



Information Integration Workgroup

White Paper

Executive Summary

The Assistant Secretary for Preparedness and Response (ASPR) awarded the Eastern Great Lakes Pediatric Consortium for Disaster Response (EGLPCDR) a grant to harness and develop best practices around disaster preparedness and response to be shared with other children's and non-children's hospital entities in the region. Each children's hospital partner has filled key roles to accomplish the organization structure to begin to address the activities and strategies in the workplan. The partners established 16 workgroups with respective leads to address the items outlined in the workplan, including the Information Technology Information. (See Appendix A.) Partners met weekly to update all sites on progress within workgroups, address areas for collaboration among workgroups, and answer questions with input from all partners.

Background

Children represent 25% of the U.S. population¹ and face medical challenges that “require specialized care including specific training, equipment, supplies and pharmaceuticals that may not be readily available during and/or immediately following a disaster.”² Treating children impacted by trauma, infectious diseases, and other hazards during a public health emergency or disaster can challenge health care facilities that do not specialize in pediatric care and stress the health care system as a whole.

In response to these challenges, the EGLPCDR’s Information Integration Workgroup supported the grant Activities A (Strategy 1) Activity C (Strategy 4); and Activity E (Strategy 1). Specifically, it engaged in efforts to:

- Crosswalk systems between Ohio and Michigan related to bed availability and resource allocation.
- Assess the interoperability of Electronic Health Record and Health Information Exchange Systems.
- Identify patient tracking systems and their potential integration into EMRs, both interstate between and intrastate within Ohio and Michigan.
- Develop recommendations for improved coordination of bed availability, resource allocation, patient tracking, and health information portability.

Results of the Workgroup Activities

In order to advance objectives of the grant funding, the Workgroup conducted activities, each of which are described below, to assess:

- The full range of capabilities for integration of the consortium's Electronic Medical Records' with third-party systems and mass communication system.
- The interoperability of Electronic Health Record and Health Information Exchange systems.
- The most critical information that could be transferred with the patient-Essential Elements of Information (EEI).

These activities were used to develop recommendations for improved coordination of bed availability, resource allocation, patient tracking, and health information portability.

Assess the full range of capabilities for integration of the consortium's Electronic Medical Records' integration with third-party systems and mass communication system

The Workgroup first assessed the potential for integrating the full range of capabilities of the consortium's Electronic Medical Records (EMRs) (e.g., Epic, Cerner & Allscripts) with third-party systems (e.g., Juvare and SurgeNet) and mass communication systems.

The designated situational resource awareness system for Michigan is provided by Juvare (which provides EMTrac to facilities)³ and by SurgeNet for Ohio (via OHTrac).⁴ The Workgroup created a crosswalk of the information available on resources and bed availability in the two systems (See Figure 1, below).

Figure 1. Crosswalk of Resources / Bed Availability Information Collected by Ohio & Michigan

Beds	Juvare	SurgeNet	Resources	Juvare	SurgeNet
Total Pediatric Med-Surg beds	x		Available Ventilators	x	x
Available Pediatric Med-Surge beds	x	x	Gloves	x	x
Total PICU beds	x		N95 Respirator Masks	x	x
Available PICU beds	x	x	KN-95 Masks	x	
Total NICU beds	x		Other Masks/ Respirators	x	
Available NICU beds	x	x	Surgical Masks/ Facemasks	x	
Available Pediatric Burn beds	x	x	Surgical Gowns	x	x
ECMO Availability	x		Face Shields	x	x
Available Pediatric Neg Press Isolation	x	x	Goggles	x	
Count of Peds w/Confirmed COVID	x		Saline		x
NICU/PICU Transfer Capability	x		Shoe Covers		x
Available Psych beds		x	Hand Hygiene Supplies		x
Available Critical Care beds	x				
COVID ICU	x				
Pediatric COVID Med-Surge	x				
Pediatric Long Term Acute	x				
Morgue Capacity	x				

Both Juvare and SurgeNet have the capability of interoperability within their respective state EMR systems to automate information directly to their resource dashboard. This option, however, can only be added with a mutual agreement with the third-party and the EMR system and has a fee associated with it. (See Figure 2, below).

