

IN DEPTH

Mobile Integrated Health Care in Los Angeles: Upstream Solutions to Mitigate the Covid-19 Pandemic



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Innovative collaborations between a 911 emergency medical service (EMS) and local health care leaders helped foster a prehospital Mobile Integrated Health Care strategy that enhanced patient care while also mitigating the impact of Covid-19. Incorporating novel skill sets, alternate-destination pathways, safe and selective nontransport policies, and telehealth into upstream care has helped divert low-acuity patients from hospital EDs and optimally match patient need to location of care. In the City of Los Angeles, these strategies bought time for hospitals to stage for a patient surge, while the EMS bureau created the first Covid-19 testing sites for health care workers and, eventually, the public at large.

Challenges such as cost, the need for increased medical oversight, EMS mission creep, and integrating this comprehensive EMS response into the community's health care system have led to broader discussions with health care executives about unlocking the upstream value of prehospital patient navigation.

In many communities, the local 911 emergency medical service (EMS) operator may be the largest provider of acute, unscheduled health care. In the City of Los Angeles, for example, the Los Angeles Fire Department (LAFD) is the sole provider of 911 care and in 2019 received more than 1.1 million calls for help and attended more than 400,000 incidents, treating/releasing more than 135,000 patients on scene and transporting 600-plus patients to area hospitals each day. As the upstream triage and treatment provider for 70 different area hospitals serving a population of 4 million, LAFD has a unique geographic view of public health problems and practices medicine directly in the

patient's home (be it a mansion, single-room occupancy, jail cell, or tent). With most patient encounters, emergency medical technicians (EMTs) and paramedics practice shared decision-making with patients as they decide, "Do I go to the hospital, go somewhere else on my own, or do nothing?"

The structure and staffing of 911 EMS provider agencies come in many shapes and sizes, giving rise to the expression, "If you've seen one EMS system, you've only seen one EMS system." Los Angeles uses a fire-based all-life-hazard response agency ([Appendix](#)), meaning it responds to everything from time-critical patients in cardiac arrest, to low-acuity patients with minor trauma or cough, to more specialized rescue calls including swift-water rescues or individuals threatening to jump from a high-rise building. LAFD also provides tiered dispatch, meaning it can send either EMTs with basic training or paramedics with advanced training ([Appendix](#)), and LAFD performs its own transports using conventional ambulances — 93 paramedic ambulances and 45 EMT ambulances dispersed among 106 stations. Of course, a concern among ED clinical teams is overuse of EMS and ED beds for care that is not truly emergent.¹⁻³ But a 911 call can set in motion a response that usually leads to an ED visit.

When a 911 call is transferred to LAFD, its telecommunicators ask a series of semiscripted questions to determine the appropriate response using a unique dispatch system developed for Los Angeles.⁴⁻⁶ Time-critical emergencies (which may require guiding the caller in performing a life-saving intervention) now account for less than 2.5% of all 911 EMS incidents,⁴ while the remainder are low or moderate acuity. A review of 2005–2009 U.S. Centers for Medicare & Medicaid Services (CMS) claims data estimated that 13%–16% of Medicare-covered 911 EMS transports involved conditions that were probably nonemergent or could have been handled in a primary care setting, while 34.5% of EMS-transported patients who were discharged from the ED might have been managed outside the ED altogether.⁷

Once on scene, EMTs and paramedics work within their respective scopes of practice to arrive at a provider impression of the patient's acute problem, and they either release patients on scene or transport them to the closest, most appropriate acute-care hospital ED.

Over the past 60 years, EMS system design, training, and reimbursement in the United States have overwhelmingly promoted transport of 911 patients to the hospital, regardless of their medical issue or acuity. In fact, 911 provider agencies usually are paid only if they transport the patient to the hospital.⁸ In Los Angeles, a basic EMT transport charge is \$1,030 and paramedic transport, \$1,452 (which may increase to more than \$2,000 in 2021).⁹ The median hospital charge for routine patients discharged from the ED in this region was \$2,071 in 2017.¹⁰ The need for 911 providers to transport patients to the hospital in order to get paid and recoup costs creates a perverse incentive in low-acuity cases (and pandemics) to take all patients to a high-cost, inefficient site where one might have to wait hours to be seen and possibly even be exposed to others who are sicker. Patients with mental health exacerbations or who simply require a safe sobering environment may spend days in their ED bed pending psychiatric evaluation and dispositioning, contributing to decreased

throughput, ED overcrowding, increased use of ancillary staff as “sitters,” and increased indirect hospital costs.

