In March 2020, with the Covid-19 pandemic taking hold across the United States, the Arizona Department of Health Services (ADHS) and Arizona hospital leaders joined to form the Arizona Surge Line, a 24/7 transfer service that has facilitated the rapid placement and equal distribution of Covid-19 patients across the state’s hospitals. The goal is to ensure patients receive the right level of care without delay, while also load-balancing ICU beds and other health care resources. Since July 2020, more than 130 distinct hospitals within Arizona have sent or received patients with Covid-19 for higher levels of care through the service. This public-private collaboration involved a variety of hospital types, health care systems, funding sources, jurisdictions, and payers. Working together — and with the public health department’s facilitation — Arizona’s hospitals effectively formed a single, efficient statewide system of care for Covid-19. We believe this initiative can serve as a model for others.

Arizona has distinct urban and rural regions with differing population and hospital densities. Across the state’s 113,635 square miles, there exists a heterogeneity of private for-profit hospitals, public non-profit hospitals, public for-profit hospitals, Critical Access Hospitals, Indian Health Service and Tribally operated P.L. 93-638 Hospitals, and Veterans Affairs Medical Centers (VAMCs). The
bulk of the population and tertiary health care resources are located within two large urban areas: Phoenix and Tucson.

In March 2020, Arizona’s Covid-19 case counts were stable, but New York City’s counts were surging and hospitals were unable to efficiently transfer patients across networks, leading to poor patient outcomes and overrun facilities.1,2 To protect both Arizona residents and hospitals, the state’s hospital leaders joined together to put aside competitive, jurisdictional, and health system–and insurance-related barriers to create the Arizona Surge Line, a 24/7 transfer service that has facilitated the rapid placement and equitable distribution of Covid-19 patients across the state’s hospitals.

The Arizona Surge Line

The Arizona Department of Health Services (ADHS) is the state’s public health department with the mission to promote, protect, and improve the health and wellness of individuals and communities in Arizona. Throughout the Covid-19 pandemic, it has brought together hospitals’ associations and leadership to address hospital-specific challenges.

In March 2020, ADHS initially met with several major hospital systems (Banner Health, Common Spirit-Dignity Health, HonorHealth, Northern Arizona Healthcare, Mayo Clinic, Phoenix Children’s Hospital, Tenet Healthcare, Tucson Medical Center, and Valleywise Health) to propose the concept of a single transfer service for patients with Covid-19, with a goal of expediting placements while load-balancing patients and health care resources such as medical/surgical beds, intensive care unit (ICU) beds, ventilators, and specialist care. The crux of the service was based on a 24/7 call line in which physicians at the sending facility and physicians at the receiving facility were connected via phone. To operationalize this, ADHS facilitated daily 30-minute steering committee meetings with the hospitals’ executive leadership, including Chief Medical Officers, Chief Nursing Officers, and Transfer Directors to develop the scope and protocols of this service.3

The Arizona Surge Line was determined to have four major objectives:

• to expedite patient transfer to higher levels of care (i.e., ICUs);
• to expedite patient transfer to lower levels of care (i.e., post-ICU, discharge);
• to assist with interfacility transport when resources are scarce; and
• to provide real-time critical care and palliative care consultations for transferring providers.

The steering committee primarily focused on the first objective: the transfer of patients to higher levels of care. Thus, the first structural capability of the Arizona Surge Line surrounded real-time visibility of bed availability across the state. Two of the major health care organizations involved were already utilizing an electronic platform (from Central Logic) capable of integrating existing software systems in order to provide coordination and visibility of their institutional hospital beds. ADHS thus contracted with Central Logic through an existing state contract vehicle and partnered
with Health Current, the state’s Health Information Exchange, to develop a real-time bed visibility platform for all systems.

"The Arizona Surge Line is fully funded (less than $2 million for one year) and administrated by ADHS, but strategies and protocols were developed in conjunction with the hospital representation on the steering committee."

The Arizona Surge Line is fully funded (less than $2 million for one year) and administrated by ADHS, but strategies and protocols were developed in conjunction with the hospital representation on the steering committee. These included guiding principles, agreement to a 30-minute turnaround time for bed assignment, destination hospital selection criteria, bed visibility input criteria, and major workflows (including the hiring of EMTs as the transfer agents), most of which are listed on the Arizona Surge Line website: www.azdhs.gov/surgeline.

