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Augmenting Rural Hospital Capacity in California: Lessons Learned from COVID-19

The COVID-19 pandemic challenged all aspects of health care, and rural areas were hit particularly hard. Many rural hospitals do not have the capacity to accommodate patient surge, may not have the on-site capabilities to treat very ill patients, and may be challenged with providing care in place versus transferring patients, especially during a pandemic. ASPR TRACIE met with the following subject matter experts from California (listed alphabetically) who helped manage the response to the pandemic across the state to learn more about how they worked with hospital staff particularly in Imperial County (a rural area bordered by San Diego, Riverside, and Yuma [Arizona] counties, and Mexico) to augment capacity and accommodate patient surge:

- **Howard Backer**, MD (retired, former Director of California EMS Authority [EMSA], served as Medical Director of California Medical Assistance Teams [CAL-MAT] during COVID-19).
- **Dave Duncan**, MD (retired from the state of California in 2021 as the Director of the California EMS Authority, a position he held from 2019. He is currently the Medical Director for El Dorado County EMS and San Diego County Fire. He has also served as Medical Director for CAL FIRE, CALSTAR and REACH Air Medical Services).
- **Kathy Staats**, MD, FAEMS, FACEP (EMS Medical Director of Imperial County)

John Hick, MD (ASPR TRACIE Senior Editor, JH): Please give us an overview of the hospitals and their capacity in Imperial County.

Dave Duncan (DD):

There are two community hospitals in Imperial County. El Centro Regional Medical Center (ECRMC) is licensed for 161 beds. Pioneers Memorial Healthcare District (PMHD) is licensed for 107 beds. Both hospitals are usually limited to about 2/3 of that, secondary to staffing and other limitations. Prior to the pandemic, these hospitals leaned heavily on transferring patients to health care facilities in San Diego County for tertiary care (e.g., treating patients with significant trauma). While they both have intensive care units (ICUs) and intensivists, the units were relatively small pre-COVID.

Kathy Staats (KS)

Funding for the hospitals from different sources is also primarily based on Census data, which approximates 180,000 persons living in Imperial County. However, both hospitals also provide care for a large population from Mexicali, where estimates vary between 200,000-400,000 persons that are legal residents or citizens of and receive health care in the U.S. Funding is then focused on approximately 50% of potential patient volume.

JH

Imperial County was overwhelmed in the early phase of the pandemic for a variety of reasons. How did you help those two hospitals manage patient surge and transfer during that time?

DD

We expanded space, staff, and stuff. It is important to note that in the early stage of the pandemic, hospital FEMA support covered 75% of eligible patient care expenses; the state, counties, or hospitals typically covered the rest. Imperial County was so challenged from a staff and financial perspective, that the state covered 100% of their COVID response. First, we helped them expand their staff markedly. Staffing support occurred at all levels from prehospital EMTs and paramedics, to hospital nurses and physicians. State, federal, and international clinicians were brought in to meet the need. Within these hospitals, they were desperate to transfer patients, but physicians were so overwhelmed they literally didn't have time to manage the process. At both hospitals we brought in transfer coordinators who would monitor system status and help augment, prioritize, and coordinate patient transfers.

Both hospitals expanded within and outside of their walls. Within hospital walls, we expanded in every nook and cranny possible, including gift shops, vacant rooms and areas, and conference rooms. There was an area adjacent to the ICU that we converted to "double occupancy" ICU space. Another strategy with these hospitals and others was to maximally expand in and around the hospital, to take advantage of the existing ancillary and support services. The starting priority was to take advantage of the areas of the hospital that can deliver ICU services. A typical scenario involved converting the monitored floor units or post-anesthesia care units (PACUs) into ICU space and expanding ICU rooms to double occupancy if space allowed, and then transition med-surg space to monitored "tele" units. Med-surg might then get pushed out to other areas. At ECRMC, CAL-MAT built a 60-bed, climate-controlled tent/med-surg area adjacent to the hospital. That helped us to nearly double the hospital capacity and take advantage of the support services of the hospital for the patients in those tents.