Figure 2. Interoperability: Automation is Achievable

EHR System	Juvare (MI)	SurgeNet (OH)
Epic	Yes	Yes
Cerner	Yes	Yes
Allscripts/Sorian	Yes	Yes

At this time, there is no such arrangement with Juvare and CS. Mott's Children's Hospital, Children's of Michigan or Helen Devos Children's Hospital to provide automation services. Additionally, there is no such arrangement with SurgeNet and Rainbow Babies and Children, Cincinnati Children's or Nationwide Children's Hospital. All the information collected must be manually manipulated within the third-party site for updates. Prior to the SARS-CoV-2 pandemic, most of the information collected was voluntary.

In response to the COVID-19 pandemic, both states pushed mandates to assess resources and bed availability and capacity to allow for continuous situational awareness. The wealth of information that is currently being shared regionally as a result of the pandemic is exactly what the Workgroup hoped to achieve. The Workgroup's next goal is to advocate for this information to be shared at all times, after the end of the COVID-19 pandemic.

Often, as a disaster progresses, victims are moved from one location to another in order to best meet their needs. This may mean transporting patients to more distant hospitals or moving patients to shelters or temporary medical facilities. These movements compound families' confusion as they try to locate their loved ones, and complicate agencies' attempts to obtain accurate patient counts.

Patient Tracking services are provided in Michigan by Juvare (through EMTrack) and in Ohio by SurgeNet (often OHTrac). The systems service the States by tracking patients from the scene by EMS to the final treatment destination, and assist with reunification as needed. Having the initial triage assessment in the field is very beneficial, since this information is relayed to the facility to which the patient will be transferred and allows for proper planning of personnel and resources prior to the patient's arrival.

Both States use tagging systems for initial assessments. EMTrack and OHTrac both provide mobile access to provide flexibility for the EMS team members to capture essential information on scene. The Workgroup's discussions about the use and benefits of tagging systems (for both those who treat on-site as well as off-site) identified many inconsistencies in their use throughout the regions and during specific encounters (i.e., mass casualty incidents, multiple

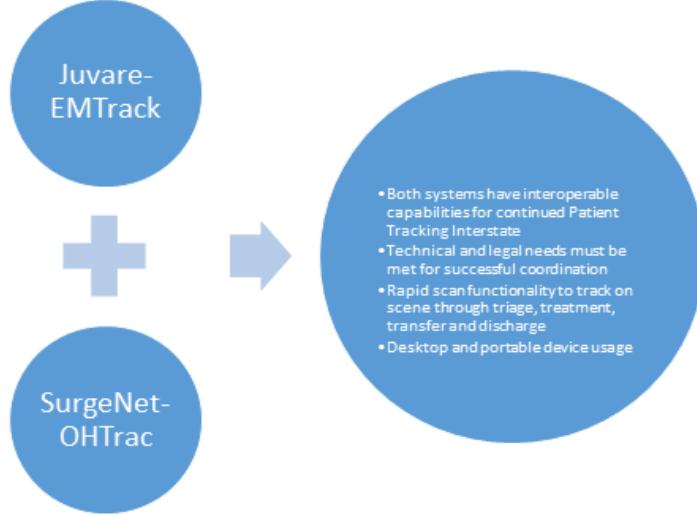
traumas, etc.). The two States differ in their procedures and protocols for adding patients into their tagging systems, as well as at what point they are added. The States capture primarily the same type of information and are used until the patient is discharged.

