STATE OF MICHIGAN TRAUMA SYSTEM ANNUAL REPORT 2022

Division of EMS & Systems of Care

Bureau of Emergency Preparedness, EMS and Systems of Care

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Introduction

The statewide trauma system is charged with providing seamless care for the injured through a regionalized, coordinated, and accountable system. For the past ten years the trauma system in Michigan has been effectively meeting the needs of the injured by implementing initiatives to prevent injuries from occurring, working to provide and improve prehospital and inpatient care and working to better understanding rehabilitation and what's needed to return the injured to a productive life. Each component of the system is in place to ensure the best outcomes for those injured.

The experience of trauma system building generated interest in developing the same system approach for the time sensitive emergencies, stroke, and heart attacks (otherwise known as an ST-elevation myocardial infarction or STEMI). As noted in the White Paper, *A Statewide System of Care for Time Sensitive Emergencies the Integration of Stroke and STEMI into the Regional Trauma System* Stroke, STEMI and trauma patients require timely EMS triage, informed diagnosis and definitive treatment by a multidisciplinary team of health care providers, supported by appropriate resources in order to reduce the risk of death and serious disability.

Over the past year stakeholders and partners convened to draft legislative language (Administrative Rules) that describe the operationalization of a system approach that integrates into the existing trauma system that support getting these stroke and STEMI patients to the right resources at the right time.

Data

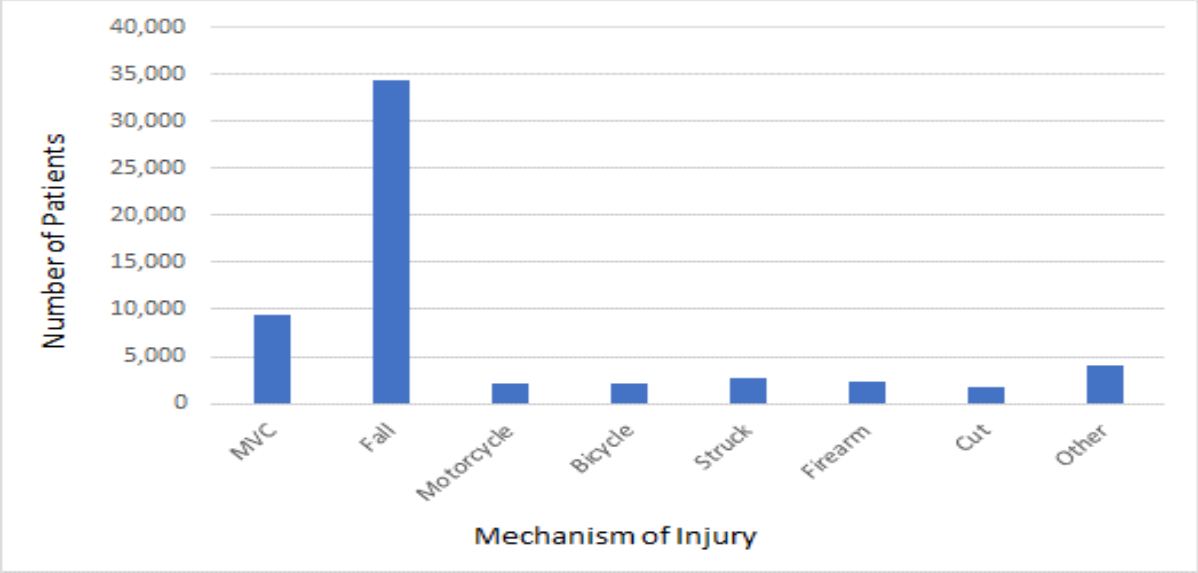
Data continues to drive trauma system decision making, identify issues, inform performance improvement (PI), and effect change. There are currently 562,544 incidents in the state trauma registry. There are 127 trauma facilities that participate in data submission to the state trauma registry. Both the regions and individual trauma facilities identify and track these data which allows for program resource planning, focused injury prevention initiatives, other targeted issues to improve outcomes and care delivery. The COVID-19 epidemic continued to have an impact on mortality rates in Michigan and the country and potentially, the mortality rates reported secondary to unintentional injury.