In the years following approval of the Patient Protection and Affordable Care Act in 2010, LAFD and local area hospitals experienced a marked shift in how people used emergency care. While LAFD’s EMS volume typically increased by 1%–2% per year since 1998, starting in 2012, and through 2016, the number of incidents increased by 4%–8% per year. This was driven by a number of factors, including growth among patients using Medicaid expansion (which became effective in 2014); poor access to after-hours care for minor trauma; poor access in at-risk neighborhoods to primary and preventive care, resulting in an increased burden of poorly controlled chronic medical illness; substance use and mental health exacerbations; a swelling number of seniors with limited resources; and a rapidly expanding homeless population. This rate of increase abated after 2017 and has since returned to 1% growth per year (calendar year 2018–2019).

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Increased EMS dispatches for low-acuity 911 callers translated into ED overcrowding, increased wall time (the time it takes for paramedics to hand off patients), and decreased EMS ambulance availability for time-critical patients.¹¹ In addition, a 400% increase in 911 superusers — those with 15 or more encounters per year — meant more patients with recurrent ED visits, repetitive testing, and ineffective care plans. From 2012 to 2016, the number of unique LAFD EMS patients with 15 or more incidents increased from 39 to 183 (a 369% increase), and the number of annual incidents they generated increased from 996 to 4,974 (a 399% increase).

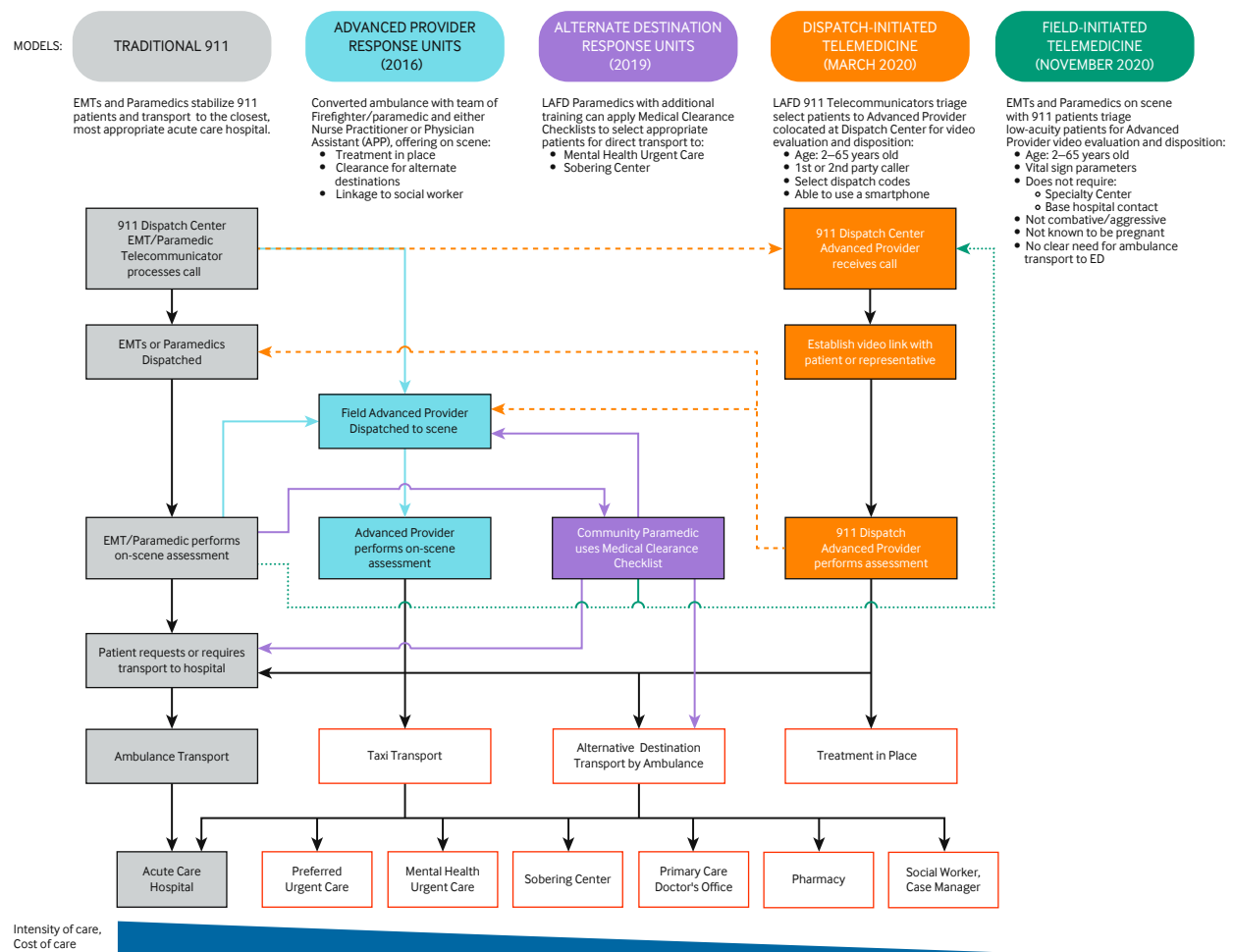
New Approaches to Prehospital Care Delivery

