

CASE STUDY

Quality of care and emergency department throughput during the COVID-19 pandemic in a community health system

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ABSTRACT

Objective: This retrospective study explores the strategic plan formulated by AHMC Health System in California, USA, to sustain and improve quality of care and emergency department (ED) efficiency during the COVID-19 pandemic. It also analyzes the plan's outcomes.

Background: The COVID-19 pandemic has posed challenges for both individuals and healthcare industries alike, impacting decision-making and access to care. AHMC faced staff and resource shortages, patient reluctance, and difficulties adapting to rapidly evolving public health guidelines. These challenges highlighted the critical need for effective plans to maintain or improve healthcare quality and ED performance.

Methods: AHMC adopted a comprehensive three-layer strategic plan in 2020. The first layer, "Pandemic Response," focused on leadership, staff training and education, infection control, new treatments, and employee vaccination rates. The second layer, "ED Throughput," set objectives for metrics such as door-to-doctor (door-to-doc) time, ancillary turnaround time (TAT), ED length of stay (LOS), and the left-without-being-seen (LWBS) rates. Progress was monitored through monthly improvement meetings. The third layer, "Quality Excellence," tracked improvements in COVID-adapted objectives on quality initiatives, based on CMS Quality Star Ratings, Leapfrog Hospital Safety Grades, and Yelp review scores.

Results: By 2023, the three-layer strategic plan had led to many improvements in the quality of care and ED efficiency. AHMC identified 22,287 positive COVID-19 cases, expanded its ventilator inventory by 50%, and enhanced patient outcomes by applying updated treatments. Additionally, AHMC saw a 3% reduction in ED wait times and sustained its overall patient satisfaction rates, CMS Quality Star Rating, and Leapfrog Hospital Safety Grade scores.

Conclusions: AHMC's three-layer strategic plan showed effectiveness in maintaining quality of care and ED efficiency during the COVID-19 pandemic. By focusing on "Pandemic Response," "ED Throughput," and "Quality Excellence," AHMC was able to adapt to the rapidly evolving public health guidelines, expand its capacity to treat COVID-19 patients and sustain its overall patient safety, satisfaction, and quality ratings. The implementation of this plan highlights the importance of proactive and comprehensive strategies in managing healthcare crises.

Key Words: Emergency department, COVID-19, Quality of care, Emergency department throughput, Three-layer strategic plan

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1. INTRODUCTION

The COVID-19 pandemic has caused significant challenges for individuals and healthcare facilities, particularly hospitals. Despite these difficulties, hospitals have remained committed to maintaining and improving the quality of care and patient satisfaction. The ongoing global health crisis has highlighted the critical concern of ensuring service quality during the pandemic, emphasizing the need for comprehensive measures to safeguard the well-being of individuals seeking medical care.

However, the COVID-19 pandemic severely impacted patient decision-making regarding healthcare access. Fear of virus exposure in healthcare settings created widespread reluctance, leading many individuals to postpone or avoid essential medical attention.^[1] This resulted in delayed diagnoses and treatments, potentially worsening health conditions and negatively impacting patient outcomes.^[2] As healthcare providers engage with these complex issues, the healthcare system’s quest for solutions and strategies has become imperative. To ensure the quality of care and emergency department (ED) processing time during these unprecedented circumstances, it is important to thoroughly understand these

challenges and continuously pursue solutions.

2. METHODS

2.1 Setting

AHMC Health System (AHMC) is a healthcare system of 10 community hospitals across California, USA. With 2,200 beds, a network of 6,000 affiliated physicians, and over 10,000 employees (as of 2024^[3]), AHMC Health System prioritizes delivering high-quality care and ensuring patient satisfaction, earning numerous regional, national, and international accolades. At the beginning of the pandemic, to minimize the impact of care on patients, AHMC implemented a three-layer strategic plan, which included the “Pandemic Response,” “ED Throughput,” and “Quality Excellence” (see Figure 1). This three-layer strategic plan aimed at effectively managing the challenging circumstances and meeting the demands of the situation, but also prioritized enhancing healthcare capacity, strengthening staffing, ensuring efficient and safe treatment, and improving hospital quality using Lean Six Sigma and the Six-Dimensional Approach.^[4] These measures demonstrated AHMC’s commitment to effectively responding to the pandemic and maintaining high-quality, patient safety and satisfaction in the ED.

