



2020-2021 ANNUAL REPORT



**Maryland Institute for
Emergency Medical Services Systems**



MIEMSS

The Maryland Institute for Emergency Medical Services Systems (MIEMSS) oversees and coordinates all components of the statewide EMS system (including planning, operations, evaluation, and research), provides leadership and medical direction, conducts and/or supports EMS educational programs, operates and maintains a statewide communications system, designates trauma and specialty centers, licenses and regulates commercial ambulance services, and participates in EMS-related public education and prevention programs. MIEMSS provides the executive support for the EMS Board in reviewing and approving the budgets for agencies receiving funds from the EMS Operations Fund, developing and promulgating regulations and protocols, proposing EMS system legislation, licensing/certifying and disciplining EMS clinicians, and conducting other EMS Board business. MIEMSS also provides the administrative and staff support for the State-wide EMS Advisory Council (SEMSAC) and five EMS regional councils.



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MISSION, VISION, AND KEY GOALS

MISSION

Consistent with Maryland law and guided by the EMS Plan, to provide the resources (communications, infrastructure, grants, and training), leadership (vision, expertise, and coordination), and oversight (medical, regulatory, and administrative) necessary for Maryland's statewide emergency medical services (EMS) system to function optimally and to provide effective care to patients by reducing preventable deaths, disability, and discomfort.

VISION

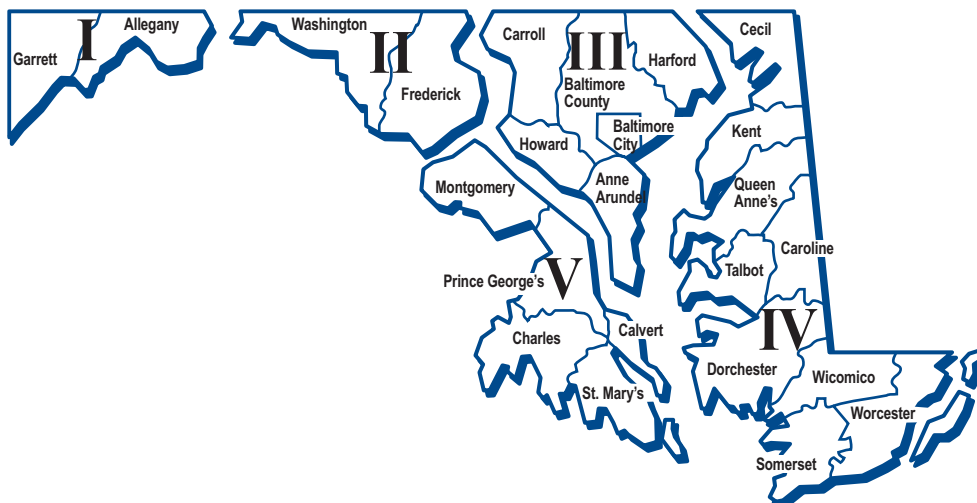
To be a state EMS system acknowledged as a leader for providing the highest quality patient care and that is sought out to help other EMS systems attain the same level of quality care.

KEY GOALS

- Provide high quality medical care to individuals receiving emergency medical services.
- Maintain a well-functioning emergency medical services system.

MARYLAND EMS REGIONS

Maryland's EMS system is composed of five regions. Each region has a Regional EMS Advisory Council composed of members who have an interest in EMS. Council responsibilities are defined by regulation, and council meetings typically cover a range of topics, including grants, training, EMS policies and protocols, legislation, and communications. Input from each Regional EMS Advisory Council is provided to the Statewide EMS Advisory Council for recommendation to the EMS Board. MIEMSS' regional administrators support the councils, facilitate communication, and address regional EMS issues.





*Clay B. Stamp, NRP
Chairman, EMS Board*

FROM THE MARYLAND EMS BOARD CHAIR

On behalf of the State EMS Board, I offer our greetings and heartfelt gratitude to all of Maryland's volunteer and career EMS clinicians for the work they do every day to save lives and reduce suffering. Our EMS clinicians, along with our nursing and physician colleagues, our hospitals and specialty referral centers, and partner organizations including the Maryland State Fireman's Association, the Maryland State Police, the Maryland Fire and Rescue Institute, and the R Adams Cowley Shock Trauma Center, make our statewide system of emergency medical care a model for the nation.

As I draft these remarks, we find ourselves in the midst of some very challenging times as a nation, as a state, and as a community. The COVID-19 pandemic, now in its second year, has thrust the medical sector into overdrive in dealing with not only highly contagious patients, but also an increasingly divided public who challenge the validity of protective measures. Collaterally, the loss of employment and the cancellation of events and activities are driving economic uncertainties. Additionally, it is clear the pandemic is having an impact – personally and professionally – on every clinician and health care practitioner. The toll of the pandemic has been high, and I urge all EMS clinicians to take care of yourselves, as well as your patients.

In the face of these challenges, Maryland Emergency Medical Services continue to do what we do best – responding to the needs of our patients, ensuring they are provided with the best possible treatment, and delivering the most appropriate level of care in a timely manner. Additionally, we have witnessed firsthand the benefits of having a coordinated statewide EMS system, especially during these times. We can all be proud of the work of our MIEMSS Executive Director, State EMS Medical Director, the MIEMSS staff, and our emergency medical services partners who have been working hand in hand with local and county officials, the Maryland Department of Health, and the Maryland Emergency Management Agency to coordinate and support the expansion of medical surge capacity and efforts to ensure our EMS clinicians have access to the right protection and operational guidance during the COVID-19 pandemic.

One day, we will be able to not only look back and reflect on the devastating impact of the COVID-19 pandemic, but also work together to identify “silver linings” – changes and improvements to the EMS system that result from our collective experiences and lessons learned during these challenging times. We will use the same well-proven consensus-building mechanisms inherent in our MIEMSS system to evaluate, collaborate, and perfect these changes to further strengthen our EMS system.

As we move forward, the updated Maryland Emergency Medical Services Vision 2030 plan for the EMS system, developed with input from our clinicians, operational programs, SEMSAC, regional councils, EMS partner agencies and organizations, provides us with a roadmap for the future – a roadmap to ensure that, as a statewide system, we are developing research, advancing evidenced-based protocols, embracing technology, and leveraging partnerships to deliver highly effective care and transport to those utilizing the Maryland EMS system, no matter how difficult the circumstances.

I will close with an analogy in relation to the pandemic and its broad and diverse effects. While serving on a crew of a ship navigating high winds, rough seas, and driving rain, it is sometimes hard to see anything but your present situation. But the truth is that if you persistently rely on your training, follow your plans and procedures, and do the hard work, ahead will lie calm waters, sunshine, and cool breezes. Our collective success will continue to be realized through the foundational strength of our EMS system along with the dedication, support, and commitment of all of you who make up Maryland EMS system.

On behalf of the citizens of Maryland, we thank all who are part of the statewide EMS system. Your commitment, selfless dedication, excellent clinical care and expertise in responding to difficult situations, and empathy and calm reassurance for your patients and their families make all the difference for the people we serve.



Theodore R. Delbridge, MD, MPH
Executive Director, MIEMSS

FROM THE EXECUTIVE DIRECTOR

Maryland EMS is a critical feature of the health care system. If such an assertion was ever in doubt, the events of the past year have proven the point. At the core are more than 18,000 EMS clinicians who stepped up to meet the challenges of managing a viral pandemic in myriad ways. They are, quite literally, at the heart of EMS contributions to caring for communities and reviving their health.

Early in Maryland's strategy to address COVID-19, EMS was the subject of a Governor's Executive Order, providing considerable flexibility and potential for innovation. We responded by inviting more than 1,600 new provisional EMS clinicians to join the ranks. They were emergency medical technicians and paramedics who were students at the end of training, recently expired, or with credentials in other states. Subsequently, we promulgated new regulations that defined a path for them to gain full credentials. Hundreds have begun that process.

In all, we exercised options specifically afforded by the Executive Order by issuing nine public notices. They resulted in extension of EMS clinician licenses, flexibility with regard to licensure testing, commercial ambulance staffing flexibility, and authorization for EMS clinicians to vaccinate the public. We also used the MIEMSS licensing apparatus to designate more than 1,500 nurse clinical externs and 100 respiratory care clinical externs. They are students who, like EMS clinicians, stepped up to engage within the health care system.

The EMS system response to COVID-19 in Maryland has resulted in preparation of multiple scientific manuscripts for publication. Among them is an analysis of EMS data regarding persons under investigation (PUI) as it relates to hospitalizations. The interesting finding was that EMS-identified PUIs related to hospital admissions nine days later. The implication is that EMS sees in its communities what the rest of the health care system will see shortly. In the case of COVID-19, specifically, the lead-time was nine days. It also emphasizes the value of medical records generated by EMS clinicians, accurately characterizing the nature of patients' illnesses.

Another paper reports an evaluation of the *Viral Syndrome Pandemic Triage Protocol*. The most frequent disposition for EMS patients identified as PUIs was "no transport." When the protocol was appropriately applied, and the triage tool was documented, the likelihood of requiring subsequent hospitalization was quite low. EMS clinicians used the protocol successfully to help people avoid unnecessary evaluation at an emergency department and to help decompress the emergency care system.

The most effective tool for dealing with COVID-19 is vaccination. Over the past year, EMS clinicians have broadened their contributions to health care by joining the vaccination effort. Hundreds of EMTs sought credentials as vaccinators. Together, with their paramedic and cardiac rescue technician colleagues, they vaccinated hundreds of thousands of Marylanders.

Each year, we work closely with the state legislature to review proposed legislation and provide subject matter expertise. During the 2021 legislative session, existing law was amended to allow paramedics to play an ongoing part in COVID-19 and influenza vaccine efforts. Existing law had restricted them to public safety occupational health initiatives. The updated law extends their capabilities to include public vaccinations and now includes paramedics who are affiliated with agencies outside of the public safety system, such as commercial ambulance services.

Another area in which we worked with legislators dealt with preserving the autonomy of the EMS Board, and the various advisory committees on which it relies, to define EMS practice through the statewide EMS protocols. The issue in focus concerned management of severely agitated patients and their safe transition to definitive care. We are committed to monitoring this area as we strive to ensure safety of patients and EMS clinicians and others attempting to provide appropriate care for them.

Over the past year, we have also been working closely with our colleagues at the Maryland Department of Health. In addition to coordinating our response to COVID-19, we have positioned the state's EMS system to avail itself of a supplemental payment program related to caring for Medicaid beneficiaries. Although it may take a couple of years for the entirety of the system to configure itself to take advantage of this opportunity, several jurisdictions are poised to recover portions of costs incurred during the past fiscal year. This stands to be a significant resource to support EMS system development.

Finally, I would be remiss if I failed to acknowledge my colleagues at MIEMSS. They have worked tirelessly, and in many cases have re-defined themselves to meet the challenges of the year. They developed, and continue to operate, the Critical Care Coordination Center (C4). The C4 provides critical care bed clearinghouse services, helping to match patients' needs to available resources throughout the state. They distributed pallets of personal protective equipment and coronavirus testing kits to EMS agencies. For months, they operated a vaccination clinic, administering thousands of doses to public safety and government personnel. Finally, they continue to coordinate surveillance of hospital resource utilization and availability every single day.

We continue to work with health system leaders regarding emergency department crowding, particularly as it relates to transitioning patient care from EMS personnel to hospital staff. Delays can be frustrating and affect EMS system efficiency. Earlier this year, the MIEMSS information technology staff introduced the At-Hospital Ambulance Dashboard, or @HA. EMS clinicians in the field and communications center personnel can see how many EMS units are at specific hospitals. In conjunction with hospital alerts, @HA can help identify busier and less-busy emergency departments, facilitating meaningful decisions about appropriate patient destinations. Development is continuing to ensure that the most robust information is available.

While the EMS response to COVID-19 over the past year doesn't define the spectrum of EMS care, it does say something about who we are. EMS clinicians did not hesitate to continue to care for their communities, adapting to the potential risks they faced. As this report reflects, Maryland's EMS system is one that makes significant contributions to the health and safety of the people of our state, and for which Marylanders can be grateful and proud.

MIEMSS DEPARTMENTAL REPORTS

ADMINISTRATION

Mission

To provide comprehensive accounting, personnel, and administrative resources in compliance with all applicable state laws, regulations, and policies in support of MIEMSS operations and overall mission.

Administration is responsible for the accounting, procurement, grant administration, and human resources functions of MIEMSS. All human resources functions are currently assigned to the Maryland Department of Budget and Management's Personnel Unit, under the guidance of MIEMSS' chief administrative officer.

The Accounting Unit provides guidance to management on various fiscal and budgetary matters. The staff develops the budget, tracks and monitors expenditures, processes accounts payables and receivables, maintains employee leave and payroll records, and deposits cash receipts. They also administer special, federal grant, and reimbursable fund appropriations.

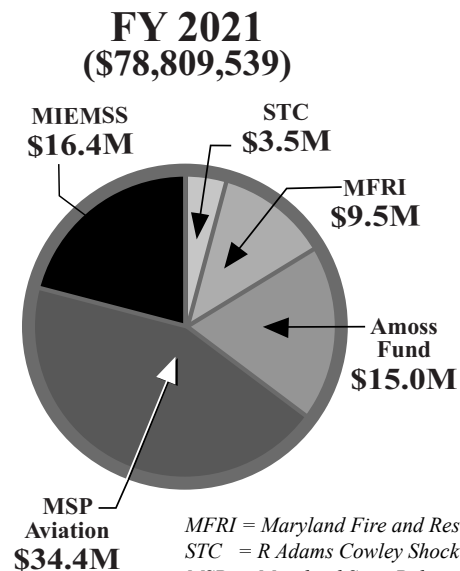
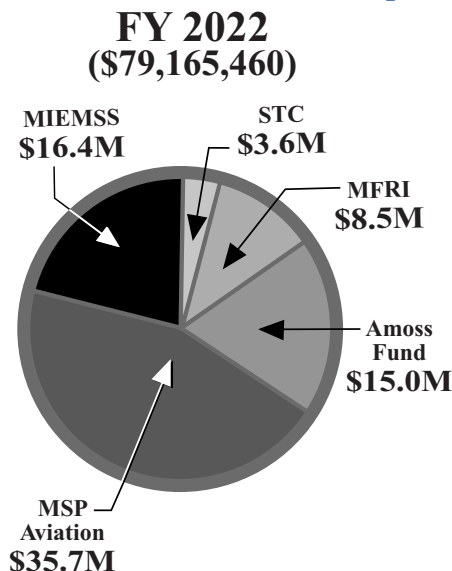
The Procurement Unit obtains all necessary supplies, materials, and services required by MIEMSS to fulfill its mission in accordance with all applicable state procurement laws and regulations. The unit is also responsible for contract and grant administration. Administration is also responsible for inventory control, fleet management, travel services, and building operations and maintenance.

MIEMSS budget information is displayed by state object code in the chart to the right. The distribution of EMS operations funds statewide is shown below.

MIEMSS FY 2021 Expenditure by Object Code (Includes All Funds)

FY 2021	Actual
Salaries and Wages.....	\$9,909,482
Technical/Special Fees.....	2,449,113
Communication.....	1,665,274
Travel.....	283,794
Fuel and Utilities.....	120,955
Motor Vehicle Operations and Maintenance.....	209,183
Contractual Services.....	3,864,618
Supplies and Materials.....	280,497
Equipment—Replacement.....	95,467
Equipment—Additional.....	13,693
Fixed Charges.....	177,421
Grants.....	760,040
Land and Structures.....	0
Total Expenditure.....	\$19,829,537

EMS Operations Fund



MFRI = Maryland Fire and Rescue Institute
STC = R Adams Cowley Shock Trauma Center
MSP = Maryland State Police



AEROMEDICAL OPERATIONS

Mission

To provide the physician medical support necessary to the Maryland State Police Aviation Command to meet the emergency helicopter needs of Maryland's citizens. State Aeromedical Director Douglas J. Floccare, MD, MPH, FACEP, is actively involved in ongoing training and verification of skill proficiency for state police flight paramedics. Dr. Floccare provides around-the-clock consultation support to SYSCOM for medevac requests and medical direction and is actively involved in the development of new patient care protocols and the oversight of ongoing care.

In FY 2021, the Maryland State Police Aviation Command (MSPAC) transported 1,868 patients. Of these patients, 1,857 (99%) were transported from the scene at the request of the local emergency services and 11 (1%) were transported between hospitals to a higher level of care.

Types of calls included the following:

• Motor vehicle crashes	1,013
• Falls	189
• Pedestrians	79
• Gunshot wounds	77
• Stabbings	33
• Assaults	28
• Burns	27
• Industrial injuries	13

The MSPAC saw continued successful use of the AgustaWestland 139 (AW-139) model of aircraft as an excellent platform for its multiple missions. Equipped with the most current safety technology as recommended by the National Transportation Safety Board, the AW-139 aircraft are powerful enough to carry two patients and two EMS clinicians despite the challenging heat and humidity of the summer months. The acquisition of an FAA-certified Flight Training Device has allowed significant hours of pilot training to be conducted under simulated conditions, not only saving

aircraft flight hours but also allowing the simulation of in-flight emergencies not able to be performed in an actual flying aircraft.

The COVID-19 pandemic provided unique challenges to providing patient care in FY 2021, as well as a prolonged period of diminished call volume. However, statewide need for medevac transports returned to pre-pandemic levels following successful widespread vaccination efforts and the ability to return to more customary activities of daily life. Sophisticated transport ventilators continued to add to our treatment capabilities for our sickest patients in FY 2021, allowing early initiation of lung-protective ventilation while using cutting-edge strategies to maintain blood pressure until patients can reach the operating room.

FY 2021 also saw the continued participation of the MSPAC in the adult and pediatric rapid sequence intubation (RSI) programs as defined in *The Maryland Medical Protocols for Emergency Medical Services*. Designed to address the needs of patients with severe head injuries, these pilot RSI protocols allow MSPAC flight paramedics to use neuromuscular blocking agents in the field to provide endotracheal intubation for patients who are not breathing adequately. To verify advanced skill proficiency, scenario-based simulation training was used. These exercises, also used for recertification in Advanced Cardiac Life Support and Pediatric Advanced Life Support training, enabled life-like simulation of patient care situations as would be faced by MSPAC flight paramedics in the course of their normal duties.

ATTORNEY GENERAL'S OFFICE

Mission

To provide legal advice to the EMS Board, the Statewide EMS Advisory Council, and MIEMSS in connection with all aspects of EMS, the ongoing administrative functions of the agency, and the regulation of commercial ambulance services. The Attorney General's Office also serves as the administrative prosecutor for cases involving allegations of prohibited acts by EMS providers before the EMS Provider Review Panel, the EMS Board, the Office of Administrative Hearings, and the courts.

During the past fiscal year, the Attorney General's Office continued to support MIEMSS in promulgating and implementing the agency's regulations, procurement, personnel matters, and contracts, including technology initiatives. The office also assisted in the administration of several state and federal grant programs.

In FY 2021, the Attorney General's Office provided the following services to MIEMSS:

- Reviewed and prosecuted 44 cases of alleged prohibited acts by EMS clinicians and applicants. Provided legal advice and support to the State Office of Commercial Ambulance Licensing and Regulation in all compliance matters, including contested cases.
- Prepared responses to 213 public information act requests, three subpoenas, and eight research requests.

Assistant attorneys general worked with MIEMSS in FY 2021 to amend various regulations, including updating standards for stroke centers and neonatal ambulance services. They also provided advice on the Maryland Public Access Defibrillation program and the AED Registry.

Other tasks completed included reviewing and providing advice concerning designation of trauma and specialty referral centers and base stations. The assistant attorneys general also provided advice and support for actions taken by MIEMSS and the EMS Board under Governor Larry Hogan's emergency declaration.

This office routinely provides support to the Perinatal Advisory Committee and the Perinatal Referral Center reverification process, the Commercial Ambulance Services Advisory Committee, and the Pediatric Emergency Medical Advisory Committee. Assistant attorneys general also help the Office of Hospital Programs to monitor specialty referral centers for compliance with their requirements and the Office of Licensure and Certification to enforce EMS education program standards.

The Maryland Orders for Life-Sustaining Treatment (MOLST) program, which provides patients with the legal means for communicating medical care wishes to EMS and other health care professionals, is supported by the Attorney General's Office. The MOLST form may be downloaded by the public for use, and MIEMSS provides copies to individuals without access to the Internet. MIEMSS also provides plastic bracelets for use with any MOLST insert to the public, free of charge. Additionally, MIEMSS routinely responds to phone calls and emails from the public for assistance in obtaining and using the MOLST form. MIEMSS also serves as a resource for health care clinicians regarding implementation of MOLST.

COMMERCIAL AMBULANCE LICENSING AND REGULATION

Mission

To provide leadership and direction to support the operations and growth of Maryland's commercial ambulance industry. Protecting the health, safety, and welfare of persons using these services is achieved

through the development and modification of statewide requirements for commercial ambulance services and vehicles and the uniform and equitable regulation of the commercial ambulance industry throughout Maryland.

At the conclusion of FY 2021, 38 commercial ambulance services and 472 commercial ambulance units held licenses issued by the State Office of Commercial Ambulance Licensing and Regulation (SOCALR). (See page 81 for additional statistics on SOCALR licensing and operations.)

To fulfill its own mission, SOCALR remains efficient and responsive in providing service and vehicle licensure, and offers sound leadership and direction to the industry while ensuring patient and clinician health, safety, and welfare. In doing so, SOCALR remains continuously committed to MIEMSS' organizational mission and vision. The department continues to seek opportunities to streamline internal business processes and develop strategies to enhance records management.

Based on continuous positive feedback from licensed commercial services, SOCALR continues to maintain a year-round licensure renewal schedule. In response to the COVID-19 pandemic, the SOCALR team leveraged technology to devise a remote virtual inspection (RVI) process to continue to meet the needs of commercial ambulance customers in and around Maryland. A return to in-person inspections has been implemented as COVID-related restrictions have been reduced. SOCALR continues to use the Commercial Ambulance Inspection Program (CAIP), a web-based application implemented in FY 2019, to conduct these vehicle inspections.

The web-based Commercial Ambulance Licensing System (CALs) continues to serve as the platform in which applications are processed and commercial service data is stored. The system provides a real-time snapshot of the commercial resources in Maryland, resulting in expedited data retrieval. Commercial service base surveys were put on hold during the pandemic, however these surveys have resumed as the COVID restrictions have been reduced. These surveys were conducted by a team of personnel from SOCALR, who provided follow-up reports outlining any corrective actions necessary to maintain COMAR Title 30.09 compliance.

COMAR regulation changes related to neonatal transport were implemented in May 2021 following extensive work by the statewide Neonatal Transport Stakeholders Workgroup.

The SOCALR team remains committed to supporting the MIEMSS Field Operations Support Team (FOST), assisting with emergency operations efforts throughout the state, and coordinating commercial



resources when disasters strike. During FY 2021, SOCALR played an integral role in the planning and coordination of the agency’s response to the COVID-19 pandemic. SOCALR personnel assisted with the MIEMSS vaccination clinic which administered thousands of doses of COVID-19 vaccine to Maryland State employees and first responders.

SOCALR continues to work closely with commercial services and third-party ePCR vendors to ensure the smooth import of data from those platforms. Reports are randomly reviewed for completeness, and to verify the receipt of data from services that import from third-party vendors.

COMMUNICATIONS ENGINEERING SERVICES

Mission

To provide the equipment, support, and expertise necessary to operate the statewide EMS communications systems and to support public safety interoperability.

Communications Upgrade Project (CUP)

Since the approval of the Detailed Design Review (DDR) in June 2019, Overland Contracting Inc. (OCI) has been working with their subcontractors to procure the equipment and services to begin the Phase 1 deployment in MIEMSS Region V, which covers Frederick, Montgomery, Prince George’s, Calvert, Charles, and St. Mary’s Counties. Delays in development of the core patching systems software led MIEMSS to alter the original deployment schedule to keep the project moving. This change allowed OCI to begin deploying the Radio-over-IP (ROIP) adapters that convert analog UHF Base Stations to the digital system and connect EMRC to the various county radio systems in Regions I, II, and III. The COVID-19 pandemic has impacted the communications upgrade project and daily operations as we struggled with keeping our staff safe while continuing forward momentum on the project.