Both the Ohio and Michigan State Emergency Management Agencies (EMAs) utilize the Juvare WebEOC software to track and analyze disaster information and assist with making decisions and maintaining a common operating picture before, during, and after incidents.³

While there are inconsistencies from location to location regarding the tagging systems' use, standardized state methodologies would alleviate these gaps and reduce missteps in achieving continuous patient tracking.

Both Juvare and SurgeNet systems have the capacity to create interoperability with identified EHR systems. (See Figure 3, below.) Juvare presents all customers with add-on features that allow connections that enable EHR providers to populate linked information to the EMResource dashboard for resource awareness and bed availability. SurgeNet currently does not have interoperability with any systems, but this technical capability exists in the creation Application Programming Interface (API).^a The OHTrac system requires the initiation of a mass casualty incident before a patient can be added to the program. The exchange of status information once the event and patient are added can be bi-directional with an API in place. This would include only the essential details currently captured by OHTrac as protected health information cannot be shared in this space. This limitation restricts the ability to initiate directly from the EHR, since the event must be added first.

Figure 3. Interoperability of Patient Tracking Systems



^a An API information exchange occurs when data are extracted from one system and imported into another. Extraction can occur manually (i.e. a push button option to tell the system to obtain the data) or be set up as an auto-routine option (i.e. at regularly scheduled intervals).

Assess the Interoperability of Electronic Health Record and Health Information Exchange Systems

Among the six participating pediatric institutions, three EMR systems are used for patient charting: Epic, Cerner, and Sorian/Allscripts. Historically, sharing paper charts externally requires time and personnel, given that requests are made within the medical records department that require the requested documents to be copied and then either mailed or scanning via fax. The Workgroup finds these methods to be archaic, given technological advances in information-sharing.

Migrating most paper charting systems into electronic charting creates opportunities to improve communication between providers that can be vital to patients' continued care.

There are a wide variety of EMR software options available and institutions chose different products. For this reason, each program should offer interoperability with other systems in order to effectively communicate critical health information and foster the best treatment plans. Uniformly, EMR platforms provide accommodations to allow for the exchange of information within the same platform or with other EMR systems. Among consortium partners' EMRs, this is true for Epic, Cerner, and Sorian/Allscripts. (See Figure 4, below.) All three EMR systems have interoperability within their systems to connect with other EMR systems.

Figure 4. EHR Interoperability is Achievable

Pediatric Hospital	EHR System	Interoperability is achievable
C.S. Mott Children's Hospital	Epic	Yes
Helen DeVos/Spectrum Health	Epic	Yes
Children's of Michigan	Cerner	Yes
Cincinnati Children's	Epic	Yes
Rainbow Babies and Children Hospital	Allscripts/Sorian	Yes

Epic is the predominate EHR of the six Children's Health systems within EGLPCDR. The system provides multiple ways to connect; the connection route depends on inclusiveness within or outside of the Epic community. Successful interoperability occurs through Epic's "Care Everywhere" function (which assists in obtaining records when patients are seen outside the institution, by another participating health system within the network), APIs, and web services, and standard point-to-point interfaces.⁵ Care Everywhere processes requests to and from other health systems, sends a standardized summary (C-CDA), and incorporates the new data into the patient record.⁵ Epic CareLink provides web portal access to non-Epic community users.⁵ Additionally, Epic, Allscripts/Sorian, and Cerner are all participating implementers in the CareEquality network, which enables nationwide coordination of care for patients across

disparate electronic health information systems.⁵ Similar to the Health Information Exchanges (HIE) options, participation is voluntary and fee-based; the fee is based upon the organization's size, annual revenue, and type of information to be shared.⁶

Figure 5: HIE Interoperability with EHRs



In the event of disasters and other incidents that impact facilities' IT infrastructure, connectivity to those systems can be a hurdle. Each institution addresses these issues in their policies and procedures. Nonetheless, it will be very difficult (if not impossible) to send or obtain records through these various pathways if the facility experiences a power outage or lacks Internet capacities. Hence, planning for a continuous workflow to include these charting details is imperative.