01	Pandemic Response	<ul style="list-style-type: none"> ● Leadership Management, Staff Training and Education ● Infection Control and New Treatments ● Employee Vaccination Rate
02	ED Throughput	<ul style="list-style-type: none"> ● Door-to-Doctor (Door-to-Doc) ● Ancillary Turnaround Time (TAT) ● Emergency Department Length-of-Stay (ED LOS) ● Left-Without-Being-Seen Rate (LWBS) ● Emergency Department Consumer Assessment of Healthcare Providers and Systems (ED CAHPS)
03	Quality Excellence	<ul style="list-style-type: none"> ● Quality, Patient Safety and Satisfaction ● CMS Star Rating (5 items) ● Leapfrog Hospital Safety Grade (9 items) ● Yelp Review Score

Figure 1. Three-layer strategic plan for promoting patient safety, satisfaction, quality of care, and ED efficiency during the COVID-19 pandemic at AHMC Health System

2.2 Layer 1: Pandemic response

AHMC systematically implemented three approaches encompassing critical aspects of the “Pandemic Response.” Firstly, AHMC’s governing board and its COVID-19 committee collaborated closely with local public health departments, taking a leadership role in the region by instituting training programs, standardizing testing, and expanding the

capacity of negative pressure rooms and ICU beds by 30% in all 10 AHMC hospitals. Secondly, AHMC took the lead in the region using new treatments including antiviral medications and monoclonal antibody infusions in ED at the beginning of the pandemic. Additionally, AHMC actively participated in convalescent plasma programs and swiftly applied Remdesivir, Dexamethasone therapy, and Paxlovid

as treatments to enhance patient outcomes. In adherence to CDC requirements, AHMC distributed extra ventilators and PPE and established a weekly PCR testing regimen for employees to maintain nosocomial infection rates among AHMC staff to remain below 5%. Furthermore, AHMC also implemented comprehensive employee education and training programs.^[5] Lastly, AHMC prioritized vaccinating all healthcare professionals and collaborated closely with stakeholders and representatives to facilitate mass vaccinations to achieve and surpass a 90% employee vaccination rate.

2.3 Layer 2: ED throughput

COVID-19 pandemic affected the ED the most. AHMC adopted new strategies based on Lean Six Sigma during the pandemic to drive ongoing improvements in “ED Throughput” for quality and efficiency. These strategies included setting up fever stations in each hospital’s ED during the pandemic and transforming in-person monthly ED throughput performance improvement meetings into multiple virtual approaches that provide new COVID-19 trend updates. Additionally, AHMC hosted monthly conference calls with sister facilities to develop mitigation strategies and tracked five objectives in each ED, including three processes and two outcome indicators. These objectives included achieving a door-to-doctor (door-to-doc) time, which is the time from patient arrival to seeing a doctor – to under 30 minutes, maintaining ancillary turnaround time (TAT) which is from patient disposition to admission/discharge/transfer – to under 60 minutes, targeting a total ED length of stay (LOS) – to under 150 minutes; maintaining a left without being seen (LWBS) rate below 1%, and ensuring sustainment of Emergency Department Consumer Assessment of Healthcare Providers and Systems (ED CAHPS)^[6] aggregate scores above 55%.

2.4 Layer 3: Quality excellence

To pursue “Quality Excellence,” AHMC launched the Six-Dimensional Approach, continuously focusing on six key areas, including inpatient, outpatient, emergency department, employees, physician relationships, and the community. Three nationwide quality measurements were used in this study.