Public Safety Microwave System

The MIEMSS Communications Engineering Services Department continues its leadership role in the design, implementation, and maintenance of the Statewide Public Safety Microwave System, a critical component of EMS communications in Maryland. In addition to supporting MIEMSS, this microwave system supports state public safety agencies such as the Maryland State Police (MSP); Maryland Department of Natural Resources (DNR); Maryland State Highway Administration (SHA); many county public safety radio systems; and numerous other state and federal partners, including the statewide 700 MHz radio system project (MFiRST). During this year, MIEMSS has replaced many key microwave links outside of the CUP project that directly enhance the reliability and resiliency of the current and planned communication systems. These microwave paths include new high availability ethernet capable radios in key locations that provide the native ethernet transport required by the CUP project. The upgrade of radios from Bressler building-Rt. 40 tower-Mt. Airy tower-LEC tower provide direct ethernet connectivity from MIEMSS headquarters to the LEC fiber and microwave that feeds into western Maryland. Other notable microwave path upgrades that expand the native ethernet network and enhance the CUP project include:

1. Mt. Airy tower to Rockville EOB building
2. Ocean City tower to Berlin tower
3. Berlin tower to Central Site tower
4. Central Site tower to Naylor Mill tower
5. Central Site tower to Pittsville tower
6. Central Site tower to Princess Anne MSP tower
7. Snow Hill tower to Klej Grange tower
8. Princess Anne MSP tower to Vienna tower
9. Princess Anne MSP tower to Marion tower
10. Princess Anne MSP tower to Nassawango tower
11. Owings Mills tower to Sinai Hospital

Hospital Relocations and Upgrades

During this year we saw two hospitals relocate to completely new facilities located many miles from their original location. This included the former Washington Adventist Hospital, which became White Oak Medical Center, and Prince George’s Hospital, which opened their new facility as University of Maryland Capitol Region Medical Center (UMCRMC). The communications staff worked diligently with each facility to develop direct microwave connectivity from state towers to their new facilities, allowing a seamless transition from the old locations to the new. In support of these relocations, a microwave link from Cobb tower to UMCRMC and College Park MSP tower to White Oak

Medical Center were constructed. In addition to the new facilities, the department also installed a new licensed microwave link connecting Suburban Hospital to the Rockville MSP tower, eliminating the need for leased circuits, and paving the way for the CUP project.

Maryland FiRST: Statewide 700 MHz Radio System

MIEMSS remains an active partner in the Maryland First Responder Interoperable Radio System Team (MFiRST) program. MIEMSS serves as a member of the Radio Control Board, which is responsible for coordinating the operation and maintenance of the Statewide Public Safety Interoperability Radio System. The agency also participates on the state's Radio Control Board's Operations Committee.

MIEMSS has the necessary interfaces to the MFiRST radio system to enable all Maryland jurisdictions to leverage the MFiRST system for medical consultation. These interfaces support field clinicians operating on the MFiRST system, allowing them to obtain medical direction via EMRC. The MFiRST's final phase, in Southern Maryland, is still in progress, with an anticipated completion date in 2021.

MIEMSS continues to expand its network monitoring and alarm monitoring systems to enable staff to be more efficient and to effect system repairs quickly and decisively. Work continues to integrate the MFiRST system alarms into the MIEMSS master alarm system, providing daily insight into maintenance and performance issues that allow rapid identification and diagnosis of system problems. This integration leverages the state's investment in the master alarm system and enables a comprehensive, overall view of MIEMSS, DNR, SHA, and the MFiRST radio infrastructure. This year, the department installed enhanced alarm monitoring at many additional MIEMSS' tower sites.

While it is expected that MSP aviation communications will migrate completely to the MFiRST system, it will be at least another year before there is statewide coverage for medevac helicopters. MIEMSS continues to support the VHF low-band system to allow MSP aviation to communicate across the state. MIEMSS and MSP ESD successfully promoted the creation and adoption of Aviation talkgroups (AVTacs) on MFiRST, which are utilized to create a common gateway between Maryland counties and aviation resources. To date, Talbot, Cecil, Queen Anne's, Kent, Harford, Allegany, Garrett, Dorchester, and Cecil Counties have adopted the use of the AVTacs, greatly benefitting the EMS continuum of care. Many other counties are considering or have committed to adopting these talkgroups as the MFiRST system completes its deployment.

Public Safety Interoperability Network

Communications Engineering Services continues to deploy, administer, and maintain the Public Safety Interoperability network (PSInet), a statewide, private IP-based public safety network composed of fiber, microwave, and wireless links that support critical data and voice communications managed by MIEMSS. PSInet is the foundation upon which the EMS communications system upgrade to an IP-based EMS system is being implemented, and it is vital to MIEMSS' future operations. Deployed across the state, the network provides connectivity into MSP barracks, MIEMSS regional operating centers, jurisdictional emergency operations centers (EOC), public safety answering points (PSAP), state and jurisdictional health departments, hospitals, and other allied agencies. Applications that currently operate on PSInet in addition to MFiRST include Digital Emergency Medical Services Telephone (DEMSTEL); Central Maryland Area Radio Communications (CMARC); other systems monitoring/controlling the state's public safety microwave network, and tower infrastructure. In concert with the communication upgrade project, MIEMSS has continued its strategic plan to replace older equipment in key locations in support of the project.

Communications Systems Maintenance and Improvements

While analog technologies have served the EMS communications system and MIEMSS reliably since the early 1990s, most of the critical technology systems supporting this system have become outdated and, correspondingly, increasingly prone to failure. The risk of system failure is further exacerbated by difficulty in securing vendor support for these critical, outdated systems. The Communications Upgrade Project (CUP) will remove many of these vulnerabilities.

While Communications Engineering Services is leveraging newer communications systems such as MFiRST, a large portion of departmental responsibilities and resources involves maintaining or improving current systems to provide the best service possible to EMS clinicians and the public.

Communications Engineering Services upgraded numerous microwave power and battery systems throughout the state to ensure reliable backup power for critical systems, and established remote control and monitoring capabilities for the power systems and other system components.

COVID-19

Communications Engineering Services was successful in completing many important projects while managing constantly changing priorities at the local

and state level in FY 2021. The COVID-19 pandemic has increased the difficulty in performing many duties as we try to balance the demands of the job and maintain a safe work environment for all employees. The department was further hampered by the realities of changing work environments internally and with our public safety and health partners due to the COVID-19 pandemic.

Challenges

MIEMSS will continue to migrate systems to new, more resilient technologies that enhance services provided to the EMS community. As in past years, none of this year’s successes would be possible without the dedicated staff in Communications Engineering Services and our public safety partners.

In FY 2021, MIEMSS lost critical staff members due to retirement and other job opportunities, leaving four vacancies out of 11 staff members. The loss of 36% of the communications staff that responds statewide would be crippling enough, but added to the additional responsibilities required to keep the CUP project moving it has made this an incredibly difficult year.

Without the dedication of the remaining staff, MIEMSS would not have been able to keep up and make progress in many areas. Of great note this year, as in many years in the past, was the monumental efforts of the department’s Deputy Director, Charles Rollman, who not only performed his duties beyond measure but also filled in as the Administrative Aide and as part of the technical staff.

As in years past, the department continues to struggle with meeting an increased workload with a decreased staffing level exacerbated by the state hiring freeze during the pandemic. The continuing challenge that we face as we move into the new fiscal year is finding the skilled and dedicated individuals that are necessary to support the EMS Communications system.

COMPLIANCE OFFICE

Mission

To ensure the health, safety, and welfare of the public as it relates to the delivery of emergency medical services by Maryland-licensed and certified EMS clinicians. The Compliance Office assists in assuring the quality of patient care by investigating complaints and allegations of prohibited conduct.

The Compliance Office works closely with the EMS Board, the Attorney General’s Office, the Incident Review Committee (IRC), the Peer Review Panel (PRP), and EMS operational program (EMSOP) quality assurance officers statewide. The PRP is a

13-member panel comprised of physicians representing the Maryland Board of Physicians, Maryland Medical Chirurgical Society, and EMSOP medical directors. All levels of EMS clinicians are also represented on this panel. The PRP reviews complaints, as well as the results of the investigations presented by the Compliance Office, and recommends corrective and disciplinary actions to the EMS Board. The State EMS Medical Director and MIEMSS Executive Director serve as ex-officio members on the PRP.

■ FY 2021 Compliance Office Activity

- Provisional applicant background investigations completed2,163
- Initial and renewal background investigations completed10,214
- **Total background investigations completed14,120**
- IRC investigations conducted 64
- IRC complaints forwarded to PRP35
- Complaints forwarded to EMS Board34

■ EMS Board Action

- Reprimands9
- Probation30
- Suspensions3
- Revocations1
- Remedial training4
- Surrenders2
- Evaluations1
- Applications denied1
- Random testing14
- Case Resolution Conferences8
- OAH hearings conducted1
- OAH hearings defaulted1
- Settlement agreements3

CRITICAL INCIDENT STRESS MANAGEMENT

Mission

To offer crisis support services to EMS clinicians, firefighters, law enforcement officers, dispatchers, and other emergency services personnel involved in stressful emergency incidents, and to help accelerate recovery of those individuals exhibiting symptoms of severe stress reaction.

The Maryland Critical Incident Stress Management (CISM) program offers education, defusings, and debriefings conducted by a statewide team of trained volunteers. The team consists of volunteer doctoral- or master-level psychosocial clinicians and emergency services personnel as well as fire/rescue/law enforcement peer-support individuals trained in critical inci-



dent stress management. Volunteer regional coordinators are responsible for specific geographic areas of the state and serve as points of contact, through local 9-1-1 centers and EMRC/SYSCOM, for critical incident stress management. In addition to coordination of the state CISM team, MIEMSS works closely with local CISM/peer-support teams and the International Critical Incident Stress Foundation to improve capabilities throughout the state.

In planning for FY 2021, MIEMSS anticipated the coordination of several CISM training sessions for first responders. One three-day CISM course was conducted in coordination with the Prince George's County Police Department in May 2021. Due to the COVID-19 outbreak, all other planned trainings were postponed.

The focus in 2021 continued to be on assisting with the statewide response to the pandemic, and the focus of wellness-related efforts was likewise adjusted accordingly. Efforts related to the pandemic included the following:

- MIEMSS coordinated multiple webinars for state agency personnel involved in the COVID-19 response. In these sessions, trainers from the International Critical Incident Stress Foundation (ICISF) provided one-hour training sessions focused on stress management and self-care.
- MIEMSS continued coordination of a crisis support program for frontline workers in skilled nursing and other long-term care facilities. These personnel were on the front lines of the COVID-19 pandemic and were in need support.

With funding made available from the Maryland Department of Health, Behavioral Health Administration, MIEMSS contracted with the Workplace Trauma Center to provide these training sessions. This program provides virtual group and individual training and support provided by licensed mental health clinicians. Training is focused on self-care, resiliency, stress management, and general wellness. By the end of June, multiple group and individual crisis training and support sessions have been held. This

project is has been extended and will continue through December 31, 2021.

EDUCATIONAL SUPPORT SERVICES

Mission

To contribute to MIEMSS' vision of eliminating preventable death and disability by providing to the public essential information on how to recognize an emergency, summon an EMS response, and incorporate injury prevention methods in their daily lives, as well as designing and developing educational programs for EMS clinicians through state-of-the-art technology..

Educational Support Services provides education and information to Maryland's EMS community and the public through various modes of media and communication. The department develops, designs, and produces instructional training modules and informative programs that are distributed statewide.

Print Projects

The department is responsible for the design, photography, and editorial content of the MIEMSS Annual Report, MIEMSS website, and the *Maryland EMS News* monthly newsletter, which can be downloaded from MIEMSS' website and is posted on Facebook and Twitter. It is also emailed to hospital, pre-hospital, and emergency services personnel, and printed copies are sent to volunteer stations throughout the state. The newsletter keeps EMS personnel in touch with local, state, and national EMS issues. COVID-19-related information has received significant coverage since the start of the pandemic. In FY 2021, *Maryland EMS News* covered other various topics, including:

- COVID-19-specific guidance and EMS response;
- MIEMSS' Licensure System;
- Regional EMS events, educational opportunities, and other highlights;
- Adult and pediatric injury prevention news and information and;
- EMS protocol updates and information.

Collaboration with other emergency services partners helps to support the dissemination of information to broader audiences. Departmental staff contributes content to the *Maryland Fire Dispatch* and the *Trumpet*, published by the Maryland State Firemen's Association (MSFA).

Each year, Educational Support Services staff produces *The Maryland Medical Protocols for Emergency Medical Services*, in collaboration with the Medical Director's Office, including editing, layout, and design. This year, a completely new look to the protocol document was produced. The use of color and an easier

flow makes the comprehensive document more user-friendly. The complete 2021 protocol manual was printed and made available on MIEMSS' website. The printed pocket version and 5"x7" spiral-bound version of the protocols were also designed and edited by department staff. A copy of the pocket version is distributed to every Maryland EMS clinician statewide.

Media Events and Social Networking

Media events, press releases, and social networking applications were used during the year to reach target audiences on many EMS-related issues. MIEMSS engages the EMS community and the public through Facebook, Twitter, Instagram, and YouTube. Social media messaging reached thousands of EMS clinicians and members of the public throughout the year. As of June 30, 2021, more than 11,760 users were following MIEMSS' Facebook page and 1,670 users were following its Twitter feed. Posts on Facebook during this period had a total reach of over 460,000, meaning MIEMSS' activity was seen at least that many times by users through news feeds, subscriptions, likes by other people, or shares. MIEMSS posted social media messages on various topics of interest to EMS clinicians, including important messages specifically for Maryland clinicians as well as illness and injury prevention messages intended for the public. Information about COVID-19 pandemic updates, as well as safety reminders and tips were shared on social media throughout the year.

Training Support

In FY 2021, the department produced the EMS Update 2021 training video, required viewing for Maryland EMS clinicians and hospital base station personnel, which included educational content as well as changes and additions to the 2021 EMS protocols. Due to the COVID-19 pandemic, the department produced a modified version of the training; the production was made available to BLS and ALS clinicians through the MIEMSS' Online Training Center and the MIEMSS YouTube channel. Department staff also produced a version of the training for hospital base station personnel, which was posted to the MIEMSS website and YouTube channel.

Other videos produced by Educational Support Services during the past year included the Maryland Fire-Rescue Memorial Foundation annual ceremony and the annual memorial service program for the Maryland State Firemen's Association (MSFA) Convention. Again, this year, the MSFA Memorial Service was held virtually. Components of the service were produced and then edited into the ceremony for viewing on YouTube. An EMS Week 2021 video

message from MIEMSS Executive Director Dr. Ted Delbridge thanked EMS clinicians for their commitment to caring for others and highlighted their hard work during the pandemic. Filming and production of various topics for educational lectures and programs were developed, including presentations for the virtual 2021 Winterfest EMS conference, Public Fire and Lifesafety conference, educational presentations for the MSFA Convention, and Heat Stroke Display Usage. Videos relating to COVID-19 updates and issues were produced, including COVID-19 vaccine administration. Several online webinars were edited and made available; topics included Car Seat Tolerance, Child Passenger Safety, and Bike Safety Resources. Production of Public Service Announcements included a Stop the Bleed™ awareness PSA featuring a trauma victim that was saved utilizing the lifesaving training.

Educational Support Services assists with conference planning, and prior to COVID-19 provided technical and audiovisual support to regional and MIEMSS-sponsored in-person continuing education programs. Department staff designs and generates high-quality printed media, photographs, and video productions. The department contributes a variety of services to MIEMSS' educational programs, which are critical to the continuing education learning process for prehospital and hospital personnel. Staff also provides assistance and support with in-house web conferencing, video conferencing, and teleconferencing.

Maryland EMS Awards

Again, this year, the annual Maryland EMS awards ceremony was postponed. Nominations for the EMS for Children's Right Care When It Counts Awards and the Maryland Stars of Life Awards were collected, collated, and reviewed by a statewide committee to determine the award winners. Award winners were recognized during individual presentations around the state. Dr. Ted Delbridge, EMS Board Chairman Clay Stamp, State EMS Medical Director Dr. Timothy Chizmar, Associate State EMS Medical Director for Pediatrics Dr. Jennifer Anders, and EMS-C Program Director Cyndy Wright-Johnson traveled to various locations to honor those who were chosen for their outstanding efforts in assisting Maryland's citizens. A compilation video production of the ceremonies was produced. .

Outreach and Prevention

Educational Support Services provides support, including photography, design, and fabrication for MIEMSS exhibits that disseminate information about the EMS system and topics in injury and illness prevention. In FY 2021, the department collaborated on many injury prevention projects with the Maryland EMS for

Children program, fabricating displays, designing and printing educational materials, and producing videos, including car seat safety and bike safety messages for the public. Printed materials, banners, and public service announcements featured Maryland's prehospital and hospital personnel in prevention messages. Educational Support Services works collaboratively on multiple prevention projects and messages with other state and local government agencies. In FY 2021, the department collaborated on statewide injury prevention initiatives with the Maryland Department of Transportation's Occupant Protection Emphasis Area Team, the Pedestrian/Bicycle Emphasis Area Team, the Impaired Driver Emphasis Area Team, the American Trauma Society, and the Maryland Committee on Trauma. In partnership with the Maryland Highway Safety Office, a page in the *Maryland EMS News* has been included to inform EMS clinicians of highway safety and prevention efforts.

EMERGENCY MEDICAL SERVICES FOR CHILDREN

Mission

To provide the leadership, direction, and expertise in the coordination of resources that focus on the unique needs of children and their families in a manner that facilitates the efficient and effective delivery of out-of-hospital, hospital, and restorative care throughout the state. These resources include injury and illness prevention, clinical protocols, standards of care and facility regulation, quality improvement and data analysis initiatives, interagency collaboration, and initial and continuing education for professionals across the continuum of care that will promote the health and well-being of children, youth, and their families in Maryland.

The Emergency Medical Services for Children (EMS for Children) Department is responsible for a multitude of services related to emergency care for children and their families across Maryland, including:

- Coordinating the state Pediatric Emergency Medical Advisory Committee;
- Developing statewide guidelines, regulations, and resources for pediatric care;
- Conducting pediatric emergency care quality assurance and improvement through the Maryland Pediatric Quality Improvement Committee and Data Analysis and Research Team (DART);
- Providing EMS for Children representation at regional and national levels and through interagency collaboration;

- Implementing Pediatric Base Station, Pediatric Trauma, and Pediatric Burn Center regulations and designation;
- Coordinating pediatric education programs and activities for prehospital and hospital professionals with a focus on train-the-trainer and regional EMS and ED conferences;
- Managing state and federal grants related to pediatric emergency care, injury prevention, and EMS for Children research;
- Supporting the Maryland EMSC Family Advisory Network (EMS for Children State Partnership Grant);
- Promoting pediatric injury prevention activities and trainings through Maryland Highway Safety Office grants, Safe Kids Maryland state coalition, and Maryland Risk Watch in partnership with the MSFA Fire & Injury Prevention Committee.

Program Activities

The State Pediatric Emergency Medical Advisory Committee (PEMAC) meets bimonthly and during the past year have met through web-based participation. Committee task forces meet regularly to update documents and procedures for EMS protocols, interfacility transport and transfer, and pediatric facility designation. PEMAC has five standing subcommittees: Pediatric Protocol Development, Pediatric Education, Pediatric EMS Champions, Pediatric Data & Research, and Family Advisory Network (FAN) Council. Additional committees and workgroup focus on injury prevention and pediatric disaster emergency medicine and preparedness.

Jennifer F. Anders, MD, FAAP, is the Associate State EMS Medical Director for Pediatrics. She serves on MIEMSS' Protocol Review Committee (PRC) revising current medical protocols for EMS clinicians, reviewing new protocols, and recommending modifications founded on evidence-based practices. She also chairs the MIEMSS' Pediatric Quality Improvement Committee (QIC) and the Data Analysis Research Team (DART). One of the functions of the Pediatric QIC is to coordinate the Pediatric Base Station Course for emergency department healthcare teams at Children's National Hospital and Johns Hopkins Children's Center, Maryland's two designated Pediatric Base Stations, which provide statewide coverage for online and offline pediatric medical direction and community education. In 2020, this course was modified to meet the learning needs of pediatric and neonatal transport team members and was recorded to be converted to an online platform. The Pediatric QIC is involved in ongoing QI activities, making recommendations that directly impact protocol development, revision,

and advancement, as well as targeted pediatric education at conferences and seminars. Pediatric DART has four ongoing data projects: 1) pediatric rapid sequence intubation conducted by Maryland State Police and other EMS agencies, in partnership with the Johns Hopkins Hospital and Children's National Hospital; 2) data collected on the pediatric sepsis protocol for EMS clinicians; 3) cardiac arrest occurrence and Cardiac Arrest Registry to Enhance Survival (CARES) outcome reports; and 4) development of a pediatric EMS dashboard of calls and transports. Dr. Anders is also the principle investigator for a project to develop an EMS triage tool for a pediatric decision tree (PDTree), in partnership with Baltimore City and Prince George's and Queen Anne's Counties. The project was funded by an EMS for Children Targeted Issues grant awarded to the Johns Hopkins University. Dr. Anders currently chairs the American Academy of Pediatrics PEPP Steering Committee and worked closely with Maryland faculty to plan the 4th edition rollout courses.

Cynthia Wright-Johnson, RN, MSN, is the EMS for Children's director at MIEMSS, leading a team of grant-funded projects and the state pediatric committees and task forces. She represents the National Association of State EMS Officials' (NASEMSO) Pediatric Emergency Care Council as liaison to the American Academy of Pediatrics (AAP) Committee on Pediatric Emergency Medicine. She continues to serve as the NASEMSO representative to the advisory board of the EMSC Innovation and Improvement Center Pediatric Recognition Collaborative. She chairs the Institute for Quality Safety and Injury Prevention for the Maryland Emergency Nurses Association (ENA) and is appointed to the Maryland State Child Fatality Review Committee. Maryland EMS for Children continues to participate in NASEMSO projects that focus on safe transport of children in ambulances through representation on the Safe Transport of Children Committee and the Highway Incident Traffic Committee.

Maryland EMS for Children coordinates the 10 states and territories in the EMS for Children Atlantic Region, which meet annually at national EMSC or NASEMSO conferences to share resources. EMS for Children continues to support the Maryland ENA Council, three local ENA chapters, and the western Maryland SIG by providing Certification in Pediatric Emergency Nursing (CPEN) review courses and supporting the wider distribution of ENPC courses.

In recognition of the specialized care required for pediatric emergencies, EMS for Children Day information was shared on social media and nominations for the Right Care When It Counts award were solicited from across the state. Due to response and mitigation to COVID-19 pandemic, the state awards ceremonies

for 2020 were held in October at local fire stations and the ceremonies for 2021 were held during May again at local stations.

Maryland EMS for Children State Partnership Grant

MIEMSS has a current EMS for Children State Partnership Grant from the Maternal and Child Health Bureau/Health Resources Services Administration of the US Department of Health and Human Services. These 16 years of consecutive grant funding have focused on the continued integration of pediatric EMS into the Maryland EMS system, using both the federal Maternal Child Health Core Performance Measures and the federal EMS for Children Performance Measures, and supported pediatric education for prehospital and hospital emergency healthcare professionals (see Pediatric and EMS Hospital Education, below). The grant focuses on three new measures:

1. NEMSIS data reporting statewide which Maryland has achieved with 100% reporting in eMEDS[®] from all public safety agencies;
2. Creating and supporting Pediatric EMS Champions in each EMS agency, with 26 Champions participating at this time from across all five EMS regions;
3. Promoting pediatric EMS education in both skills and scenario-based training that is offered at EMS conferences and quarterly through in person workshops and online webinars or Learning Management System continuing education.

The other federal measures remain unchanged and focus on pediatric medical and trauma ED readiness, interfacility transportation, and integration of EMSC at the state and local level. Two federal EMSC surveys were conducted in 2021. The first survey in January and February requested all EMS Agencies to respond to the EMS performance measures with 100% participation by Maryland EMS Operational Programs. The second survey for all hospital and freestanding emergency departments opened on May 1 and focused on the 2018 Joint Policy Statement for Pediatric Readiness in the ED. Maryland again had 100% participation. Pediatric ED Champions will form a collaborative this fall. Maryland's grant continues to also support FAN Council activities and pilot QI projects through the DART.

Pediatric EMS and Hospital Education (programs primarily funded through EMSC SP Grant)

During FY 2021, the Maryland EMS for Children Department provided pediatric course offerings during each of the EMS and emergency nursing educational seminars and conferences held virtually across Maryland. Topics included autism awareness, best

practices in spinal protection and safe transport for children, understanding the why of seatbelts and child restraint systems, and pediatric trauma and pediatric burn assessment, triage, and treatment. As the FY ended and COVID-19 restrictions were lifted, the Maryland EMS for Children Department was able to offer pediatric displays in addition to educational content at in-person educational offerings at Maryland ENA by the Bay.

