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Emergency Medicine and Rapid Response Virtual Team (EM-RRVT): Insights from the Hajj 1445/2025 Experience

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Emergency Medicine and Rapid Response Virtual Team (EM-RRVT): Insights from the Hajj 1445/2025 Experience

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***Abstract—Introduction*: The use of telemedicine in acute care settings has not been investigated in the context of large mass gatherings. Further exploration is needed to determine its efficacy and applicability, and to explore the associated challenges and opportunities.**

***Aim*: This study aims to evaluate a pilot deployment of a virtual emergency team during one of the largest mass gatherings in the world, the Hajj religious season.**

***Methods*: The Emergency Medicine and Rapid Response Virtual Team (EM-RRVT) was deployed from June 13 to July 6, 2024. The pilot was conducted in phases, with Phase One occurring in Mecca from June 13 to June 19. Subsequently, the team was activated on an on-demand basis. Their role was to complement the on-ground teams as well as various emergency departments.**

***Results*: The team encountered a total of 324 patients from 20 countries, with a variety of medical conditions. The most prevalent condition was acute coronary syndrome, followed by trauma, within the peak hours from 10:00 to 22:00 coinciding with the movement of pilgrims. In the holy city, 58.03% of patients (n=65) received treatment and were discharged to continue their participation in the Hajj ceremony, compared to those who required hospital admission or transfer via EMS (Fisher's exact test, p=0.010). Within the ED model of care, direct consultations accounted for the majority of interactions at 74.7% (n=242), whereas 25.3% (n=82) were planned rounds.**

***Conclusion*: The use of telemedicine in an acute setting showed promising results. The establishment of the Emergency Medicine and Rapid Response Virtual Team proved to be both feasible and applicable. The scalability and flexibility of the service contributed to its efficiency.**

***Index Terms*— Disaster medicine; disaster planning; emergency medical services; emergency treatment; evidence-based emergency medicine; mass gatherings; telemedicine.**

I. BACKGROUND

In large-scale mass gathering, resources, no matter how abundant, often remain challenged. Mobilising all of a country's resources is unfeasible despite its theoretical applicability. In such scenarios, telemedicine solutions present a significant step towards improved planning and preparedness. Traditionally, telemedicine has been perceived as a means to enhance healthcare accessibility, initially focusing on rural, remote, or underserved communities [1]. However, its scope has expanded significantly to provide specialised care in areas of greater need [2].

One of the earliest applications of telemedicine in disaster medicine was the satellite-based communication system that connected three countries following two

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major disasters in 1988 and 1989 [3]. Prior to that, telecommunication was employed to assist in the aftermath of Mexico City's catastrophic 1985 earthquake [1]. The core of this strategy is to augment the capacity of local groups, strengthening their healthcare capabilities to ensure continuity of care and facilitate faster recovery [4,5].

More recently, the increased use of telemedicine during the COVID-19 pandemic highlighted several operational benefits. These include limiting the flow of people entering healthcare facilities, reducing the need for in-person interactions, and consequently minimising the consumption of personal protective equipment (PPE) [4]. Examples of these applications include virtual registration, virtual waiting rooms, online appointment scheduling, and the provision of virtual clinical care for certain medical specialities [4,5].

Furthermore, the literature reveals varying scopes of telemedicine applications in mass gathering settings, with a focus on optimising workforce distribution and sharing resources to augment overwhelmed capacity. The applications range from communication between first responders (in both civilian and military settings) and physicians for clinical management and remote procedural guidance; interactions between generalists and subspecialists for initial and secondary triage; and leadership support, including decision-making and scene management [6]. Moreover, telemedicine enables direct clinical interventions through telementoring, allowing healthcare providers to remotely diagnose, treat, and oversee procedures [6].

Despite the evident potential of telemedicine, its application in patient surge and acute care settings remains largely unexplored. Consider the possibility of augmenting medical assistance teams multiple times through virtual means, while addressing confounding factors such as housing, transport, health, security, safety, and nutrition. Although technological integration can enhance decision-making quality and reduce the need for critical choices, several key questions remain unanswered: Which telemedicine models should be utilised, and what steps should be taken in the implementation process? Will connectivity pose a challenge, and how reliable is the service? Additionally, can virtual emergency care deliver effective healthcare outcomes?