In 2016, LAFD medical directors worked with policy decision-makers and local hospital leaders to implement and bring to scale the first of several novel prehospital resources. The new Advanced Provider Response Unit (APRU) was an ambulance staffed by a nurse practitioner or physician assistant (i.e., an advanced practice provider [APP]) teamed up with a firefighter/paramedic trained in both basic and advanced cardiac life support. The APP is capable of treating patients in place or navigating them to select alternate destinations, such as a mental health urgent care or a sobering center (Figure 1).¹²

FIGURE 1

The Evolving Shape of 21st Century Prehospital Care and Patient Navigation

In the City of Los Angeles, prehospital care delivery has evolved from the traditional model of simply transporting all patients to the ED (gray oval, far left) to progressively innovative models that incorporate providers with new skill sets, broader scopes of practice, and just-in-time virtual presence via telehealth (green oval, far right). Advanced practice providers (APPs) and paramedics with additional training in the field can help select appropriate patients for treatment in place or alternate-destination transport. Telemedicine providers can interact with 911 callers prior to deciding if any on-scene help is needed, or alternatively, they can work with 911 responders that do arrive on scene to optimize care, safety, and disposition decisions. Boxes highlighted in red represent novel, prehospital patient-centered care options. EMT = emergency medical technician, LAFD = Los Angeles Fire Department.



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Keys to early success included community-benefit funding to study the epidemiology of EMS growth and perform basic market segmentation; identifying and partnering with alternate destinations (e.g., [Exodus Recovery](#)); and linkage to social services and at-home care options using community health partners (e.g., [Partners in Care](#)). The initial APRU deployed in South Los Angeles was able to safely treat or navigate 50% of patients away from the ED by performing on-scene, simple procedures that lie just beyond the traditional paramedic's scope of practice, including applying clinical decision rules, performing uncomplicated laceration repair, providing culturally sensitive health teaching and promotion, connecting patients with social workers, and helping patients and their families navigate to ongoing in-network care.¹³ Patients with mental health exacerbations who were transported to a freestanding mental health urgent care center saw a mental health provider within an average of 26 minutes, instead of the hours or days it takes at community hospital EDs in Los Angeles. Earlier linkage to mental health care, in turn, was associated with a decreased need for involuntary holds or inpatient admission. Less than 1% of patients selected for transport directly to a mental health urgent care center and only 2% of patients navigated to the sobering center required subsequent transport to an ED. Patients surveyed afterward reported being more satisfied with their experience and the quality of care received than if they had visited the ED or even their primary care doctor's office.¹³ On the basis, in large part, of these early findings, the APP's salary (about \$187,000 per year), which had been supported on a pilot basis through a Mayoral Innovation Grant,¹⁴ was subsequently folded into the permanent LAFD budget.

Developing Partnerships and Scale

From 2017 to 2019, LAFD's Mobile Integrated Health Care (MIH) Unit entered into public-private partnerships with other stakeholders, including the Department of Health Services [Housing for Health](#) office, Kaiser Permanente Southern California Medical Group, Cedars Sinai, Dignity Health, and Providence Health & Services, in order to bring this new model of care delivery to scale. These partnerships were steered by direct communications between prehospital medical directors and health system chief medical officers in order to focus, first and foremost, on patient safety and selection. This led to:

1. The addition of four new strategically located APRUs around the city;
2. The creation of a prehospital Sobriety Emergency Response (SOBER) Unit to transport select inebriated patients to a dedicated freestanding Sobering Center;
3. The launch of two community paramedic pilots by which traditional EMS providers could apply checklists to select patients for transport to alternate destinations instead of the ED; and
4. The creation of a telemedicine service in which APPs or physicians provide virtual on-scene consultation.