The Maryland EMS for Children Department was pleased to offer the revised Pediatric Education for Prehospital Professionals Fourth Edition (PEPP-4) hybrid course for both ALS and BLS clinicians. Core faculty and medical directors met to evaluate the updated content and strategically plan how the Maryland EMSC Department could offer the in-person course utilizing established best practices for hands-on skills stations and simulations with COVID-19 safety precautions in place. The PEPP-4 hybrid course was offered three times – as preconference offerings for the Miltenberger Emergency Services Seminar and the Winterfest EMS conference as well as a regional course offering in Southern Maryland. The updated course received rave reviews and participants were excited to, once again, attend an in-person course.

The Maryland EMS for Children Department continues to work closely with the EMS operational programs Pediatric EMS Champions. Virtual forums have been held quarterly to support the work of the Pediatric EMS Champions and provide continuing educational offerings such as autism awareness, ALTE vs. BRUE, and pediatric sepsis.

Child Passenger Safety and Occupant Protection Health Care Project

The Child Passenger Safety (CPS) and Occupant Protection (OP) Health Care project promotes buckling up and safe travel for all ages. It is in its 21st year of funding from the Maryland Department of Transportation's (MDOT) Highway Safety Office (MHSO). The project uses many strategies to promote CPS/OP best practices including training for Maryland healthcare professionals and CPS technicians, social media on MIEMSS' Facebook and Twitter accounts, development and distribution of educational materials, and assistance at car seat checks. Nationally, the rates of injury and death among child passengers due to motor vehicle crashes have decreased. However, they are high-risk groups, and no deaths due to vehicle crashes are acceptable. Planned grant activities were severely limited beginning in March 2020 and continuing through the year due to the COVID-19 pandemic, but the project reached out primarily online to healthcare providers and the public to meet the ongoing

needs for education on CPS and OP. Some highlights of this project include:

- Provided 103 car seats to EMS agencies, hospitals, and Safe Kids-Maryland coalitions for them to give to local needy families;
- Distributed over 14,000 educational items on CPS and OP;
- Conducted eight live trainings (mostly virtual) for 149 healthcare providers or student nurses;
- Provided 10 online, live car seat “checks” for families;
- Coordinated seven webinars on CPS and OP topics for 364 listeners. All webinars were then archived on the project's website for additional learners;
- Conducted one in-person exhibit and three online exhibits at professional conferences;
- Created and distributed online a new training for hospital newborn nursery/NICU staff on the car seat tolerance screen;
- Coordinated the use of the Outdoor Heatstroke prevention/temperature displays for 15 events in seven agencies;
- Published 13 articles and highway safety messages related to occupant protection and child passenger safety in *Maryland EMS News* during the past 12 months;
- Promoted CPS and OP via social media:
 - 61 messages with 528 “likes” and 465 “shares”;
 - Also posted 48 messages on other traffic safety topics with 431 “likes” and 214 “shares”;
- Loaned four special-needs car seats and consulted on seven cases;
- Contact CPS@miemss.org for more information.

Bike Helmet Safety Grant

The Bike Helmet Safety project completed a fourth year of funding from the Maryland Department of Transportation's (MDOT) Maryland Highway Safety Office (MHSO). The project has three focuses: 1) to provide bike helmets to children, youth, and adults through partnerships with the Safe Kids local coalitions and community partners; 2) develop and disseminate bike safety messages for print and social media for distribution across the state; and 3) provide in-person training of professionals in healthcare, injury prevention, and education on the correct use and fitting of bike helmets. During this year, the project:

- Distributed 765 bike helmets for children, youth and parents through local Safe Kids partners as well as trauma coordinators and pediatric champions across the state (total helmet distribution for the three years is 3,000);

- Developed a double-sided bike safety checklist card with both personal safety and rules of the road messages for use while distributing helmets;
- Continued to distribute “Bike Helmet Fit Test” and “Be Seen & Be Safe” posters and magnets (combining helmet and rider visibility safety) across Maryland;
- Produced various educational display elements which will be available for partners to use in educating the public, including: one double-sided “Be Seen & Be Safe” pull-up banner (English and Spanish); two outdoor-quality “Be Seen & Be Safe” and “Bike Helmet Fit Test” wind resistant signs (English and Spanish); and 15 sets of table top “Be Seen & Be Safe” and “Brain Function” signs;
- Promotion of safety messages through online (YouTube) public service announcements on bike helmet fit and safety, monthly Bike Safety Facebook safety messages, and quarterly articles in *Maryland EMS News*;
- Participation virtually in the MHSO Pedestrian Bike Area Emphasis Team;
- Provided in-person training at the Maryland Emergency Nurses Association annual conference and virtually to our EMS, Fire, and Rescue partners due to the changes in the MSFA convention and EMS conferences as a result of the COVID-19 pandemic;
- Contact bikesafety@mimss.org for more information and to request posters.

Additional Injury Prevention and Life Safety Programs

Maryland EMS for Children staff participate in national, state, and local Safe Kids coalitions meetings and webinars. Safe Kids Maryland also maintains membership on the board of the Maryland division of the American Trauma Society which met virtually in 2020-2021. Ongoing participation in Maryland State ENA, Partnership for a Safer Maryland, and the Maryland Trauma Center Network (TraumaNet) have facilitated distribution of resources and educational materials from both MHSO grants reaching out to rural, suburban, and urban areas in Maryland. These collaborations provide a consistent flow of information to MIEMSS’ five regional advisory councils and PEMAC on injury prevention resources and initiatives.

The Maryland RISK WATCH community, which has been in operation for 24 years, is led by EMS for Children in collaboration with the Office of State Fire Marshal and the MSFA Fire Prevention and Life Safety Committee. Other partners in RISK WATCH include the Cecil County Department of Emergency Services,

Johns Hopkins Pediatric Emergency Department, TidalHealth Peninsula Regional, the Maryland Poison Center, and the American Trauma Society – Maryland Division (ATS). Prerecorded injury prevention presentations were provided on both Child Passenger Safety and Medication Safety for the virtual 2021 MSFA Convention in June.

Maryland EMS for Children is the lead agency for the Safe Kids Maryland state coalition. In FY 2021, Safe Kids Maryland hosted two virtual statewide educational meetings with seven local coalitions and eight community partners. In partnership with the MSFA, Office of State Fire Marshal, and Maryland Fire and Rescue Institute EMSC supported the March Public Fire & Life Safety Educators Symposium with a half-day live broadcast of three presentations. Throughout the year, EMSC and Safe Kids Maryland promote educational displays and social media information to raise awareness of the risk to children if left in cars. There are now five outdoor thermometer display kits for use throughout the state that provide visual education on the dangers of leaving children in cars and can be seen at a distance. Social media posts extend the reach of these displays. The CPS project coordinates the schedule for these displays and updates printed materials regularly.

EMERGENCY OPERATIONS

Mission

To enhance EMS system disaster preparedness and to coordinate the statewide EMS response to large health/medical-related emergencies and disasters.

Preparedness Planning

Emergency operations personnel began FY 2021 by participating in many emergency and disaster preparedness efforts, including the following:

- Participated and co-chaired the Maryland Active Assailant Interagency Workgroup and subcommittees;
- National Disaster Medical System patient reception preparedness;
- Critical incident stress management team development and coordination;
- Mass casualty incident preparedness;
- Healthcare facility evacuation preparedness and exercises;
- CHEMPACK program maintenance, awareness, and operations;
- Ambulance Strike Team preparedness;
- High-consequence infectious disease (HCID) planning and preparedness, including:
 - Continued development of EMS transportation resources for HCID patient transportation;

- Participated in planning and preparedness with the Special Pathogens Assessment Hospitals;
- Participated with Maryland Department of Health (MDH) in regional and statewide HCID exercises planning;
- Participated in MDH's COVID-19 Immunization Planning process.
- Continued to development of a MIEMSS infectious disease application for Android and iOS platforms. This application will provide up-to-date information on infectious disease and other information via phones and tablets;
- Participated in the State Incident Management Team (IMT) meetings and training sessions;
- Coordinated agency Continuity of Operation (COOP) planning;
- Participated in Continuity of Operation (COOP) operations during the COVID-19 pandemic and transition of most staff to telework;
- Management of the EMS portion of the ASPR/ HHS Hospital Preparedness Program (HPP) grant programs and funding;
- Emergency operations staffing and programs are supported by HPP grant funds from the Maryland Department of Health with funds from the Hospital Preparedness Program provided by the Assistant Secretary for Preparedness and Response, U.S. Health and Human Services.

Emergency Response

The focus of Emergency Operations personnel and most MIEMSS staff redirected to focus on responding to the COVID-19 pandemic beginning in February/ March 2020. Emergency Operations staff assisted in coordination of the overall MIEMSS response in support of the statewide EMS system. Emergency Operations-related activities included:

- Development of an ICS structure and daily incident action planning process to organize MIEMSS response activities;
- Maintained daily situational awareness through frequent communications with federal, state, and local stakeholders;
- Activated the MIEMSS Department Operations Center (DOC) and staffed both DOC and State Emergency Operations Center (SEOC) from early March through end of the fiscal year;
- Received, stored, allocated, and dispersed PPE for public safety and commercial EMS operational programs. PPE from the Strategic National Stockpile and from state purchases was received by MIEMSS via MDH and distributed multiple times;



- Assisted EMS/Fire personnel with COVID-19 testing by providing access to test kits when requested;
- Supported EMS transportation of patients from skilled nursing facilities experiencing COVID-19 outbreaks;
- Coordinated and maintained state-procured ALS ambulances, as well as an ambulance strike team, maintained in a 24/7 state of readiness, for part of the year. In April, ALS ambulances were procured to provide on-site medical coverage at FEMA mobile and fixed vaccination sites;
- MIEMSS Field Operations Support Team (FOST) personnel provided on-site support to health and medical task forces that supported skilled nursing facilities heavily impacted by the pandemic;
- MIEMSS coordinated a joint project with MDH-BHA to provide crisis mental health support to personnel working in skilled nursing and other long-term care facilities. FOST personnel provided on-site logistical support for virtual training sessions;
- Collaborated with the International Critical Incident Stress Foundation to coordinate virtual wellness training for state personnel. These sessions focused on self-care, resiliency, and stress management;
- Operated vaccination clinics for critical state workers and public safety personnel;
- Operated vaccination clinics in support of the Port of Baltimore and the Maritime Community by vaccinating port workers and ships' crews;
- MIEMSS Emergency Operations and Regional programs staff participated in multiple planning efforts preparing for the Presidential Inauguration. On Inauguration Day, MIEMSS personnel functioned in a liaison role in the DC Fire/EMS Medical Communications Center;

- MIEMSS Emergency Operations personnel, in response to Hurricane Isaias, participated in twice-daily preparedness/weather calls. MIEMSS and other state agencies also provided virtual staffing for the State Emergency Operations Center.

Emergency Exercises

Emergency Operations and Regional Programs personnel participated in a disaster exercise at the Salisbury Airport on March 13, 2021.

On June 10, 2021, MIEMSS Emergency Operations personnel observed an HCID exercise conducted by the MedStar transport team. The team exercised patient hand-off procedures, as well as donning and doffing procedures, with the MedStar Washington Hospital's Biocontainment Unit staff.

EMRC/SYSCOM

Mission

The Maryland EMS Communications Center is a state-wide coordination and operation center for Maryland's EMS system composed of two integrated components, Systems Communications (SYSCOM) and the Emergency Medical Resource Center (EMRC), which function 24 hours, 365 days a year.

Systems Communications (SYSCOM) at MIEMSS receives requests and coordinates helicopter resources for medevac missions. The Maryland State Police Aviation Command (MSPAC) Operational Control Center is located within SYSCOM, and SYSCOM staff assist MSPAC Duty Officers with missions involving medevac, search and rescue, law enforcement, homeland security, and disaster assessment.

The Emergency Medical Resource Center (EMRC) has a threefold mission:

1. Provide communications linkages and facilitate medical consultations between prehospital EMS clinicians and emergency departments, trauma centers, and specialty centers;
2. Maintain and share situational awareness of the activities, capabilities, and capacities of the prehospital system and hospitals;
3. Provide initial alerting and coordination of resources and the distribution of patients during major medical incidents.

In FY 2021, the EMRC handled 159,526 telephone and radio calls. Of these calls, 159,332 were communications involving a patient or incidents with multiple patients, while 14,339 of these calls involved online medical direction. SYSCOM handled 20,760 telephone

calls and 10,380 radio calls. Of these, the majority (28,050 calls) were related to requests for medevac helicopters.

EMRC/SYSCOM staff also monitors EMS system activity so as to alert key MIEMSS staff of significant or extraordinary major medical incidents that may require MIEMSS support and response.

GOVERNMENT AFFAIRS

Mission

The MIEMSS Office of Government Affairs is the agency's liaison with the Executive and Legislative branches of Maryland government and helps develop effective statutory and regulatory approaches and solutions to a variety of prehospital emergency and healthcare issues. MIEMSS works on proposed legislation that affects all the various components of the statewide EMS system, the emergency care system, and Maryland's health-care system as a whole. MIEMSS partners with EMS clinicians, physicians, nurses, hospitals, and other healthcare providers to ensure that EMS system issues are accounted for in legislation considered by the Maryland General Assembly.

During the 2021 Session, EMS-related legislation that passed and was signed into law by the Governor included the following:

- Both public safety and commercial EMS are now able to administer Hepatitis B and influenza vaccines and tuberculin skin testing to their own personnel. Additionally, until January 1, 2023, paramedics will be able to continue to assist local health departments and hospitals and health systems in vaccination initiatives for COVID-19 and influenza in order to address population health needs. MIEMSS will report to the Legislature in December 2021 on efforts to include paramedics in public health vaccination programs.
- MIEMSS will collect and report to the Legislature information on EMS administration of ketamine in the field. Reports will be submitted annually from 2022 through 2024.
- The Maryland Department of Emergency Management was established as a principal department of the Executive Branch of State government and as the successor to the Maryland Emergency Management Agency.
- The regulatory structure governing the State's 9-1-1 system related to 9-1-1 service outages was changed, and the Maryland 9-1-1 Board membership was expanded from 17 to 24 members.

HEALTH CARE FACILITIES AND SPECIAL PROGRAMS

Office of Hospital Programs

Mission

To implement the designation and verification processes for trauma and specialty referral centers, provide continuing evaluation of these centers for compliance with the regulations and standards in COMAR 30.08 et seq., and ensure ongoing quality monitoring of the trauma/specialty care system.

Trauma System

The Maryland trauma system is regionalized and tiered, which ensures prompt and appropriate care of the trauma patient throughout Maryland. A complete list of facilities within the Maryland trauma system, including out-of-state hospitals that receive Maryland trauma patients, appears on page 30.

Trauma Centers

Under Code of Maryland Regulations (COMAR) 30.08.05, MIEMSS is responsible for oversight of the Maryland trauma system, the foundation of which is comprised of the nine Maryland-designated adult trauma centers and five categories of specialty referral centers: pediatric trauma, adult and pediatric burn, neurotrauma, eye, and hand/upper extremity.

Adult trauma centers are designated at one of four levels of care (Primary Adult Resource Center, Level I, Level II, and Level III), which provides for the appropriate resources necessary to care for injured and ill patients across the state. Memorandums of understanding are in place with three out-of-state hospitals (MedStar Washington Hospital Center, Children's National Hospital, and ChristianaCare) to facilitate trauma services for injured patients requiring a higher level of care in outlying areas of the state.

Since 2015, all Maryland adult and pediatric trauma centers submit data to the National Trauma Data Bank (NTDB), which assists the centers in benchmarking their trauma center with other centers around the country. Side-by-side comparisons between Maryland trauma centers and national trauma centers is completed yearly using the NTDB submitted data.

The Maryland Trauma Quality Improvement Committee (TQIC) is comprised of trauma program managers and directors; trauma performance improvement staff; trauma registrars; and injury prevention and education staff, and uses a trauma quality scorecard to review, monitor, and trend statewide compliance with these quality metrics:

- Emergency department documentation of patient's temperature;

- Emergency department documentation of patient's Glasgow Coma Scale;
- Emergency department documentation of patient's pain assessment;
- Hourly patient vital sign documentation;
- The patient required reintubation within 24 hours of extubation;
- The patient had an unplanned visit to the intensive care unit;
- The patient had an unplanned visit to the operating room;
- Antibiotic administration within one hour of arrival, excluding penetrating trauma;
- Antibiotic administration within one hour of arrival, including penetrating trauma;
- Anticoagulant reversal administration within two hours of arrival when found to be on anticoagulants;
- Trauma bypass hours per month.

In FY 2021, we have worked with ESO Solutions, Inc., to successfully move to the GEN6 Trauma Registry platform for the Trauma, Eye Trauma, and Hand and Upper Extremity Trauma Registries. We continue to link EMS documents to the patient's Trauma Registry documentation.

The Maryland Burn Collaborative continues to meet to focus on burn data submission, standard audit indicators, and performance improvement. A Maryland burn center scorecard is in place to monitor and trend statewide compliance with the following burn quality indicators:

- Burn Total Body Surface (TBSA) greater than 10% of patients admitted within six hours from the scene;
- Burn TBSA greater than 10% of patients admitted within six hours from interhospital transfer;
- Greater than 10% TBSA first temperature within 30 minutes of arrival;
- First temperature within 30 minutes of arrival at the hospital;
- Deaths less than 10% TBSA.

Designated Stroke Centers

Maryland's statewide regional system approach to stroke care continues to evolve as new literature and research findings on stroke care are published. Currently, Maryland has designated 36 primary stroke centers and three comprehensive stroke centers. All stroke centers are re-designated every five years, and in FY 2021, four (4) Primary Stroke Centers (PSC) were re-designated. In FY 2021, the Stroke Quality Improvement Committee (Stroke QIC), comprised of stroke program coordinators and medical directors, continued their focus on new and ongoing initiatives

Stroke Core Measures (5-Year Comparison)

Core Measure	CY 2016	CY 2017	CY 2018	CY 2019	CY 2020
Percent of ischemic stroke patients who arrive at the hospital within 2 hours of time last known well and for whom IV t-PA is initiated within 3 hours of time last known well	93.1%	90.7%	93.2%	93.3%	92.7%
Percent of patients with ischemic stroke or TIA who receive anti-thrombotic therapy by the end of hospital day two	98.8%	98.8%	98.6%	98.2%	98.3%
Percent of patients with an ischemic stroke, or hemorrhagic stroke, who receive VTE prophylaxis the day of or the day after hospital admission	98.2%	97.9%	98.2%	98.0%	97.5%
Percent of patients with an ischemic stroke or TIA prescribed anti-thrombotic therapy at discharge	99.5%	99.5%	99.5%	99.6%	99.7%
Percent of patients with an ischemic stroke or TIA with atrial fibrillation/flutter discharged on anticoagulation therapy	97.7%	97.3%	98.2%	97.7%	98.9%
Percent of patients with ischemic or hemorrhagic stroke, or TIA with a history of smoking cigarettes, who are, or whose caregivers are, given smoking cessation advice or counseling during hospital stay	99.0%	99.4%	99.0%	99.0%	99.1%
Percent of ischemic stroke or TIA patients with a cholesterol LDL level=100, or LDL not measured, or on cholesterol-reducer prior to admission who are discharged on statin medication	98.3%	98.8%	98.5%	99.1%	99.0%
Percent of stroke patients who undergo screening for dysphagia (difficulty swallowing) with an evidence-based bedside testing protocol approved by the hospital before being given any food, fluids, or medication by mouth	90.2%	90.7%	89.1%	89.0%	91.0%
Percent of patients with stroke or TIA, or their caregivers, who were given education and/or educational materials during the hospital stay addressing all of the following: personal risk factors for stroke, warning signs for stroke, activation of emergency medical system, the need for follow-up after discharge, and medications prescribed	97.29%	97.5%	97.5%	96.9%	96.7%
Percent of patients with stroke who were assessed for rehabilitation services	99.1%	99.5%	99.3%	99.1%	99.5%
<p><i>Source: Get With the Guidelines-Stroke Registry</i></p> <p>IV t-PA = Intravenous Tissue Plasminogen Activator VTE = Venous Thromboembolism LDL = Low Density Lipoprotein (bad cholesterol) TIA = Transient Ischemic Attack</p>					

for improving stroke care in Maryland. In addition to revising and updating the current Primary Stroke Center (PSC) and Comprehensive Stroke Center (CSC) COMAR Regulations in FY 2021, the Stroke QIC developed and approved two additional Stroke Center designations to the regional system of care approach. The two (2) new designations include the Acute Stroke Ready Hospital Center (ASRHC) and the Thrombectomy-Capable Primary Stroke Center (TCPSC). The ASRHC can provide the initial diagnostic services, stabilization, emergent care, and therapies to patients with acute stroke and arrange for appropri-

ate patients to be transferred to a PSC, TCPSC, or CSC that would provide ongoing definitive care. The TCPSC is an intermediate level of care between the Primary Stroke Center and the Comprehensive Stroke Center. The TCPSC must meet all of the COMAR Regulation Standards for PSC designation, plus have the ability to perform mechanical endovascular thrombectomy on patients presenting as acute ischemic stroke with large vessel occlusion 24/7.

Each stroke center submits data monthly to the American Heart Association's (AHA) Get with the Guidelines® (GWTG) – Stroke registry. MIEMSS

accesses the registry each month and monitors for compliance with the core performance measures for standards of care established by the AHA and American Stroke Association (ASA) (see page 16). MIEMSS utilizes this data to benchmark Maryland's compliance rate with the core performance measures to national compliance rates, as compliance has been shown to improve patient outcomes. The annual state aggregate data for CY 2020 revealed Maryland had a compliance rate of 91% or greater for each of the core performance measures, significantly higher than the AHA/ASA minimal compliance rate of 80%.

The stroke centers use GWTG data to support changes to their stroke alert protocols, improve their response times, and to share best practices and processes with each other. In FY 2021, stroke centers continued their efforts to improve door-to-intravenous tissue plasminogen activator (IV t-PA) times utilizing GWTG data. It has been well established that the sooner a patient is treated with the clot-busting fibrinolytic t-PA, the better their outcome. The AHA/ASA Target Stroke program has set a new minimal compliance rate of 75% of stroke patients who are eligible for t-PA to receive the drug within 60 minutes from time of hospital arrival ("door"). For CY 2020, Maryland's median door-to-t-PA time was 45 minutes. Additionally, 86.5% % of all acute ischemic stroke patients eligible to receive t-PA had a door-to-t-PA time of 60 minutes or less.

Perinatal Referral Centers

In Maryland, there are 12 designated Level III and two designated Level IV perinatal referral centers. All perinatal referral centers are re-designated every five years. The re-designation process began again in December 2020.

Hospitals participating in the Maryland perinatal system submit patient care data to the Maryland Department of Health (MDH) and MIEMSS, as appropriate, for system and quality management. All Level III and Level IV perinatal referral centers submit an annual perinatal indicator report that provides statistics beyond mortality data and focuses on striving for clinical excellence, patient safety, and reliability with zero preventable adverse outcomes. Database elements and indicators include variables related to maternal and infant health. The MIEMSS Perinatal Advisory Committee uses this database to identify areas common to all centers that indicate a need for improvement, as well as to highlight and share best practices.

The Vermont Oxford Network (VON) is a collaborative comprised of neonatal specialty care hospitals and medical professionals that participate in a coordinated program of research, education, and quality improvement initiatives. VON maintains and analyzes

data on the care and outcome of very low-birthweight infants and infants meeting other special criteria. The system provides each participating center with the information necessary to conduct quality improvement projects and to benchmark their data to data from all centers in the network. MIEMSS has entered into an agreement with VON to develop the Maryland State Group Reporting Service, a comprehensive reporting option that allows Level III and Level IV perinatal referral centers in Maryland to combine data for collaborative learning and improvement. A combined report is generated that compares individual center data among all the Level III and Level IV perinatal centers. The report also includes aggregated summary group data as well as tables and figures of individual center data. MIEMSS continues to work closely with MDH in supporting all perinatal referral centers that have the ability to participate in VON.

Office of Cardiac and Special Programs

Mission

To develop and implement policies, regulations, and programs for the enhancement and improvement of the statewide EMS system and Maryland communities.

Public Access Automated External Defibrillator Program

Public high schools, middle schools, and county- or municipality-owned or operated swimming pools are required to have AEDs, as are some public/semipublic pools and health clubs per local ordinances. However, the voluntary Maryland Public Access Automated External Defibrillator (AED) Program permits facilities that do not provide health care but meet certain requirements to have an AED onsite for use in the event of a sudden cardiac arrest (SCA) until EMS arrives.

Through the online Maryland AED registry (www.marylandaedregistry.com), MIEMSS received and approved 247 public access AED applications in FY



2021. As of June 30, 2021, there were 8,614 locations in the state with AEDs onsite. Registered users can receive automated notifications regarding battery and electrode expirations, program renewals, and AED recalls. The registry also integrates with AED Link, an application that displays all registered AEDs within a certain jurisdiction without having to manually enter site addresses.