The Arizona Surge Line went live statewide on April 16, 2020, and continues to function today. As of December 2020, the Arizona Surge Line has transferred over 4,000 patients with Covid-19 to higher levels of care in hospitals across Arizona (Figure 1). Its evolution has been driven by public health facilitation, transparency, adaptability, reflection, and continual feedback.
FIGURE 1

**Arizona Surge Line Volume**

This graphic shows the number of patients by week with presumed or confirmed Covid-19 whose transfers to higher levels of care were facilitated by the Arizona Surge Line. The peak of these transfers coincided with the state’s peak of new Covid-19 case counts in late June 2020. At its peak, the Arizona Surge Line was facilitating the transfer of nearly 70 patients per day. Every requested patient was able to be placed at the appropriate level of care in hospitals across Arizona.

Source: The authors
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**Widespread participation**

Hospital participation with the Arizona Surge Line was initially voluntary and expanded from the original large health care systems to 77 hospitals (including Indian Health Service and Tribally operated P.L. 93-638 Hospitals) that had utilized the Arizona Surge Line by late May 2020. As Arizona experienced escalating case counts, Executive Order 2020-38 was issued by Arizona Governor Doug Ducey on May 21, 2020, requiring hospital participation with the Arizona Surge Line. By June 2020, participation further increased to 93 unique hospitals.

By August 2020, the fourth month of functioning, 132 distinct hospitals within Arizona had sent or received patients with Covid-19 to higher levels of care through the Arizona Surge Line. These included hospitals from all 15 counties in Arizona, county and federal facilities, and public and private facilities (Table 1 and Figure 2). Transfers included rural-to-urban and urban-to-urban facilities, the latter more so when resources became scarce.
As of December 2020, the number of in-state hospitals participating remains at 132.

**Public health facilitation**

ADHS has facilitated regular calls with the Arizona Surge Line steering committee, which grew to include 20 distinct health care systems. ADHS has maintained one or two medical directors present on each call and occasionally the Director. The public health facilitation has enabled

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**Table 1. Number of Different Hospitals, by Type, participating with the Arizona Surge Line (i.e., sent and/or received patients) in the First 6 Months of Functioning**

| Hospital type                      | Number of Unique Hospital Participants, April–October 2020 |
|-----------------------------------|------------------------------------------------------------|
| Private, non-profit               | 57                                                         |
| Private, for-profit                | 34                                                         |
| Critical Access Hospital           | 15                                                         |
| Indian Health Service              | 15                                                         |
| Public, non-profit                 | 6                                                          |
| Tribally operated P.L. 93-638     | 5                                                          |
| **Total**                          | **132**                                                    |

Source: Authors

**FIGURE 2**

*Map of Hospitals Participating in the Arizona Surge Line*

As of December 2020, more than 130 hospitals throughout the state were participating in the Arizona Surge Line.

Source: The authors; map © OpenStreetMap contributors, openstreetmap.org
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As of December 2020, the number of in-state hospitals participating remains at 132.
regular updates on situational awareness and streamlined the necessary policy actions to make the Arizona Surge Line a success (e.g., staffing challenges led to a statewide Surge Staffing Initiative that brought in hundreds of out-of-state nurses to Arizona; also, a lack of extracorporeal membrane oxygenation [ECMO] surveillance led to it becoming a required hospital reportable).

“The public health facilitation has enabled regular updates on situational awareness and streamlined the necessary policy actions to make the Arizona Surge Line a success”

One of the important policy collaborations occurred after the steering committee urged ADHS to waive insurance considerations for Covid-19 transfers. Based on the recommendation of ADHS, Governor Ducey issued Executive Order 2020-38, which states that all insurers regulated by the state are to cover Covid-19 transfers to and from hospitals, along with treatment, at in-network rates when the transfer is facilitated by the Arizona Surge Line.4

As of December 2020, these calls continue to be held on a weekly basis. Recent policy discussions in the face of the second surge (winter 2020–2021) include enhancing transfers to lower levels of care and clarifying out-of-state transfer protocols.

**Transparency**

Transparent communication of data has been a key component in maintaining the alliance among the various health care systems. During the steering committee calls, the Director of the Arizona Surge Line presents the transfer patterns, turnaround times, and hotspots. This transparency has eased any concerns about potential inequitable distribution, has fostered a shared objective to improve acceptance times, and has promoted acceptance of referrals.