Medical oversight for these programs includes readily available online medical control with an emergency medicine/EMS physician (i.e., an emergency medicine physician with certification in the subspecialty of Emergency Medicine Services); monthly case reviews with an emphasis on

lessons learned; and continuing medical education aimed at keeping the small cadre of MIH providers up to date on public health developments, local epidemiologic trends, and evidence-based practices.

On the basis of these innovative EMS–hospital partnerships, LAFD was also selected to participate in a CMS pilot called [Emergency Triage, Treat, and Transport](#) (ET₃) designed to evaluate a reimbursement model for Medicare fee-for-service patients, which led LAFD to more closely engage with payers, hospital system executives, and local coalitions of federally qualified health centers (FQHCs). ET₃ is scheduled to launch in spring 2021.

The Impact of MIH on Covid-19

The creation of an MIH infrastructure and its collaboration with multiple stakeholders in the local health care system gave the Fire Department a unique ability to mitigate the impact of Covid-19 on local hospitals. EMS and the MIH Unit played a pivotal role in early access to Covid-19 testing. Here, the Fire Department’s comfort in operating in the field, agility of mobile resources, training in infectious/hazmat precautions, and mission-driven culture were well suited for immediate implementation.

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In mid-February 2020, LAFD established the first screening protocols and drive-through testing sites for public safety and health care providers, including hospital workers. By early March, six operational testing centers were in place to provide free drive-through testing to the lay public throughout the City of Los Angeles. Data from this testing facilitated the first descriptions of community spread of Covid-19. LAFD personnel also led efforts to perform testing in skilled nursing facilities and convalescent homes, including those adjacent to community hospitals that were at risk of being overwhelmed by outbreaks in the senior community. This, in turn, helped the Department of Public Health quarantine and investigate higher-risk facilities. By late June 2020, more than 500,000 Angelinos had been tested by LAFD, which helped relieve the burden on local hospitals, clinics, and care facilities that were still struggling to implement widespread testing for their patients and providers.

LAFD also implemented a dispatch-initiated telemedicine program to further reduce the exposure of field providers to potential patients with Covid-19 and maximize ambulance availability in anticipation of the initial surge (Figure 1). Starting in April 2020, select low-acuity 911 calls from patients younger than 65 years old with a smartphone were routed to an APP colocated at the dispatch center who engaged them using video chat, offered linkage to testing and self-quarantine guidance, made appointments in local in-network clinics, and texted or emailed postdischarge instructions directly to the patient. Case types managed by APP-telemedicine providers included

previously healthy patients with mild flu-like symptoms, minor trauma (e.g., abrasions and low-energy mechanisms), wound checks, and requests for medication refills (Clinical Vignettes: Figure 2, Figure 3).

FIGURE 2

Clinical Vignette #1

Traditional approach: 911 telecommunicators deploy an ambulance that transports her to the most accessible receiving hospital. Given her immunocompromise and lack of access to prior records, she has numerous tests performed and is admitted for 3 days of intravenous (IV) antibiotics. Her doctors are never contacted, and it takes her weeks to get copies of her medical records. **Dispatch-initiated telemedicine:** 911 telemedicine provider contacted in-network urgent care affiliated with her patient-centered medical home, where all of her records are kept and specialists could easily see and track her. She is taken by taxi to the clinic, seen by her team, and, after a period of observation, is discharged home with close follow-up.



60-year-old female with renal transplant on immunosuppressive medications has subacute dog bite to hand and calls 911 as she had difficulty contacting her doctors

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Dispatch-initiated telemedicine: 911 telemedicine provider contacted in-network urgent care affiliated with her patient-centered medical home, where all of her records are kept and specialists could easily see and track her. She is taken by taxi to the clinic, seen by her team, and after a period of observation is discharged home with close follow-up.

Source: The authors.