The AED program has had 249 (23.4%) successful AED uses out of 1,065 reported incidents. Success is measured by the patient having a return of pulse at EMS arrival, during EMS arrival, or during EMS transport. Of the overall arrests, 579 were witnessed, and 180 of those witnessed arrests regained a pulse at the time of EMS arrival, for a 31.1% save rate for witnessed cardiac arrests.

Cardiac Arrest Steering Committee

Maryland maintains a Cardiac Arrest Steering Committee (CASC), authorized by the State EMS Board, which serves to provide guidance to the MIEMSS medical and executive leadership teams on matters related to sudden cardiac arrest in Maryland. The committee actively works on matters related to public safety answering point engagement, prehospital cardiac arrest management performance improvement, and further development of a comprehensive statewide system for the treatment of sudden cardiac arrest. Additionally, the committee works with the MIEMSS public information team to develop public messaging campaigns related to increasing bystander use of CPR and AEDs.

The mission of the Cardiac Arrest Steering Committee is to improve cardiac arrest survival in all communities in Maryland. In the past year, the CASC has been evaluating two new educational and implementation strategies that utilize feedback of high-fidelity simulation data on CPR performance to EMS clinicians and on telephone CPR data to 9-1-1 Specialists. Results of these trials are positive and have been presented to the 9-1-1 Board and to SEMSAC. Plans are underway to share the results of these pilot programs and identify a few early adopter communities that may be interested in trying new educational and quality improvement strategies to improve survival in their communities.

Maryland STEMI System

Hospitals that comply with state standards to receive patients who are transported by EMS and are experiencing the most common type of heart attack, called an ST-elevation myocardial infarction (STEMI), are designated as cardiac interventional centers (CIC) by MIEMSS. Twenty-eight centers have been desig-

nated by MIEMSS, including four out-of-state. For STEMI patients, primary percutaneous coronary intervention (pPCI) is recognized by the American College of Cardiology and the American Heart Association (AHA) as the treatment of choice, and is generally associated with fewer complications and better outcomes than other forms of treatment. It is also well established that the sooner a patient is treated to relieve the blockage causing the STEMI, the better the heart muscle will recover.

All CICs submit data quarterly to the AHA's Get with the Guidelines® (GWTG) – Coronary Artery Disease (CAD) registry. MIEMSS is able to measure care for STEMI patients in Maryland as compared to national data from participating hospitals. The goal for first medical contact (FMC) to intervention in the cardiac catheterization lab (“device”) time is 90 minutes or less. Data from the registry indicated that for the rolling four quarters of CY 2019, FMC-to-device in less than 90 minutes was achieved in 72.8% of STEMI patients transported by EMS, with a median time of 87 minutes.

INFORMATION TECHNOLOGY AND DATA MANAGEMENT

Mission

To improve Maryland's EMS systems by providing leadership, support, and guidance to the agency and Maryland's EMS community regarding the use of information technology and the meaning of collected EMS data.

electronic Maryland EMS Data System (eMEDS®)

The electronic Maryland EMS Data System (eMEDS®) uses commercial, off-the-shelf software provided and hosted by ImageTrend, the industry leader for emergency patient care reporting. MIEMSS owns a statewide site license for the eMEDS® system, permitting EMS services to use it at no cost and no additional burden on local funding. All 24 of Maryland's jurisdictional EMS operational programs (EMSOP) and most licensed commercial ambulance services submit patient care reports directly into eMEDS®. Maryland has one of the few truly comprehensive prehospital patient care reporting systems in the nation.

The eMEDS® system supports a number of important system goals, including:

1. Providing uniform and consistent data collection and reporting on prehospital medical care delivered by Maryland's emergency medical clinicians;
2. Supporting the advancement of the practice of EMS medicine, which includes the modification of scope of practice, roles of EMS clinicians, and destination capacity;

3. Providing the foundation for applying performance measures to patient care and clinicians' compliance with protocols by local departments, EMSOPs, regional medical directors, and MIEMSS;
4. Enabling data reporting to the National EMS Information System (NEMSIS).

It also provides timely information to hospital emergency department physicians and nurses. All Maryland healthcare facilities have access to the eMEDS® Hospital Hub website to obtain prehospital patient care reports. MIEMSS also provides an interface to populate prehospital data into the Maryland State Trauma Registry and to report hospital patient outcomes back to EMS services.

eMEDS® Elite Software Project

MIEMSS has completed upgrading the State's patient care reporting system to the new Elite version of eMEDS®. Elite provides better data collection and software tools to EMS programs in Maryland. The Information Technology (IT) department, in coordination with the Office of the State EMS Medical Director, leads this project. As of January 2, 2019, MIEMSS completed transition of all public safety jurisdictions and 18 commercial services to ImageTrend's Elite platform, now known as eMEDS®. As of March 1, 2021, all federal EMS partners have transitioned to eMEDS® Elite as well.

Upgrading eMEDS® to ImageTrend's Elite software program made Maryland's system compatible with the National EMS Information System (NEMSIS) Version 3. NEMSIS is a nationwide database for prehospital information and research, and is the de facto standard for prehospital patient care reporting. Moving eMEDS® to the Elite platform has also improved its compatibility with the Health Level Seven International (HL7) data framework, enabling better exchange of data with health information exchange systems. eMEDS® is able to function on many popular electronic tablets and laptops with a variety of operating systems so that EMS clinicians have more flexibility on the equipment they use. The Elite system also adds many new and enhanced features requested by Maryland's EMS clinicians.

Chesapeake Regional Information System for our Patients (CRISP) and eMEDS® Integration Project

One important ongoing project is the integration of eMEDS® with Chesapeake Regional Information System for our Patients (CRISP), the health information exchange service for Maryland and Washington, DC. This integration is being enhanced in order to allow



additional patient care data to be received by CRISP in a timelier manner. Aligning these two systems makes prehospital emergency care information available to participating physicians and hospitals throughout the state. A future goal of the project is to make select patient medical data, such as medical history and medications, available to EMS clinicians to enhance the care they are able to provide at the patient's side. This is an ongoing effort.

National Study Center Collaboration

MIEMSS continues to work collaboratively with the National Study Center for Trauma and Emergency Medical Systems (NSC) to the further the use of EMS data. Collaborative efforts include working on Crash Outcome Data for Enhancing Survival (CODES) project and the EMS Research Interest Group (RIG).

Teleworking

The COVID-19 pandemic has posed many challenges for everyone. MIEMSS, along with other state agencies, needed to quickly shift from an office-oriented workforce to a telework-oriented workforce. While MIEMSS has resumed in-office work, MIEMSS IT continues to support a hybrid of onsite and remote staff. Key to the transition was maintaining the agency's ability to provide ongoing customer-focused support to the EMS community. MIEMSS is well-positioned to continue this hybrid model to maintain and support business initiatives.

Ongoing Missions

- **Flight Vector.** MIEMSS hosts, supports, and maintains Flight Vector, the computer-aided dispatch system utilized by the Maryland State Police Aviation Command (MSPAC) and MIEMSS. This application streamlines the process of requesting, selecting, assigning, and tracking aircraft to respond to medevac requests in and around Maryland. The system accelerates the request and dispatch process, and improves



MSPAC flight safety by providing real-time, automated tracking of MSPAC aircraft. The system also automates the tracking of Emergency Medical Resource Center (EMRC) consultations. The system includes a disaster recovery instance located at a data center that is geographically separate from the MIEMSS data center. MIEMSS is actively working with MSPAC to complete a server refresh to upgrade the operating system and database to a more recent version.

■ **Maryland Emergency Medical Resource and Alerting Database.** MIEMSS continues to host and operate the Maryland Emergency Medical Resource and Alerting Database (MEMRAD). The system includes the County/Hospital Alert Tracking System (CHATS) and Facility Resource Emergency Database (FRED) applications, which are mission-critical services for EMS operations as well as disaster response. CHATS is a public, web-based service that displays the alert status information and capacity of hospitals in Maryland and adjacent regions. FRED is utilized to alert healthcare partners of an incident or the need for aid, and allows them to indicate what resources they are able to lend to the response.

■ **Trauma and Specialty Care Registries.** MIEMSS hosts and, in conjunction with ESO, supports the Maryland State Trauma Registry and related specialty registries. The MIEMSS IT department continues to host the Maryland State Trauma Registry, as well as the Hand Registry and Eye Registry. MIEMSS and ESO worked collaboratively to upgrade the Maryland State Trauma Registry, the Hand Registry, and the Eye Registry software to Gen 6. This upgrade provided productivity and security enhancements, allowing the decommissioning of the Flash Plugin.

■ **EMRC/SYSCOM Support.** The Emergency Medical Resource Center and System Communications (EMRC/SYSCOM), located in Baltimore City, is operational 24/7 and is staffed by MIEMSS and Maryland State Police Aviation Command (MSPAC) personnel. The facility is home to the Region III and

Region V EMRC communications centers, as well as the state's medevac dispatch and SYSCOM. The IT department continues to provide 24/7 technical support to EMRC/SYSCOM in coordination with MIEMSS' Communications Engineering Services.

■ **EMS Audio Recording (EMSAR) System.** MIEMSS IT continues to work with MIEMSS' Communications Engineering Services to host a new way for hospitals to retrieve EMS/Hospital consult recordings through the internet using a secure portal. This continues to be a necessary step in the completion of the EMS Communications Upgrade Project as well as copper circuit retirement by Verizon. The system provides connectivity to the MIEMSS NICE Audio Recorder system for hospitals to review consults for quality assurance needs.

■ **Help Desk and User Support.** The MIEMSS IT department is committed to providing support to end-users, including both agency staff and EMS clinicians, statewide. MIEMSS IT hosts a help desk ticketing system, which supports a number of agency departments. This system is set up to create support tickets from incoming phone calls and emails. Dedicated, skilled staff monitor these queues, and tickets are investigated, resolved, and closed.

Two of the primary IT support queues are eMEDS® and Computer Support. The eMEDS® queue receives tickets from EMS clinicians throughout the state for issues like password resets and login issues, access questions, report writer functionality, and other eMEDS®-related issues. Computer Support receives requests for password and login issues, VPN, email, and general computer support. The eMEDS® support queue again received nearly 2,000 tickets that were created and worked in CY 2020. Similarly, Computer Support received more than 1,000 requests that were resolved in that same period. IT strives to improve users' technology experiences by maintaining and proactively improving IT infrastructure, protecting data and systems through enhanced IT security, and providing quick resolutions to PC and application software issues.

In addition, the IT department created a new ticket queue for Infectious Diseases to support the COVID-19 pandemic response, and a new queue for MEMRAD to support CHATS.

■ **Opioid Overdose Data Reporting.** MIEMSS, in compliance with state law, continues to provide data from EMS patient care reports into the Washington/Baltimore High Intensity Drug Trafficking Areas (HIDTA) Overdose Map (ODMAP) database to assist with statewide monitoring of and responding to the opioid overdose problem. MIEMSS is also collaborating with the Maryland Department of Health and other agencies to do everything possible to monitor and

combat the opioid overdose epidemic in Maryland.

■ **Security Improvements.** The Information Security department continues to monitor and make enhancements to the MIEMSS IT infrastructure and related systems. Security awareness training continues to be a focal point, ensuring that staff are aware of common security threats and take necessary action. MIEMSS also continues to work closely with the Maryland Coordination and Analysis Center (MCAC) in identifying and reporting of threats.

MIEMSS continues to apply critical security patches to the IT infrastructure and related systems in a timely fashion to protect against emerging cyber security threats and vulnerabilities. In addition, the Information Security department and IT continue to work together collaboratively to expand and develop system security plans, and codify managerial, operational, and technical security controls.

■ **Computer Network Improvements.** The IT department continues to improve computer resources, network reliability, and disaster preparedness by upgrading core server, storage, and VMware systems. Following last year's collaboration with the University of Maryland (UMD) to add a new fiber connection, MIEMSS has continued to enhance the backup network path by retiring aging equipment with new devices. This includes routing equipment as well as a redundant microwave path.

MIEMSS IT continues to expand resources including adding additional storage and server hardware. These resources allow MIEMSS to expand the capacity of the computing infrastructure allowing continued growth of the virtual server environment, and to decommission end-of-life technology.

■ **Strengthen Data Analysis.** Recognizing the importance of accurate, timely, and accessible pre-hospital patient care data, MIEMSS has continued to expand data analysis capability through the use of local copies of hosted eMEDS® and the Licensure System databases. The emphasis continues on statistical reporting, key metrics for system-wide quality improvement and assurance, and practical applications of EMS and hospital data.

MIEMSS IT and Security continues to support the Data Management department and other MIEMSS departments by creating a reporting server for future reporting enhancements, as well as supplying critical daily COVID-19-related data reports for distribution.

■ **EMS Portal.** Additionally, the MIEMSS Data Management department continues to work with the Licensing and Certification department to maintain an EMS Portal to provide local jurisdictions the ability to create and run custom educational reports. This enhances jurisdictional awareness of educational needs

for affiliated clinicians.

■ **@Hospital Ambulances (@HA).** The At Hospital Ambulances (@HA) app is a web-based application that displays ambulance activity at each of the Maryland Hospitals utilized by jurisdictional EMS clinicians. The MIEMSS Data Management department developed this application to work on desktop computers and mobile devices, including iOS, Android, and Windows mobile devices. The @HA application displays information pertaining to ambulances located at the hospitals including the hospital name, number of ambulance units, alert status, and length of stay. Participating jurisdictions supply data via CAD that populates the information displayed in the app, and is made available to clinicians via a link in the eMEDS® patient care reporting system dashboard. It can also be viewed with limited details at <https://aha.miemss.org>. Jurisdictional EMS administrators may login and view additional information about the ambulance units, including unit number and jurisdiction.

Future Projects

■ **Mobile Apps.** MIEMSS' IT and Data Management department is continuing to work alongside other groups within MIEMSS on the creation of mobile applications. These mobile apps will provide clinicians and stakeholders the ability to easily obtain information necessary for emergency response while on the go. The Infectious Disease app provides relevant information about MIEMSS protocols as well as contact information necessary in support of at-patient side care.

■ **Public Website.** MIEMSS IT continues to work with the Educational Support Services (ESS) department to update the MIEMSS public website. The IT department, alongside the Data Management department, will work on upgrading the existing IT infrastructure of the website. ESS is working with IT and Data Management, along with other departments within MIEMSS, to update the content and organization of the public website. This upgrade and enhancement will make the public-facing website easier to navigate and find relevant data for visitors.

■ **Additional IT Security Tools.** MIEMSS IT and Security are working collaboratively to enhancing the suite of IT Security tools. These tools will help to prevent and detect vulnerabilities and provide critical information to IT staff for investigations.

LICENSURE AND CERTIFICATION

Mission

To coordinate a variety of services to protect the public and promote and facilitate the development of knowledgeable, skilled, and proficient prehospi-

tal professionals who deliver emergency care in the Maryland EMS system.

Maryland EMS Clinicians and Education Programs

■ **FY 2021 EMS Clinician Data.** Licensure and Certification had a steady workload in FY 2021, issuing 1,040 initial prehospital clinician certifications and licenses and renewing 5,607 certifications and licenses. The vast majority of new entrants into Maryland EMS are through an initial emergency medical technician (EMT) clinician course. Guided by an Executive Order from the Governor to augment the EMS workforce during the COVID-19 emergency, Licensure and Certification issued 420 provisional EMS certifications and licenses, and processed 446 applications for EMT vaccinator. In an effort to augment the hospital workforce, in cooperation with Respiratory Care and Nursing programs across the country, there were 1,630 Nurse/Respiratory Extern applications processed.

The chart on page 23 depicts the number of newly certified EMTs by fiscal year. Although the numbers fluctuate, hundreds of EMTs enter the Maryland EMS system each year. Upon gaining EMT certification, many subsequently transition to the advanced life support (ALS) level. While most remain in the Maryland EMS system, some explore opportunities in other healthcare professions.

The number of cardiac rescue technicians (CRT) declined slightly this year. Some clinicians have upgraded to the paramedic level, while others have downgraded to basic life support (BLS) certifications. The National Registry of EMTs (NREMT) no longer certifies clinicians at the Intermediate/99 (I/99) level. Maryland, however, will continue to license existing CRTs as long as they meet all State requirements for license renewal prior to the end of each licensure period.

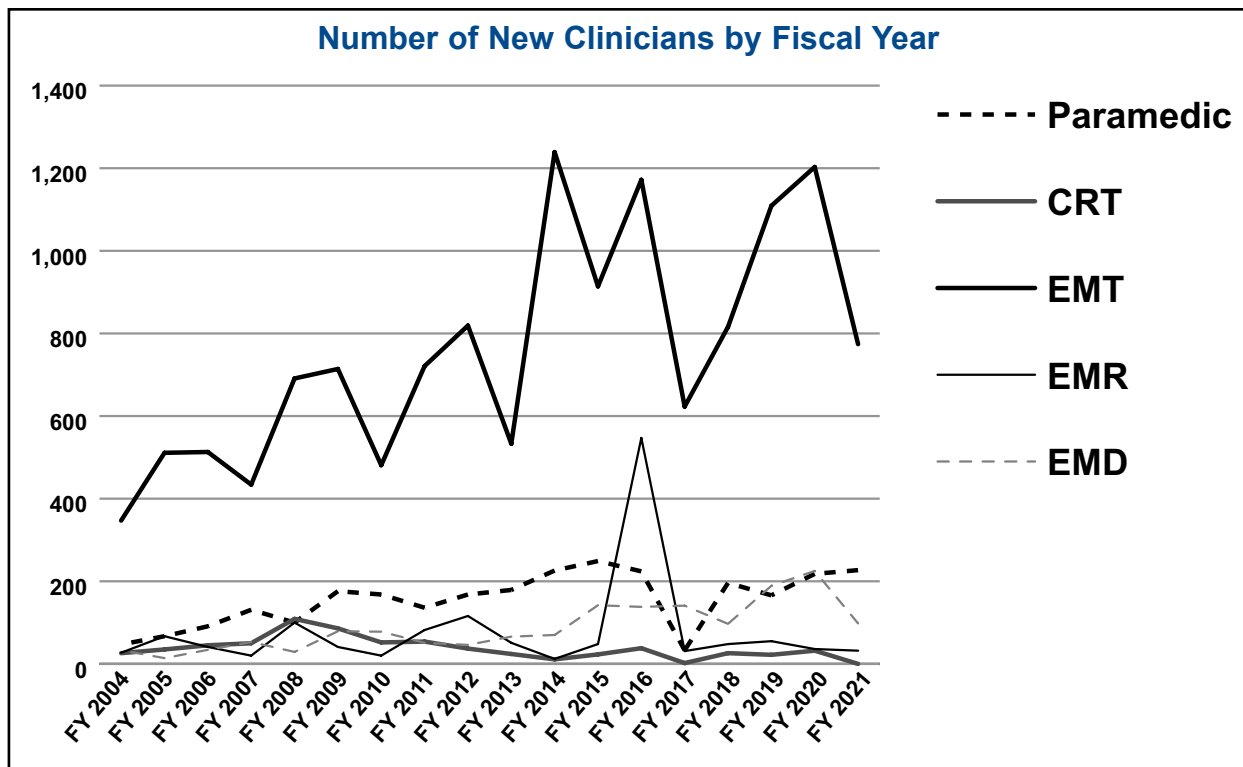
The number of Maryland clinicians is shown

below. Licensure and Certification worked with other MIEMSS departments to supply clinician data and trends (e.g., clinician numbers by affiliation and NREMT pass rates) to various statewide committees for analytical purposes.

■ **MIEMSS Online Training Center.** The Online Training Center, MIEMSS’ distance learning management system, reached over 56,000 registered users in FY 2021. Of those registered users, 17,298 clinicians were active in the Online Training Center during the same period. The Online Training Center hosted 51 active courses in FY 2021. Several new courses were made available this year, including Maryland ALS Update 2021, Maryland BLS Update 2021, and course content for EMT vaccinators. Additionally, the power of the Online Training Center was used to virtually host the 2021 Winterfest EMS Conference as well as the course examinations for Hospital Base Station Courses conducted from a distance due to the constraints of the COVID-19 pandemic. Looking to FY 2022, it is anticipated that additional training will be developed and provided through the MIEMSS Online Training Center, including a BLS Protocol Orientation Course, Maryland EMS Updates for 2022, and courses designed to fulfill Professional Development for Instructors’ requirements established by MICRB. The Office of Licensure and Certification, in conjunction with ImageTrend® and MIEMSS’ Information Technology Department, continues to expand and enhance functionality in the Online Training Center while working towards 100% grade capture into clinician continuing education records in the Licensure system. With the current year’s annual updates coming to a close, MIEMSS is moving forward with a planned major version upgrade to the Online Training Center, which will bring improved navigation and functionality for both MIEMSS and the clinicians in the field as well.

Number of EMDs, EMRs, EMTs, CRTs, and Paramedics [Includes Current, Extended, and Military Status; Excludes Lapsed (Inactive and Expired)]

Level	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021
EMD	1,058	1,320	1,377	1,066	1,110	1,210
EMR	2,020	1,589	1,136	662	603	652
TOTAL	3,078	2,909	2,513	1,728	1,713	1,852
EMT	15,839	16,069	15,485	14,853	14,875	15,501
CRT	662	619	587	575	546	509
Paramedic	3,293	3,336	3,278	3,491	3,573	3,787
TOTAL	19,794	20,024	19,350	18,919	18,994	19,797



Maryland Clinician Registry for Licensure and Certification

MIEMSS continues to implement critical improvements to the electronic Licensure/Certification System that will support seamless processing and enhance functionality. The number of users in the Licensure System continues to increase. The system allows for more efficient processing and the ability to communicate electronically to clinicians across the spectrum. With continual feedback from the EMS community at-large, Licensure and Certification is making great progress on improving system functionality, while meeting the needs of its stakeholders.

Further system enhancements, coupled with quality management, have made it possible to process with greater efficiency while providing faster turnaround times.

MEDICAL DIRECTOR'S OFFICE

Mission

To provide leadership and coordination for state medical programs, protocols, and quality assurance; to liaison with the regional programs and clinical facilities; and to promote creative, responsive, and scientifically sound programs for the delivery of medical care to all citizens.

The Maryland Medical Protocols for Emergency Medical Services

Dr. Timothy Chizmar, State EMS Medical Director, led a yearlong effort to launch the new and improved 2021 *Maryland Medical Protocols for*

Emergency Medical Services. The protocols were completely redesigned and streamlined with the guidance of the Protocol Review Committee, medical directors, and EMS clinicians throughout the state. Although Maryland's EMS protocols have always been updated on an at least annual basis, this year's effort represents the most comprehensive enhancements in over a decade.

In addition to refining the protocols to be succinct and evidence-based, the following additions and changes to content were made this year:

- **Agitation:** The agitation protocol has been revised based upon a detailed review of ketamine data from 2018-2020. ALS clinicians should be aware of the need for intensive monitoring after administration of ketamine and other sedating medications.
- **Albuterol for BLS Clinicians:** Nebulized albuterol has been added to the BLS formulary. The medication may be administered for patients with asthma/COPD and allergic reactions. While approved for use with this release of the protocols, it will not be required for all BLS ambulances until July 2022.
- **Burn Patients – Fluid Administration:** Following the recommendation of the Maryland burn centers and the American Burn Association, fluid administration has been restricted to only situations which indicate the presence of shock or greater than 20% body surface area burns (for adults).

- **Hypoglycemia and Hyperglycemia:** The Glucometer procedure has been replaced by two new treatment protocols, Hypoglycemia and Hyperglycemia. Blood glucose testing using a glucometer will now be a standard BLS procedure for all Maryland EMTs.
- **Snake Bite:** Changes to the protocol include no longer encouraging the transport of the dead snake to the hospital.
- **Stroke:** The LAMS Research protocol has concluded and its procedure regarding optimal stroke destination has been moved into the statewide Stroke treatment protocol. Patients with a last known well time of 22 hours or less, who have positive Cincinnati Prehospital Stroke Scale or positive Posterior Cerebellar Assessment, and a Los Angeles Motor Score of 4 or higher should be transported to a Comprehensive Stroke Center or Thrombectomy Capable Primary Stroke Center, if one is available within 30 minutes.

As a reminder, the information located in the full protocol book is the official medical reference for Maryland's EMS clinicians.

COVID-19 Protocols and Clinical Guidance

Dr. Chizmar continues to work closely with the MIEMSS Infectious Diseases program to ensure that EMS clinicians have access to the latest clinical guidance regarding COVID-19. During late 2020 and early 2021, MIEMSS held biweekly calls with EMSOPs and published frequent updates concerning personal protective equipment, patient treatment guidelines, and management of potential exposures for EMS clinicians.