In addition to statewide transfers, individual health care systems are sent their own dashboard on a weekly basis that shows the number of transfers, originating and receiving facilities, and time to bed placement. Upon request, the Arizona Surge Line distributes comparative information on volumes of transfers by health care system, in addition to unique data requests.

During the peak of the state’s Covid-19 cases in June–July 2020, Arizona hospitals or health care systems experiencing a surge were invited to share their experiences, struggles, and lessons learned. This enhanced situational awareness and increased the team’s desire to expedite these transfers to offload the challenged facility or region.

As of October 2020, in ongoing efforts toward transparency, breakdown reports of out-of-state transfers are now being addressed in detail at steering committee meetings.
Adaptability

The Covid-19 pandemic’s first peak in Arizona was during late June 2020. During this time, the Arizona Surge Line was transferring nearly 70 patients per day across the state.

The steering committee made rapid changes to its strategies, such as reducing bed market share as a leading component of determination of destination facility. New protocols were drafted and published, including transfer protocols for remdesivir, out-of-state requests, repatriation back to the community of origin, and load-leveling waitlists when bed capacity is reached.

The steering committee also sought participation from the Phoenix and Tucson Veterans Affairs Medical Centers as the state approached complete hospital bed occupancy. These centers committed beds for civilian patients to support the community. The VAMCs were onboarded without difficulty and, between July and August 2020, took care of 19 civilians with Covid-19, many of whom were critically ill.

The governor issued Executive Order 2020-48 requiring hospitals that provide pediatric services to accept admissions for patients up to 26 years of age. Through the steering committee, Phoenix Children’s Hospital requested placement of adult patients through the Arizona Surge Line.

In October 2020, the original remdesivir protocol was paused, given that the medication was no longer considered in short supply.

Opportunities for Improvement

As per regular non–Covid-19 practice, a receiving facility can deny a Covid-19 transfer facilitated by the Arizona Surge Line based on clinical appropriateness and resource availability. After experiencing a transfer denial from a receiving hospital organization soon after the Arizona Surge Line went live, the steering committee requested a swift review of all denials. Arizona hospitals volunteered representatives to sit on a denial review committee, all of whom agreed to abide by ADHS’s privacy policies and signed a pledge to protect confidential information. Meetings were facilitated by ADHS and the Director of the Arizona Surge Line.

During the first six months of activation, the Arizona Surge Line had a total of five denied transfers, all of which were reviewed by the subcommittee. In each case, the involved hospitals would present the details of the case, barriers, and challenges faced, and what changes needed to be made. There was concern that hospitals would be defensive about decisions made, and that this kind of case review could threaten the built collaboration.

Instead, this was an open and beneficial process, as both hospitals and the Arizona Surge Line reflected, acknowledged opportunities for improvement, and made real-time adjustments to facility and transfer protocols. From those five cases, the Arizona Surge Line took action to provide education to hospitals about appropriate utilization of the service, created the remdesivir transfer protocol, worked to add ECMO availability to required hospital reporting, and increased focus on palliative care consultation (Table 2).
Table 2. Summary of Denied Transfers and Resultant Changes in Arizona Surge Line Protocol, April 16 to October 16, 2020

| Case # | Summary of Case                                                                 | Resultant Action by the Arizona Surge Line                                                                 |
|-------|-------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| 1     | Patient was denied transfer by the receiving facility because patient was at end of life | None                                                                                                      |
| 2     | Patient experienced a significant delay in acceptance at receiving facility, leading to an eventual denied transfer by the receiving facility | None                                                                                                      |
| 3     | Patient was denied transfer by the receiving facility due to lack of remdesivir at the receiving facility | Arizona Surge Line created the remdesivir transfer protocol                                               |
| 4     | Patient was denied transfer by the receiving facility because ECMO unavailable at the receiving facility | An Executive Order from the governor addressed the issue by requiring that ECMO availability be added to hospital-required reporting |
| 5     | Patient was denied transfer by the receiving facility because patient was at end of life | Arizona Surge Line changed their recorded greeting to include offers of real-time palliative care consultation |

Source: The authors

Of note, all patients who had been denied a transfer request were successfully placed in another hospital system by the Arizona Surge Line.