Quality data is the key in identifying issues, providing measures of performance, injury prevention initiatives, and ultimately impacting patient outcomes in the state trauma system. Aggregate reporting allows for system evaluation from prehospital through discharge of the injured. There was a focused effort this year to review trauma registry

data for quality, completeness, and accuracy. The State Database Manager and the Division Epidemiologist presented a webinar/office hour attended by trauma registrars and those responsible for trauma data entry to review; effective data entry and file transfer processes, available resources, basic report writing and troubleshooting. Throughout the year, the statewide trauma advisory committee (STAC) was routinely provided updates about the submission process, missing or incomplete data, trends, and issues. Trending data has been added to the Regional Professional Standards Review Organization (RPSRO) Inventory system assessment tool to provide a more detailed overview of the system components and issues. Work next year will include a review of the report, how it's used and what revisions, if any, are needed.

Designated trauma centers and a quality trauma system continue to be important to properly care for injured patients in the State of Michigan. According to 2021 data from the National Vital Statistics System the age-adjusted death rate increased from 2020 to 2021, 835.4 deaths per 100,000 standard population to 879.7 deaths, an increase of 5.3%[1]. Death rates increased for every age group over 1 year old in the same period. The top five leading causes of death for 2021 were: heart disease, cancer, COVID-19, unintentional injuries, and stroke[1]. Falls and motor vehicle crashes continue to be in the top five mechanism of injuries according to data collected by the Michigan Trauma Quality Improvement Program[2] (Figure 1). According to Michigan State Police 2021 Statewide Traffic Crash Data Year End Report there were 71,246 traffic crash injuries and 1,131 traffic crash fatalities[3] (Table 1). Reviewing data from multiple sources will help to inform the overall Michigan Trauma System. This annual report will highlight data from Michigan Trauma Quality Improvement Project (MTQIP), Michigan State Police Traffic Crashing Reporting System, and the Michigan Trauma Registry.

Figure 1
MTQIP Mechanism of Injury 1/1/2021-12/31/2021[2]



Please note this data is only from participating MTQIP trauma centers.

Table 1
2021 Statewide Traffic Crash Data Year End Report[3]

	2019	2020	2021
Total Crashes	314,377	245,432	282,640
Total Fatal Crashes*	902	1,010	1,068
Total Fatalities*	985	1,083	1,131
Total Injury Crashes^	54,539	44,417	51,666
Total Injuries^	**74,963**	**60,986**	**71,246**

*Total fatal crashes equal the number of crashes that involved fatalities, whereas total fatalities equal the total number of people who died in all the crashes. ^Total injury crashes equal the number of crashes that involved injuries, whereas total injuries equal the total number of people who suffered an injury.

2021 Fatalities

- 1,131 traffic crash fatalities
- 71.9% were male and 28.1% were female
- 19.8% were in age group 25-34
- 50.8% of fatalities were reported as the driver

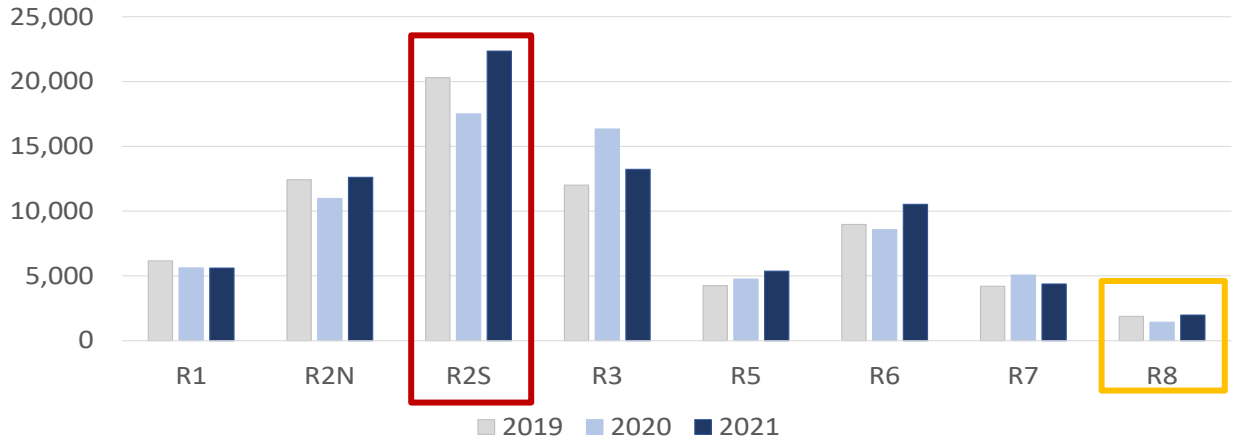
2021 Injuries

- 71,246 traffic crash injuries
- 48.9% were male and 51.1% were female
- 20.6% injuries in age group 25-34
- 70% of injuries were reported as the drive