This study aims to test the establishment and deployment of an emergency team to respond to patient surge. We chose the largest mass gathering in the world: the Hajj involves the convergence of an extraordinarily large number of pilgrims within a small geographical area, in which the pilgrims move from one place to another in a dynamic fashion.

We also explored the associated opportunities and challenges associated with the establishment of an emergency virtual response team.

II. METHODS

Setting and timing:

The Emergency Medicine and Rapid Response Virtual Team (EM-RRVT) was established as part of the SEHA virtual hospital's role in the national preparedness efforts for the Hajj pilgrimage in Saudi Arabia for the year 2024. The preparedness phase began in December 2023, with the team officially launched one day prior to the Hajj gathering on June 13, 2024 (the 7th of Dhu al-Hijjah in the Hijri calendar). It remained operational until July 6, 2024.

The EM-RRVT's operations were divided into two phases. Phase One took place in the holy city of Mecca from June 13 to June 19. Following this, Phase Two was activated on-demand, responding to the evolving movement and needs of the pilgrims throughout the country.

The virtual team system was considered complementary to, rather than mutually exclusive from, the on-scene Disaster Medical Assistance Teams (DMAT) during the first deployment phase, which served as a pilot phase. The virtual team's activation was synchronised with the on-ground team, and it was assumed that the virtual team would share the burden of the on-site team, thereby enhancing overall service delivery.

Workforce:

The selection criteria for the virtual workforce were

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based on a combination of background knowledge of emergency medicine, and availability in the season of the mass gathering. The team was selected based on their competencies in communication, professionalism, leadership, health informatics, digital literacy, and clinical expertise [7]. Prior to deployment, they were credentialed and given training on various aspects of patient flow. The training encompassed telemedicine connectivity, troubleshooting, documentation, and using a ring-down system. Similarly, training was also provided for new on-site members utilising the virtual services. This training regimen was replicated for both the physicians in the field or the emergency department (ED), and the medical directors overseeing the operation.

The result was a pool of specialised emergency medicine physicians to ensure 24-hour coverage, with one physician per shift providing virtual emergency care. Additional physicians were made available during surge times, based on historical data and prior experience with the same religious ceremony.

Additionally, the team included three operational personnel with experience in telehealth, each covering an 8-hour operational shift. These personnel oversaw operations; monitored patient status, patient volume, and the schedule; and supervised logistical and technical personnel. During the planning phase, a dedicated project manager was responsible for managing logistics. Once the team was deployed, these logistical responsibilities were handed over to the on-scene operational staff, whose duties included the allocation and management of telehealth cases.

The team also included representatives from the national telecom company, which opened a communication channel for any issues related to connectivity and technical support. In addition, three on-call IT team members were dedicated to maintaining the health and functionality of the devices used during virtual operations.

The team's structure followed that of the Incident Command System (ICS), as illustrated in Figure 1, with the service lead acting as the commander and planning manager.

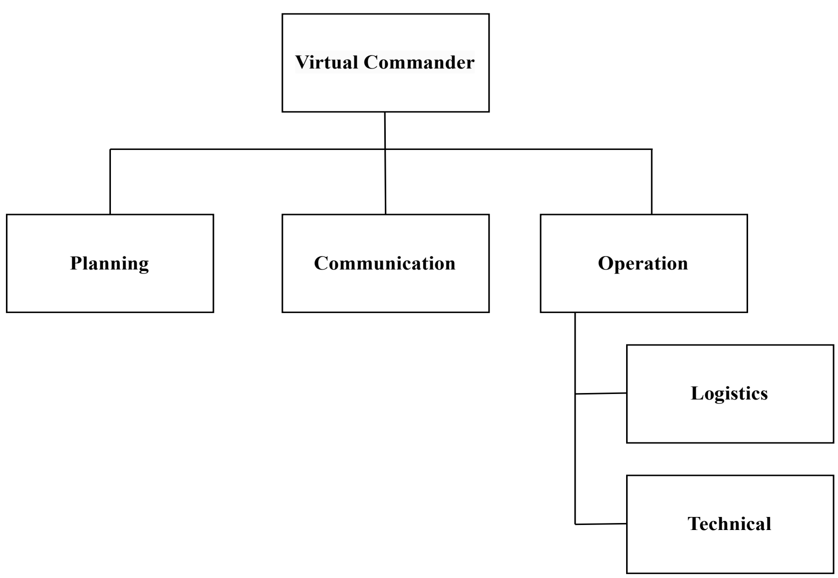

Figure 1. Organisational structure of the virtual team

Planning and Implementation of Telecommunication Tools:

Various telecommunication tools were evaluated during the planning phase, including telemedicine case, open platforms, and video conferencing solutions for patient encounters. The selection criteria for these tools included user-friendliness, compatibility with mobilised teams, adherence to cybersecurity

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legislation, and cost-effectiveness.

