [Key Considerations for Transferring Patients to Relief Healthcare Facilities when Responding to Community Transmission of COVID-19 in the United States](#), which provides guidance for facilities receiving transferred patients. This brief document focuses on potential metrics and measures to assess the need for and effect of MOCC activities surrounding inpatient transfers with an emphasis on critical care assets. It is intended to assist those developing regional and state policies for MOCC operations to monitor and improve operations. This is a discussion document and not prescriptive as each state and region will have specific variables and systems that may require a slightly different approach than outlined.

Note that the MOCC should complement, not replace, usual patient referral mechanisms and that transfers to load-balance within multi-hospital healthcare systems are both common and encouraged within those systems to maximize resource use. These transfers in many cases move outside of coalition and even state lines. Optimally, there should be some tracking of the degree of these transfers. These may be captured by the healthcare system's own operations/transfer centers and/or may be tracked by emergency medical services (EMS) as inter-facility transfers.

Additionally, when MOCC activities are required, coincident efforts to reduce patient loads such as reduction of elective procedures that require inpatient beds and community-based interventions to decrease transmission are required.

Measurements to assess the load-balancing activities are an important part of improving the quality of these operations and the quality of care provided.

Each MOCC, in coordination with key partners such as the hospital association, state health department, and state office of EMS, should **collect and analyze data related to regional health system loads, issues, or transfers** such as:

1. Current regional healthcare capacity information (e.g., current census vs. baseline or percentage of maximal conventional occupancy)
2. Type of facility wanting to transfer patients (critical access hospital, tertiary care center, etc.)
3. Staffed bed availability and type (ICU, ECMO, Tele, Med-Surg, Pediatric)
4. Transfer information
 - a. Calling party/facility
 - b. Reason for transfer: Emergency (lack of staff or bed for individual patient) or load-balancing transfer (requested by overcapacity hospital to facilitate return to conventional or contingency status)
 - c. Bed available at time of request?
 - d. Was online data used for placement/was it accurate?
 - e. Rotation-based placement used? (i.e., hospitals accept transfers in order of a pre-set list)
 - f. Clinical consultation required? (what type of consultation?)
 - g. Accepting physician/hospitalist?
 - h. Group resource decision-making needed? (e.g., discussion between critical care physicians or patient placement personnel between multiple facilities/systems to address issue, which has been valuable in several states when multiple patients are being moved from a single facility to best match resources to patient needs)
 - i. Disposition - bed found (what hospital)
 - j. Time from call to bed found
 - k. Issues with transfer/finding bed?
 - l. Other notes/process issues?
5. Transport used: agency/ground/rotor-wing/fixed wing/other special requirements (e.g., ECMO)

Local policies, agreements, and information platforms will guide the mechanisms, frequency of reporting, frequency of coordination calls, and other specifics of operations.

A policy group for the MOCC or the healthcare coalition may use the above data and community-based data to examine the following (not all measures will apply to all regions). More consistent use of a few proposed metrics and target outcomes could enable better comparison of effect within and between regions:

Marker	Metric/measure	Target outcome
Hospital saturation	<ul style="list-style-type: none"> • ICU census, total census, % of baseline ICU capacity occupied, • Boarding admits in ED – number and average duration (count toward 	Number of referral hospital in coalition/region more than 20% variance of capacity vs. others (e.g., 90% vs. 120% of capacity should prompt

	total % of inpatient capacity)	evaluation and possible support/transfers)
Contingency care	<ul style="list-style-type: none"> Number of “surge” ICU beds (non-traditional locations) in use 	Keep hospitals out of contingency (e.g., use of ICU surge spaces such as PACU) or at least ensure similar degree of use relative to others in area
Unused capacity	<ul style="list-style-type: none"> Unstaffed beds 	Move staff/adjust staffing to maximal utilization
Acuity of ICU patients	<ul style="list-style-type: none"> Ventilators in use to ICU census ratio or other markers of patient acuity (e.g., use of vasopressors, ECMO vs. those that are appropriate for discharge to lower level of care when available) 	Approximately equivalent rates of acuity between intensive care units – e.g., ICU with 40% intubated patients vs. 95% intubated patients consider potential need for balance-loading
Staffing contingencies	<ul style="list-style-type: none"> Nurse:patient ratio in ICU and on floor, use of non-traditional staff for inpatient care Implementation of “tiered” staffing (team staffing) 	Monitor to ensure staffing contingencies are proportionate between major facilities, help prioritize assignment of staff available to coalition (e.g., via MRC or State National Guard, etc.)
Patient distribution	<ul style="list-style-type: none"> EMS diversion EMS hand-off times > 1 hour 	Monitor diversion and hand-off times, potentially use diversion to decrease arrivals to already saturated facilities if there are alternate appropriate destinations
Balance-loading	<ul style="list-style-type: none"> Number of patient transfers between facilities in region Number of patient transfers to facilities outside the region 	Targeted Outcome: all regional facilities balance-loaded with appropriate resources to care for patient population

Successful balance-loading could be consistently evaluated by looking at the **variance from mean % of baseline occupancy** maintained through the surge for referral hospitals in the coalition/area. Even if hospitals are not impacted equally, movement of staff and patients can

diffuse impact to ensure consistency of care. This is a key data element that is currently not assessed as inputs rely on raw numbers rather than a percent of maximum occupancy. Ideal systems would maintain all hospitals in the area at a consistent percentage to avoid asymmetric stress on specific facilities. This is not a currently collected metric in most areas. To avoid the risk of healthcare provider-associated transmission during load-balancing operations, strict infection prevention and control measures should be implemented.

Ideally, **load-balancing should maintain pre-surge baseline morbidity, mortality and length of hospital stay**, which may indicate that care standards were adequately maintained. Comparing these values for patients to baseline regional rates for COVID-19 outcomes (e.g., among patients who require mechanical ventilation) to **determine variability from baseline** is important with ultimate success if the variation is minimal. Comparison to metropolitan areas that did not execute load-balancing may not be valid as these occurred early in the pandemic prior to implementation of many treatments that may reduce disease severity.