Michigan Trauma Registry Data, 2019-2021

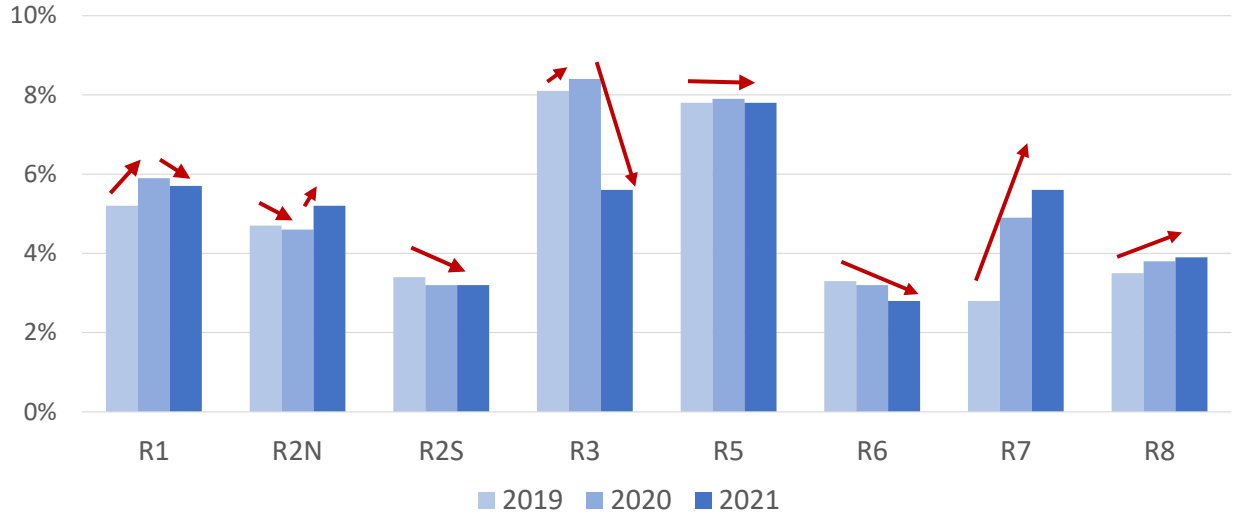
The Michigan Trauma Registry relies on trauma centers to either upload data on a quarterly basis or enter in data manually to the state trauma registry. The data presented in this report was retrieved from the state trauma registry (September 2022) and analyzed in SAS to provide an overview of the Michigan Trauma System for 2019-2021.

Figure 2
Total Trauma Patients by Region, 2019-2021



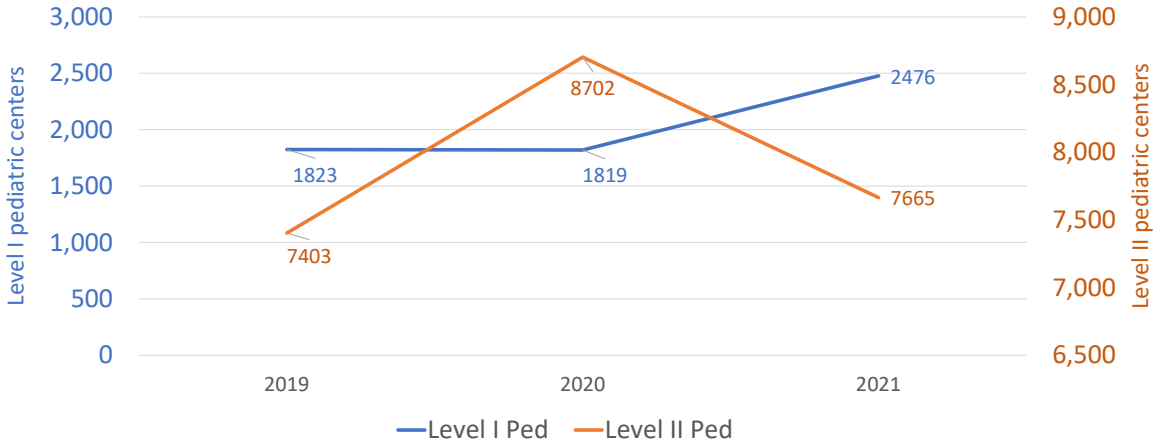
Region 2 South had the greatest number of patients for each of the three years. **Region 8** had the fewest.