A web conferencing and video conferencing platform was chosen. Four virtual rooms were created, named (Alpha, Beta, Gamma, and Delta), and tested for readiness. They were constantly open and aligned with the on-site mobilised teams assigned to various geographical locations. Five computers were prepared at the headquarters for use. To ensure scalability of the service, additional on-call teams could be activated during patient surges, with new virtual rooms being opened as necessary.

Connectivity and Reliability:

Reliable connectivity was a critical aspect of the operations. Given the large number of pilgrims, we expected a congested mobile network which may interrupt or reduce the quality of virtual calls. To foresee any potential interruption, the team conducted multiple connectivity drills over several days during the deployment, especially when joining new locations.

Case Management and Dispatch System:

The EM-RRVT's case management process simulated a dispatch system, where the on-site physicians would notify designated dispatchers about the presence of patients requiring virtual care. The dispatcher would then immediately link the physician to an available virtual emergency physician.

To further optimise patient triage and care delivery, the team implemented measures to minimise waiting times. If more than one patient was waiting for the same virtual room, the virtual dispatcher would promptly redirect patients to different available rooms, ensuring that no one had to wait unnecessarily. Moreover, the virtual dispatcher played a role in monitoring the status of video conferences and quickly re-establishing connections in the event of any disruptions by direct communication with the provider on-scene. Within each geographical location, the on-scene providers organised as teams using cross-platform messaging and voice-over-IP (VoIP) services.

In addition to efficient dispatch protocols, the EM-RRVT also had in place well-defined triage protocols. Patients were prioritised according to the urgency of their medical needs, ensuring that the most critical cases received immediate attention from the available virtual physicians.

Operational Perspective:

The model of care, emulating an on-ground medical assistance team with three tiers, is illustrated in Figures 2 and 3. Tier 1 provided on-scene prehospital care, while Tier 2 supported mobilised teams in primary clinics and healthcare hubs. The third tier operated within hospitals for triage and comprehensive emergency ward coverage. Two models were developed to implement this structure effectively: physician-to-physician and patient-to-physician. In the physician-to-physician model, an on-site physician communicated with a virtual emergency physician for guidance and decision-making support in the prehospital setting, as a member of the mobilised DMAT or within the ED. The patient-to-physician model allowed virtual emergency physicians to conduct patient assessments and manage care through on-site junior physicians, general practitioners, or nurses.

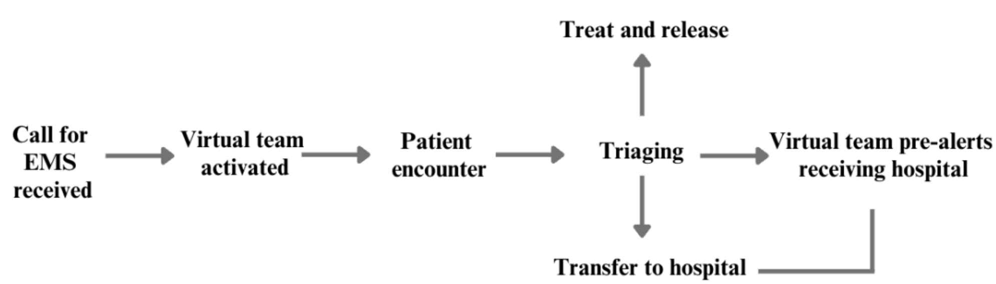

Figure 2. Tiers 1 and 2 of prehospital care and patient flow encountered by mobilised groups. For tier 1, this would be a call initiated by the end user requesting EMS, whereas for tier 2, the mobilised team would either encounter the patient based on their geographical area of coverage or would be asked for help by the EMS.