During COVID response, the components that comprise three California mobile field hospitals were divided and disseminated; we used portions of those in Imperial. The tent structures were used by many hospitals in CA to expand the ED, triage, and for housing patients who would need care for a longer period. Different hospitals in duress had between three and six tent structures that nearly doubled their ED space at times. At the state level we also purchased a lot of equipment, including hundreds of hospital grade beds to allow us to expand patient care space across the state. Also, IV pumps, stands, oxygen concentrators, high flow nasal cannulas (HFNC), and ventilators were required for expansion. Hospitals had a lot of ancillary supplies and services, but not enough of this equipment. Before the pandemic, EMSA had 10,000 square feet of storage; we now require over 200,000 square feet of warehouse space to maintain the equipment. Managing the logistics was a huge challenge. We never imagined we would grow our needs more than tenfold.

Related Resources

Establishment of an Alternate Care Site (ACS) in Imperial County During COVID-19

Oxygen and Ventilator Logistics During California's COVID-19 Surge: When Oxygen Becomes a Scarce Resource

Rapid Expansion and Adaptability of California Medical Disaster Teams

Related ASPR TRACIE Resources

ACS Funding Summary: Establishment and Operationalization

Alternative Care Sites-The Federal Experience in New York City

Baltimore Convention Center Field Hospital: One State's Experience during COVID-19

COVID-19 Alternate Care Strategies (Webinar)

Funding Sources for the Establishment and Operationalization of Alternate Care Sites

Telehealth in Alternate Care Sites: Ensuring Patient Care and Staff Safety in Massachusetts

Use of Telemedicine in Alternate Care Sites (Webinar)

Using Electronic Health Records to Track Patients at an Alternate Care Site

Photo provided by the authors

KS

Public health initiatives were also leaned upon to try and avoid patients becoming ill. We used social distancing measures and pop-up vaccine clinics. Our prehospital providers were approved as vaccine administrators, allowing more people to provide immunizations.

In efforts to free hospital beds for the most ill, a community paramedicine, oxygen-at-home program was also implemented. This program included 58 patients where the average length of stay in the program was 12.34 days and totaled 716 days combined amongst the patients. When each bed was critical, 716 saved days proved to be an important intervention.

JH

When did you decide to open a community-based alternate care site (ACS) and how was it operated?

DD

We tried our best to stand up ACS in those regions that were the most impacted. In most areas, the best place to expand was around the hospital, but in Imperial County, we realized that a more appropriate geographic area (deemed medically appropriate by the U.S. Army Corps of Engineers) was the gymnasium in the community college. This ACS grew in numbers and capabilities over the two years we used it. At one point, it held 60 patients, but on average, we housed between 30 and 40 patients.

Howard Backer (HB)

Imperial County was the most impacted area due in part to it being on the border with Mexico and binational people coming to California for care. In addition, there were some large outbreaks near the border, and while the health care system in Mexico was capable of treating patients, many chose to seek treatment in the U.S. A primary role of the ACS at the community college was to support the two hospitals and accept their low acuity patients. Over time, we increased the capabilities of our ACS facilities at the request of hospitals statewide. Eventually, we were able to accept patients who were being treated with ten liters of oxygen per minute. In the Imperial ACS, we were able to provide med-surg level hospital care; we never attempted to provide intensive care at that or any other site. We tended to get patients who didn't have insurance, and those who had passed peak acuity and were relatively stable with low risk of deteriorating and requiring transfer back to the hospital. Towards the end of the surge, when we had the capacity (i.e., the equipment, staff, and beds), we sent a transfer coordinator or medical staff to the Imperial hospitals to accompany their staff on rounds and offer to take appropriate patients to the ACS to make room for higher acuity patients. While this ACS had the capacity to serve 100 patients, it did not reach that level of admittance for the majority of its use.