Figure 3
Percent of Pediatric Patients by Region, 2019-2021



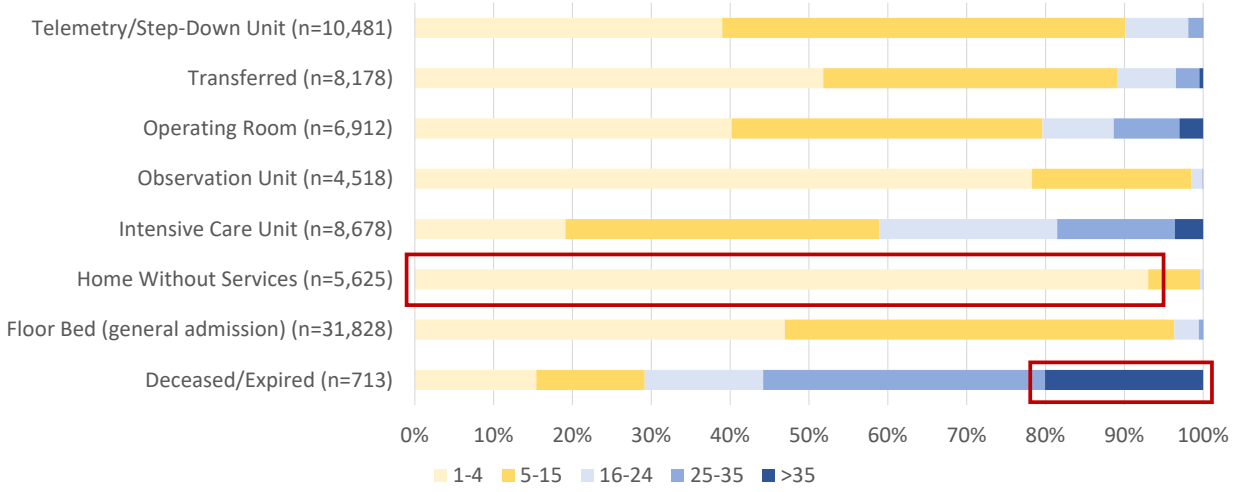
Region 3 had the greatest percent of pediatric patients for 2019 and 2020, **Region 5** had the greatest for 2021.

Figure 4
Number of Trauma Patients at Pediatric Centers, 2019-2021



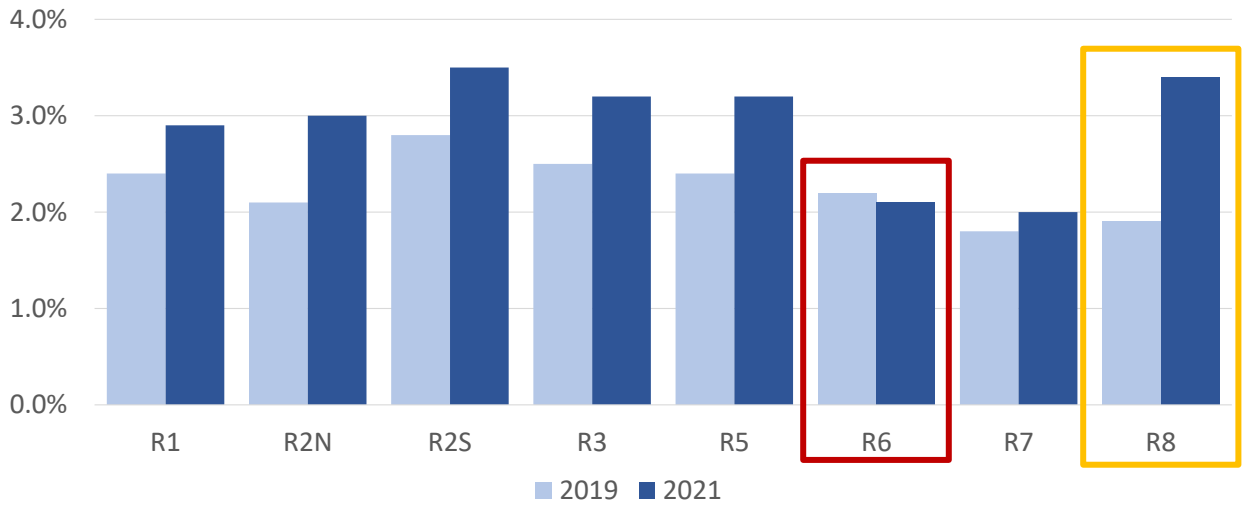
Level I pediatric trauma centers had an increase in patients in 2021 vs 2019, **level II pediatric centers** also had an increase in patients for the same time period and peaked in 2020 (n=8,702).

Figure 5
ED/Acute Care Disposition by Injury Severity Score (ISS) Group (1-4, 5-15, 16-24, 25-35, >35) for 2021



As expected, home without services had the greatest number of patients in the ISS group 1-4. For ISS group > 35, deceased had the greatest number of patients. This is true for 2019-2021.

