

**Fast EMR: An Online and Offline Mobile Electronic Medical Record for Disaster Settings**

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**Introduction:** The absence of clinical information in the aftermath of disasters in resource-constrained environments costs lives. fEMR– fast Electronic Medical Records—is a medical records system designed for mobile clinics and has proven useful in post-disaster settings. While the original version of the system was developed for areas without access to the Internet, a new version of this system was developed in 2019 to accommodate regions with connectivity.

**Method:** We reviewed the design, implementation, and usage of fEMR from June 2014 to October 2022. We used logged data of the number of users, patient encounters, and the circumstances of each deployment. We compared usage between the original fEMR system and fEMR-on-chain.

**Results:** The original fEMR system was created in an iterative process by students in Computer Science classes at three different American universities. The system creates a closed intranet signal to which clinicians connect their own device to access the software. The hardware is transported to the medical team in a carry-on suitcase prior to deployment. All data are stored on a laptop that acts as a server. The online version, fEMR On-Chain, was developed under a grant, but is sustained in development through academic partnerships. Both versions are designed so that the provider can complete an encounter with as few clicks as possible and with as little input as necessary to identify patients. The original fEMR system has been deployed to mobile clinics worldwide since 2014. The system has about 14,181 patients and 16,021 clinical encounters from 12 different countries. fEMR On-Chain has been deployed to refugee and migrant settings since 2019, containing about 18,000 patients and 22,000 encounters in two different countries.

**Conclusion:** Successive versions of the fEMR system have been used in a variety of conditions and settings, with usage accelerating since 2019 in refugee and migrant health centers.

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**Developing a Statewide System for Prehospital Routing of Burn Injuries**

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**Introduction:** In the USA, traumatic injuries are the leading cause of death before age 45 and have significantly lower mortality if treated in a verified trauma center. Burn injuries are included in trauma statistics and represent 1.1 million injured people annually seeking medical assistance. Routing of burn injuries to ABA-recognized burn centers has yet to be assessed as it has in trauma injury. Our goal was to examine the impact of prehospital routing of burn injuries on hospital length of stay, mortality, and potential costs-of-care through a statewide care coordination center.

**Method:** Our study is a retrospective statewide analysis of burn injuries from 01/01/2017 thru 12/31/2019 using the Louisiana Hospital Inpatient Discharge Database. Routing of burn patients was implemented in 2018 using the ABA burn referral criteria. Data included: total admissions with primary burn diagnosis, region, discharge status, length of stay, and raw mortality by region and state. Descriptive and comparative statistics were performed to assess the impact of routing burn-injured patients. Cost analysis was performed using Louisiana Medicaid per diem rates from 2021 at \$1,907.92/day.

**Results:** 1,288 patients were treated in Louisiana during the study period, with 855 post-routing and 433 pre-routing. The mean length of stay was reduced from 11.84 days in 2017 to 8.82 days in 2018 (p value=0.0988), with a potential savings of 761 inpatient care days or \$2.17 million. Overall mortality across the state was unchanged except in the highest volume region, where it dropped from 7.9% in 2017 to 3.6% in 2019 (54%).

**Conclusion:** Burn injuries are a time-sensitive trauma. This study marks the first analysis pre and post-implementation of routing for burn injuries by a statewide care coordination center. Our study demonstrates improvement in length of stay and mortality but a continued need to examine other contributing factors, such as injury severity and concomitant trauma.

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**Necessity and Feasibility of Medical Containers in Nankai Trough Mega Earthquake**

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**Introduction:** In Japan, there is an 80% probability that the Nankai Trough Mega Earthquake will occur within 30 years, and a tsunami of more than 30 meters is expected to hit the Pacific coast, killing more than 320,000 people and devastating many towns. This study clarifies the necessity and feasibility of a



high-performance medical container developed by Showa to fill the gap in medical care during a large-scale disaster, especially after the sub-acute stage.

**Method:** 1) Simulation of the damage to disaster center hospitals in the event of the Nankai Trough Mega Earthquake.

2) To clarify the feasibility of immediate response, a demonstration experiment was conducted by combining and installing ten units of medical containers.

**Results:** 1) Of the prefectures where the death toll from Nankai Trough Mega Earthquake is estimated to be 5,000 or more, 119 disaster center hospitals located in cities and towns with coastlines were examined to determine if they were in the tsunami inundation zone. The results showed that 44 hospitals, or about 37%, were inundated and their medical functions were likely to be paralyzed.

2) Ten containers of medical treatment rooms, ICUs, CTs, power supplies, and oxygen could be assembled in seven days. This is by far the shortest time compared to the more than two months it takes for a temporary hospital.

**Conclusion:** It is clear that medical containers can fill the void of medical care in the event of Nankai Trough Mega Earthquake.

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### Disaster Education in Hospitals using Metaverse: Focusing on COVID-19

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**Introduction:** During the COVID-19 pandemic, it became difficult to conduct face-to-face training and practice for disaster medical education. As an alternative to this, it was proposed to build a metaverse world using virtual and augmented reality (XR) technology and implement disaster training education within it. Therefore, the authors investigated the process and effects.

**Method:** The authors conducted training of healthcare workers through software implementing a metaverse called MediBase and NurseBase, which was created for doctors and nurses in hospitals to respond to disasters such as COVID-19. The trainees were given a practical orientation after basic theoretical education, attached a VR headset, and performed a medical response to a virtual disaster according to their judgment, and the records and debriefing were organized and analyzed.

**Results:** The satisfaction of trainees with education reached a maximum of 88%. Even in the part where the correct choice was made in the theoretical evaluation, the time was delayed or the wrong choice or behavior appeared in the metaverse practical education and training.

**Conclusion:** In disaster situations that cannot be implemented identically to reality and most disaster education and training that cannot target actual patients, metaverse-based disaster medical education and training is expected to become a more effective alternative in the future.

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### Emerging Technologies for the Early Location of Entrapped Victims Under Collapsed Structures and Advanced Wearables for Risk Assessment and First Responders Safety in SAR Operations, Search and Rescue Project

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**Introduction:** Natural disasters and catastrophes are challenges faced by emergency services. These are dangerous environments in which there are life-threatening victims as in other CBRN incidents, which can add great risks for nearby populations and the environment. The main objective of this project is the development and testing of new technologies that increase the safety and efficiency of the work of first responders in disasters.

**Method:** The SnR consortium, with 28 partners, has designed, implemented, and tested new technologies, with an advanced communication and monitoring system for professionals, victims, and other first responders, with innovative positioning and assistance ICT that facilitate the exploration and evaluation of disaster areas.

These technological advances are validated and evaluated with performance, efficiency, and usability indicators, in laboratories and in real working conditions, through a total of seven case studies, in seven different countries, covering a wide range of representative disaster scenarios.

**Results:** The development of a new communication and monitoring system for professionals and victims, coordinated on the Concorde platform, together with chemical alert sensors, synchronized with smartwatches, smart uniforms, and pediatric immobilizers, are some of the tools tested. The pilots carried out to confirm the usefulness of the 26 technological tools designed and tested in the field, which have helped to reduce the damage and casualties that can occur in S&R operations.

**Conclusion:** In conclusion, the H2020 European Search and Rescue project (S&R), through the development of new technologies, offers a holistic approach to the effective response to emergencies and provides increased capabilities and resources to first responders in the field, increasing their effectiveness and safety. This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement (No. 882897).

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### Using Novel Technologies to Implement Belize's First Formal Prehospital Emergency System

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**Introduction:** Belize has no formal prehospital emergency medical system, leaving the majority of acutely sick and injured persons overwhelmingly dependent on private transport. To