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Clinical Vignette #2

Traditional approach: 911 telecommunicators send an Advanced Life Support ambulance with two paramedics, who perform an electrocardiogram (ECG) showing normal sinus rhythm, and transport the patient to a nearby out-of-network hospital, where the patient is placed on observation status and receives serial troponin tests. He is ultimately discharged with acetaminophen as a “possible viral syndrome” and does not see his primary medical doctor (PMD). Mobile-integrated health care: 911 telemedicine provider observes the patient is not in distress and dispatches an Advanced Practice Response Unit. The field Advanced Provider (nurse practitioner or physician assistant) performs and interprets an ECG; calculates Wells, pulmonary embolism rule-out criteria (PERC), and cardiac risk stratification scores; performs a 6-minute walk test and observes no hypoxemia; diagnoses the patient as having mild Covid-19 symptoms; provides self-quarantine teaching to him and his family; and contacts the patient’s PMD to discuss the plan. The patient is contacted within 24 hours by an emergency medical services (EMS) patient liaison and takes a free taxi to his 48-hour follow-up with his family doctor for outpatient risk stratification.



38-year-old man with high cholesterol calls 911 for cough, chest pain, and shortness of breath

Traditional approach: 911 telecommunicators send an Advanced Life Support ambulance with two paramedics, who perform an electrocardiogram (ECG) showing normal sinus rhythm, and transport the patient to a nearby out-of-network hospital, where the patient is placed on observation status and receives serial troponin tests. He is ultimately discharged with acetaminophen as a “possible viral syndrome” and does not see his primary medical doctor (PMD).

Mobile-integrated health care: 911 telemedicine provider observes the patient is not in distress and dispatches an Advanced Practice Response Unit. The field Advanced Provider (nurse practitioner or physician assistant) performs and interprets an ECG; calculates Wells, pulmonary embolism rule-out criteria (PERC), and cardiac risk stratification scores; performs a 6-minute walk test and observes no hypoxemia; diagnoses the patient as having mild Covid-19 symptoms; provides self-quarantine teaching to him and his family; and contacts the patient’s PMD to discuss the plan. The patient is contacted within 24 hours by an emergency medical services (EMS) patient liaison and takes a free taxi to his 48-hour follow-up with his family doctor for outpatient risk stratification.

Source: The authors.

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For patients requesting or requiring transport to the hospital, taxi service was offered free of charge (through grant funding) in order to keep ambulances available for other time-critical calls and to limit exposure of first responders to potential patients with Covid-19. For patients with questionable

clinical findings on video chat, such as patients with poor histories, those with abnormal work of breathing, and those requiring a focused examination in order to apply clinical decision rules, APRUs in the field were summoned to perform a more comprehensive physical examination and troubleshoot complex linkage-to-care issues. Regular case reviews led by the physicians who serve as EMS Medical Directors, which promoted both homogenized practices as well as small-group trust and cohesion among all APPs, proved helpful in establishing common expectations about the types of tasks to be performed on scene to achieve a patient-centered disposition, such as understanding and proper use of clinical decision rules, antibiotic selection, new medication use, procedural competency, and evaluation of patient capacity to accept/refuse care. For example, an APRU may be added so that a field APP can perform a specific clinical assessment, such as checking for focal malleolar tenderness of the ankle in order to apply Ottawa ankle rules,^{15,16} to obviate the need for ambulance transport to the ED to obtain X-rays.

“ *Under temporary countywide policies, EMTs and paramedics were given additional leeway to select patients in the field who had upper respiratory symptoms suggestive of mild Covid-19 infection and advise them to stay at home and self-quarantine.*”

Care for the homeless in Los Angeles presented a unique challenge. The city had 41,290 people experiencing homelessness (PEH) as of January 2020,¹⁷ a 16% increase over the prior year. PEH account for 10% of 911 incidents and 13% of ambulance transports — a rate 19 times higher than that of housed EMS patients.¹⁸ More than 32% of ambulance transports in downtown Los Angeles are for homeless patients, and those living in congregate settings such as shelters are at much higher risk of viral transmission and have a higher prevalence of poorly controlled chronic medical, mental health, and substance abuse disorders. LAFD launched dedicated homeless testing sites in Skid Row, worked with community leaders to identify higher-risk individuals, and repurposed its SOBER Unit to provide care at the Sobering Center for Covid-19-positive homeless individuals in need of safe quarantine, all of which helped mitigate the tide of patients coming to Los Angeles’ busiest downtown hospitals.