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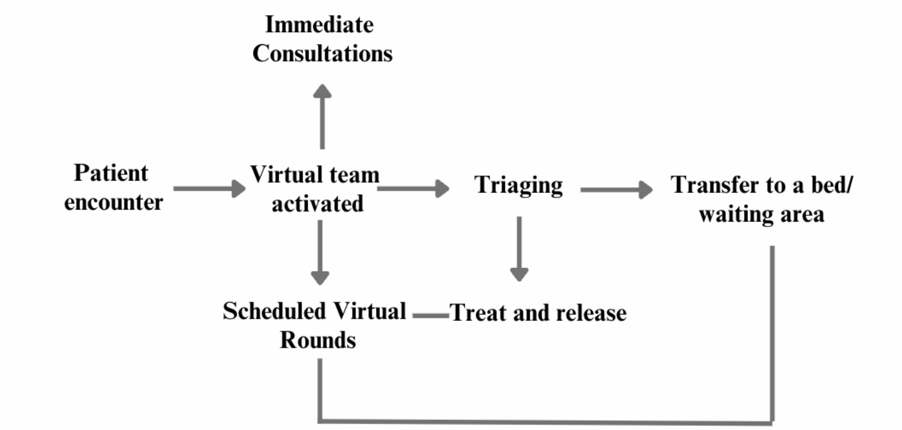

Figure 3. The third tier, wherein virtual acute care is provided within the ED, either through scheduled rounds or immediate on-demand consultations.

Documentation:

Data were collected using pre-prepared templates, based on several meetings that explored the necessary factors for quality auditing and service value measurement. The data included patient identification, site of encounter, patient’s place of origin, vital signs, history and physical examination, investigations, diagnosis, and disposition (e.g., treat and release, referral to physical bed/request for EMS, admission, or referral to other virtual outpatient departments).

To address language barriers, the EM-RRVT installed an open online language translation service on all hub computers, and team members were trained to effectively use the shared screen feature for enhanced communication.

Data Quality and Protocols:

Data quality was continuously monitored, resulting in two modifications of the documentation template to ensure accuracy and completeness. Existing hospital protocols were strictly adhered to, including guidelines for patients leaving without completing treatment, leaving without being seen, and those discharged against medical advice.

Privacy, Consent, and Governance:

Implied consent for telemedicine was ensured, and privacy and confidentiality were strictly maintained in accordance with the Telehealth Application Guidelines [8] and the Standard Operating Procedures of the Clinical Governance Directorate at the Digital Health Center of Excellence [9]. The business model, workflow, and documentation were approved prior to the launch of the service, and the design started as a pilot during phase one.

Additionally, the team ensured that information about the medications carried by the mobilised on-site groups was communicated to all team members.

Data Analysis:

Descriptive and inferential statistics were used. Pearson’s chi-square and Fisher's exact tests were applied, and data were analysed using Stata version 17. A p-value < 0.05 was established as the threshold for statistical significance. The outcomes examined in the study included patient demographics and vital signs, initial diagnoses, the timing of patient encounters, and patient dispositions.

Instances where patients refused to participate were considered missing data. In such cases, the team was instructed to attempt to capture the reasons for refusal and document them accordingly. Additionally, we anticipated the possibility of missing data for certain vital signs, particularly during periods of high patient surge when the vital signs communicated were within normal ranges. While monotonous missing data were omitted from the analysis, for simplicity, the team applied a consistent method (e.g., mean imputation) to handle non-monotonous missing data points.

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III. RESULTS

The total number of patients encountered by the team was 324, with males representing 58.3% (n=189) and females 41.6% (n=134). The patients were nationals of 20 different countries, including Saudi Arabia, Egypt, Pakistan, Yemen, India, , Bangladesh, Iran, Indonesia, Turkey, Libya, Syria, Algeria, Bahrain, Canada, China, Germany, Kenya, Malaysia, the Maldives, as well as displaced tribes.

The EM-RRVT's coverage area included a field hospital, which was activated for one day during the peak of the mass gathering season. Telemedicine was integrated into the operations of this field hospital, covering two key areas: the triage section and the yellow (intermediate care) zone. Additionally, the virtual care coverage extended beyond the field hospital, expanding to multiple primary healthcare centres in Madinah during the subsequent phases of the season. The team's reach also encompassed hospitals located in the northern, eastern, and southern territories as the demand for services increased due to the patient surge.