In addition, the Office of the Medical Director (OMD) produced the Viral Pandemic Triage Protocol, which enables EMS clinicians to advise certain patients with suspected viral syndrome on home self-care, as opposed to immediate transport to an emergency department. Terbutaline was also introduced to offer an alternative to nebulized medications for treatment of patients with wheezing or bronchospasm. This medication may help to limit the generation of aerosols, which contribute to the spread of COVID-19.

Finally, as COVID-19 vaccines became available, the OMD developed a just-in-time training program that enabled EMTs to serve as vaccinators alongside CRTs and paramedics. In addition to being viewed by over 800 EMTs in Maryland, this training video was disseminated by the National Highway Traffic Safety Administration (NHTSA) to serve as a model training resource for other states.

Regional Medical Directors

The OMD coordinates a network of Regional

EMS Medical Directors, all of whom serve on the Protocol Review Committee, as well as on their respective regional councils. In addition, they serve as a resource to jurisdictional medical directors and lead quality improvement initiatives within their regions of the state. In conjunction with the Division of Regional Programs and Office of Health Care Facilities and Special Programs, the Regional EMS Medical Directors administer the statewide EMS base station program, which provides for online (real time) medical consultation for Maryland's EMS clinicians.

Research

The OMD works closely with the regional medical directors, regional administrators, and colleagues at Johns Hopkins Medicine and the University of Maryland School of Medicine's National Study Center for Trauma and Emergency Medical Systems to coordinate the statewide EMS research interest group. This collaboration has led to the publication of several peer-reviewed articles, including "Correlation Between Emergency Medical Services, Suspected COVID-19 Patients, and Daily Hospitalizations" in *Prehospital Emergency Care* in early 2021.

CHEMPACK Program

MIEMSS coordinates the CHEMPACK program for first responders in the State of Maryland, in partnership with the HHS Assistant Secretary of Preparedness and Response and the Maryland Department of Health Office of Preparedness and Response. Originally an initiative of the CDC's Strategic National Stockpile (SNS), this program allows EMS clinicians to access time-critical antidotes for intentional nerve agent attacks and large-scale organophosphate poisonings. The nerve agent antidotes are strategically deployed at secure locations throughout Maryland to ensure rapid accessibility. The CHEMPACK inventory is closely monitored, and near-expiring medications were replaced this year by MIEMSS Regional and Emergency Operations personnel using the new Drop Ship Program.

Base Stations

There are 47 base stations designated by the EMS Board. All physicians and nurses who answer a base station radio are required to successfully complete the MIEMSS-approved Base Station Communications Course for Emergency Department Personnel and the 2021 Maryland EMS Updates for Hospital Base Station Personnel training video in order to communicate with EMS clinicians and provide appropriate online medical consultation. MIEMSS' Base Station Communications Course for Emergency Department Personnel was

offered at multiple hospitals entirely in a virtual format or in-person with appropriate social distancing measures in place in FY 2021, resulting in 414 base station certificates issued to emergency physicians and nurses. Additionally, four ED physicians became new MIEMSS-approved base station instructors.

CARES Program

MIEMSS has been working with the Cardiac Arrest Registry to Enhance Survival (CARES) in order to measure, and ultimately improve, emergency cardiac care in Maryland. CARES is an out-of-hospital cardiac arrest registry for the United States, facilitating uniform data collection and quality improvement in each state and nationally.

With the dedicated Cardiac Arrest tab in eMEDS®, the statewide EMS patient care reporting system, EMS clinicians readily enter comprehensive out-of-hospital cardiac arrest data. This information is then directly exported by MIEMSS to CARES when it is first entered, saving time for clinicians and EMS CARES coordinators. Using a single patient care record for CARES submission makes Maryland one of the first states to incorporate this process within their electronic patient care reporting documentation. Maryland hospitals then enter outcome data into the CARES report for those cardiac patients who receive ongoing care in the ED. A drowning module was also added to CARES to collect eight new data elements which will provide important information about drowning events.

Since January 2017, all 26 jurisdictional EMS operational programs and Maryland health care facilities have submitted their cardiac arrest data to CARES. Statewide data for calendar years 2017 to 2020 is now included in CARES National Reports (see tables and graphs on page 79). Of note, the number of out-of-hospital cardiac arrests in Maryland increased from 6,796 in CY 2019 to 7,850 in CY 2020, which represents an increase of 15.5%. Nationally, the number of out-of-hospital cardiac arrests sharply increased during the COVID-19 pandemic.

Two factors have demonstrated a significant impact on survival from sudden cardiac arrest: early cardiopulmonary resuscitation (CPR) and early defibrillation. CPR has become required training for all Maryland high school students prior to graduation. Nearly every jurisdictional EMS operational program offers layperson CPR and automated external defibrillator (AED) courses. Using the CARES data, it is clear that patient outcomes in Maryland are significantly improved by early bystander CPR and the use of public-access AEDs. CARES data is used to drive quality improvement efforts in emergency cardiac care on a continuous basis.

EMS Medical Directors' Symposium

The 25th Annual EMS Medical Directors' Symposium was held as a virtual meeting on April 14, 2021. The Symposium was attended virtually by regional, jurisdictional, and commercial ambulance service medical directors, base station physicians and coordinators, highest jurisdictional officials, quality assurance officials, and MIEMSS personnel. This year, there were two keynote speakers: Michael Redlener, MD, Medical Director for EMS Quality, Mount Sinai Health System, and Demetri Yannopoulos, MD, Medical Director, Center for Resuscitation Medicine, University of Minnesota Medical School. Dr. Redlener's presentation was entitled "National EMS Quality Measures: Challenges and Opportunities to Improve EMS Care". Dr. Yannopoulos spoke on "Advances in Cardiac Resuscitation. The Era of the Machines." Other symposium presentations included the following:

- "EMS State of the State": Theodore R. Delbridge, MD, MPH
- "It's in Their Hands: EMS Interventions for Pediatric Cardiopulmonary Arrest": Jennifer Anders, MD
- "Top EMS Articles You Have to Know": Timothy P. Chizmar, MD

Opioid Crisis in Maryland

Dr. Chizmar works closely with the Maryland Opioid Operational Command Center, which was established by an Executive Order signed by Governor Larry Hogan declaring a State of Emergency in response to the opioid crisis in Maryland. Governor Hogan subsequently extended this declared State of Emergency by Executive Order. For its part, MIEMSS has implemented multiple strategies in an effort to reduce morbidity and mortality related to opioid overdoses.

- Authorized all EMS clinicians to administer naloxone;
- Enhanced EMS clinician education and community awareness on opioids;
- Promoted distribution of an opioid overdose information and crisis hotline card by EMS clinicians to patients and their family members;
- Partnered with the Maryland Department of Health to identify individuals who need treatment for opioid use disorder;
- Encouraged EMSOPs to share identified opioid overdose information with local health officers so they can provide peer support and rehabilitation opportunities;
- Reported opioid overdose data to the Washington/Baltimore High Intensity Drug Trafficking Area Overdose Map (ODMAP),

which provides real-time overdose surveillance data across jurisdictions, as required by law.

Additionally, fourteen (14) of Maryland's jurisdictional EMSOPs currently participate in the Naloxone Leave Behind Pilot Protocol, which allows EMS clinicians to supply an opioid overdose kit with naloxone to adult patients most at risk (history of previous overdose).

QUALITY MANAGEMENT

Mission

To support both MIEMSS and the EMS community in their continuous quality improvement initiatives and commitment to a customer-based way of doing business. Successfully accomplishing this is not simply dependent upon recognizing that the ultimate customer is a patient in need of timely, proficient, and compassionate care, but understanding and improving the processes that maintain a well-functioning EMS system for the delivery of quality medical care.

MIEMSS' quality management program supports requests for information, query design, and results interpretation, and also educates data owners and managers in process improvement, enhancing the ability to effect improvement in related fields. Data analysis and process examination form the basis of much of the program's responsibilities.

Managing for Results

MIEMSS is required to submit Managing for Results (MFR) updates along with its fiscal year budget requests to the Maryland Department of Budget and Management. MIEMSS has met the MFR requirements this year, which include re-evaluation of key goals, objectives, and strategies; development of action plans; and creation and monitoring of performance indicators.

Two MFR goals were established by MIEMSS: 1) provide high-quality medical care to individuals receiving emergency medical services and 2) maintain a well-functioning emergency medical services system. The measures for successful achievement of these goals include two objectives: 1) maintain statewide trauma patient care performance above the national norm at a 95% or higher statistical level of confidence and 2) transport at least 89% of seriously injured patients to a designated trauma center throughout the calendar year.

EMS Surveillance Measures

MIEMSS has maintained several EMS system surveillance priorities based on routine data review, customer requests, and research outcomes. Hospital yellow alert demand is monitored at state, regional, jurisdictional, and hospital-specific levels through the online

County Hospital Alert Tracking System (CHATS) for real-time system response capabilities as well as historical trends. This monitoring, coupled with hospital strategies that address high demand for emergency department services, help improve the availability of this vital service system-wide. Yellow alert data also form one measurement in the Maryland Department of Health's (MDH) syndromic surveillance programs.

The Helicopter Utilization Database (HUD) accounts for all helicopter requests for transport independent of actual transport mode outcome, and permits requesting EMS managers and medical directors to conduct case reviews. HUD data analysis supports MIEMSS' efforts to utilize aerial transportation for only the most severe, time-critical scene incident patients statewide.

Since FY 2017, EMS encounters resulting in naloxone administration for opioid overdose patients are identified and reported to the MDH and the Opioid Operational Command Center. This non-confidential data set is used, along with other resources, to monitor the incidents of opioid overdoses and help plan effective strategies in combating the crisis.

Data Confidentiality

MIEMSS maintains or has access to eight confidential databases used in ensuring quality EMS care delivery. The Data Access Committee was formed to ensure that all data and requests for information are expedited efficiently and accurately while ensuring patient and clinician confidentiality at all times. Since January 2000, MIEMSS has tracked and responded to over 2,400 data requests.

REGIONAL PROGRAMS

Mission

To provide leadership and support to the statewide EMS system by cultivating strong relationships with system stakeholders, ensuring that the system is effectively prepared and responding to the prehospital medical needs of the residents and visitors of Maryland.

The Regional Programs Division consists of five regional offices, geographically dispersed throughout the state, staffed by regional coordinators and administrative staff. Each office is responsible for monitoring the operation of their assigned region of the statewide EMS system. They serve as technical experts to EMS jurisdictions, hospitals, and other system partners on emergency medical services systems coordination and development. Each regional coordinator works with jurisdictional EMS programs to ensure efficient and effective emergency care is available at all times.

Additionally, the regional coordinators support the agency’s Emergency Operations program by participating in local, regional and/or statewide emergency prevention, preparedness, response, and recovery efforts.

Regional EMS Advisory Councils

By statute, each region of the statewide EMS system has a regional EMS advisory council tasked with advising MIEMSS on EMS function within each particular region. Each council provides a forum for regional coordination of the EMS system among neighboring jurisdictions, hospitals, emergency management personnel, public safety answering points, local health departments, and other EMS system partners. The councils collaborate on matters related to regional EMS conferences. EMS clinician training, quality improvement, emergency preparedness and response, and mutual aid activities.

Prehospital EMS Performance Improvement Initiatives

The Regional Programs Division coordinators serve as the lead for a number of systemic prehospital EMS performance improvement initiatives. During FY 2021, work continued on the following initiatives:

- **eMEDS®/CRISP Integration Project.** This project provides a bi-directional data linkage between eMEDS® and the Chesapeake Regional Information System for our Patients (CRISP), the State’s designated health information exchange. This data linkage has provided a number of products to EMS system partners including hospital staff access to prehospital care summaries, notification to EMS jurisdictions of exposure to certain infectious diseases, and the ability for EMS quality assurance officers to review an EMS patient’s hospital outcome.
- **eMEDS®/ESSENCE Integration Project.** This project provides unidirectional data linkage between

eMEDS® and the Electronic Surveillance System for the Early Notification of Community-Based Epidemics (ESSENCE), the State’s syndromic surveillance system. This system has allowed the Maryland Department of Health’s emergency preparedness epidemiology staff access to Maryland’s EMS data to identify emerging trends in infectious diseases. During the year, the project was expanded to focus attention on opioid overdoses in Maryland.

Critical Care Coordination Center (C4)

The Regional Programs Division played an instrumental role in developing and implementing the Maryland Critical Care Coordination Center (C4). The C4 was initiated at MIEMSS’ Emergency Medical Resource Center (EMRC) in December 2020, as the winter 2020-2021 COVID-19 surge was escalating. It is staffed by an EMS clinician and a critical care medicine physician who monitor the availability of critical care resources throughout Maryland, receive calls from referring clinicians, provide consultative guidance when appropriate, match patient needs to available resources, and facilitate transfer of patient knowledge between the referring physician and the receiving one(s).

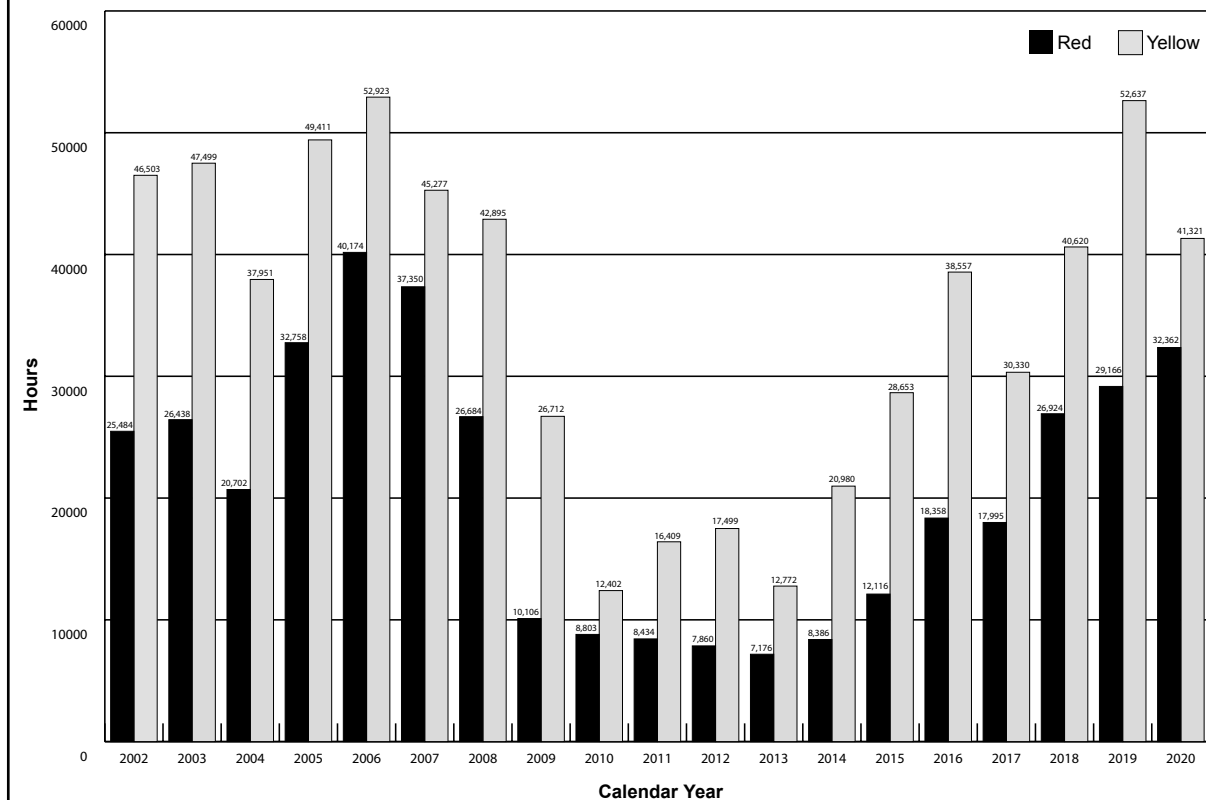
The EMS clinician, typically a paramedic, is responsible for monitoring availability of critical care resources. He/she does so by monitoring daily census reports from hospitals and a data feed from the Chesapeake Regional Information System for our Patients (CRISP), and maintaining periodic contact with hospital intensive care units and health system transfer/coordination centers. The EMS clinician, also known as the C4 Coordinator, receives the calls from referring centers and collects necessary patient demographic information as well as an overview of the clinical situation. The C4 Coordinator is dedicated exclusively to this function for the time he/she is on duty.

The C4 critical care medicine physician, or C4

MIEMSS Grant Disbursements (FY 2021) by Region

	Cardiac Devices Grant for Fiscal Year 2021	ALS Training Funds	Emergency Dispatch Programs	Totals By Region
Region I	\$59,923	\$28,000	\$0	\$87,923
Region II	\$68,350	\$28,000	\$16,147	\$96,350
Region III	\$107,197	\$98,000	\$2,500	\$248,488
Region IV	\$119,837	\$67,998	\$15,730	\$153,870
Region V	\$68,478	\$78,000	\$8,898	\$204,672
Total	\$423,785	\$299,998	\$43,274	\$791,303

State Diversion Alert Totals (Calendar Years 2002 to 2020)



Intensivist, is a practicing intensivist in Maryland. More than 30 intensivists participate in C4; while on duty, they are on-call exclusively dedicated to C4. As each is a practicing critical care physician, they have working knowledge of the capabilities of hospitals in the state, including the tiers of sophistication of intensive care units.

The C4 physician discusses each clinical case with the referring physician. In many cases, he/she will provide clinical guidance. Frequently, the consultation suffices to help the referring physician manage the case in a way that obviates, altogether, the need for transfer.

When transfer is necessary, the C4 Intensivist identifies the patient’s anticipated critical care needs and, subsequently, the tier of intensive care that is most appropriate. The C4 Coordinator identifies available resources that are the most proximate to the referring facility based on their near-real time knowledge of intensive care unit statuses. Conditions in hospitals are dynamic and the resources in hospitals are fluid, and each patient’s unique circumstances and specific clinical needs are factors in any hospital’s capabilities to

manage him/her. Once the C4 Coordinator identifies an acceptable receiving facility, the C4 Intensivist confers with accepting physician to ensure that relevant clinical information is conveyed.

From December 1, 2020, through June 2021, the C4 managed nearly 1,100 calls regarding critical care patients. Approximately 42% of calls were managed with C4 Intensivist consultation only, meaning these calls involved patients destined to be transferred, with the associated risks and costs involved. Instead, they were cared for by the referring facility with no need for immediate relocation. Seventy percent of patients were unrelated to COVID-19, and most had typical critical care needs that would be occur regardless of a viral pandemic. As of July 2021, the average call volume to the C4 is five cases per day (range 1 to 23).

During the year, C4 helped 58 requesting hospitals and 59 receiving hospitals; that is more than the number of hospitals in Maryland. Every hospital in Maryland has been, at one time or another, both a referring facility and an accepting facility. This provides evidence to the effectiveness of the C4 in facilitating movement of pa-

tients to facilities that match their needs, and not default to quaternary care hospitals, as is otherwise typical. The result is optimal utilization of available resources, and caring for people closer to their homes in many cases.

Some C4 calls have come from hospitals outside Maryland, when nearby bordering hospitals have tried to effect transfers to Maryland hospitals and the referring hospital was directed to C4. Alternatively, several Maryland patients have been referred to out-of-state hospitals when necessary in-state resources were not available. Patient transfers have been facilitated to Washington, DC; Northern Virginia; Charlottesville, Virginia; York, Pennsylvania; Hershey, Pennsylvania; Pittsburgh, Pennsylvania; and Philadelphia.

The C4 continues to serve an important function for facilitating the most appropriate critical care for emergency department and hospitalized patients in Maryland. It has proven effective in freeing clinicians to continue to provide necessary care, obviating the need for many would-be transfers, identifying appropriate critical care resources to match patients' needs, and distributing patients more optimally within Maryland's health care system.

Emergency Preparedness and Response

The Regional Programs Division helps provide the first line of defense in supporting local jurisdictions in response to emergencies affecting the state. Each regional office is actively involved in the Regional Health & Medical Coalitions, administered by the Maryland Department of Health. During 2021, each of the regional coordinators was actively engaged in the State's response to the COVID-19 pandemic, with several serving in interagency coordinating roles and providing crucial data, including hospital capacity data, to support the State's response. Regional Programs provided COVID-19 testing kits throughout the state, testing EMS clinicians who were symptomatic for COVID-19, or who had a COVID-19 exposure, and coordinators were heavily involved in the distribution of personal protective equipment (PPE) to EMS jurisdictions throughout the state. Coordinators also supported the MIEMSS emergency operations team by serving as members of the State Incident Management Team and MIEMSS Field Operations Support Team.

COVID Vaccination Clinic for State Employees

In January 2021, MIEMSS was tasked with providing COVID-19 vaccinations to State continuity-of-government employees and to EMS clinicians who had not yet received the vaccine. Through May 2021, the clinic administered over 9,000 vaccine immunizations. MIEMSS Regional Coordinators assisted in all phases of clinic operations.



Communications System Upgrade

The Regional Programs Division is assisting in the statewide upgrade of the MIEMSS communication system from analog to digital. Personnel assisted in the developing of statements-of-work for project phases and worked to coordinate on-site hospital work with project contractors.

Grant Programs

The Regional Programs Division work closely with the SEMSAC Regional Affairs Committee and Regional EMS Advisory Councils to administer a statewide grants program that provides funding directly to jurisdictional EMS operational programs and to represent EMS and MIEMSS on entities that coordinate funding priorities for Maryland. Grant programs have included the Hospital Preparedness Program and the State Homeland Security Grant Program. Regional coordinators also work on MIEMSS-funded grant programs that provide funds for EMS clinician training programs to support initial and continuing education and the purchase of automated external defibrillators.

Research

The Regional Programs Division is actively engaged in EMS research, working on projects related to behavioral health, cardiac arrest management, and patient safety. Staff also participated in the 2020 Field Internship Student Data Acquisition Project (FISDAP) Research Summit, published research in two scholarly journals, and presented research findings in two international conferences.