> "The scale of the COVID disaster in Imperial County was so impressive. The unfortunate Imperial County "Rule of Twos" greatly affected capacity during the pandemic. They have about 200,000 residents, and two hospitals, which together included about 200 available beds. This ratio of population-to-hospital beds is not typical, and is compounded by the ground transport time to adjacent metropolitan areas being two hours and right across the border and nearly two million people, many of them binational, seeking care in the U.S. The interventions we provided in our Imperial County alternate care site (ACS) supported med-surg level care with capacity nearly equal to an additional hospital. Also, for weeks we completed about 14 transfers a day, with destinations all over California, removing the equivalent of a hospital a week from Imperial County alone.
>
> --Dave Duncan, MD

KS

Imperial's ACS was opened after the immense surge we were experiencing, the inability of our hospitals to keep up with the numbers of those critically ill and infected, and the challenges in transferring patients out of county were evident. This decision was primarily completed between EMSA, our regional care coordination system (MHOAC the Regional Disaster Medical Health Coordination Program), the local EMS agency, and our hospitals.

The challenges surrounding the stand-up for the ACS in Imperial County were immense. Imperial County's gymnasium initially carried supplies best suited for mass casualties where traumatic injury was the primary source of the incident. Cots were low to the ground and not suitable for the majority of patients who were geriatric and had comorbidities limiting mobility. Electricity was suited for the needs of lighting a gymnasium and was difficult to adjust for continuous monitoring, air conditioning, and hot water heating for dozens of persons. Weekly logistical challenges for retrofitting a school gymnasium to serve as a med-surg hospital floor were present.

Photo provided by the authors

JH

Who staffed the ACS?

HB

Our primary ACS staffing came from CAL-MAT personnel. We use physicians, advanced care providers, and nurses supplemented by EMS personnel (paramedics and EMTs). For hospital augmentation, we also had medical teams from a variety of sources, including military teams, teams from the U.S. Department of Health and Human Services, and traveling health care providers. As time went on, our primary shortage was in nursing; we were obtaining them from across the country. Many of the nurses in our ACS came from southern states; they were drawn in part to the increased salaries compared to what they were being paid in their home states.

JH

Did you face challenges deploying CAL-MAT members who were needed at their home institutions?

HB

Ironically, a lot of our rostered health care staff in the state were not working early during the pandemic, so we did not have too much trouble getting physicians and nurses to deploy. For those who leave their jobs, they do have job protection and are paid by CAL-MAT during their deployment. An executive order allowed EMS personnel to work in stationary settings (we also used EMTs and paramedics), and we maximized our use of RNs and LPNs when we could get them.

"In the first month of operations (May 26–June 17, 2020), the ACS received a total of 106 patients. Of those patients, 54 (50.9%) were male and 52 (49.0%) were female. The average patient age was 55.5 years old with a range of 19–95 years. The most common comorbidities were hypertension (35, 33.0%) and diabetes (39, 36.8%). The average length of stay was a mean of 3.47 days and median of 3 days. The longest length of stay was 16 days. Twenty-seven patients were transferred to the ED (25.5%) for evaluation, with chief complaints ranging from hypotension to worsening hypoxia. Disposition of remaining patients included 1.8% of patients who left against medical advice and 72.7% who were discharged home or to SNF. There were no deaths on site." Taken directly from Breyre, Sloane, Herring, et al. (2021). Establishment of an Alternate Care Site (ACS) in Imperial County During COVID-19. Western Journal of Emergency Medicine. 22(3): 608-612.

DD

During the pandemic our CAL-MAT roster grew 10-fold, from about 200 in 2020 to approximately 2,200 members in June (2021). (For more information, access Rymer, Breyre, Lovett-Floom, et al., 2023.)

Photo provided by the authors

JH

Once the surge eased, did you provide additional services through the ACS or otherwise?

HB

In Imperial County, we built out home health care through a community paramedic program. We could discharge people who had an oxygen requirement, and paramedics would check up on them at home, monitor their capacity and oxygen needs, and make sure they were improving and getting rehabilitative care. That helped patients to return home, where they preferred to be. The ACS was an open ward without a lot of privacy. While it had the capability, and the care provided was excellent, it was not the nicest place to be.