Patients' Health Status:

The patients had a mean systolic blood pressure (BP) of 132 mmHg (SD = 23) and mean diastolic BP of 76 mmHg (SD = 14), with a systolic BP range from 82 to 220 mmHg and a diastolic range from 45 to 120 mmHg. The mean heart rate (HR) was 91 bpm (SD = 17), with a range from 45 to 187 bpm; one patient suffered cardiac arrest. The median respiratory rate was 19 breaths per minute (IQR 18-20), with a range from 12 to 32. The median oxygen saturation was 96% (IQR 94-98%), with the lowest recorded saturation at 82%. The median body temperature was 36.9°C (IQR 36.8-37°C), with a range of 36 to 40°C. The median Glasgow Coma Scale (GCS) score was 15 (IQR 15), with scores ranging from 3 to 15.

There was considerable variation in the diseases and conditions encountered, with 93 different pathologies identified, as shown in Table 1. Acute coronary syndrome (ACS) was the most common condition, accounting for 10.3% (n=33) of cases, followed by trauma, which accounted for 6.5% (n=21).

Two intubations were performed due to seizure; one secondary to heat stroke that did not improve despite cooling, and the other due to an intracranial insult with focal deficits. In the first case, tele-intubation was performed under the direct supervision of a virtual physician, and executed by the provider in the field. The virtual physician guided the on-scene physician regarding equipment, use of medication, preoxygenation, and intubation strategy. In the second case, the patient had a difficult airway and was in a primary healthcare clinic equipped with a crash cart. The virtual team provided instructions on equipment assembly, use of medication, and intubation strategy. They also coordinated the mobilisation of the backup team and necessary equipment and medications to the site where the physician was performing the intubation.

Table 1. Diseases encountered by the team.

Disposition Diagnosis	N	Percent (%)
Acute coronary syndrome	33	10.28
Trauma	21	6.54
Gastroenteritis	17	5.3
Heat exhaustion	13	4.05
Pneumonia	13	4.05
Asthma exacerbation	8	2.49
Diabetic ketoacidosis	8	2.49
Hyperglycaemia	8	2.49
Sickle cell disease crisis	8	2.49
Upper respiratory tract infection	8	2.49
Acute appendicitis	7	2.18
Stroke	7	2.18
Abdominal pain/Surgical abdomen	6	1.87
Musculoskeletal pain	6	1.87

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Disposition Diagnosis	**N**	**Percent (%)**
Seizure	6	1.87
Septic shock	6	1.87
Allergy/Anaphylactic shock	5	1.56
Acute confusion	5	1.56
End-stage renal failure for haemodialysis	5	1.56
Chronic obstructive pulmonary disease exacerbation	4	1.25
Acute decompensated heart failure	4	1.25
Gastritis	4	1.25
Heat stroke	4	1.25
Hypoglycaemia	4	1.25
Acute coronary syndrome (vs acute decompensated heart failure)	3	0.93
Abscess	3	0.93
Acute kidney injury	3	0.93
Anaemia	3	0.93
Bowel obstruction	3	0.93
Central nervous system insult	3	0.93
Deep venous thrombosis	3	0.93
Epistaxis	3	0.93
Trauma	3	0.93
High blood pressure reading	3	0.93
Hypertensive emergency	3	0.93
Pulmonary embolism	3	0.93
Renal colic	3	0.93
Scorpion sting	3	0.93
Shortness of breath for investigation	3	0.93
Vertigo	3	0.93
Acute cholecystitis	2	0.62
Acute cholecystitis/Pancreatitis	2	0.62
Acute pancreatitis	2	0.62
Psychiatry-related anxiety	2	0.62
Burn	2	0.62
Dehydration	2	0.62
Fever of unknown origin	2	0.62
Foreign body ingestion	2	0.62
Pulmonary oedema	2	0.62
Upper gastrointestinal bleeding	2	0.62
3rd cranial nerve palsy	1	0.31
Arrested	1	0.31
Arrhythmia	1	0.31
Bilateral hearing loss	1	0.31
Cat bite	1	0.31
Central nervous system infections	1	0.31
Costochondritis	1	0.31
Decreased oral intake	1	0.31
Deep neck infection	1	0.31
Diabetic foot	1	0.31
Diabetic blisters	1	0.31
Diabetic ketoacidosis vs hyperosmolarity	1	0.31
Dysmenorrhoea	1	0.31
Electrical exposure/Head injury	1	0.31