HIEs allow patients and clinical providers to appropriately and securely access and share patients' vital medical information electronically. Additionally, that information exchange can significantly reduce the cost of care by eliminating duplicate tests and will tremendously influence the quality of care patients receive from all their providers given access to documentation of their specific health needs. Exchanges can take place using three different exchange methods: Direct, query-based and consumer mediated.⁷ HIE foster information-sharing and continuity of care. The latter is especially important during a disaster, when safety and expedited attention are critical factors.

Both Ohio and Michigan have identified partnered HIE affiliates to assist with continuous information-sharing to coordinate care for patients being treated in disparate health care settings. Ohio has two primary HIE partnerships:⁸ CliniSync and HealthBridge. Michigan has 13 HIEs connected to Michigan Health Information Network Shared Services (MiHIN),⁹ which is an agreed framework of standards within Michigan to make sharing information more convenient:

1. Administrative Network Technology Solutions, Inc
2. Great Lakes Health Connect
3. Henry Ford Health System
4. Huron Valley Physicians Association
5. Ingenium
6. Jackson Community Medical Record
7. Michiana Health Information Network
8. Michigan Medicine
9. Northern Physicians Organization
10. Oakland Physician Network Services
11. PatientPing

12. Southeast Michigan Health Information Exchange
13. Upper Peninsula Health Information Exchange

Participation within an HIE partnership is voluntary and comes at a cost to a facility. As noted, interoperability challenges exist both nationally and with many HIE platforms, which can operate in silos. Efforts to address these challenges include the interoperability framework set forth in the Trusted Exchange Framework and Common Agreement (TEFCA), which seeks to provide a single connection for nationwide connectivity and ensure the integrity and security of data delivery wherever and whenever these data are needed.¹⁰ Another effort is the U.S. Qualified Health Information Network (QHIN) initiative seeks to accomplish this goal “by closing the gap between effective local or regional exchange and national exchange and by emphasizing collaboration and honoring existing network relationships to benefit all participants.”¹⁰ The MiHIN aligns with the goals of the TEFCA and QHIN.¹⁰

Achieving QHIN status is the ultimate goal in order to ensure that all U.S. systems that exchange information do so in a trustworthy manner and adhere to a common framework. Yet, no HIE system has met TEFCA standards to formally be recognized as “qualified.”¹⁰

Well-executed and -enforced federal or regulatory and compliance standards would foster interoperability among all systems, thereby allowing health information to be obtainable regardless of patients’ physical location.

Determine the Most-Critical Information that Could be Transferred with the Patient-Essential Elements of Information

The Workgroup identified that the definition of the Essential Elements of Information (EEI) was a short-term alternative to HIE that would foster the exchange of in-depth, non-templated patient records. Implementing EEI could drastically reduce the time and effort required on the part of providers treating pediatric disaster patients outside of their familiar health care systems.

The most critical and essential elements to share were identified by the American College of Emergency Physicians and the American Association of Pediatrics, which were the creators of the Emergency Information Form (EIF) for Children with Special Needs.^{11 b}

The Workgroup explored EHR systems, HIE platforms, and patient tracking systems to determine whether patient information could be pulled into a report that was easily accessible within these systems. The Workgroup noted that, historically, patient tracking systems include basic demographic information and patient disposition, rather than more detailed medical information. It is not currently possible to attach and/or upload patient health information to tracking systems, but this may be an option to explore with appropriate state authorities.

The Workgroup also noted that medical records existing outside of the EHR system and

^b <https://www.acep.org/by-medical-focus/pediatrics/medical-forms/emergency-information-form-for-children-with-special-health-care-needs/>

information channels, creating the risk of significant gaps within a patient record. This underscores the importance of utilizing HIE systems to connect *all* patient medical records. A request for an EPIC system to gather these patient details into a report is currently in progress; findings will help determine the complexity and accuracy of separating out the essential elements from within a patient's EHR system. This effort is in progress.

