of persons a ected, along with the detection of the virus in more than two dozen countries, raises the specter of a global pandemic. More people were reported dead in the first month after the SARS-CoV-2 virus was recognized than died during the 8 months that SARS circumnavigated the globe [4].

Proactive planning, in which leaders anticipate and take steps to address worst-case scenarios, is the first link in the chain to reducing morbidity, mortality, and other undesirable e ects of an emerging disaster. It is vital that the principles and practices of crisis care planning guide public health and health care system preparations. This discussion paper summarizes some key areas in which CSC principles should be applied to COVID-19 planning, with an emphasis on health care for a large number of patients. Hospitals routinely utilize selected principles of CSC to deal with seasonal outbreaks, lack of bed availability, and drug shortages, but a potential pandemic requires a deeper understanding and application of CSC.

Reduced to its fundamental elements, CSC describe a planning framework based on strong ethical princi-

vices [EMS]) play an integral role in both planning and response [17]:

- Public health agencies provide public messaging on when to seek care; public health laboratory response; epidemiology; non-pharmaceutical interventions such as social distancing, closure of schools, and vaccine allocation and distribution; and a joint role with health care facilities and emergency management agencies to coordinate alternate care delivery, including the establishment of alternate care sites. These are generally defined as unregulated sites within the community that can be adopted for the delivery of basic care to patients. They may include locations such as gymnasiums and other large spaces, and it is understood that the level of care delivered will not approach the level provided in a hospital.
- Emergency management agencies can provide incident command structure, resources, and local and state declarations and actions/orders that may greatly facilitate the response. They may also provide transportation, workforce/volunteers, and other assets.
- Health care coalitions must coordinate information and response strategies within their geographic area [18], including decisions about expanded or alternate care delivery systems and a process for managing and de-conflicting resource requests (so that if multiple requests for the same asset in shortage [e.g., N95 masks] are received that there is a way to fairly allocate them). This may include working with distributors or public agencies, depending on the source of the materials.
- Based on the strategies identified, facilities and coalition partners may monitor data that can act as "indicators" of pending problems or "triggers" that prompt a change in a strategy. For example, the rapidly declining availability of critical care beds may be an indicator to consider a regional referral system, deferral of elective procedures, and other adjustments. A "trigger" point for implementing these changes may occur when there are no more ventilators available at a local hospital or regionally. Additional information on indicators and triggers, as well as tables for public health, hospital, EMS, and emergency management strategies and tactics during a pandemic event are available in the IOM 2013 report [3]. A few examples are provided in .
- Finally, health care coalitions provide a platform for clinical coordination between providers through constructs such as a Regional Disaster Medical Advisory Committee (RDMAC) [2]. In some cases, clinical and other coordination may occur at a regional level or state level incorporating multiple coalitions (and even multiple states) [19]. Depending on the geography, this may provide an opportunity for improved clinical information sharing and policy coordination or even allow for a regional approach to clinical care provision (e.g., regional approach to Extra-Corporeal Membrane Oxygenation [ECMO] services) or a referral "gateway" process for community hospitals seeking to transfer patients with specialty needs when multiple tertiary centers are at capacity.

Critical care saturation at referral centers may result in community hospitals not accustomed to caring for patients on Bi-level Positive Airway Pressure (BiPAP) or mechanical ventilation having to provide these services with the assistance of remote telemedicine or telephone consultant support. Sources of critical care expertise and telemedicine systems need to be identified in advance.

Rural hospitals may also contribute to inpatient capacity for stable patients that can be transferred from tertiary centers ("two-way flow"). For example, a critical access hospital with a capacity of 20 and an average daily census of 5 may not contribute greatly on its own, but 10 similar hospitals can contribute 150 beds in total, though the capabilities and sta ng of these facilities must be carefully considered when transferring patients.

Any coordination activity that promotes consistency of care, access to care, and communication may be considered, though in the setting of a transmissible infectious disease like COVID-19, in-person meetings may need to be discouraged in favor of virtual meetings.

The remainder of this discussion paper will focus on clinical care beginning at the provider level and then consider EMS, outpatient, alternate care delivery, and then inpatient care with a deliberate focus on critical care. Critical care is likely to be the most consequentially impacted resource due to the current lack of vaccine or specific treatment and the likely long clinical course.