Regular Feedback

Hospital feedback on the performance and function of the Arizona Surge Line has become more formal over time. Interfacility successes and concerns have been regularly addressed during steering committee meetings and through electronic discussion. This feedback has led to changes in protocols and data collection, including developing analytics to address transfers “out of region” and refining calculations of time to bed placement.

After four months of activation, the Arizona Surge Line distributed a 5-question evaluation to be completed by first-line staff interacting with the service. This communication was sent through the steering committee to be forwarded to their staff in addition to ADHS contacts at rural facilities not consistently present on the steering committee meetings. Specific instruction was included for the steering committee members not to complete the evaluation themselves.

A total of 122 persons received the survey with a response rate of 41.8% (51/122) from a representation of 30 unique facilities. Questions were structured as a Likert-based question scaling 1 to 10, where 10 indicated the highest level of satisfaction. Outliers for each question were determined as a response 1.5 times the interquartile range (IQR) below the first quartile or 1.5 times the IQR above the third quartile. Individual question responses identified as an outlier were excluded from the analysis of that question. The most common survey respondents were Transferring Providers (Table 3).

The results revealed an overwhelming level of satisfaction with the Arizona Surge Line’s effect on hospitals and patients statewide (Figure 3).
As of November 2020, the Arizona Surge Line is in the process of reaching out to representatives from every hospital system on the steering committee, quantifying their satisfaction with the transparency, participation, and collaboration of the service.

Table 3. Job Positions of Individuals Completing the Arizona Surge Line 4-Month Evaluation

| Job Position                     | Number of Respondents (n=50) |
|----------------------------------|------------------------------|
| Transferring Provider            | 15                           |
| Administration                   | 11                           |
| Emergency Department Personnel   | 9                            |
| Transfer Center Staff            | 7                            |
| Care Coordination Staff          | 4                            |
| Accepting Provider               | 3                            |
| Incident Command Staff           | 1                            |

The public health facilitation has enabled regular updates on situational awareness and streamlined the necessary policy actions to make the Arizona Surge Line a success.

Source: The authors

FIGURE 3

Results of the Arizona Surge Line 4-Month Evaluation, on a Scale of 1–10 (1= strongly disagree, 10=strongly agree)

The results from the 4-month evaluation showed satisfaction with the core functions of the Arizona Surge Line, which was to expedite the transfer of patients with Covid-19 to higher levels of care and load-balance hospitals. In addition, the Arizona Surge Line was reported to have a positive influence or impact for hospitals, patient outcomes, and the state’s health care system.

The Arizona Surge Line ...

- Expedited the transfer of patients with Covid-19 to higher levels of care. 9
- Load-balanced patients with Covid-19 across Arizona hospitals. 8.5
- Was beneficial to our hospital or health care system. 8.7
- Improved patient outcomes. 8.2
- Safeguarded the health of the health care system in Arizona. 8.5

Source: The authors

NEJM Catalyst (catalyst.nejm.org) © Massachusetts Medical Society
Looking Ahead

The Arizona Surge Line has been a successful initiative within the state, effectively managing surges of Covid-19 patients and potentially averting the use of costly alternative care sites. Fostering collaboration among health care systems within the state enhanced the ability of the initiative to better utilize available resources, ensure proper load-leveling, and contribute to improved patient outcomes.

The Arizona Surge Line continues to oversee the rapid and balanced placement of patients with Covid-19 and is piloting its voluntary use for hospital transfer patients with influenza. The steering committee and widespread hospital participation will continue to enhance the strength of the state’s health care system.

“Working together and with the facilitation of ADHS, Arizona’s hospitals merged into a single, efficient statewide health care system for Covid-19 to protect hospitals and patients against unbalanced hospital surges.”

The level of collaboration among the heterogenous types of hospitals, health care systems, funding sources, jurisdictions, and payers was unprecedented in the state and, to our knowledge, in the country. Working together and with the facilitation of ADHS, Arizona’s hospitals merged into a single, efficient statewide health care system for Covid-19 to protect hospitals and patients against unbalanced hospital surges. As a second surge continues to grow throughout the winter in Arizona, we will need to continue to rely on our built collaboration through a challenging Covid-19 and respiratory virus season. This statewide system can be applied to Covid-19 and any future hospital surge due to pandemics, wildfires, terrorism, or other public health threats.

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