The first measurement was the CMS Quality Star Rating, which evaluates quality of healthcare with 1 to 5 stars in the United States. These categories include mortality, safety, readmission, patient experience, and timely and effective care. Each of these categories plays a pivotal role in determining the overall star rating awarded to a healthcare facility. Higher scores reflect better quality and patient outcomes, making this rating system a valuable tool for patients choosing where to receive care.^[7] As of 2023, the average CMS

rating nationwide was 3.21.^[8] In 2020, we set our goal to achieve an average rating greater than 3.25 in our health system, with at least two hospitals obtaining a CMS 5-star rating.

The second measurement was to monitor hospital patient safety. The Leapfrog Hospital Safety Grade is the only patient safety monitoring program used in nearly three thousand hospitals throughout the U.S. The Leapfrog Hospital Safety Grade is a bi-annual assessment that provides a letter grade, from A (best) through F (worst), representing the safety of hospitals across the United States. This grade is particularly focused on how well hospitals protect patients from errors, injuries, accidents, and infections. This includes patient rights and ethics, medication safety, maternity care, ICU physician staffing (IPS), patient safety practices, managing serious errors, pediatric care, and outpatient procedures. We set our goal to ensure that at least two hospitals received an “A” rating in the Leapfrog Hospital Safety Grade.

The third measurement is the most commonly used patient satisfaction tool online – the Yelp review in the U.S. The Yelp review platform is a website and app that functions as a community feedback indicator of service and quality. Yelp is widely recognized as an important patient satisfaction tool because it offers a platform where real patients share their unfiltered experiences and opinions about healthcare providers. Yelp allows patients to rate and review their interactions with medical facilities on a scale from 1 to 5 stars. Nationwide, the average hospital Yelp score ranges between 2.5 to 2.6 stars.^[9] Our goal was to maintain a Yelp review average review score above 3.0 stars.

3. RESULTS

Throughout the four-year battle against COVID-19, AHMC has exemplified resilience and adaptability in its approach to hospital administration. The “Pandemic Response” was highlighted by noteworthy achievements, including cross-training staff, ensuring adequate supplies, and preparing for a surge in severe COVID-19 patients.^[10] For example, more than 150,000 patients were tested, with 22,287 positive cases identified across AHMC’s ten hospitals. Additionally, AHMC expanded its ventilator inventory by 50% and sourced over 300,000 masks and essential PPE through collaborations with the Los Angeles County Department of Public Health (LACDPH), healthcare foundations, local communities, and international partners. AHMC led in providing outpatient care with new antiviral treatments and monoclonal antibody infusion service in the ED, reducing COVID-19 hospitalization rates from 10% at the beginning to 3% in 2023. Furthermore, AHMC maintained average nosocomial infection rates under 4% and achieved an employee vaccination rate

above 90% in 2023. Lastly, the organization also conducted a comprehensive COVID-19 health outcome study and published it in a renowned international journal,^[11] providing valuable insights by analyzing disparities between Asian and non-Asian patients following hospitalization. This initiative aligned with other research efforts to understand disparities in COVID-19 outcomes among diverse populations. Additionally, in 2021, AHMC facilitated organizational growth and expanded its service areas to provide more affordable and accessible community care. This was achieved through the acquisition of two hospitals in Northern California, with 116 and 357 beds respectively, thereby enhancing community

healthcare access in the region.^[12]

Our commitment extended to the second layer, “ED Throughput,” and we successfully achieved most of the ED throughput objectives. As shown in Table 1, the door-to-doc time decreased to a mere 13.2 minutes, surpassing the target by nearly half. Furthermore, we achieved an efficient median ancillary TAT of 40 minutes and an ED LOS of 146 minutes. Moreover, our LWBS rate decreased to less than 1%. Alongside these improvements, our ED CAHPS score reached 60.46%. These outcomes demonstrate our concerted efforts to reduce wait times, enhance patient safety and satisfaction, and ensure the delivery of effective and compassionate care.