MARYLAND TRAUMA AND SPECIALTY REFERRAL CENTERS

MARYLAND DESIGNATED ADULT TRAUMA CENTERS (For explanation of differences in levels, see Trauma Center Categorization chart on page 31)		
<u>Primary Adult Resource Center</u> <ul style="list-style-type: none"> R Adams Cowley Shock Trauma Center/ University of Maryland Medical Center, Baltimore City (MIEMSS Region III) 	<u>Level II Adult Trauma Centers</u> <ul style="list-style-type: none"> Johns Hopkins Bayview Medical Center, Baltimore City (MIEMSS Region III) Sinai Hospital, Baltimore City (MIEMSS Region III) Suburban Hospital–Johns Hopkins Medicine (JHM), Bethesda (MIEMSS Region V) University of Maryland Capital Region Medical Center, Largo (MIEMSS Region V) 	<u>Level III Adult Trauma Centers</u> <ul style="list-style-type: none"> Meritus Medical Center, Hagerstown (MIEMSS Region II) TidalHealth Peninsula Regional, Salisbury (MIEMSS Region IV) UPMC Western Maryland, Cumberland (MIEMSS Region I)
<u>Level I Adult Trauma Center</u> <ul style="list-style-type: none"> The Johns Hopkins Hospital, Baltimore City (MIEMSS Region III) 		
OUT-OF-STATE HOSPITALS (with MOUs)		
<ul style="list-style-type: none"> Adult Trauma Center/ChristianaCare Health System, Newark, DE Adult Trauma Center/MedStar Washington Hospital Center, Washington, DC 	<ul style="list-style-type: none"> Adult Burn Center/MedStar Washington Hospital Center, Washington, DC Pediatric Trauma Center/Children’s National Hospital, Washington, DC 	<ul style="list-style-type: none"> Pediatric Burn Center/Children’s National Hospital, Washington, DC
MARYLAND DESIGNATED SPECIALTY REFERRAL CENTERS		
<u>Burn Centers</u> <ul style="list-style-type: none"> Adult Burn Center/Johns Hopkins Bayview Medical Center, Baltimore City Pediatric Burn Center/Johns Hopkins Children’s Center, Baltimore City 	<ul style="list-style-type: none"> Out-of-State Cardiac Interventional Centers <ul style="list-style-type: none"> Bayhealth Kent General, Dover, DE Christiana Hospital, Newark, DE MedStar Washington Hospital Center, Washington, DC Nanticoke Memorial Hospital, Seaford, DE 	<u>Comprehensive Stroke Centers</u> <ul style="list-style-type: none"> The Johns Hopkins Hospital University of Maryland Medical Center Johns Hopkins Bayview Medical Center
<u>Cardiac Interventional Centers</u> <ul style="list-style-type: none"> Region I <ul style="list-style-type: none"> UPMC Western Maryland Region II <ul style="list-style-type: none"> Frederick Health Meritus Medical Center Region III <ul style="list-style-type: none"> Anne Arundel Medical Center Carroll Hospital Center Howard County General Hospital, JHM Johns Hopkins Bayview Medical Center The Johns Hopkins Hospital MedStar Franklin Square Medical Center MedStar Union Memorial Hospital Sinai Hospital St. Agnes Hospital University of Maryland (UM) Medical Center UM Baltimore Washington Medical Center UM St. Joseph Medical Center UM Upper Chesapeake Medical Center Region IV <ul style="list-style-type: none"> TidalHealth Peninsula Regional University of Maryland Shore Health at Easton Region V <ul style="list-style-type: none"> Adventist HealthCare White Oak Medical Center Holy Cross Hospital MedStar Southern Maryland Hospital Center Shady Grove Adventist Hospital Suburban Hospital–JHM University of Maryland Capital Region Medical Center 	<u>Eye Trauma Center</u> <ul style="list-style-type: none"> The Wilmer Eye Institute/The Johns Hopkins Hospital, Baltimore City 	<u>Primary Stroke Centers</u> <ul style="list-style-type: none"> Adventist HealthCare White Oak Medical Center Anne Arundel Medical Center Atlantic General Hospital Calvert Health Medical Center Carroll Hospital Center Christiana Care, Union Hospital Doctors Community Hospital Frederick Health Greater Baltimore Medical Center Holy Cross Germantown Hospital Holy Cross Hospital Howard County General Hospital–JHM Mercy Hospital Center Meritus Medical Center MedStar Franklin Square Medical Center MedStar Good Samaritan Hospital MedStar Harbor Hospital MedStar Montgomery Medical Center MedStar Southern Maryland Hospital Center MedStar St. Mary’s Hospital MedStar Union Memorial Hospital Northwest Hospital Shady Grove Adventist Hospital Sinai Hospital St. Agnes Hospital Suburban Hospital–JHM TidalHealth Peninsula Regional University of Maryland (UM) Medical Center Midtown Campus UM Baltimore Washington Medical Center UM Capital Region Medical Center UM Charles Regional Medical Center UM Harford Memorial Hospital UM Shore Medical Center at Easton UM St. Joseph Medical Center UM Upper Chesapeake Medical Center UPMC Western Maryland
<u>Hand/Upper Extremity Trauma Center</u> <ul style="list-style-type: none"> The Curtis National Hand Center/MedStar Union Memorial Hospital, Baltimore City 	<u>Neurotrauma Center</u> <ul style="list-style-type: none"> R Adams Cowley Shock Trauma Center/ University of Maryland Medical Center, Baltimore City 	
	<u>Pediatric Trauma Center</u> <ul style="list-style-type: none"> The Johns Hopkins Children’s Center, Baltimore City 	
	<u>Perinatal Referral Centers</u> <ul style="list-style-type: none"> Anne Arundel Medical Center Frederick Memorial Health Greater Baltimore Medical Center Holy Cross Hospital Howard County General Hospital–JHM Johns Hopkins Bayview Medical Center The Johns Hopkins Hospital MedStar Franklin Square Medical Center Mercy Medical Center St. Agnes Hospital Shady Grove Adventist Hospital Sinai Hospital University of Maryland (UM) Medical Center UM St. Joseph Medical Center 	
POISON CONSULTATION CENTER		
<ul style="list-style-type: none"> Maryland Poison Center/University of Maryland School of Pharmacy, Baltimore City 		

DESIGNATED TRAUMA CENTER CATEGORIZATION

Differences in Standards Based on Physician Availability and Dedicated Resources	PARC	Level I	Level II	Level III
For the "most critical patients", an in-house fellowship-trained attending trauma surgeon, trauma fellow, or trauma equivalent/PGY5+ general surgery resident should be at the bedside upon arrival, documented at least 80% of the time.	X			
Dedicated facilities (Resuscitation Unit, Operating Room, and Intensive Care Unit) 24 hours a day	X			
Facilities (Resuscitation Area, Operating Room, and Intensive Care Unit) 24 hours a day		X	X	X
Trauma Surgeon available in-house at all times shall be at the bedside within 15 minutes of call request, documented at least 80% of the time		X	X	
On-call Trauma Surgeon shall be at the bedside within 30 minutes of call request, documented at least 80% of the time of call request				X
Anesthesiologist in-house dedicated 24 hours a day to trauma care, should be at the bedside upon arrival, documented at least 80% of the time	X			
Anesthesiologist in-house at all times but shared with other services and shall be at the bedside within 15 minutes of call request		X	X	X
Orthopedic Surgeon in-house at all times and dedicated to trauma care	X	X		
Orthopedic Surgeon on-call shall be at the bedside within 30 minutes of call request, documented at least 80% of the time of call request			X	X
Neurosurgeon in-house at all times and dedicated to trauma care	X			
Neurosurgeon in the hospital at all times but shared with other services		X		
Neurosurgeon on-call shall be at the bedside within 30 minutes of call request, documented at least 80% of the time of call request			X	X
A designated fellowship-trained/board-certified in surgery or critical care surgical director of the Intensive Care Unit	X	X	Desired	
An organized trauma research program with a designated physician director and documented research plan	X	X		
Education – Fellowship Training in Trauma	X			
Surgical Residency Program	X	X		
Injury Prevention and Public Education Program	X	X	X	X

MARYLAND EMS SYSTEM TRAUMA AND SPECIALTY CENTER REPORTS

Primary Adult Resource Center

R Adams Cowley Shock Trauma Center

22 S. Greene Street, Baltimore, Maryland
MIEMSS Region III

The R Adams Cowley Shock Trauma Center (RACSTC), located within the University of Maryland Medical Center, serves as the state's Primary Adult Resource Center. RACSTC treated 6,337 primary trauma patients from June 1, 2020, through May 31, 2021, according to the Maryland State Trauma Registry. (See pages 83 to 88 for additional patient data.) Over this 12-month period, 83% of patients admitted to the Shock Trauma Center arrived by ground transportation and 17% arrived by air. Demographic data

obtained indicate that the majority of admissions were male (68%) and aged 15-35 years (40%), followed by patients aged 56 or older (29%) and 36-55 (28%).

Mission

The R Adams Cowley Shock Trauma Center is a multi-disciplinary clinical, educational, and research institution dedicated to world-class standards in the prevention and management of critical injury and illness. Its highly specialized medical personnel and dedicated resources are focused on a single mission: to eradicate preventable death and disability, thus reducing the personal tragedy and overall costs associated with severe injury. This mission is continuously pursued through state-of-the-art clinical care services, active research, didactic and hands-on clinical education, and prevention programs.

Primary Adult Resource Center Trauma Staff

Physician-in-Chief:

Thomas M. Scalea, MD, FACS, MCCM

Senior Vice-President of Nursing and Operations:

Karen E. Doyle, DNP, MBA, MS, RN,
NEA-BC, FAAN

Center for Hyperbaric Medicine

The Center for Hyperbaric Medicine is the statewide referral center for individuals who experience decompression sickness, carbon monoxide poisoning, smoke inhalation, delayed effects of radiation treatment, non-healing wounds, and/or gas gangrene. It is internationally recognized for its leadership and expertise in the clinical application of hyperbaric therapy.

As the only multi-place chamber in Maryland, the Center is capable of simultaneously accommodating 10 patients on stretchers or 23 seated patients. Hyperbaric therapy provides oxygen to all parts of the body in amounts greater than possible under normal conditions by providing 100% oxygen under increased atmospheric pressure. The center can treat a wide spectrum of patients 24/7, from the most critically ill inpatients to ambulatory outpatients.

In FY 2021, therapeutic hyperbaric oxygen treatment (HBO) was provided during 830 dives, totaling 3,138 dive hours. Of these, 52% were inpatients and 47% were outpatients and 1% (30 dive hours) were emergent. The practitioners from the Center for Hyperbaric and Dive Medicine have a long history of treating divers suffering from decompression sickness and are available 24 hours/day for consultation and treatment of dive emergencies. In addition, four specially trained physicians provide fitness-to-dive physicals for new recreational or commercial divers, as well as providing consultation with patients who have previously suffered dive accidents.

■ **Accomplishments:**

- All nurses working in HBO are neuro critical care-trained and regularly rotate through the critical care areas in order to maintain their skills.
- Inside tender diving standards were created in order to define safe staffing ratios and chamber spacing.
- Beth Cipra, DNP, RN, APRN-CNS, CCRN-K; Melissa Schroeder, BSN, CHRN; Janelle Jones, BS, RRT, CHT and Alison Lembo, MSN, MBA, CMSRN, completed a PI project which instituted a pre-screen for potentially violent behaviors and a “STOP!” huddle with staff prior to each dive to ensure patient and staff safety.
- The Hyperbaric Chamber underwent large operational and patient flow changes in the setting of COVID-19. Rapid changes, supported

by infection prevention, included safe patient distancing and restricting head tent removal while under pressure. Viral filters were added to all head tents and surgical masks and eye protection were required prior to placing the head tent. With these changes, the HBO team was able to safely resume treating outpatients with a negative COVID-19 screen.

■ **Presentations:**

- Undersea and Hyperbaric Medical Society (UHMS) Scientific Conference “Creative Staffing Solutions for Hyperbaric Medicine at Shock Trauma”. Poster Presenters: Melissa Schroeder, BSN, RN, CHRN; Janelle Jones, BS, RRT, CHT; Alison Lembo, MSN, MBA, RN, CMSRN; Dino Gaetani, BS, RRT, RPFT; Elizabeth Cipra, DNP, RN, APRN-CNS, CCRN-K; Sarah Baker, BSN, RN; Kinjal N. Sethuraman, MD MPH.

The GO-TEAM

RACSTC maintains an advanced resuscitative team, the GO-TEAM, which treats serious injuries at the incident scene. The GO-TEAM augments Maryland’s statewide EMS system by providing critical care and surgical services beyond the scope of pre-hospital emergency care clinicians. Each dispatched GO-TEAM includes an attending physician and a certified nurse anesthetist. In FY 2021, there were eight requests for the GO-TEAM, with one deployment. This was to Cecil County for a trauma tree rescue.

Center for the Sustainment of Trauma and Readiness Skills

Since 2001, US Air Force Medical Service personnel have traveled to Baltimore for training at the US Air Force Center for the Sustainment of Trauma and Readiness Skills (C-STARS), embedded within RACSTC. These civilian-military partnerships are crucial in keeping military medics continuously ready for wartime casualty care. In addition to providing educational observation experiences to the Air Force, we are now also providing these experiences to Walter Reed nurses and technicians.

FY 2021 Annual Report

■ **Notable Accomplishments.**

- From March 2020 through May 2021, the combined Lung Rescue Unit (LRU) and Biocontainment Unit (BCU) managed 87 COVID-19 Venovenous Extracorporeal Membrane Oxygenation (ECMO) patients. Our survival from Venovenous ECMO was 69% and survival to discharge was 67%. We also cared for four COVID-19 patients who

required Venous-Arterial ECMO support with a 75% survival rate and 50% survival to discharge. During the same time period, the LRU/BCU also managed 27 non-COVID Venous-Venous ECMO patients. Our outcomes exceeded the Extracorporeal Life Support Organization (ELSO) benchmarks for all categories. Despite the challenges of the past year, our multidisciplinary team has done an excellent job providing essential care to critically ill citizens of the State of Maryland.

- Karen Doyle was recognized for her leadership as the co-incident commander for the COVID-19 pandemic at the University of Maryland Medical Center by *The Daily Record* 2020 COVID-19 Health Care Hero awards.
- Karen McQuillan, MS, RN, CNS-BC, CCRN, CNRN, TCRN, FAAN, was a finalist for *The Washington Post's* 2020 Star Nurse awards.
- Kristie Snedeker, DPT, introduced the “Discharge to Home” patient flow initiative, with the objectives of increasing the number of patient discharges by noon to enhance the patient experience, decant the PACU & AED and to decrease length of stay.
- Karen McQuillan, MS, RN, CNS-BC, CCRN, CNRN, TCRN, FAAN, was awarded first place by the *American Journal of Nursing* 2020 AJN Trauma/Critical Care Book of the Year for Trauma Nursing – From Resuscitation Through Rehabilitation, 5th edition. Over 16 RACSTC nurses served as authors and numerous others from the Center served as chapter reviewers for this publication.
- Kaitlyn Cipra, BSN, RN, was the recipient of the Society of Trauma Nursing 2020 Evidence-Based Practice oral abstract presentation award.
- In an effort to respond to and to reduce the deaths and hospitalizations from substance use/abuse, in July 2020 Shock Trauma, in collaboration with The Mosaic Group and the State Opioid Response (SOR) Program, instituted “Reverse the Cycle”, a comprehensive hospital substance use response program. The Reverse the Cycle Program went live at Shock Trauma on July 8, 2020, with a total of four full-time trained Peer Recovery Coaches, with three working in the Trauma Resuscitation Unit and the fourth working as the Coach in the OSOP program, working specifically with opioid overdose survivors in the community. From July 2020 through June 2021, we screened a total of 4,253 patients, provided 1,060 brief Interventions, 101 referrals to treatment, and 74 linkages to

treatment.

- The R Adams Cowley Shock Trauma Center (RACSTC) EMS Liaison team was established to enhance communication between STC and EMS clinicians. This group is comprised of eight members who have extensive experience working in the Trauma Resuscitation Unit and are active within the EMS community. The team provides timely feedback to our EMS colleagues and is actively working towards building relationships and assisting with education.
- The Center for Injury prevention and Policy (CIPP) successfully transitioned the “Minds of the Future” program to a virtual format, allowing us to reach over 800 students. This program provides High School seniors with a window into healthcare and the many varied career opportunities that are available.
- The Critical Care Resuscitation Unit (CCRU) has attained 100% in Advanced Certification rate among Registered Nurses.
- The CCRU completed several Performance Improvement (PI) projects in response to the COVID-19 pandemic to focus on quality patient care and practice (“Improving documentation and handoff of patient belongings.” Joseph Walker, BSN, RN, CCRN; “Initiation of Trauma Technician Outreach.” Joel Sainz, BSN, RN, CCRN; “Algorithm for COVID Admissions in CCRU.” Dr. Daniel Haase and Kristen George, MPH, RN, CCRN; “Donning and Doffing.” Louis Lee MSN, RN, CCRN, TCRN, CEN; “Rapid on-boarding of travel RNs during the pandemic.” Kristen George, MPH, RN, CC).

■ Presentations.

- TraumaCon 2021 – Society of Trauma Nurses Annual Conference
 - “A Multidisciplinary Quality Improvement Initiative for Improved Trauma Discharges.” Presented by Rachel Moore, BSN, RN, TCRN and Beth Cipra, DNP, RN, APRN-CNS, CCRN-K.
 - “Pandemic Preparedness.” Poster Presenters: Jeff Broski, BSN, RN, CCRN, SCN II; Brittany Daniels, BSN, RN, CCRN, SCN I.
- Ellen Plummer, MSN, RN, MBA, CCRN, presented “Hip Fractures in the Elderly: Co-Morbidities, Complications, and Treatment Options for Optimal Outcomes” for the Meritus Health Virtual Trauma Spring Conference 2021.
- Frannie Grissom, BSN, RN, presented “Staying the Course While Clearing the Hurdles: An Insider’s Perspective on Long-Term Recovery”

for the Case Management Society of America annual conference.

- Paul Thurman, PhD, RN, ACNPC, CCNS, CCRN, presented posters at both the National and International levels:
 - Thurman, P, McDiarmid, M.A., Hines, S.E. (2021) “Healthcare Respiratory Protection Gap Leads to Development of Elastomeric Respirator Implementation Guide”, American College of Occupational and Environmental Medicine, American Occupational Health Conference.
 - Zhuang, E., Thurman, P., Kolesnik, O., Chen, H., McDiarmid, MA., Hines, S.E. (2021) “Physiologic Effects of Elastomeric Half-Mask Respirator Use with or Without a Surgical Mask in Healthcare Workers”, American Thoracic Society, ATS International Conference 2021.
- Tiffany Kuebler, PA-C, MMS, presented “II-LUMEN-ating the Future of Trauma Care: Endovascular Interventions” for the National AAPA Conference on endovascular interventions used to treat traumatic injuries.

■ **Publications.**

- Karen McQuillan, MS, RN, CNS-BC, CCRN, CNRN, TCRN, FAAN Symposium Editor for Trauma Update in *AACN Advanced Critical Care*. 32(1), 2021.
- Thurman P. Hemostatic strategies in Trauma. *AACN Advanced Critical Care*. 2021, 32(1):51-63.
- Gaasch S. Critical care considerations for damage control in a trauma patient. *AACN Advanced Critical Care*. 2021, 32(1):64-75.
- Fortune S, Frawley J. Optimizing pain control and minimizing opioid use in trauma patients. *AACN Advanced Critical Care*. 2021, 32(1): 89-1.

■ **Quality Management and Improvement.**

RACSTC maintains a complete and comprehensive quality management program. All aspects of care from prehospital trauma-line consulting to peer review of patient deaths and complications are monitored through the quality program, benchmarked to the best practices of other institutions, and continually improved. The program integrates quality activities of other specialty services that provide care to critically ill and severely injured patients. The multidisciplinary Quality Improvement Committee is responsible for outlining the quality program, monitoring performance, and developing new initiatives.

■ **Injury Prevention Programs and Initiatives.** In keeping with the mission of preventing severe injury

and death, RACSTC’s Center for Injury Prevention and Policy (CIPP) focuses on identifying injury trends and developing prevention education programs. In FY 2021, CIPP presented 135 events reaching 3,737 students and community members with important prevention messages.

CIPP Injury prevention programs include:

- Violence Intervention Program
- Bridge Program – Aimed at breaking the cycle of domestic or intimate partner violence
- Promoting Healthy Alternatives for Teens – Designed to expose youth to the consequences associated with poor decision-making
- Trauma Prevention Program – Saving Maryland’s At-Risk Teens, targeting high school students involved in dangerous behaviors related to drug and/or alcohol abuse
- Trauma Survivors Network
- Stop the Bleed® campaign – Designed to educate community members on how to stop life-threatening bleeding with tourniquet application and wound packing.

The COVID-19 pandemic necessitated the transitioning of many of our programs into a virtual format for FY 2021. Unfortunately, we were required to place the Stop the Bleed® program on hold as a result of restrictions. Previously, this program has touched and informed countless others through community outreach, such as the B’More Healthy Expo, as well as numerous local news segments and articles about this life-saving skill. RACSTC’s Stop the Bleed® program succeeds through the strong voluntary collaboration between our clinical employees and community partners. Our intention is to restart this program in the near future, in order to continue impacting our Maryland community and teach anyone and everyone how to “Stop the Bleed® and Save a Life”.

■ **Emergency Medical Services and Nursing Continuing Education.** RACSTC continues to expand and advance educational programs focused on patient care trends by delivering lectures and participating in case reviews with local jurisdictions. In FY 2021, evening educational programs open to EMS clinicians and nurses were held one time and linked via live broadcast to remote sites across the state. Eighteen EMS clinicians participated in an ALS airway course (offered one time in FY 2021) that included didactic and simulation learning. In addition, a virtual tour video is available to provide more EMS students, clinicians, and first responders an opportunity of gaining a better understanding of the process involved in transporting a patient to RACSTC. EMS clinicians are permitted to observe procedures in the Trauma Resuscitation Unit or in the Critical Care Unit.

The Trauma Observation Program provides healthcare professionals with a current understanding of their particular area of interest through clinical interactions, meetings and lectures, rounds, and observation of operational procedures. Program participants include EMS students, pre-med students, military medics, nurses, high school trainers, nurse practitioners, and physicians. In FY 2021, we welcomed 87 observers to the Shock Trauma Center.

■ **Center for Critical Care Training and Education (CCCTE).** The CCCTE has a robust educational schedule and has built environments to mimic every phase of patient care within the Primary Adult Resource Center. The Center hosts many certification courses, including Advanced Trauma Life Support, Fundamental Critical Care Support, Advanced Trauma Care for Nurses, and Maintenance of Certification in Anesthesiology. Advanced trauma skills training includes Basic Endovascular Skills for Trauma, as well as Extracorporeal Membrane Oxygenation and ultrasound training.

The American College of Surgeons designated RACSTC as the training site for both students and course instructors in Maryland. Critical care and surgical skills training courses are offered to providers from around the world. In FY 2021, 435 classes were provided to 7,000 healthcare workers, including medical students, EMS clinicians, attending physicians, and nurses through the CCCTE.

The CCCTE also is home to EMS training via Difficult Airway and Medical Express Care courses along with a myriad of programs at UMMC Downtown and Midtown campus for all departments. During our response to the COVID-19 pandemic, the CCCTE was transformed into a fit testing and PPE distribution center serving all UMMC employees. In total, 2,151 staff were involved in fit testing their colleagues, and PPE was distributed to 203,647 staff members. Please check in on us at <https://www.umms.org/ummc/pros/critical-care-trauma-education>.

■ **Fellowships and Residencies.** The Surgical Critical Care (SCC) Fellowship Program is the largest Accreditation Council for Graduate Medical Education (ACGME) accredited SCC training program in the country. RACSTC offers 21 fellowship positions in SCC, anesthesiology, orthopedic surgery, emergency medicine-SCC, and acute care surgery specialties.

The ACGME-accredited University of Maryland Orthopedic Traumatology Fellowship is considered to be the foremost orthopedic trauma fellowship worldwide. The fellowship focuses on preparing orthopedic surgeons for careers in academic orthopedic trauma surgery, including emphasis on managing musculoskeletal injuries in severely or multiply injured patients in an

interdisciplinary environment. Fellows also receive training in rigorous research methodologies and in learning to become effective surgical educators themselves. Five surgeons are selected for the fellowship annually through the orthopedic fellowship match program.

■ **Research.** Clinical research at RACSTC is conducted under the umbrella of the Shock, Trauma, and Anesthesiology Research – Organized Research Center (STAR-ORC), a multidisciplinary research and educational center focusing on brain injury, critical care and organ support, blood and resuscitation, surgical outcomes, patient safety, and injury prevention. It is the first research center in the nation dedicated exclusively to the study of trauma, its complications, and prevention. There are currently over 20 clinical studies being conducted at RACSTC. The diversity of these studies is impressive, covering nearly all body regions and systems. Study areas include, but are not limited to, spinal cord injury, traumatic brain injury, hemorrhagic shock, venous thromboembolism therapies, acute kidney injury, and the biomechanics of motor vehicle crash-related injury.

COVID-19 curtailed clinical research, but during the pandemic RACSTC participated in a number of industry-funded trials for COVID-19 related therapeutics. We were also able to participate in a study funded by the Department of Transportation to examine the incidence of COVID-19 in trauma patients. Otherwise, our research projects are designed to enhance the trauma system's ability to resuscitate, stabilize, and treat the needs of trauma patients. A few of the current studies that exemplify this goal are two NIH-funded translational studies seeking to identify key molecular biomarkers upregulated after severe trauma. The ongoing "Emergency Preservation and Resuscitation for Cardiac Arrest from Trauma", and an industry-funded study to examine a drug to improve outcomes after traumatic brain injury which is based on research from a neurosurgeon at the University of Maryland School of Medicine. RACSTC is also contributing to the ongoing Hyperbaric Oxygen Brain Injury Treatment (HOBIT) trial and about to begin the Brain Oxygen Optimization in Severe Traumatic Brain Injury, both large NIH-funded studies conducted through the SIREN Emergency Trials Network. RACSTC is participating in several studies looking at venous thromboembolism after trauma, including a new PCORI-funded study aimed to decrease missed doses of chemoprophylaxis.

■ **Rehabilitation Services.** The RACSTC emphasizes early patient mobilization as the beginning of the rehabilitative process. The University Of Maryland Rehabilitation & Orthopedic Institute and the UMMC Midtown Campus primarily provide post-acute inpatient and outpatient services for RACSTC patients.

Level I Adult Trauma Center

The Johns Hopkins Hospital

1800 Orleans Street, Baltimore, Maryland
MIEMSS Region III

The Johns Hopkins Hospital (JHH) is a designated Level I Adult Trauma Center serving Baltimore City and its surrounding counties, as well as patients throughout the state and region. JHH treated 1,717 trauma patients from June 1, 2020, through May 31, 2021, according to the Maryland State Trauma Registry. (See pages 83 to 88 for additional patient data.) Adult trauma services are provided by the Division of Acute Care Surgery in the Department of Surgery.

Mission

The mission of Johns Hopkins Medicine is to improve the health of the community and the world by setting the standard of excellence in medical education, research, and clinical care. Diverse and inclusive, Johns Hopkins Medicine educates medical students, scientists, health care professionals, and the public; conducts biomedical research; and provides patient-centered medicine to prevent, diagnose, and treat human illness.