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Disposition Diagnosis	**N**	**Percent (%)**
Encephalitis	1	0.31
Eye foreign body	1	0.31
Fatigue	1	0.31
Foot blister	1	0.31
Foot pain	1	0.31
For vaccination	1	0.31
Gastritis/Peptic ulcer disease	1	0.31
Heat stroke vs central nervous system insult	1	0.31
Hypokalaemia	1	0.31
Hypoxia	1	0.31
Jaundice - painless	1	0.31
Needle stick injury	1	0.31
Oral ulcer	1	0.31
Organophosphate toxicity	1	0.31
Overdose	1	0.31
Palpitation	1	0.31
Pancytopenia for investigation	1	0.31
Pneumonia with acute kidney injury	1	0.31
Severe asymptomatic hypertension	1	0.31
Cellulitis	1	0.31
Social service admission	1	0.31
Surgical wound infection	1	0.31
Thrombocytopenia	1	0.31
Urinary retention	1	0.31
Urinary tract infection	1	0.31
Foley's catheter-related	1	0.31
Vaginal infection	1	0.31
Postural hypotension	1	0.31
Snakebite	1	0.31

The timing of tele-care:

During the first phase of the season, the majority of telemedicine consultations occurred during the afternoon and evening hours, representing 80.36% (n=90) of the total consultations. Most patient encounters took place between 10:00 and 22:00, accounting for 88.4% (n=99) of cases. This suggests that the Hajj pilgrims were more likely to benefit from virtual care during these daytime and early evening hours. Beyond phase one, however, such timing varied more.

Quality of the service provided:

Inferential analysis revealed that 58.03% (n=65) of patients in the holy city were treated and returned to the Hajj ceremony, compared to those who required hospital admission or transfer via EMS (Fisher's exact test, p=0.010). Moreover, analysis of the virtual service showed a significant result with regard to facilitating immediate treatment, allowing more patients to return to their religious activities without the need for referral to physical beds (Pearson's chi-square = 15.94, $p < 0.0005$).

It is important to note that beyond the peak consultation hours, there was a tendency for more patients to be transferred to physical beds or require emergency medical services (10 vs. 3 cases). This indicates that the team encountered more severe medical conditions during the off-peak times, necessitating a greater reliance on in-person consultations beyond the scope of the virtual care services. Prehospital care, triage and ED models were implemented in phase one. In the ED model of care, the majority of interactions (74.7%,

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n=242) were direct consultations, while 25.3% (n=82) were scheduled rounds.

None of the patients refused telehealth consultations, and the team did not encounter any cases of discharge against medical advice or discharge without completing treatment.

Connectivity:

Connectivity disruptions were not encountered. Business continuity was activated three times due to power outages, during which all virtual rooms were switched to mobile phones to ensure uninterrupted service. On a few occasions, video conferencing was hindered by the end user's limited data plan, prompting a switch to direct telephone communication.

IV. DISCUSSION

The current study presents a novel model of care that leverages telemedicine to enhance emergency medical services during large mass gatherings and acute situations. Despite the availability of on-site care, the integration of specialised emergency medicine expertise through telemedicine further improved the care delivered, and facilitated a reduction in the number of patients transferred to physical beds, thereby alleviating the burden on the EMS and ED. Contrary to the argument that an abundant on-scene workforce negated the need for virtual support, it was observed that even with a high number of specialised physicians, the on-scene team was often exhausted, necessitating the activation of night teams during the day.

The pilot deployment revealed that the timing of care requests aligned closely with the mobilisation of pilgrims from one geographical area to another as part of the religious ceremony. The majority of consultations occurred between 10:00 and 22:00, coinciding with the peak periods of pilgrim activity. While it remains challenging to predict the exact timing of patient surges, such unpredictability and the large number of pilgrims mandate activation during the rush hours and a heightened state of alert beyond such periods. Our findings align with several previous arguments for telemedicine in similar situations. For instance, a study found that establishing a telemedicine hub for triage and remote treatment led to significant improvements in ED efficiency and patient outcomes [10]. These benefits position telemedicine as a valuable tool for improving healthcare delivery, especially in challenging or resource-limited environments, providing support during contingency periods [5].