The Workgroup determined that the proposed report would be of significant assistance for children in general, and specifically for children with complex needs. For the latter group, the report could be extracted by providers and/or parents and keep the most-accurate and up-to-date medical information readily available. Continued links of all EHRs into health record systems would provide quick access to details about pediatric disaster patients that would be advantageous in preparing for, and responding to, disaster events.

Conclusions / Recommendations

Fostering Information-Sharing on Resources and Bed Availability

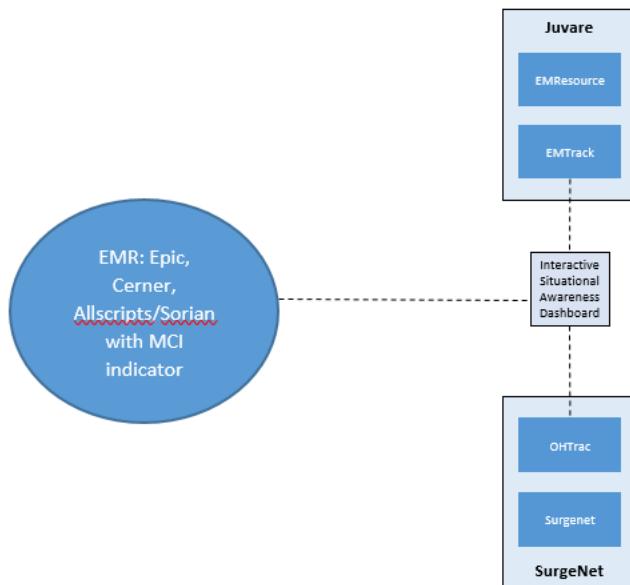
Clear, transparent, and accessible information about resources and bed availability is of significant benefit during a disaster—especially for facilities that treat pediatric disaster patients. This information reduces time wasted in identifying which institutions can accommodate pediatric patients, and facilitate timely care. Systems to gather information about resources and bed tracking can also aid reunification efforts, which are critical when children experience illness, trauma, or disasters and are separated from parents and other caregivers. This type of system needs to be implemented in advance of a disaster; it is complicated and time-consuming to try to create and track these data during an actual disaster. Given the lack of a nationwide system used nationally, facilities and health care systems must create their own communication bridges to aid information-gathering.

The Workgroup conducted several meetings with Juvare and SurgeNet, which indicated that there is no current interoperability between these two systems. Furthermore, the EMTrack and OHTrac patient tracking systems are both limited in their current use. Once patients are entered into the EHR system, agencies that provide family assistance have access to the data and can help families locate their loved ones. The system can send alerts to other agencies that may be providing support; however, this capacity is typically not available outside of system affiliates unless contractual and user agreements have been established. This can hamper communication about patients who have been transported to bordering states for care.

Identifying ways for various tracking systems to create continuity for patient tracking inside and outside of state lines is essential. One solution is to use API, as described above, to create communication routes between these separate systems (e.g., EMTrack and OHTrac). An *Interactive Situational Awareness Dashboard*, which incorporates patient charting information, resource awareness, bed availability, and patient tracking, could be a beneficial product. (Figure 6 below). The Interactive Situational Awareness Dashboard could serve as a Plan B until more ties are built within the framework. It incorporates the EHR, bed availability, and resource allocation. Information could be easily shared using an API with Juvare and SurgeNet, and would not require additional work effort. When a patient is marked in the EMR systems as a

mass casualty or surge patient—as identified in the EMTrack or OHTrac system—only the patient’s health information would be accessible in one, secure, web-based cloud data center.

Figure 6. Interactive Situational Awareness Dashboard



Expanding Interoperability Region-wide

The Juvare systems operate independently of one another, but interoperability allows alerts from regional affiliations, as noted above. Expanding the communication area beyond Ohio and Michigan to include the entire FEMA Region 5 (which includes Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin) would be invaluable. The addition of states that border Region 5 would also be beneficial, as pediatric patients could be transported to interstate hospitals for treatment in the case of surge capacity or proximity to mass incident events.