Challenges

As the initial Covid-19 curve began to flatten in mid-June 2020, Angelinos increasingly emerged from the initial lockdown with exacerbations of their poorly controlled chronic medical issues, resulting in increased EMS incidents; after a drop of about 22%, EMS incidents had returned to 90% of year-over-year volume by late summer. This, accompanied by a handful of high-profile structure fires, increased the need for LAFD resources to return their attention to standard operations, and the question of mission creep arose, given the large commitment of firefighters that had been supporting public testing.¹⁹ This led to transition planning for testing, which was facilitated by preexisting relationships between EMS medical directors and hospital system/public health leaders as well as successful collaboration with Community Organized Relief Effort,²⁰ a large nonprofit volunteer organization whose employees gradually assumed the majority of roles at each testing site, thereby allowing firefighters and LAFD inspectors to return to their traditional roles.

The public perception of the ED being a dangerous place where one could contract Covid-19, fueled by images of overwhelmed hospitals in Italy and New York City, also posed a unique challenge: 911 users would call seeking reassurance in mild cases, but would often wait too long to call for time-sensitive incident types such as strokes, heart attacks, respiratory distress, and cardiac arrest. In April 2020, compared with April 2019, LAFD saw a 22.8% decrease in EMS incidents, but a 14.5% increase in EMS-treated out-of-hospital cardiac arrests and a 24.5% increase in cardiac arrests declared dead prior to arrival. Indeed, bystander response — long a public health passion for EMS medical directors — changed dramatically. LAFD telecommunicators experienced more difficulty converting 911 third-party callers (i.e., drive-by Good Samaritans) to second-party actors (those who stop and are willing to render help), and decreased rates of bystander cardiopulmonary resuscitation (CPR) were seen among the highest-risk geographic and cultural communities. Across the city, bystander CPR rates decreased from 46.3% (April–June 2019) to 40.9% (April–June 2020), while in South Los Angeles — an ethnically diverse community with intransigent low levels of bystander CPR — the rate decreased from 41.4% to 33.1%.

Under temporary countywide policies, EMTs and paramedics were given additional leeway to select patients in the field who had upper respiratory symptoms suggestive of mild Covid-19 infection and advise them to stay at home and self-quarantine. LAFD’s overall nontransport rate increased from 34% to 47%, helping temporize the flow of low-acuity patients to local EDs but placing additional expectations on patients to recontact and follow up with their own health systems.

EMS quality improvement metrics, which historically have been limited to checking a blood sugar for altered mental status, performing an electrocardiogram for chest pain, and ensuring low on-scene times for patients requiring trauma center care, had been augmented in recent years to leverage technology. For example, LAFD’s EMS field supervisors and the EMS Quality Improvement Unit leveraged its easily sortable electronic health record (EHR) system to quickly identify rekindles — patients who were recently attended by 911 providers, treated, and released and then recontacted for further care. EMS medical directors also used undertriage and overtriage data to change the level of provider programmed to be sent to each dispatch.⁵

“ *Although little attention has been paid to EMS in the past, the current pandemic has made it abundantly clear that the next frontier in managing acute, unscheduled care will require collaborating with prehospital experts to unlock the upstream value of patient navigation.*”

The MIH Unit, which had grown thanks to collaborations with community health partners, was already tracking both the number of patients taken to alternate destinations and their lengths of stay at those sites, the need for retransport to the ED, and the referrals made for follow-up care. During Covid-19, from April 2020 on, patients attended by 911 telemedicine also receive a phone follow-up call within 24 hours to query for experience of care as well as any need to subsequently go to the ED by any means.

Data sharing and linkage-to-care for EMT/paramedic-initiated treat-and-release patients during the early months of the Covid-19 pandemic (March–May 2020) was challenged by a longstanding lack of meaningful integration between prehospital and local hospital system EHR networks. Current prehospital EHRs are designed for providers with limited scopes of practice performing discrete tasks such as stabilization and transport; they do little in the way of patient matching and almost never incorporate hospital outcomes or coordinated care plans. In the future, a fully integrated health information exchange between EMS and its receiving acute care hospitals might enable early identification of patients bouncing back to the same (or a different) ED and provide a better understanding of MIH target populations by identifying 911 patients who are ultimately discharged from the ED with primary care-sensitive conditions.

Next Steps

Prehospital APPs have helped plan vaccine distribution to LAFD’s first responders and have overseen vaccine administration and monitored for patient safety, a novel prehospital skill that will have implications for both Covid-19 and beyond.

In the coming months, LAFD will incorporate additional approaches to enhance system efficiency and improve patient outcomes by

1. Augmenting paramedic decision-making through live telehealth consultation in order to increase treatment in place and alternate-destination transport (Figure 1);
2. Linking select EMS high-utilizers to full-service partnerships using social work advocates and both city-county and public-private partnerships; and
3. Using APRUs to link prehospital patients with opioid use disorder to medication assisted treatment programs in local FQHCs.