DD

The oxygen at home program covered about 60 people over its lifespan of about 6 months. This program enrolled patients on oxygen via nasal canula who required 4 liters or less and were improving. These patients were connected into the program before they left the hospital and were followed daily by a paramedic to assure appropriate monitoring. In effect this was almost equal to staffing another hospital in the region, so we came close to tripling the capacity of each hospital in Imperial by expanding hospital beds, home care, and managing an ACS. The other key component was transferring patients from the Imperial County hospitals to larger facilities around California, but particularly in southern and central California. The majority of these patients required air transport.

HB

As the medical surge from COVID was stabilizing, pressure at border entry points in Imperial and San Diego counties increased, so we shifted some of our staff from the ACS to immigration centers where we screened people for COVID and provided quarantine, isolation, and medical services.

JH

Did you experience any shortages in oxygen?

DD

Oddly, oxygen was a scarce resource. Oxygen was quite a challenge and one of the things that made me the most nervous during the pandemic. In addition to the ACS, we supported oxygen needs for many hospitals during the pandemic. For some ACS patients, oxygen was pushed from two liters per minute to up to six L/min via nasal cannula. We did provide some continuous positive airway pressure (CPAP) and bi-level positive airway pressure (BiPAP) therapies in the ACS, but that was very hard to manage. We were very grateful for the staff who were so dedicated to the care. We couldn't get the large H-cylinder tanks, so we switched to D tanks. We eventually transitioned to using liquid oxygen systems, but this was complicated and cumbersome to pull off because we had to build the distribution system from scratch. Once we transitioned, however, it made delivery more reliable and switching tanks was less cumbersome.

Related Resources

COVID-19 Patient Surge and Scarce Resource Allocation

Considerations for Oxygen Therapy in Disasters

Oxygen and Ventilator Logistics During California's COVID-19 Surge: When Oxygen Becomes a Scarce Resource

Hospitals across the state faced similar challenges. They typically maintain oxygen stores via their built-in liquid oxygen (LOX) systems and backup oxygen cylinders. During the pandemic, oxygen use increased dramatically because of the high flow oxygen treatment required – HFNC oxygen could consume 60 liters/minute compared to the standard 2-6 liter/minute treatments we are used to. Some hospitals literally ran out of oxygen and needed to transition patients from wall

oxygen to cylinder oxygen. We saw ICUs on upper floors of hospitals with ventilators experiencing dysfunction due to O2 pressure loss. One hospital in the state needed to connect two large mobile systems into the existing system to maintain adequate pressure and flows. We created oxygen depots and strike teams to rapidly respond and address oxygen delivery. We will continue to review the challenges and lessons learned in this critical area (many of which were discussed in the article Oxygen and Ventilator Logistics During California's COVID-19 Surge: When Oxygen Becomes a Scarce Resource).

Photo provided by the authors

HB

In addition to switching to liquid oxygen, we switched to using industrial-scaled concentrators. We placed them outside of the hospitals in depots where we would fill tanks and help deliver them to patients and hospitals in need.

KS

An additional issue impacting Imperial was the high use of oxygen during patient transfers. Transports out of county were challenging for multiple reasons. BIPAP, CPAP, HFNC and intubated patients all had a much higher oxygen requirement on average than patients pre-COVID. For patients transferred by ground, oxygen requirements increased as elevations increased in the mountains on the way to our surrounding counties, and patient's pulse oximeter readings would often drop despite increasing oxygen flow rates. Due to the high flow rates, units often had to rendezvous with other ground crews to replete their oxygen supply. For our patients transported by air, equipment parts would sometimes freeze due to the high flow rates while in flight. And due to the loss of oxygen with BIPAP, CPAP and HFNC, it was often more efficient to transport patients intubated rather than with non-invasive ventilation due to the risk of running out of oxygen.