Adult Trauma Center Staff

Adult Trauma Medical Director:

Kent A. Stevens, MD, MPH, FACS

Adult Trauma Program Manager:

Kathy Noll, MSN, TCRN

FY 2021 Annual Report

■ **Notable Accomplishments.** JHH is again ranked among the top five hospitals in the nation based on *U.S. News & World Report's* Best Hospitals 2020-2021 rankings. The trauma and emergency surgery departments of JHH and Johns Hopkins Bayview Medical Center (JHBMC) are unified under a single Division of Acute Care Surgery.

Johns Hopkins Medicine's trauma surgeons, advanced practice providers, and nurses have been on the frontlines providing care to patients during the COVID-19 pandemic. In addition to taking care of injured patients, the division cared for numerous patients afflicted with COVID-19 on the Acute Care Surgery service and in the Surgical Intensive Care Units.

With the departure of David Efron, MD, FACS, to join the faculty at the University of Maryland R Adams Cowley Shock Trauma Center, Kent Stevens, MD, MPH, and FACS, was appointed the Chief of the Division of Acute Care Surgery while continuing his role as Director of Adult Trauma Services. Dr. Efron's long service to the Johns Hopkins Hospital and many trauma

victims over many years is noted and appreciated. A redeployment of Johns Hopkins faculty to assist associated hospitals during times of COVID-19 was initiated by Dr. Efron and subsequently led by Dr. Stevens. This greatly supported faculty in other associated hospitals during times of COVID-19.

Dr. Stevens's research interests continued to include Global Surgery, Trauma Care in Resource-Poor Settings, Trauma System Development, and Trauma Outcomes. Dr. Stevens holds a joint appointment in the Department of International Health at the Johns Hopkins Bloomberg School of Public Health and is Associate Director of the International Research Unit, which is a World Health Organization (WHO) collaborating center.

Joseph V. Sakran, MD, MPH, MPA, FACS, Associate Chief of the Division of Acute Care Surgery and Director of Emergency General Surgery, is the Vice Chair of the Maryland Committee on Trauma. Dr. Sakran recently completed a sabbatical in the United States Senate as the Robert Wood Johnson Health Policy Fellow where he focused on developing health-related legislative and regulatory issues with members of Congress and the executive branch. Dr. Sakran is also President-Elect of the American College of Surgeons (ACS) – Maryland Chapter, and Vice-Chair of the Maryland ACS – Committee on Trauma.

Elliott R. Haut, MD, PhD, FACS, Vice Chair of Quality, Safety & Service for the Department of Surgery, is the Director of the Trauma/Acute Care Surgery fellowship at Johns Hopkins. He recently finished his tenure as Chairman of Maryland TraumaNet. He is a member of the Board of Directors and the Scientific Advisory Council of the Coalition for National Trauma Research (CNTR). Dr. Haut serves as the Associate Editor for Social Media for Trauma Surgery & Acute Care Open (TSACO). Dr. Haut is the principal investigator on a project funded by The Patient-Centered Outcomes Research Institute (PCORI) titled "Implementing Best-Practice, Patient-Centered Venous Thromboembolism (VTE) Prevention in Trauma Centers" working with 10 trauma centers across the country.

The Division welcomes two new trauma attendings. Dr. James P. Byrne, MD, PhD, completed his trauma and acute care surgery fellowship at the University of Pennsylvania in Philadelphia. His research centers on evaluating patient-level processes of care for the purpose of quality improvement and trauma systems performance with a specific focus on geospatial access and prehospital care. Dr. Jeffrey Kyle Jopling, MD, MSHS, completed his fellowship in Surgical Critical Care at Stanford Medical Center. His research interests include improving value and outcomes in surgery, the use of artificial intelligence-assisted care, and reducing

costs and redundancy in the diagnostic process.

JHH has maintained Magnet designation since 2003 and was the first healthcare organization in Maryland to receive this award. Magnet recognition is the gold standard for nursing excellence, and is a measure of high patient satisfaction and lower risk of 30-day patient mortality. It also encompasses the quality of nursing leadership and coordination and collaboration among specialties, as well as processes for measuring and improving the quality and delivery of care.

■ **Quality Management and Improvement.** JHH continues to be a leader in the field of quality and safety. Dr. Elliott Haut, the current Vice Chair of Quality, Safety & Service for the Department of Surgery at JHH, has worked to improve outcomes and eliminate preventable harm. The Agency for Healthcare Research and Quality has used Dr. Haut's Deep Vein Thrombosis (DVT) Collaborative at JHH to highlight the use of clinical decision support to prevent thromboembolism in hospitalized trauma patients.

The Joint Commission again ranked JHH a Top Performer on Key Quality Measures. The "Top Performer" designation is reserved for accredited hospitals that consistently follow best practices in patient safety. Consistent with that, JHH's Armstrong Institute for Patient Safety and Quality continues to focus on eliminating preventable harm to patients.

■ **Injury Prevention Programs and Initiatives.** The Stop the Bleed® education campaign is once again picking up momentum with plans by JHH professionals to offer training with bimonthly classes for staff while continuing to reach out to individuals and groups in Baltimore and the surrounding communities. Stop the Bleed® classes were also offered to victims of violence and their families during their hospital stay. Dr. Matthew Levy, Senior Medical Officer for the Hopkins Center for Law Enforcement Medicine and an Associate Professor of Emergency Medicine, has worked on designing the Stop the Bleed® (STB) program on the national level, and he continues to teach hemorrhage control to civilian law enforcement as well as tactical and emergency medical service teams as part of Tactical Combat Casualty Care (TCCC).

Prevention of gun violence at the local, state, and national levels continues to be a focus of the JHH injury prevention program. Dr. Joseph Sakran, a JHH trauma surgeon, has played a major role in this effort working at the nexus of medicine, public health, and public policy. Dr. Sakran serves as the Chair of the Injury Control and Violence Prevention Committee for the Eastern Association for the Surgery of Trauma. Dr. Sakran is often an invited speaker on gun violence on Capitol Hill and has worked with numerous elected officials, including the current Presidential candidates, to advise them

on a pathway forward for make communities safer from gun violence.

The Hopkins Responder Violence Intervention Program (VIP) provides intervention services to patients who have sustained an injury from a gunshot wound, stabbing, or assault. The program's aim is to interrupt cycles of intentional violence (shooting, stabbing, and assaults) and future reinjury or death. Responders work directly in the hospital with patients during the golden moment of patient vulnerability after the episode of trauma. They also provide follow-up visits to connect victims to community employment services, substance abuse counseling, and legal assistance.

The Johns Hopkins Center for Gun Policy and Research, a division of the Johns Hopkins Bloomberg School of Public Health (JHBSPH), continued to bring its expertise to the issues related to gun violence prevention. The center provides input into the effectiveness of programs and policies aimed at reducing violence, as well as information for legislators and public health professionals on effective interventions.

■ **Emergency Medical Services and Nursing Continuing Education.** Matthew Levy, DO, MSc, Associate Professor of Emergency Medicine and senior faculty in the Johns Hopkins Emergency Medical Services Fellowship, holds multiple positions within Johns Hopkins as well as at local, state and federal level. In addition to serving as the EMS medical director for the Howard County Department of Fire and Rescue Services, Dr. Levy is also the Region III Medical Director for the Maryland Institute for Emergency Medical Services Systems. Dr. Levy collaborates with other EMS officials on projects and programs in Maryland, including EMS system quality assurance, protocol, EMS clinician education, and program development. Dr. Levy holds joint appointments at the Uniformed Services University's National Center for Disaster Medicine and Public Health, as well as the Department of Emergency Health Services at the University of Maryland, Baltimore County. He is a member of the Scientific Advisory Council for the American Red Cross. Dr. Levy has published extensively on topics related to emergency medical services, trauma critical care and the Stop the Bleed® initiative. In 2020 he was the lead author on an interdisciplinary manuscript related to hemorrhage control.

Kathy Noll, MSN, TCRN, continues to serve as a member of the Executive Committee in her role as Treasurer of TraumaNet, and she is the Maryland State Chair for the Society of Trauma Nurses. Ms. Noll is an instructor for Advanced Trauma Care for Nurses (ATCN) courses. She is a member of the Maryland Trauma Quality Improvement Committee (TQIC), and the Maryland Committee on Trauma (MDCOT). Ms.

Noll is a member of the planning committee for the American College of Surgeons Annual Point Counterpoint Conference.

Judy Schroeder, MS, RN-BC, continues to lead trauma quality improvement activities at JHH. She plans the annual Trauma Survivor's Day Celebration and a Stop the Bleed® training program for Hopkins providers and staff. Ms. Schroeder is planning Falls Prevention week activities to include a demonstration for the staff and public on exercises and stretches for balance and flexibility, such as chair yoga, tabata, and walking, and an appearance on Midday Maryland by Hopkins nurses who will discuss the importance of a strong core to prevent falls. Trauma Education continues as a priority for the trauma center. Trauma attending physicians at JHH teach Advanced Trauma Operative Management, Advanced Trauma Life Support, and Advanced Surgical Skills for Exposure in Trauma, and Rural Trauma Team Development courses. Many of the trauma physicians were also invited speakers at numerous national and international conferences this past year. They have added expertise as session moderators, visiting professors, and keynote speakers throughout the country, and have conducted presentations for members of the US Congress and military. Dr. Greg Osgood, Chief of the Division of Orthopedic Trauma, continues to deliver lectures nationwide on orthopedic trauma techniques. An enhancement to these courses is the Johns Hopkins Medicine Simulation Center, a state-of-the-art training facility that allows trauma care professionals to refine advanced techniques utilizing practice scenarios and debriefings. Through a partnership between emergency medicine and trauma staff, clinicians are challenged to hone assessment skills, improve patient safety, and increase interdisciplinary teamwork.

■ **Fellowships and Residencies.** The Adult Trauma program welcomes three new Acute Care Surgery/Trauma Fellows: Katherine Florecki, MD; Vishnu Mani, MD; and Renaldo Williams, MD. Dr. Pamela Lipsett directs the Surgical Critical Care Fellowship. Dr. Elliott Haut is the Acute Care Surgery Fellowship Director. The program graduates two to three critical care Fellows each year.

■ **Research.** As an academic medical center, all attending trauma center faculty maintain research interest and expertise through a trauma research program directed by Dr. Haut. Extramural research funding of over \$4 million in grants and contracts have been awarded to projects with trauma surgery faculty serving as primary investigators, some of which have culminated in notable publications and presentations. Extramural funding has come from sources including the Patient-Centered Outcomes Research Institute

(PCORI), the Agency for Healthcare Research and Quality (AHRQ), the Department of Defense/Army Medical Research Acquisition Activity and the Henry M. Jackson Foundation for the Advancement of Military Medicine (HJF).

The faculty carry diverse research interests, including health services research related to trauma outcomes, trauma systems in the developing world, trauma resulting from interpersonal violence, the effects of frailty on injury outcome, prehospital trauma care, and gun violence prevention. Trauma research resulted in a significant number of peer-reviewed publications this past academic year.

JHH maintains a unique collegial relationship with JHBSPH that encompasses all facets of ongoing research. Drs. Haut and Stevens have joint faculty appointments at JHBSPH, and Dr. Haut runs the Surgery Faculty – Student Mentoring Program, which pairs master's students with faculty to perform clinical and outcomes research. The success of this program has been published in *JAMA Surgery* and has trained over 100 students, resulting in over 200 peer-reviewed manuscripts.

■ **Rehabilitation Services.** The JHH Department of Physical Medicine and Rehabilitation (PM&R) continues to provide a wide range of rehabilitation services to trauma patients, from the bedside to inpatient rehab and home services. The Comprehensive Integrated Inpatient Rehabilitation Program, opened in 2017, is a state-of-the-art, 18-bed inpatient rehabilitation unit offering unique features that include a mock apartment where patients can practice the tasks of living independently and a “streetscape” area for patients to rehearse activities of daily living, such as grocery shopping and using an ATM. The JHH PM&R also sponsors a yearly national rehabilitation conference. This year's conference focus will be on early mobilization of patients in the ICU setting.

Level II Adult Trauma Center

Johns Hopkins Bayview Medical Center

4940 Eastern Avenue, Baltimore, Maryland
MIEMSS Region III

Johns Hopkins Bayview Medical Center (JHBMC) is a designated Level II Adult Trauma Center serving eastern Baltimore City, eastern Baltimore County, and Harford and Cecil Counties. From June 1, 2020, through May 31, 2021, JHBMC treated 3,809 trauma patients according to the Maryland State Trauma Registry. An additional 777 patients underwent expedited trauma evaluations upon Emergency Department

arrival due to their prehospital EMS reports, but were not significantly injured and were not entered into the Maryland State Trauma Registry. Adult trauma care services at JHBMC are provided by the Division of Acute Care Surgery.

Mission

As a member of Johns Hopkins Medicine, Johns Hopkins Bayview Medical Center provides compassionate health care that is focused on the uniqueness and the dignity of every patient. The program is committed to providing emergency access to surgical care for acutely-injured patients with time-sensitive injuries. The program provides patient-centered comprehensive care to all trauma patients, incorporating a multidisciplinary, team-oriented approach. Under the collaborative leadership of specialized physicians, nurses, and members of the allied healthcare team, the program continues to evolve through implementation of protocols to address patient, community, and institutional needs.

Adult Trauma Center Staff

Adult Trauma Medical Director:

Raymond Fang, MD, FACS

Adult Trauma Program Manager:

Afton Jamerson, BSN, RN, TCRN, CEN

FY 2021 Annual Report

■ **Notable Accomplishments.** JHBMC remains the second busiest trauma center in the state by patient volume. The trauma and emergency surgery services of both JHBMC and The Johns Hopkins Hospital are unified under a single Division of Acute Care Surgery and provide trauma attending physician support for both trauma centers. In December 2020, JHBMC Trauma Center successfully completed the re-verification process with full designation as a Level II Trauma Center in the Maryland trauma system. JHBMC welcomed new staff in FY 2021 to include Trauma Program Manager Afton Jamerson and Associate Trauma Medical Director Dr. Madhu Subramanian. The Bayview Trauma Advanced Practice Providers (APP) Service expanded to four APPs who provide care exclusively for trauma patients facilitating more admissions to the Trauma service with the goal of better patient outcomes through dedicated, specialized care.

Bayview was excited to again celebrate trauma survivors during National Trauma Awareness Month in May 2021. The Trauma Center welcomed back a survivor and their family and celebrated his recovery with a video presentation, speakers, and lunch. Trauma team members also participated in the “Race to Rebuild 5K” to support trauma survivors during Trauma Awareness Month.

■ **Quality Management and Improvement.**

JHBMC continues to strengthen its quality management process by striving to continuously improve patient care and outcomes at the individual and system level. The multi-disciplinary Trauma Joint Practice Committee consisting of department liaisons from Emergency Medicine, Trauma Surgery, Orthopaedic Surgery, and Neurosurgery reviewed patient care in order to enhance multidisciplinary collaboration and identify improvement opportunities. Trauma Services has become a leader in performance improvement for JHBMC, closely collaborating with hospital quality committees that are dedicated to patient safety and improving patient outcomes outside of trauma care. Trauma and Emergency Medicine provider and nursing leadership meet monthly for case review sessions. Two shared Trauma/Emergency Department Performance Improvement nurses provide expert bedside trauma care while mentoring their Emergency Department nursing colleagues.

■ **Injury Prevention Programs and Initiatives.**

JHBMC injury prevention efforts were impacted by social distancing restrictions related to the COVID-19 pandemic. JHBMC did successfully hold their first “Stop the Bleed®” marathon training throughout the day on “National Stop the Bleed Day®” in May 2021. The hybrid training was offered by both video-conferencing and small group sessions to all hospital employees. JHBMC looks forward to re-focusing injury prevention initiatives on the two most common injury mechanisms presenting at the trauma center in FY 2022: falls and motor vehicle crashes.

■ **Emergency Medical Services and Nursing**

Continuing Education. JHBMC supported semi-annual education for prehospital EMS clinicians with trauma and burn injury content at two full-day, virtual educational seminars in fall 2020 and spring 2021. Enhancing the knowledge of frontline nurses at JHBMC is crucial to improving patient outcomes. JHBMC supports nursing staff attendance to the Emergency Nurses’ Association Trauma Nursing Core Curriculum (TNCC). JHBMC proudly supports nurses pursuing national certification in trauma nursing with five registered nurses obtaining the Trauma Certified Registered Nurse (TCRN) designation by the Board of Certification for Emergency Nursing. JHBMC trauma program members actively support the Maryland Committee on Trauma’s Advanced Trauma Life Support and Advanced Trauma Care for Nurses Courses as Course Directors and Instructors.

■ **Research.** The integrated Division of Acute Care Surgery provides JHBMC with opportunities to join new and ongoing research initiatives focused on trauma care.

■ **Rehabilitation.** Approximately one-third of admitted trauma patients require a period of rehabilitative care after hospitalization, especially older patients with preexisting comorbidities. JHBMC has access to an inpatient acute rehabilitation center on its campus to care for patients appropriate for this level of care. JHBMC Social Work and Case Management services assess each individual patient's post discharge care needs prior to hospital release.

Level II Adult Trauma Center

University of Maryland Capital Region Medical Center

901 Harry S. Truman Dr. N., Largo, Maryland
MIEMSS Region V

As the second busiest trauma center in Maryland, the University of Maryland Capital Region Medical Center (Cap Region) is a designated Level II Adult Trauma Center serving Prince George's County and other adjacent areas, including Washington, DC. The hospital is in close proximity to four major highways, making the facility a prime location for local EMS transport and public access. Prior to our move to Largo on June 12, 2021, the University of Maryland Prince George's Hospital Center treated 2,916 trauma patients from June 1, 2020, through May 31, 2021, according to the Maryland State Trauma Registry. (See pages 83 to 88 for additional patient data.)

Mission

The University of Maryland Capital Region Health is committed to restoring the quality of life for all of our patients, beginning with prehospital communication, and extending during their hospital stay and long after discharge. Our dedication to our patients extends to their families and the communities in which they live by providing state-of-the-art clinical care delivered with compassion, dignity, and respect. We demonstrate our mission by providing exemplary care for each of our patients and their families, enhancing health and wellness, providing highly specialized services to a broad community, and building an environment where each person is valued and respected. Our mission is to the community, both in treatment of diseases as well as in the pursuit of prevention strategies.

Adult Trauma Center Staff

Adult Trauma Medical Director:

Anthony Tannous, MD, FACS

Adult Trauma Program Director:

Dawn Moreland, BSN, RN, TCRN

FY 2021 Annual Report

■ **Notable Accomplishments.** Anthony Tannous, MD, FACS, assumed the role of Trauma Medical Director on June 18, 2021, leading the Acute Care Surgery (ACS) team to a successful transition to our new site at the University of Maryland Capital Region Medical Center in Largo. Cap Region is a state-of-the-art facility and home to a large trauma resuscitation unit with four treatment bays and a procedure room, one operating room dedicated for surgical care of the trauma patient, and one hybrid operating room for multidisciplinary care. Our all-private in-patient units enhance the focused care and recovery of the injured and boost patient satisfaction.

The simultaneous implementation of a new and improved electronic health records system, Epic, allows for advanced technological functionality with clinical workflows and leverages usability and efficiency.

The ACS faculty now consist of five full-time and two part-time surgeons, as well as two community-practice surgeons. The team also hosts rotating acute care surgery fellows from the University of Maryland R Adams Cowley Shock Trauma Center in Baltimore and supports the education of Howard University surgery residents at every level of their training.

All members of our trauma teams are board-certified in surgical critical care and provide intensive care for our trauma patients in the surgical intensive care unit, a transition that took place in October 2020.

In August 2021, the ACS program welcomed residents from the Walter Reed Medical Center, joining the ACS board-certified Surgical Intensivist lead team in the critical care areas of Cap Region.

■ **Quality Management and Improvement.** Our ACS quality management program remains successful with the collaborative efforts of a multidisciplinary care team that align positive patient outcomes with clinical expertise and best practices. Through multiple monthly comprehensive case and peer reviews, loop closures and process improvement initiatives represent our commitment to improving care and outcomes of injured patients. Leading Cap Region in Structured Interdisciplinary Bedside Rounds (SIBR), the team's unified approach engages the patient and family and provides important wraparound support from care management, ancillary services, nurse leaders, and members of the executive team for enhanced throughput management. Strong collaborations enable the ACS program to have an overall institutional commitment to the care of the injured patient and ensures access to necessary resources.

■ **Injury Prevention Programs and Initiatives.** Injury-specific prevention and awareness resources are shared with in-patients during daily rounds by our

Injury Prevention and Outreach Coordinator. During National Trauma Awareness month in May, we hosted a Trauma Awareness table and provided information and resources on Stop the Bleed®, Fall Prevention, Wheel of Prevention, which includes road safety, water safety, and fire safety. Unfortunately, due to continued restrictions amidst the COVID-19 pandemic, education and outreach activities are restricted for the community and visitors. We hope to offer additional in-person education and outreach activities in the near future.

Our Capital Region Violence Intervention Program (CAP-VIP) continues to make strides in interrupting the cycle of violence and associated recidivism. Our weekly virtual Men’s Trauma Recovery Empowerment Model (M-TREM) meetings allow for continued contact with survivors ensuring the necessary mental health and resource support needed for a full recovery, post-discharge, are identified and provided.

The John “Jack” Godfrey Traumatic Brain Injury Support Group for survivors and caregivers continues via a monthly virtual platform and continues to grow. The support group is facilitated by our Trauma Social Worker and a Speech and Language Pathologist and addresses emotional, physical, resource, and support needs.

■ **Emergency Medical Services and Nursing Continuing Education.** Cap Region offers ongoing education to nursing staff for the care of the injured patient, including a web-based orientation to the care of the injured patient and Trauma Nursing Core Course (TNCC) courses. To enhance learning and build relationships, our ACS team is involved in multiple unit-specific extended-learning opportunities for care providers and identified a surgeon liaison to our local EMS departments. Included in this learning model are military personnel from joint-base institutions to allow pre-deployment, hands-on experience and exposure.

■ **Research.** Cap Region’s Trauma Registry and ACS team supports internal, local, and multi-institutional research efforts to identify trends, improve outcomes, and evaluate injury prevention efforts. Most notably, co-authoring research articles related to the impact of the COVID-19 pandemic on injury prevalence – a multicenter study, featuring interesting cases from clinical experiences.

■ **Rehabilitation.** We maintain a constant collaboration with the Physical Medicine and Rehabilitation team to ensure that the physical, occupational, and speech-language therapy needs of the injured patient are met. Acute Care Rehabilitation needs are identified early during daily SIBR rounds for safe disposition planning and additional care and support.

Level II Adult Trauma Center

Sinai Hospital

2401 West Belvedere Avenue, Baltimore, Maryland
MIEMSS Region III

Sinai Hospital (Sinai) is a designated Level II Adult Trauma Center serving the Greater Baltimore metropolitan area. Sinai treated 2,271 trauma patients from June 1, 2010, through May 31, 2021, according to the Maryland State Trauma Registry. (See pages 83 to 88 for additional patient data.) Adult trauma services at Sinai are provided by the Acute Care Division of Surgery.

Mission

Sinai Hospital is part the LifeBridge Health System. Under the leadership of President Daniel Blum, our mission is to maintain and improve the health of the individuals and communities we serve through compassionate, high-quality care. LifeBridge Health offers comprehensive treatment and preventative wellness services. In addition, Sinai Hospital is dedicated to educating medical students and residents, and engaging in research to improve lives throughout Maryland and worldwide.

Adult Trauma Center Staff

Trauma Medical Director:

Hashim Hesham, MD, FACS

Trauma Program Manager:

James Gannon MS, RN, CEN

FY 2021 Annual Report

■ **Notable Accomplishments.** Trauma Program Manager James Gannon, MS, RN, CEN, took over as Chairman of the Maryland Trauma Center Network (TraumaNet) on January 1, 2021. TraumaNet is a multidisciplinary organizational advocacy group focused on issues regarding the provision of trauma care within the Maryland Trauma System.

Dr. Farheen Qurashi, MD, FACS, Medical Director of the Surgical Intensive Care Unit at Sinai Hospital and Trauma Attending Surgeon, was appointed Co-Chair of TraumaNet’s Legislative Committee. Dr. Qurashi is a strong advocate of injury prevention, performance improvement, and quality assurance for Maryland’s trauma system.

Lindsay Cromwell, RN, BSN, MHA, HQS, joined Sinai’s Division of Trauma in January 2021 as the Quality, Safety & PI coordinator for the Department of Surgery and Division of Trauma. Prior to her new role, Ms. Cromwell served in various leadership positions in surgical and procedural departments at

Sinai and other Baltimore area hospitals. Lindsay is master's-prepared in Health Care Administration, with a focus in project management, from Stevenson University and post-master's from George Washington University in Healthcare Quality and Safety. She looks forward to utilizing her passion and skills for safety and performance improvement to help create and implement evidence-based practices and strategies for the department of surgery.