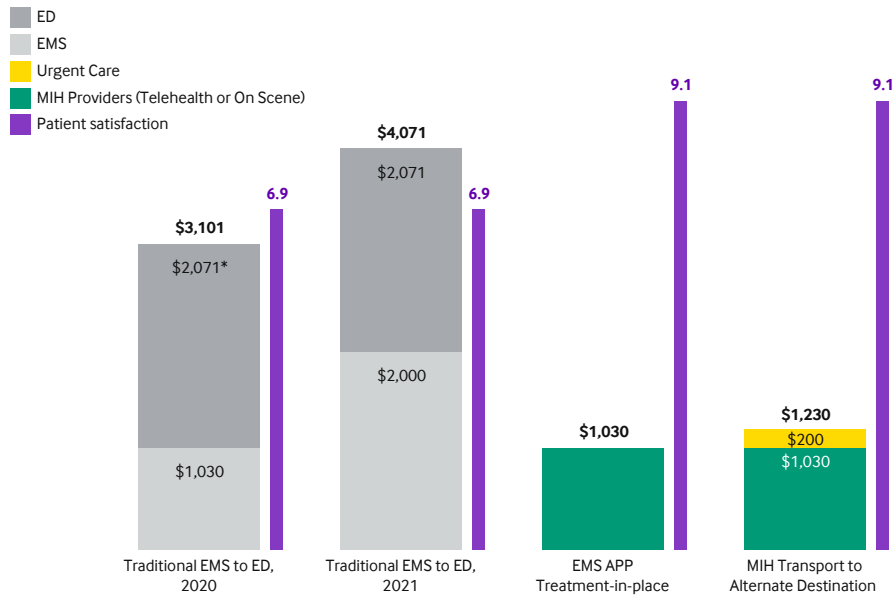
An ongoing barrier to EMS integration into the broader health care system is just-in-time identification of patient payer status. Some have feared this may promote a multitiered 911 response system in which the kind of insurance a patient has dictates the quality of care and stabilization they receive. However, early, real-time, and accurate identification of payer status among a small group of MIH team members, such as APPs, patient navigators, and social workers, would be transformative in assisting vulnerable patients to link to urgent follow-up and whole-person services and get the most out of their insurance coverage. Whereas today some patients may require transport to the ED and even admission to the hospital in order to get home health services, field-based or even 911 dispatch-based APPs with real-time support from health navigators could steer patients to the optimal site of care or services, helping control costs,^{8,21} manage flow to EDs, and even maintain, if not outperform, experience of care metrics.

Health care leaders, including payers and hospital executives alike, would be wise to engage with their local EMS medical directors in order to understand how these new models of care delivery can positively affect patient flow, linkage to services, and overall health care expenditures (Figure 4).

FIGURE 4

Comparison of Charges for Care Using Traditional EMS/ED Care Versus Mobile Integrated Health Care (MIH)

The expense of 911 emergency medical services (EMS) “treat-and-transport” to the ED for acute unscheduled care is high and projected to increase. Use of advanced practice providers (APPs) and paramedics with additional training to offer treatment in place or select patients for alternate destinations (such as urgent care centers, mental health crisis stabilization centers, or sobering centers) would significantly decrease overall costs of care while improving patient satisfaction.



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*This value does not take into account interim charge increases due to medical inflation.

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Strategies for initiating this conversation include cultivating meaningful relationships between chief medical officers and EMS medical directors and seeking common ground to improve system efficiency while protecting patient safety; establishing target populations that may be ripe for treatment-in-place and alternate-destination care; providing seed funding for municipal EMS providers to pilot new interventions until policy decision-makers can catch up and provide long-term support of new services; developing Health Insurance Portability and Accountability Act of 1996-compliant mechanisms to promote just-in-time linkage to care and share outcomes; and collaborating to set reasonable milestones and deliverables.

Although little attention has been paid to EMS in the past, the current pandemic has made it abundantly clear that the next frontier in managing acute, unscheduled care will require collaborating with prehospital experts to unlock the upstream value of patient navigation. It has also reminded us that 911 is a safety net for all of health care, and a healthy and well-connected safety net is a wise insurance policy for the unexpected.

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Appendix

[LA Fire Department EMS Organizational Structure, Training, and Staffing](#)

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