Figure 6
Percent of Deceased Trauma Patients by Region, 2019 vs. 2021



All regions except for **Region 6** saw an increase in percent of deceased patients in 2021 vs. 2019. **Region 8** had the greatest increase (please note that data for region 8 may be incomplete).

Figure 7
Percent of ED/Acute Care Visits Greater Than 120 Minutes by Designation and Region, 2021

	R 1	R 2N	R 2S	R 3	R 5	R 6	R 7	R 8
Level I	82%	☆ 85%	80%	71%	49%	63%	-	-
Level II	73%	77%	73%	64%	68%	74%	63%	☆ 39%
Level III	72%	71%	80%	80%	60%	75%	78%	43%
Level IV	64%	75%	68%	54%	60%	68%	63%	52%
Level I Peds	-	-	76%	-	-	64%	-	-
Level II Peds	-	*	74%	71%	-	-	-	-

Length of Stay varies by designation and region as seen here. **39% of patients in Region 8** (level II) stayed greater than 120 minutes vs. **85% of patients in Region 2 North** (level 1).

In summary, the data provided in this report is a snapshot of how the trauma system is functioning. As traumatic injuries continue to be a public health concern so does the need for quality care for all Michigan residents and visitors of the State. Data will be analyzed and shared on a regular basis as we strive to always get the right patient to the right place and the right time.

Regions

The Trauma Regions continue to support and maintain the system. Those efforts are enhanced by focusing on projects with specific relevance to their geographic region, and the priorities identified by regional stakeholders.

Region 1

This year Region 1 focused on increasing situational awareness between the Regional Trauma Advisory Council and the Regional Healthcare Coalition. This was in response to the continued difficulties in patient placement and ability to transfer critically ill patients. The Regional Healthcare Coalition had an extra page added to the EMResource tracking tool to allow hospitals to see what facilities have available space and are accepting transfers. In addition, if a facility was having difficulty finding a bed, they could reach out to the Regional Trauma Coordinator for information on availability statewide. The Regional Trauma Coordinator also produced daily reports for trauma staff related to COVID and, most recently, pediatric inpatient, critical care, and ventilator availability. The Healthcare Coalition staff created an Everbridge paging list for hospital trauma staff that allows them to get notifications for large events happening in Region 1. This allows for trauma programs to staff accordingly. They also receive a page if there is a mass casualty incident in the region. Lastly, all hospital staff were trained on how to contact the healthcare coalition during an incident, and for needs like supplies. They also have been trained on what redundant communication methods are available when there is a loss of methods of communication used daily.

Region 2South

The region has been tracking and trending issues related to double transfers, tourniquet use and TXA use in the pre-hospital setting. There was a total of 11 double transfers in 2022, these were reviewed through the regional performance improvement (PI) process. The tourniquet project tracked and trended the application of tourniquets, mechanism of injury, and patient disposition. The work was submitted as abstract that was accepted for presentation at a national conference. The TXA project tracked the

number of doses given prehospital and the number of follow-up doses given at the hospital. In the year there were a total of five doses given in the prehospital setting and no follow-up doses given.

Region 2 North

There were seven trauma program re-verification visits conducted in the region. The RPRSO conducted a retrospective review of the first year of data collected on the administrative of TXA in the region. The Macomb County MCA began a new protocol that allowed for the administration of antibiotics for open fractures, data from this project will inform the discussion about a potential expansion of the protocol to become a regional protocol. The RTAC discussed the Adult/Pediatric Trauma Triage protocol with a focus on pediatrics, there was discussion around imaging and their impact on time to transfer. A focus on education around the consideration for bypass to get a trauma patient to the right trauma center the first time was discussed. The Injury Prevention committee met with a focus on falls prevention, motor vehicle crashes and firearm injuries as regional projects.

Region 3

Region 3 has begun to better utilize multiple data sources to monitor system performance such as the RPSRO Inventory, MTQIP reports and biospatial EMS data. The RPSRO Inventory has provided the region with performance indicators that can be compared from each reporting period to understand system trends. One example the region is tracking is ED dwell time. The regions RPSRO and Trauma Triage and Destination Subcommittee has met several times to collaboratively address the current regional workplan objectives. These objectives include measuring the effectiveness of the region's trauma triage and destination protocol as well as the field triage criteria themselves. The region has partnered with EMS data experts from biospatial to understand which data elements will be required to construct a customized report capable of providing this information.