Sta ng

Sta shortages may be the primary challenge to implementing surge capacity plans during an epidemic. Sta may be furloughed due to unprotected exposures or illness. COVID-19 has sickened many health care workers, although it is unclear how many of these were personal protective equipment (PPE) device failures versus failure to use PPE for patients with mild or atypical symptoms [20].

Key issues to address are:

- **Child care provision** – noting that in-home day care or small group care may have to be arranged as congregate child care at the hospital may not be well accepted with a virus that may be transmitted during prodromal/asymptomatic periods. School closures are proposed as a social distancing mechanism but may impact the ability of sta to work. Pet care may also be needed.

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As case counts increase in a community, it may be helpful to designate a clinic for suspect cases. Even if this is done, clinics must have a triage process to rapidly identify, isolate, or cohort those with suspected COVID-19. At a certain point, all patients may need to be assumed to be ill and kept masked and separated at least 6 feet from other patients. Having patients wait in their car (if they have one) to be called in may be preferred to decompress the waiting room. Rapid screening and discharge should be implemented for minor cases to prevent clinic congestion.

Alternate Systems of Care

In some cases, community triage/health lines may need to be coupled with other telemedicine/telehealth modalities to augment capacity and meet demand. The public should be strongly encouraged to use telephonic and other telehealth resources first, particularly as prevalence in the community increases, because symptomatic management is the current main treatment for COVID-19, and sequestration at home reduces one's chances of passing the illness to others in the community.

One strategy is the adoption of digital health response plans to support the care of patients in the community. Application-based artificial intelligence "symptom checker" tools and telemedicine consultations could be used to determine if someone requires testing and further clinical- or hospital-based evaluation and care. The use of telemedicine strategies for patient evaluation and management within the hospital may limit sta exposures to potentially infectious patients [21].

If hospitals become overloaded, alternate care sites at the hospital or within the community (e.g., at a high school or a convention center) can provide cot-based care, and in some cases oxygen therapy to a significant number of overflow non-ambulatory patients requiring basic or convalescent care. This allows hospital beds

include, for example, the hospital chief medical o cer and a relevant sta physician in critical care or infectious diseases. Expectations of documentation of these decisions should be outlined prior to the triage event, and frequent review of available resources is required when critical care allocation decisions are being made to ensure the ethical tenets of CSC are upheld. There should also be an agreed-upon "appeals process" so that any additional or newly relevant information can be shared with decision makers (presuming such information can be delivered in an expedient, timely manner). These processes and decisions should be reviewed to ensure fidelity to ethical and procedural expectations at the facility.

Emergency Department Care

EDs often operate at or above capacity on a daily basis. In addition to the above strategies for outpatient care, in the case of a pandemic, EDs should consider:

- Diversion of non-critical possible COVID-19 cases at a triage point prior to ED entry ("parking lot triage")
- Use of current Airborne Infection Isolation Room (AIIR) isolation rooms, and a plan for how specific areas of the ED will be used as infectious care areas as the number of cases increases
- Use of specific space (e.g., urgent care, pediatric, same-day surgery waiting) for COVID-19 patients subject to appropriate isolation of that area from an air-handling and patient movement standpoint
- Use of discharge waiting areas (if not routinely used)
- Triggers for having sta wear PPE at all times, given the potential for transmission from atypical/asymptomatic cases once cases reach a certain level in the community
- Changes in patient flow and charting that can expedite non-emergency visits
- Coordination with patient placement/command center so that admission criteria and discharge criteria can be flexible depending on the patient loads
- Coordination with EMS, including through telephone triage, to avoid ED visits that can safely be cared for as outpatients

Inpatient Care

Hospitals should have a staged plan to accommodate initial cases in AIIR isolation rooms, then progress to cohorting in isolation rooms, then cohorting on specific units (which may require the adjustment of ventilation to create negative airflow and the creation of temporary partitions in hallways/entryways). As cases accumulate, units and floors may be converted to cohort units, and if the number of cases increases, a designated unit may be needed for non-infectious hospitalized patients (understanding that some of these patients may still be infected). Caring for and protecting obstetric and pediatric patients are important. Thus far, older patients and those with comorbid disease are much more a ected than pediatric patients; therefore, it might become necessary to care for select adult patients on pediatric wards or in children's hospitals.

As demand for inpatient resources grows, the focus should be on accommodating a surge in critical care patients [29,30]. Spaces such as pre- and post-anesthesia care; same-day surgeryG6Ct-; thch unorined ohecentology labsMS, entmthe-

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