JH

Did you encounter any issues with record keeping or pharmaceuticals?

HB

No, because our teams have similar experiences standing up shelters during wildfires and other disasters. We had pharmacists on site; narcotics were obtained by state public health pharmacist staff, distributed to ACS, and stored in lock boxes (similar to how they are managed and stored in fire camps). We also used paper records. We never used an electronic health record system during pandemic, though we do have a system that allows us to pull existing patient records from across the state.

KS

Getting accurate patient numbers from hospitals was very challenging initially. With hospitals not previously used to reporting real-time information to outside sources, in the beginning of the pandemic, patient and hospital bed estimates were 2-5 days behind. In the first month of Imperial's surge, we set up a daily call with our hospitals and the state to get real-time numbers and avoid the delays in information.

JH

Were you able to augment long-term care (LTC) resources in the state?

HB

Early in the pandemic, the virus was sweeping through LTC facilities; sometimes infection would begin to run through the facility and staff would become ill or simply leave the facility. In some cases, an entire shift would be without staff. We created close to 10 strike teams with nurses, paramedics, and EMTs to help stabilize and rescue these facilities until they could get their staffing stabilized. Our teams would focus on both patient care and infection control. They worked with staff to encourage proper use of personal protective equipment and social distancing. Generally, we aimed to have the strike teams stay on-site for three days, but it was common for them to stay for one to two weeks, and we sometimes had two teams work in the same location. Many teams reported that the facilities were not safe working spaces, as the need to triage and treat simultaneously was significant.

DD

The California Department of Public Health (CDPH) collaborated on the administration and guidance of the LTC strike teams. In some areas where we expanded hospitals, we could not transfer patients to skilled nursing facilities, so we did stand up some temporary LTC services. We were able to establish executive orders to expand scope and allow EMTs and medics to provide care in LTC facilities and also created “strike teams” to rapidly respond as we witnessed these LTCs failing at times without much warning. These programs were invaluable as there usually not enough staff available when these locations were hit with outbreaks.

JH

Did you provide any virtual or telehealth support during the pandemic?

DD

We did, but it was a complicated program. We wanted to provide a line of intensivists that any physician from a community hospital could call for advice. None of the existing telemed programs were designed to do this; they all want access to full records, to be able to write orders, and have requirements for contracting. We were eventually able to find two programs that worked for us. The service was provided for free to smaller hospitals and the bill increased with the size of the hospital. Physicians and staff were able to call the line and discuss patient symptoms and vitals with an intensivist and get real-time advice.

KS

ICU telehealth was a helpful resource for medication and ventilator management. The challenge of ICU telehealth is the physicians could not perform procedures, which is necessary for many patients under intensive care.

JH

Did you use ambulance strike teams to support patient transfer?

DD

Yes, ambulance strike teams were frequently active throughout the state. In some counties, augmentation of 911 systems was required. Other uses included interfacility transfer and facility evacuation needs. We also instituted a vaccination at home program for high-risk patients utilizing ambulance strike teams. A significant number of patients were transferred out of Imperial by air, however.

JH

Did you encourage discretion for EMS transports to help decrease patient volume?

DD

At a county level, yes. Los Angeles County probably led the pack with alternate approaches to dispatch. They could divert callers to both nurses and EMS physicians who could handle calls and talk with medics on scene. We encouraged EMS to “assess and refer” low-risk patients to ensure that only those who required care were taken to the hospital. Every system across California initiated some form of assess and refer policy to avoid burdening EMS systems and hospitals during surges.

KS

Assess and refer policies (also referred to “treat and release”) were used during this period. While many EMS systems implemented these policies, the overall utility and decrease patient load to hospitals is still under review.

DD

Disaster response is typically handled locally, then it expands to a regional response. In CA, we had never before reached a point where regions were inundated until this pandemic. Riverside and San Diego Counties were no longer able to support Imperial County. While many thought the state was over stepping, we, for the first time ever, had reached the point where we had failure at the regional level and now required extensive state support and resources.