The Region 3 Trauma Education Subcommittee held its annual Region 3 Trauma Symposium on April 14th. The annual symposium resumed following a 1-year break due to the COVID-19 pandemic. The full day symposium was attended by 280 individuals with 8 different speakers and 7 vendors to inform trauma stakeholders of the current trends related to trauma. The symposium offered 6 CME and EMS credits. The feedback has been extremely positive, and planning is well underway for a conference next year. The theme for the upcoming trauma symposium is *Low Frequency, High Risk Trauma.*

Region 5

The subcommittees in Region 5 worked to address the workplan initiatives and topic areas. This included communication, this subcommittee discussed if the regional trauma facilities can utilize the Regional Emergency Disaster plan in the event of a regional failed phone system. A survey was developed and sent to ED directors, ED medical directors, and trauma stakeholders. After the results are reviewed the committee will develop an action plan such as education of the regional plan for the EDs, review various plan that are utilized, etc.
The infrastructure subcommittee developed an interactive map (Google) for Region 5 that identifies all of the hospitals in the region, including contact information, trauma level, distances, and locations. This map was sent to all trauma stakeholders, including EMS agencies.
The performance improvement subcommittee discussed the need for data on trauma transfers within Region 5. Specifically, they are seeking to obtain data on delayed trauma transfers. The RTC held multiple meetings with the TPM, and registrars to discuss possibility of obtaining specific data on trauma transfers, and the process for obtaining this data. This has been discussed at the RPSRO as well. A plan has been developed to obtain transfer data. The goal is to obtain and review this data for a period of 6 months then review to see if a gap is identified and develop an action plan accordingly. The injury prevention/education subcommittee developed the trauma page on the 5DMRC website. The format has been completed and information is in the process of being placed on the page. Information on trauma page includes Injury Prevention (IP) coordinators for each facility and their contact information, interactive map, educational opportunities, region 5 IP resource guide, link to SOM trauma system website, meeting schedule, trauma links.

Region 6

Region 6 has an engaged regional trauma constituency with active participation by hospital, physician, and EMS leaders. Several RTAC committees have been responsible for successful achievement of most workgroup objectives and special projects, and workplan objectives from all areas within the workplan continue to advance. The Education and PI committees have shared work in the areas of EMS bypass and providing guidance to hospitals on completing the Pre-Review Questionnaire (PRQ) and preparing for a virtual visit. The EMS bypass project was wrapped up, concluding that Region 6 EMS appropriately transports patients to the closest appropriate hospital and calls medical control before diverting patients from the closest appropriate in non-critical situations. Two education sessions for the RTAC focused on how to complete the PRQ focusing on accurate information and how best to describe hospital strengths and PI. The RPSRO met three times to review trauma cases submitted by the constituency resulting in the identification of hospital to EMS handoff as a safety issue and the recommendation that a workgroup be established. The Interfacility Transfer

Workgroup was created; a purpose statement and Plan Do Study Act (PDSA) process established. Opportunities and barriers to implementing a standardized handoff were identified during a June trial in four hospitals. Subsequently the plan was revisited, and the group decided to formally collaborate with West Michigan Regional Medical Control Consortium (WMRMCC) as well as broaden the scope to include DMIST[4] EMS handoff to hospitals. The group is meeting twice a month and plans to initiate a new trial in December 2022 or January 2023. The Region 6 RTN remains active, engaged, and successful in advancing the region's trauma system.

Region 7

Trauma leadership continues to evolve in Region 7 as does the program capabilities. All hospitals in the Region have successfully achieved designation except for one which lost their trauma designation and two that remain provisional. The turnover of trauma program managers and trauma medical directors continues. The Regional Trauma Coordinator (RTC) organized a bi-monthly education session followed by an open forum to discuss specific topics, such as activations and the components of the hospital trauma program PI plan.

Six level IV hospitals in one hospital system were divided into two groups of three, each group with just one trauma program manager. This configuration is resulting in standardization of policies, better sharing of resources, improved communication, and better management of patient care and flow to definitive care.

All hospitals in the region have adopted the Region 7 Trauma Transfer Guideline document which is posted in each emergency department and is considered the standard for the Region. Code Coagulation is a new process developed and being trialed first by one sub-region. The process is aimed at rapid identification and imaging of the patient population who are on anticoagulants and/or antiplatelets (with exception of Aspirin) which should enhance speed of identifying injury and subsequent disposition.

Regional injury prevention has focused on falls with active programs in every hospital in the Region. There was one Advanced Trauma Life Support course held this year.