While this capacity exists, Juvare has noted that the appropriate Michigan and Ohio State authorities must approve this collaboration and information-sharing.

The Workgroup determined that—while a universal national system would be difficult to implement among all 50 states—the concept of a universal national dashboard was feasible to advance, and preferable to the use of API for just two systems.

To that end, a group of external collaborators that use Juvare services has teamed up to construct a national dashboard prototype that would be available to all pediatric hospitals that wish to retain this information post-pandemic. Such a system would enable each state and/or region to maintain its own system, while creating a secondary space to foster national awareness about resources and bed availability. Maximizing the number of participating institutions will minimize costs, which are expected to be shared evenly among all national dashboard users. In a best-case scenario, funding would help alleviate financial burdens faced by facilities that lack the budget to participate.

Contributors have selected the categories that they believe are the most informative and will promote this effort within this specialized pediatric centric community for future broader buy-in.

The Workgroup communicated with Epic and IT subject matter experts (SMEs) and identified two options to foster interoperability: Fast Healthcare Interoperability Resources (FHIR) and App Orchard. The Workgroup determined that App Orchard is the best option for exchange information filtering from the Epic, Juvare, and SurgeNet systems. The App Orchard model uses APIs to create apps that work within the Epic EHR system and is available to companies and organizations outside of 3M (the owner of the Epic system). App Orchard has three membership tiers that include different annual costs and features to meet clients' specific needs. These cost can be significant and are likely to require authorization from executive leadership and State committees.

Expanding Interoperability Nation-wide

While interoperability exists among the EGLPCDR's three EMR systems, the Workgroup's goal is to pursue universal interoperability. Such a goal *should* be attainable, since nearly every organization has an EHR, and since all health care IT vendors should strive to combine disparate streams of information into a single, actionable patient record. There have been several attempts to create national linkages with HIEs as the health care industry has migrated from paper charts to electronic health records. The goal is to create an infrastructure that allowed for, and fosters, information-sharing. Unfortunately, as EHR systems grew, so did the complications with sharing information outside of specific communities.

To address these complications, State- or national-level governmental funding is needed to unite all U.S. health care systems in one system. The benefits in continuity of care and future cost reductions stemming from reduction in unnecessary labs and medical procedures are likely to far exceed the costs to support such an effort.

Several HIEs enable health care providers and patients to access and share information electronically. These include:

- The eHealth Exchange, which has connectivity spanning all 50 states. The eHealth Exchange is the largest data-sharing network in the country, and is the only network connecting health care providers to four Federal agencies.
- Carequality, which allows sharing between EHR systems, community providers, pharmacies, and HIEs.

Workgroup recommendations are to:

- Automate situational resource awareness and patient tracking to eliminate manual entry errors, unnecessary personnel distractions, and duplicated efforts.
- Expand bed availability and resource awareness between Michigan and Ohio, and eventually within the entire FEMA 5 region.
- Obtain permission and technical aspects to connect WebEOC systems between Michigan and Ohio, and eventually within FEMA 5 region.
- Obtain permission and technical aspects to connect patient tracking systems between

Michigan and Ohio, and eventually within FEMA 5 region.

- Ensure funding availability to link with HIE systems to promote safe and secure information-sharing for maximum clinical treatment plan regardless of patient location.
- Explore universal template formatting to send and receive information to avoid mass data dumps that make information-gathering cumbersome.
- Support efforts to standardize interoperability of systems nationally.
- Create the Eastern Great Lakes Pediatric Consortium for Disaster Response Situational Awareness Dashboard as a one stop location for bed availability, resource awareness, patient tracking, and health information.

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Appendix A. Workgroup Members & Sites

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