Table 1. Comparison of ED throughput and quality excellence objectives (Goal of 2020 versus year 2023)

	Goal of 2020	Year 2023
Emergency Department Throughput		
Door-to-Doc	< 30 minutes	13.2 minutes
Ancillary TAT	< 60 minutes	40 minutes
ED LOS	< 150 minutes	146 minutes
LWBS	< 1%	0.1%
ED CAHPS*	55%	60.46%
Quality Excellence		
CMS Star Rating**	Overall score > 3.25-star; and two hospitals got 5-star	Overall score = 3.22; and two hospitals got 5-star
Leapfrog***	Two hospitals got an ‘A’	One hospital got an ‘A’
Yelp review****	Overall score > 3	Overall score = 2.81

Note. *Emergency Department Consumer Assessment of Healthcare Providers and Systems (ED CAHPS) is a standardized survey that measures patient experiences in hospital emergency departments; **CMS Star Rating is a way for the Centers for Medicare & Medicaid Services (CMS) to evaluate the quality of Medicare Advantage and Medicare Part D prescription drug plans; ***Leapfrog assigns letter grades (like A, B, C) to hospitals based on safety and quality measures; ****Yelp review is a website and app that functions as a crowd-sourced business review platform

The third layer, “Quality Excellence,” emphasized our aim of achieving and sustaining high-quality healthcare services. In the face of these challenges, AHMC’s continued efforts towards quality and patient satisfaction have improved its CMS Quality Star Rating, steadily climbing from 2.43 to 3.22 between 2020 and 2023. During this period, we saw an expansion in the number of our hospitals and achieved average Yelp review scores that surpassed those of neighboring hospitals. These accomplishments were particularly noteworthy considering the backdrop of the pandemic and its pervasive impacts on healthcare institutions. These outcomes signified AHMC’s capacity to navigate and overcome pandemic-induced disruptions while steadfastly focusing on providing high-quality healthcare services to our communities.

4. DISCUSSION

The pandemic has significantly impacted people’s lives and presented substantial challenges to healthcare facilities. In response, AHMC has focused on maintaining high patient

safety, satisfaction, and quality of care standards. This included implementing the three-layer strategic plan that has helped us achieve our goals. The three-layer strategic plan, adaptability, and proactive approach provided valuable insights for healthcare institutions looking to maintain high standards during the pandemic and beyond.^[13] It may offer insights as a reference for other hospitals to consider. Despite the hospital achieving commendable outcomes, there exists room for further enhancement. Throughout the pandemic and post-COVID era, we observed periodic fluctuations in quality control metrics.^[14] Identifying the main reasons for these differences was important to improve this situation. A key element of this process was the effort invested in maintaining consistent standards of care and operational efficiency. Proactive steps such as regularly calibrating medical equipment, ensuring adequate staffing, and consistently adhering to hygiene and safety protocols were fundamental to a seamless healthcare delivery system.^[15] By prioritizing routine checks and fostering a culture of continuous improvement, we aimed to stabilize and enhance the patient experience while miti-

gating risks. In the aftermath of the pandemic, numerous challenges^[16] have emerged, necessitating immediate and strategic attention.

As depicted in Table 1, our key areas of concentration for improvement included ED LOS, CMS Quality Star Ratings, the Leapfrog Hospital Safety Grade, and Yelp review scores. Although we achieved our benchmark LOS goal in 2023, examining the previous year's figures reveals room for additional improvement. In the face of this challenge, incorporating strategic initiatives such as streamlining procedural workflows, strategically allocating staffing resources, and implementing effective triage paradigms could hold promising potential. By aligning these measures with our goals, the efficiency of the ED performance could be improved, resulting in great reductions in LOS metrics. Additionally, the efficient utilization of point-of-care testing has decreased patients' ED waiting times. Enhancing patient flow and alleviating departmental crowding can be achieved by introducing novel working practices and incorporating advanced technologies like point-of-care testing in the ED.^[17,18]

During the COVID-19 period, numerous families have endured the pain of having their loved ones contract the virus, experience diminished quality of life or even succumb to it.^[19] The resulting anger and frustration can be vented through negative ratings on the application platforms, impacting both the CMS Quality Star Rating and social media scores.