Region 8

Region 8 continues to grapple with the challenges brought by the pandemic that has impacted the entire healthcare system. Two hospitals lost their trauma designations, four hospitals are still provisional, eight of the 14 hospitals had turnover with their trauma program manager and/or trauma medical director. Hospital administrators have also experienced turnover in addition to more hospitals being acquired by health

systems. The Regional Trauma Coordinator (RTC) has conducted numerous orientations and is now embarking upon scheduled open office hours for specific topics, such as activations and the components of the hospital trauma program PI plan. Additionally, the RTC represents regional trauma in a variety of ways:

- Michigan Office of Highway Safety Planning's Bystander Care Course,
- Michigan DNR's Ride Right campaign for snowmobiles and ORVs,
- Upper Peninsula Traffic Safety Network for motor vehicle crash analysis and injury prevention initiatives
- Northern Michigan University Center for Rural Health for EMS recruitment and retention in addition to community awareness of trauma centers
- UP Health System School of EMT instruction
- Region 8 MCA Network
- Region 8 Healthcare Preparedness
- Central UP Senior Network
- Marquette Alger Regional Education Services Agency and UP school nurses for Stop the Bleed
- Marquette Alger Critical Incident Stress Management for UP responders' mental health
- UP 911 Authority for consultation regarding communication plans

Regional Trauma Networks have continued work on network workplans and initiatives, meeting virtually, discussing challenges and best practices, planning injury prevention activities, supporting the pandemic response, and when requested, mentoring facilities that are preparing for state verification visits. These efforts were reported to the State Trauma Advisory Committee (STAC) quarterly and are posted on the trauma system website Link.

Verification and Designation

Michigan hospitals continue to support the trauma system by becoming verified or reverified and designated as Level I, II, III or IV trauma facilities, 82 percent of the hospitals in Michigan have become designated trauma facilities. The verification process has been facilitated by the virtual verification process launched in 2021. The virtual visits initially designed and implemented in response to the pandemic have been found to be an effective, well received method to verify trauma programs. Conducting visits virtually allow more review time for the site reviewers to synthesize the provided materials, look deeply into the performance improvement process, and ask more detailed questions to ascertain the status of the program. The technical support is

provided by two members of the verification program team and the Regional Trauma Coordinator attends to support any inquiries about the regional trauma system. Information on the process and requirements for participation can be found here. Maintaining the resources and support necessary to be a designated trauma facility in the current environment can be challenging, three facilities in Michigan were not designated in 2021.

The Designation committee for 2022-2025 was seated in October. The committee is supporting the virtual verification process in some cases by taking on lead site reviewer roles and mentoring new reviewers keeping institutional memory fresh and sharing their experience.

The Verification and Designation team continues to support the process by providing education to stakeholders in the form of office hours offered throughout the year. The last session of the year focused on performance improvement. This has been an identified gap noted in the reviewer reports.

Systems of Care

The Bureau has been engaged in a systems approach for time sensitive emergencies for many years, first with the EMS system then with the advent of the trauma system formally funded in 2012 and next with the integration of stroke and ST elevation myocardial infarction (STEMI) system into the trauma system. This initiative was recently funded in 2021. This forward-facing approach that commits to the principal of getting the right patient to the right resource to support the best outcome has been adopted by many states across the country. The Michigan Department of Health and Human Services support of work was made more visible by the change made to the Bureau name, as of September the Bureau name has been changed to the Bureau of Emergency Preparedness, EMS, and Systems of Care. Staff have been added to the Systems of Care Section to support the work of system building for stroke and STEMI. The initial work included a White Paper drafted in collaboration with state content experts, titled *A Statewide System of Care for Time Sensitive Emergencies the Integration of Stroke and STEMI Care into the Regional Trauma System* (link). This foundational work guided the next steps in 2022 where multiple workgroups met to draft Administrative Rule language that would define how the system for stroke and STEMI would be operationalized. The draft was presented at a meeting in September, where the language was discussed, and presentations were made regarding the burden of cardiovascular disease in Michigan and included a presentation from a rural hospital

who was successful in becoming certified as both acute stroke ready and acute heart attack ready. After some revisions the rule language was submitted to the department and began the rule making process. Timelines for the process were estimated to be approximately 18 months.

The Systems of Care Section remains engaged in ongoing planning and discussions on the next system building steps for stroke and STEMI. One of the steps relates to the certification of programs as outlined in the rules. To support that work an additional staff member was hired. While their focus will be stroke and STEMI, they will initially support some of the trauma designation work to learn the processes and best practices that can be leveraged for the new certification of stroke and STEMI facilities. Further discussions will be centered around formalizing a process for data collection and organizing advisory groups.