Although the number of patients treated by the EM-RRVT was not particularly high, it was largely influenced by the complementary nature of the deployment, with the on-site teams being activated on a demand basis.

In line with the nationwide adoption of digital health technologies, such virtual teams enhance the overall quality of healthcare [11]. In this light, acute care telemedicine is no different from other services that can be provided virtually [12,13]. Furthermore, the reliability and the positive impact of the service was evident post-implementation. The high acceptance rate we observed contradicts previous reports that predicted a significant number of patient no-shows [14].

Concerns regarding potential connectivity failures during patient encounters were unfounded, as connectivity was tested in multiple locations, with contingency plans and three communication channels in place to ensure continuous service. Preparedness and the implementation of mitigation strategies can only be effectively achieved through comprehensive risk assessment. This includes analysing the impact of potential failures and determining how business continuity plans should be executed. Several incidents of power outage did occur but had been foreseen in the preparation phase.

From a quality perspective, the service altered the diagnosis and disposition of some patients, as well as providing up-to-date, evidence-based medical care. The EM-RRVT also played a role in mentoring and elevating the skills of the general practitioners and junior staff of the mobilised teams, ensuring that each member received guidance from specialised emergency physicians. The variety of cases managed by the EM-RRVT reflects the diverse nature of medical issues commonly encountered during mass gatherings.

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As our results revealed, acute coronary syndrome (ACS) had the highest prevalence among the observed diseases. This is congruent with several reported cases from the previous Hajj season [15-18]. Such observations could be attributed the cardiovascular changes associated with aging, comorbidities, and exhaustion [19]. Despite the large number of pilgrims and the mobilisation dynamics of the crowd, trauma cases were not predominant, ranking second to ACS. While factors such as the mood and age of a crowd [20] are often linked to the prevalence of trauma, these factors were not relevant in our case due to the religious nature of the gathering and the absence of major incidents. Critical cases, such as the two intubations performed in unpredictable settings, highlighted the erratic nature of the situations encountered and underscored the need for adaptability and readiness.

While the use of telemedicine equipment and infrastructure may represent a significant cost driver - in terms of installation, purchasing, transport, battery/power supply, security, and inventory management, as well as the need for dedicated personnel for logistics and troubleshooting - these factors are outweighed by the benefits of reduced patient transfers and the alleviation of burden on the on-ground emergency medical teams. Conversely, the EM-RRVT's utilisation of readily available video conferencing platforms proved to be a cost-saving measure and demonstrated a high degree of self-sufficiency.

The positive impact of remote service care must be carefully weighed against the challenges of treating acute patients from a distance. For instance, given its limitations, such a service can only provide guidance on CPR, intubation, and central venous catheterisation rather than perform hands-on procedures on the patient. Therefore, we believe that this service should complement, rather than replace, the current practices in emergency medical care.

V. CONCLUSION AND FUTURE DIRECTION

In conclusion, this pilot phase has provided valuable insights into the deployment of virtual emergency teams and their potential to improve clinical care in mass gathering situations. Importantly, it demonstrated that the virtual emergency response model could be generalised to regular day-to-day emergency departments, and can be scaled accordingly.

Examining the principles of acute patient surge, the virtual service offered new perspectives on scalability, rapid deployment, and resource optimisation. The initiative successfully transformed what could have been a resource-strained scenario into a managed situation where the demand for healthcare services during a large mass gathering was effectively met, thereby reducing the gap between demand and supply. The service also proved to be scalable, with applications in pre-hospital settings, triage, and inside the ED regardless of available resources.

To enhance the effectiveness of the virtual emergency response model, several future directions can be considered. A virtual ED could be implemented in every emergency care unit in the various locations of the Hajj ceremony, and its impact evaluated in terms of waiting times, patient throughput, revisit rates, and triage efficiency and safety. Future implementations should also focus on increasing awareness, and addressing resistance. Deploying a dedicated telemedicine coordinator with the on-scene team could enhance engagement and provide immediate solutions to unforeseen challenges. Implementing the service in smaller mass gatherings, rural areas, and during drills prior to season may prove beneficial. The introduction of wearable remote monitoring technology for early detection of vital sign instability, for instance, would facilitate prompt identification and may be helpful to connect directly to a virtual physician [11, 21]. Additionally, further analysis is needed to better understand the role of the virtual dispatcher and to improve integrated case management.

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