5. CONCLUSIONS

Focusing on maintaining and improving the quality of care and ED efficiency, this study elaborates on AHMC's three-layer strategic plan, which includes "Pandemic Response," "ED Throughput," and "Quality Excellence." Despite facing challenges such as staff shortages, resource constraints, patient reluctance, employee adaptation, financial stress, and mental health issues, AHMC has demonstrated resilience and innovation in response to the constantly evolving COVID-19 pandemic.

AHMC's progress includes an increase in ventilator inventory, collaborative procurement of PPE, and the implementation of updated treatments as they become available, such as Remdesivir and Paxlovid in the emergency department. Additionally, AHMC has maintained a high staff vaccination rate and a low rate of nosocomial infections. Regarding emergency department throughput, AHMC has excelled in metrics such as median door-to-doc time, Ancillary TAT, ED LOS, and LWBS rates, surpassing established goals. The patient-centered approach is also reflected in the overall ED CAHPS scores. The layer of "Quality Excellence" emphasizes AHMC's commitment to achieving and maintaining

high-quality healthcare services. The CMS star rating has improved, and the average Yelp review scores exceed that of neighboring hospitals, demonstrating its commitment to patient satisfaction throughout the community.

Despite these achievements, we have identified areas that require further improvement. We recognize the need for continuous progress in quality of care indicators, a more comprehensive focus on reducing ED LOS times, and substantial enhancements in CMS star ratings, Leapfrog patient safety grades, and Yelp review scores. AHMC acknowledges that sustained progress and a strategic focus on addressing the challenges posed by the pandemic are essential for stabilizing and elevating the patient experience.

COVID-19 represents a pivotal transition point in our lives, imposing substantial challenges that span the domains of public health, socio-economic stability, and global collaboration. These hardships have resonated across communities and nations, ushering in a period of reflection and necessitating adaptation. It is crucial not only to acknowledge these adversities, but also to learn from them. Academics, policy-makers, and practitioners must examine the global response, identify gaps, and strategize for future crises. The narrative should shift towards constructive learning and proactive improvement, contributing to the development of more resilient public health systems and enhancing societal preparedness.

Furthermore, effective teamwork and collaborative sharing play pivotal roles in addressing the challenges posed by the pandemic. Cross-national and inter-organizational exchanges foster mutual understanding and cooperation, expediting the return of individuals to a harmonious everyday life.^[20] This interconnected approach facilitates the exchange of ideas, resources, and expertise, further enhancing the collective efforts to restore a sense of peace and stability within communities. Consequently, the pandemic highlights the importance of continuous improvement and collaboration, guiding academic discourse towards the development of resilient and transformative strategies.

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AUTHORS CONTRIBUTIONS

Wen-Ta Chiu: Conceptualization, methodology, validation, writing, supervision; Wan-Yi Lin: Conceptualization, formal

analysis, writing, visualization, project administration; Yu-Tien Lin: Conceptualization, writing, visualization, project administration; Chia-Hsing Yeh: Conceptualization, writing, visualization; Kaveh Aflakian, Pei-Chen Pan, Chien-Yu Liu, Han-Kuan Bai: Investigation, validation, writing; Stanley Toy, John Chon, Steve Giordano, Victor Lange, Suyen Wu, Jonathan Wu: Conceptualization, methodology, validation, supervision.

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Informed patient consent was not required because no patient clinical or identity data was collected, and no patient interventions were completed during the course of study. Therefore ethical review board approval was not required and waived.

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The authors declare they have no conflicts of interest.

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DATA SHARING STATEMENT

No additional data are available.

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