Projects

biospatial

Work with the company biospatial is ongoing, the project has been challenged by the process of moving large data sets effectively enough to allow for analysis. Methods to address that are ongoing. To recap the project purpose; biospatial has been engaged in developing user-friendly displays of EMS data initially for the federal government as part of data gathering for preparedness. The company has expanded that role to offer similar services directly to states to assist in just-in-time data displays of EMS data, writing programming to allow for dashboard displays of data, etc. biospatial has been engaged in work with the Division to display a variety of EMS data elements including writing a dashboard to display the (required) CDC Field Triage criteria which determines the most appropriate trauma facility based on the injury. biospatial approached Michigan with a proposal to display trauma data. The project will use biospatial software to display EMS and trauma data and to probabilistically link patient care records in both the MI-EMSIS and trauma data collection repositories. The vision is that the user-friendly graphics will assist in informing partners and stakeholders about the effectiveness of the system and the care provided across the continuum of care from prehospital to discharge.

Rehabilitation

The *Trauma Rehabilitation Needs Assessment* report was presented to STAC in October by Dr. Clare Tanner from the Center for Data management and Translational Research.

The report outlined some of the current barriers to addressing rehabilitation for the injured in Michigan. The report provided information on the picture of rehabilitation nationally and internationally including the lack of universally accepted metrics to measure outcomes, a key informant survey of discharge planners that identified gaps related to insurance issues, returning patients to their rural communities for rehab, the challenge of mental health needs and the impact of social determinants of health. The committee discussed next steps for the discussion and what future work may entail such as potentially mapping a patients journey through the process.

System Evaluation

The Statewide Trauma Advisory Committee (STAC), Regional Trauma Advisory Committees, and Regional Professional Standards Review Organizations met throughout the year (virtually) to review data, discuss issues, report on projects and initiatives, and vote on policy and procedures as needed. The Regional Trauma Network Boards did not consistently meet as there were limited issues that required Board action.

The Michigan Trauma System Strategic Plan initiatives were reported to the STAC quarterly as well as regional workplan progress and administrative rule requirements.

The Risk Adjusted Benchmarking (RAB) project for Level III Trauma Facilities is ongoing. An additional ongoing project is the voluntary audit project Level III facilities are working on with the MTQIP team to monitor data completeness and accuracy. Of the 26 Level III facilities engaged in RAB, nine will participate in the audit project this year (two have volunteered for the audit annually since 2019). Validation error rates so far range from 2.2% to 3.5%.

Data hygiene practices are ongoing including monitoring user access and permissions, ensuring EMS NTDS data elements are included in the registry after STAC supported the return of these elements from the previous 2019 NTDS, monitoring IDTX file transfers and troubleshooting data input, identifying data discrepancies and null values including those in MIEMISIS as it relates to patient disposition.

Ten years

The initial trauma system legislation was passed in 2004, however the system wasn't fully funded until 2012 when operationalizing the system began in earnest. Much has

happened over the course of those ten years. The STAC convened 60 times in that time frame advising the department on a myriad of topics, bringing issues to discuss both local and national. The regional trauma networks were organized, responsibilities outlined, leadership identified and applications requesting recognition were formally submitted to the state triennially, since 2016. More than 600 trauma content experts contributed time and expertise to regional work, establishing and participating in the verification process, drafting the first state trauma system strategic plan, state injury prevention plan, training sessions, workshops, three statewide conferences that were collectively attended by more than a thousand people. The past ten years saw state supported initiatives related to *Stop the Bleed* trainings across the state and training materials supplied to each region, injury prevention initiatives related to falls prevention, car seat installation, bike helmets, teen driving and countless others all designed to prevent injuries in communities, schools and elsewhere. Trauma system partners were awarded a total of 471 grants since 2016 to support trauma education, injury prevention, infrastructure, and performance improvement. The grants demonstrated the cutting edge thinking and evidenced based best practices stakeholders used to implement projects that addressed the needs of their communities, staff, and their regional trauma system.

Michigan's trauma system continues to mature, working to improve care for the injured and to capitalize on the efficiencies the system has realized. Including improved communication, stronger partnerships, data driven change, mentoring and program building between Level I and Level II trauma facilities and the smaller facilities throughout the state, follow up and learning about care delivery to improve patient outcomes. This work is crucial particularly now when resources are strained, and capacity continues to be challenged. Throughout the past year this and in previous years, the regionalized, coordinated, and accountable system of care for the injured continued to ensure the right patient gets to the right resource at the right time and will continue that charge well into the future

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