■ **Injury Prevention Programs and Initiatives.**

In November 2020, Sinai hospital began teaching Stop the Bleed® in a partially virtual format. Trauma attending surgeon Dr. Farheen Qurashi recorded a Stop the Bleed® lecture to provide the material in a virtual format. In response to COVID-19 restrictions, the hands-on portion of the classes were held in a limited capacity but continued to allow Sinai Hospital to provide this life-saving education.

Sinai continues to be active in community injury prevention initiatives. The Street Violence Intervention Program (SVIP) continues to expand in Baltimore's Park Heights community. In collaboration with Safe Streets, SVIP identifies trauma patients who are victims of street violence to help intervene and provide them with alternatives to violence. The team intervenes to offer our patients safety, positive and productive growth opportunities, and other support the individuals may need. We continue to attempt to recognize persons susceptible to street violence and intervene before they commit a retaliatory act or become a victim of trauma again.

In November 2020, Trauma Program Manager James Gannon gave a recorded virtual talk on fall prevention to Sinai's community partners. The talk addressed the unique challenges the COVID-19 pandemic presented for our aging population. This included ensuring regularly checking on the elderly, resources for medication and food delivery services, addressing safety concerns while socially distancing at home, encouraging the older population to continue speaking with their health care providers, and the safety of seeking medical and injury attention in hospitals when needed.

■ **Quality Measures and Improvements.** Sinai Trauma Services continues to be active in quality improvement initiatives. Partnering with our system-wide LBH Quality and Patient Safety Department and various multidisciplinary hospital committees allows Trauma Services to concurrently and retrospectively review cases individual, unit, divisional and system levels. Through a large multidisciplinary approach, providers from all services involved in the injured persons' care routinely review and implement best practices to improve the outcomes and experience for our trauma population.

■ **Emergency Medical Services and Nursing Continuing Education.** In FY 2021, Sinai Hospital's Emergency Department underwent a complete remodeling and facelift. These renovations included an Emergency Medical Services (EMS) clinician area with 24-hour refreshments and break area. Sinai Hospital engaged our EMS clinicians to become actively involved in quality assurance and improvement through surveys and providing them with a direct email to the Quality Department of the Division of Trauma. Through this direct communication, EMS clinicians can receive timely feedback regarding patient care and quality and are invited to participate in our monthly Morbidity and Mortality conferences. Sinai Hospital continues to actively partner with our EMS colleagues to collaborate on wait times, patient off-loading, diversion, and the construction of our new Emergency Department.

Over the course of FY 2021, the Division of Trauma provided information for nursing trauma continuing education through the many virtual conferences that were offered nationally. Sinai's Emergency Department worked with the Emergency Nurses Association (ENA) to provide their staff with Trauma Nurse Core Course (TNCC) and Emergency Nurse Pediatric Course (ENPC) via a virtual platform to ensure our staff could receive advanced trauma nursing training. Sinai Hospital's Education Resource Center also transformed Advanced Cardiac Life Support (ACLS), Pediatric Advanced Life Supports (PALS), and Basic Life Support (BLS) onto virtual platforms with modified hands-on classes.

The simulation lab at Sinai also adapted to COVID-19 social distancing restrictions by providing modified hands-on instruction, multidisciplinary training, and team-building opportunities. These modifications included trauma simulations with attendings, residents, and nursing staff dressing in full personal protective equipment.

■ **Fellowships and Residencies.** Sinai continues to boast a full staff of fellowship-trained acute care surgeons providing in-house 24/7 coverage, 21 surgical residents ranging from interns through fifth year who have extensive training in trauma care, and a dedicated and experienced advanced practice provider staff.

Sinai is the third largest teaching hospital in the state, training residents in multiple specialties. All surgical residents and advanced practice providers at Sinai maintain current ATLS, ACLS, and BLS certifications. The surgical residents also have the opportunity to pursue additional trauma training in Advanced Trauma Operative Management, Focused Abdominal Sonography in Trauma, and Advanced Surgical Skills for Exposure in Trauma. Our residents complete four-

week rotations at the University of Maryland R Adams Cowley Shock Trauma Center during their post-graduate III year, focusing on treating soft-tissue injuries, and at Johns Hopkins Bayview Medical Center during their post-graduate II year, focusing on burn surgery and wound care

■ **Research.** LBH Department of Research provides opportunities for all levels of providers and staff to participate in research initiatives, including those that advance trauma care.

■ **Rehabilitation.** Sinai rehabilitation services are integrated throughout the patient's hospital stay. When a patient is ready for discharge, Sinai can accommodate qualifying patients in a 43-bed inpatient rehabilitation center. A full spectrum of acute rehabilitation services is offered, including pain management, aquatic therapy, physical therapy, occupational therapy, and speech-language therapies. The rehabilitation center also supports patients with specialists in physiatry, social work, rehab psychology, offers programs for individuals with balance and dizziness, driving evaluations, return-to-work programs, and a brand-new division of rehabilitation engineering.

Level II Adult Trauma Center

Suburban Hospital – Johns Hopkins Medicine

8600 Old Georgetown Road, Bethesda, Maryland
MIEMSS Region V

Suburban Hospital – Johns Hopkins Medicine (Suburban) is a designated Level II Adult Trauma Center serving Montgomery County, but is also easily accessible from Frederick and Prince George's Counties. Suburban treated 1,969 trauma patients from June 1, 2020, through May 31, 2021, according to the Maryland State Trauma Registry. (See pages 83 to 88 for additional patient data.) Adult trauma services at Suburban are provided by the Trauma and Emergency Surgery Section of the Department of Surgery.

Mission

Suburban Hospital's mission is improving health with skill and compassion. As a member of Johns Hopkins Medicine, Suburban Hospital is committed to fostering the development of an integrated and innovative system of care that provides state-of-the-art clinical care, supported by a strong base of medical research and education. The Board of Trustees continues to reaffirm its commitment to providing all the resources and the infrastructure necessary for a Level II trauma designation, and the entire staff of Suburban Hospital remains dedicated to the delivery of safe and individualized

quality medical care that is so much appreciated by patients and families.

Adult Trauma Center Staff

Trauma Medical Director:

Dany Westerband, MD, FACS

Trauma Program Director:

Melissa E. Meyers, RN, BSN, MBA

FY 2021 Report

■ **Notable Accomplishments.** Suburban Hospital's campus-wide transformation was completed in March 2020. The renovations included a 300,000 sq. ft. addition, a parking garage and dedicated ambulance driveway with direct access to the Emergency Department entrance, and the construction of an upgraded suite of 14 state-of-the-art operating rooms adjacent to the trauma bay, including one hybrid operating room for enhanced imaging capabilities during procedures. In addition to the operating suite, 108 new private patient rooms with enhanced infection control and patient privacy were added.

■ **Injury Prevention Programs and Initiatives.**

Due to COVID-19, all Stop the Bleed® programs were suspended in March 2020. Since September 2016, Suburban had been an active participant in the national Stop the Bleed® campaign, thanks to generous donations made by the Wolpoff Family Foundation. These funds were used to purchase training mannequins and tourniquets, as well as wall-mounted Stop the Bleed® kits that remain strategically placed throughout the hospital.

■ **Quality Management and Improvement.** In an effort to identify opportunities for improvement at all levels, Suburban's comprehensive care review process was significantly strengthened to include a review of every trauma chart by the trauma clinical data abstractor, the trauma performance improvement nurses, the trauma program director, and the trauma medical director. In addition, all deaths, transfers out, and complications continue to be presented at the monthly multidisciplinary trauma Morbidity and Mortality Conference.

■ **Emergency Medical Services and Nursing Continuing Education.** Suburban's Emergency Department continues to be a training site for pre-hospital care clinicians through an agreement with the Montgomery County Training Academy and Montgomery County Community College. Due to the COVID-19 pandemic, the spring 2021 Critical Issues in Trauma seminar was cancelled. However, the conference is expected to be offered in the spring of 2022.

■ **Research.** Suburban continues to participate in the National Institutes of Health study on mild to moderate traumatic brain injuries, with the goal of advancing

knowledge on mechanisms of brain injury and recovery, and developing better diagnostic tools and more effective treatments.

■ **Rehabilitation.** Suburban retains a memorandum of understanding with Adventist HealthCare Rehabilitation Center to provide rehabilitation services. Occupational, physical, and speech therapy are provided onsite to trauma patients during their hospital stay. All admitted trauma patients are assigned a case manager who works closely with the trauma team to make appropriate referrals to rehabilitation facilities.

Level III Adult Trauma Center

Meritus Medical Center

11116 Medical Campus Road, Hagerstown, Maryland
MIEMSS Region II

Meritus Medical Center (MMC) is a designated Level III Adult Trauma Center serving Washington and Frederick Counties in Maryland, southern Pennsylvania, and the eastern panhandle of West Virginia. MMC treated 2,421 trauma patients from June 1, 2020, through May 31, 2021, according to the Maryland State Trauma Registry (See pages 83 to 88 for additional patient data). Adult trauma services are provided by the staff of the emergency department.

Mission

To improve the health status of our region by providing comprehensive health services to patients and families.

Adult Trauma Center Staff

Trauma Medical Director:

Joseph Schulz, MD

Trauma Program Manager:

Susie Burtleson, DNP, MBA, RN

FY 2021 Annual Report

■ **Notable Accomplishments.** In FY 2021, MMC provided continuing education through its biannual trauma conferences to more than 300 clinicians, including EMS, hospital staff and other local health care providers outside the organization.

MMC provided a Trauma Care after Resuscitation class for 28 nurses throughout the organization who provide care to the trauma patients.

MMC implemented an Acute Care Emergency Surgery/Trauma program in the organization.

MMC's emergency room received Geriatric Emergency Department Accreditation (GEDA) from the American College of Emergency Physicians.

■ **Quality Management and Improvement.** Throughout the past year, MMC trauma center staff

worked to improve trauma documentation. To help identify those patients who do not present as trauma patients, but clearly meet the trauma criteria, the staff ensures that each patient has a complete vital signs assessment upon arrival and discharge. We have implemented changes to our electronic health record to allow for questions to provide documentation needed. The trauma team has also redesigned the workflow in the trauma rooms to allow for better movement and care of the trauma patient. The trauma center staff has also worked with the ED physicians and pharmacy to help provide antibiotics within one hour of arrival for open fractures.

■ **Injury Prevention Programs and Initiatives.**

In FY 2021, MMC participated in statewide injury prevention days, promoting distracted driving awareness and falls prevention. MMC trauma staff taught several virtual Stepping On classes in the community to help decrease falls among the elderly.

MMC worked collaboratively with Safe Kids Washington County to provide bicycle, fire, poison, sun, and pedestrian safety education to 1,135 children in the community. MMC also partnered with local summer camps to discuss overall safety with children.

In addition to car seat checks and loaner programs (see Notable Accomplishments at left), MMC trauma staff offered one-on-one car seat installation assistance to families in the community, teaching parents and grandparents how to properly install child passenger safety seats. During this time, MMC offered virtual car seat checks to assist families with proper installation.

■ **Emergency Medical Services and Nursing Continuing Education.** In FY 2021, MMC organized free trauma conferences for staff and EMS partners and provided trauma nurse core curriculum and emergency nursing pediatric care courses at the hospital.

Each spring, the trauma department team recognizes a Trauma Nurse of the Year for his/her outstanding care of patients. The honoree is granted an educational stipend to spend at a trauma conference.

■ **Research.** MMC has a professional nursing research council that studies evidence-based best practices in nursing, including a recent study on nurses' perception of "quiet time" in the critical care unit.

■ **Rehabilitation.** Meritus Total Rehab Care (TRC) is the largest, most comprehensive rehabilitation center in the region, providing care in an inpatient hospital unit, as well as at an outpatient facility located in Robinwood Professional Center, adjacent to the hospital. The medical director, nursing staff, therapists, social workers and program managers at TRC work together to provide innovative treatment to patients. A full range of rehabilitation programs is available at the center, including comprehensive adult inpatient rehabilitation, outpatient pediatric and adult services,

traumatic brain injury rehabilitation and an inpatient joint replacement program. TRC's inpatient rehabilitation unit is certified to meet national rehabilitation standards set forth by the Commission on Accreditation of Rehabilitation Facilities (CARF).

Level III Adult Trauma Center

TidalHealth Peninsula Regional

100 East Carroll Street, Salisbury, Maryland
MIEMSS Region IV

TidalHealth Peninsula Regional is a designated Level III Adult Trauma Center serving the Delmarva Peninsula, Sussex County in southern Delaware, and Accomack County in Northern Virginia. TidalHealth encompasses the former Peninsula Regional Health Systems, Nanticoke Memorial Hospital, McCready Memorial, the Peninsula Regional Medical Group, Nanticoke Physician Network, Delmarva Heart, Peninsula Cardiology. TidalHealth treated 1663 trauma patients from June 1, 2020, to May 31, 2021, according to the Maryland State Trauma Registry. (See pages 83 to 88 for additional patient data.) Adult trauma services at TidalHealth Peninsula Regional are provided by the Emergency/Trauma Center.

Values

Quality. Service. Community. These values set the foundation for our culture and purpose, and they are the driving force behind our attitudes and actions.

Mission

Improve the health of the communities we serve.

Adult Trauma Center Staff

Trauma Medical Director:

Brion McCutcheon, MD

Trauma Program Manager:

Kari Cheezum, MSN, RN, CEN, TCRN

FY 2021 Annual Report

■ **Notable Accomplishments.** The trauma department was able to establish a program to provide car seats to families that needed replacement seats after motor vehicle collisions with the assistance of Maryland Kids in Safety Seats and MIEMSS' CPS Healthcare Project. To improve communication and performance improvement regarding trauma care throughout the organization, an email account dedicated for trauma PI was created. The PowerPoint modules utilized for trauma orientation were updated.

■ **Quality Management and Improvement.** TidalHealth has been working on several quality

improvement initiatives this past year. In an effort to continue to improve trauma documentation, trauma and ED leadership continue to work with the EPIC healthcare software team to improve Trauma Narrator, an EPIC proprietary application, making it more user-friendly for clinicians. Working with clinical staff, a multi-disciplinary team continues to work to improve quality metrics, including vital signs, antibiotics for open fractures, time to head CT, and door to reversal times for anticoagulated patient with abnormal imaging. New processes were implemented regarding ordering of head CT's for anticoagulated patient's, as well as time of order to time of administration of medication. Over the past year, the trauma department worked to provide daily feedback to staff regarding trauma care and documentation. Mandatory trauma simulation training was offered monthly to all staff. The trauma activation naming convention was changed from Trauma Red and Trauma Yellow, to Trauma Level One for the highest trauma activation and Trauma Level Two for the modified trauma team activation.

■ **Injury Prevention Programs and Initiatives.**

TidalHealth Peninsula Regional continues to coordinate and participate in community-based injury prevention initiatives. The trauma department had planned to focus on the two most common injury mechanisms presenting to the trauma center – falls and motor vehicle collisions – but the COVID-19 pandemic required the cancellation of the April distracted driving statewide injury campaign as well as the September Fall Prevention Day. The 2nd National Trauma Survivors Celebration that was scheduled in May was also canceled due to the pandemic. Although In-person car seat checks were cancelled, staff were able to provide education regarding the dangers of hot cars. Injury prevention messages were shared on social media throughout the year. Staff also continue to support the nationwide Stop the Bleed® campaign to deliver hemorrhage control education to the public by offering training to local businesses, organizations, private clubs, churches, and community members.

■ **Emergency Medical Services and Nursing**

Continuing Education. Because of the COVID-19 pandemic, many of the in-person educational events were cancelled in 2020. TidalHealth continues to assist in planning, coordinating, and sponsoring regular educational events for prehospital and hospital health care providers. The Trauma Conference, which was postponed in 2020, is scheduled for September 2021.

Conference topics are applicable to the daily practice of prehospital care as well as to advanced inpatient trauma care. This annual regional conference continues to attract nurses and EMS clinicians from Maryland, Delaware, Pennsylvania, and Virginia. As in previous

years, in FY 2021, TidalHealth continued to provide educational classes, such as Advanced Life ALS Skills and paramedic recertifications/refreshers, to EMS clinicians in Worcester, Wicomico, and Somerset Counties. TidalHealth also supports Wor-Wic Community College EMS programs as a clinical site for students.

■ **Rehabilitation.** TidalHealth maintains an in-house rehabilitation program that offers physical, occupational, and speech therapy. TidalHealth offers inpatient skilled nursing care at Alice B. Tawes Nursing & Rehab in Crisfield, MD, for those patients recovering from injury. The hospital retains a memorandum of understanding with HealthSouth Chesapeake Rehabilitation Hospital in Salisbury and other appropriate centers to provide care to those who require additional resources and time to recover from traumatic injuries.

Level III Adult Trauma Center

UPMC Western Maryland

12500 Willowbrook Road, Cumberland, Maryland
MIEMSS Region I

UPMC Western Maryland is a designated Level III Adult Trauma Center serving Allegany and Garrett Counties. UPMC Western Maryland treated 506 trauma patients from June 1, 2020, to May 31, 2021, according to the Maryland State Trauma Registry. Adult trauma services at UPMC Western Maryland are provided by the Emergency Department.

Mission

To serve our community by providing outstanding patient care and to shape tomorrow's health system through clinical and technological innovation, research, and education.

UPMC Western Maryland Vision

UPMC will lead the transformation of health care. The UPMC model will be nationally recognized for redefining health care by:

- *Putting our patients, health plan members, employees, and community at the center of everything we do and creating a model that ensures that every patient gets the right care, in the right way, at the right time, every time.*
- *Harnessing our integrated capabilities to deliver both superb state-of-the-art care to our patients and high value to our stakeholders.*
- *Employing our partnership with the University of Pittsburgh to advance the understanding of disease, its prevention, treatment, and cure.*
- *Serving the underserved and disadvantaged and*

advancing excellence and innovation throughout health care.

- *Fueling the development of new businesses globally that are consistent with our mission as an ongoing catalyst and driver of economic development for the benefit of the residents of the region.*

UPMC Western Maryland Values

- *Quality and Safety – We create a safe environment where quality is our guiding principle.*
- *Caring and Listening – We listen to and care for our patients, our health plan members, our fellow employees, our physicians, and our community.*
- *Dignity and Respect – We treat all individuals with dignity and respect*
- *Excellence and Innovation – We think creatively and build excellence into everything that we do.*
- *Responsibility and Integrity – We perform our work with the highest levels of responsibility and integrity.*

UPMC Western Maryland is caring for what matters most.

Adult Trauma Center Staff

Trauma Medical Director: Milton Lum, MD, FACS
Trauma Program Manager: Elizabeth Wooster, RN
Trauma Registrar: Christine Clites

FY 2021 Annual Report

■ **Quality Management and Improvement.**

Effective February 1, 2020, Western Maryland Health System officially became UPMC Western Maryland, merging into the University of Pittsburgh Medical Center (UPMC) hospital network to ensure a future of high-quality patient care for communities in western Maryland and the surrounding region for generations to come. Becoming part of UPMC allows us to further enhance healthcare services, leverage UPMC's innovation and clinical expertise, advance quality initiatives, and continue our longstanding commitment to provide superior, compassionate care to patients throughout our tristate service region. In FY 2021, trauma services at UPMC Western Maryland utilized policies to standardize patient care and improve patient outcomes based on evidence-based best practices. UPMC Western Maryland is enrolled in the American College of Surgeons Trauma Quality Improvement Program in an effort to streamline and benchmark quality.

UPMC Western Maryland's multidisciplinary team approach is designed to serve the unique needs of each patient. In addition, staff work diligently to facilitate communication between hospital and pre-

hospital personnel. To support this goal, in addition to the base station, UPMC Western Maryland maintains representation on the Miltenberger Emergency Services Seminar planning committee, the MIEMSS Region I EMS Advisory Council, and the Maryland Trauma Center Network (Trauma Net), Maryland EMS Protocol Revision Team for Trauma, Allegany County Emergency Services Quality Assurance Board, Allegany County Medical Review Board, Maryland Region I & II Healthcare Council, the MIEMSS Region I Prehospital Care and Quality Improvement Committee, and has served on the State of Maryland EMS Plan Steering Committee.

■ **Injury Prevention Programs and Initiatives.** UPMC Western Maryland, along with the Allegany County Department of Emergency Services and the Garrett County Department of Public Safety, teaches Stop the Bleed® courses to local EMS/fire/law enforcement and citizens of MIEMSS Region I and surrounding bordering counties in Pennsylvania and West Virginia. Efforts continue throughout the region, with more than 75 current instructors serving requests for the Stop the Bleed® program.

UPMC Western Maryland also participated in Distracted Driving Prevention Awareness Day in April 2021, an initiative of the Maryland Trauma Quality Improvement Committee. UPMC Western Maryland has partnered with the YMCA and HRDC to provide Stepping On classes. Stepping On is a proven program designed to build confidence and reduce falls for adults. Stepping On leaders coach you to recognize your risk of falling and help you build the balance, strength, and practical skills you need to avoid falling. You learn in a fun, hands-on way, putting information to use from the very first session.

■ **Emergency Medical Services and Nursing Continuing Education.** UPMC Western Maryland is the trauma education hub for MIEMSS Region I and offers continuing education credit for Advanced Cardiac Life Support, Pediatric Advanced Life Support, Neonatal Advanced Life Support, and Trauma Nursing Core Course. UPMC Western Maryland working with Garrett College also offers cadaver lab clinical competency for physicians, nurses, and paramedics. UPMC Western Maryland is part of the planning team and provides course lectures yearly at the Annual Miltenberger Emergency Services Seminar. UPMC Western Maryland educational offerings also include skills training for nurses, emergency department technicians, and EMS clinicians, as well as multidisciplinary case reviews.

■ **Rehabilitation.** The 13-bed Comprehensive Inpatient Rehabilitation Unit, located within UPMC Western Maryland, operates 24/7 to provide rehabili-

tation services to its trauma patients. Although each patient's needs are unique, the overall mission of the inpatient program is to improve ability for self-care, movement, and communication; reduce limitations; promote wellness and self-worth; plan for after rehabilitation care; and return individuals to their homes and communities.

Out-of-State Adult Trauma Center **MedStar Washington Hospital Center**

110 Irving Street, NW, Washington, DC

Adult Trauma Center Staff

Adult Trauma Medical Director:

Christine T. Frankiem, MD, FACS

Adult Trauma Administrative Director:

Susan Kennedy, RN, BSN

The MedSTAR (Medical Shock/Trauma Acute Resuscitation) Trauma Unit at MedStar Washington Hospital Center is the regional referral center for critical multiple trauma, treating individual victims of traumatic injury and multiple victims of mass trauma occurrences.

In the heart of the nation's capital, the Center has responded to thousands of medical crises, including treating patients of the September 11, 2001, terrorist attack on the Pentagon, victims of the Navy Yard shootings in 2013, and the active assailant attack on the Congressional Baseball Game for Charity in 2017.

MedSTAR is verified by the American College of Surgeons as a Level I Facility. MedSTAR serves as a referral center for a 150-mile radius of the hospital, receiving critical trauma patients from the District of Columbia, Maryland, Virginia, Delaware, and Pennsylvania. It provides both air and ground transport via MedSTAR Transport, bringing in patients from referring hospitals and from the site of injury. MedSTAR treated 2,426 trauma patients in FY 2021.

Mission

MWHC is dedicated to delivering exceptional patient-first health care. We provide the region with the highest quality and latest medical advances through excellence in patient care, education, and research. Our guiding principle is to treat each patient as we would a member of our own family by providing the best medical treatment with care and compassion, responsive service, and intelligent use of resources. Through this achievement, we will be recognized as a national model for excellence in patient-centered care.

Adult Burn Center

Johns Hopkins Bayview Medical Center

4940 Eastern Avenue, Baltimore, Maryland
MIEMSS Region III

The Burn Center at Johns Hopkins Bayview Medical Center (JHBMC) serves the residents of Maryland and specific regions of adjacent states. The Burn Center provides a comprehensive, nationally recognized program of care for patients with burn injuries. In FY 2021, JHBMC treated 816 patients – 262 inpatients and 554 patients either in the emergency room or under observation.

Mission

JHBMC, a member of Johns Hopkins Medicine, provides compassionate health care focused on the uniqueness and dignity of each person we serve. We offer this care in an environment that promotes, embraces, and honors the diversity of our global community. With a rich and long tradition of medical care, education and research, we are dedicated to providing and advancing medicine that is respectful and nurturing of the lives of those we touch.

Adult Trauma Center Staff

Burn Medical Director:

C. Scott Hultman, MD, MBA, FACS

Burn Fellowship Program Director:

Julie Caffrey, DO, MS

Burn Program Coordinator:

Emily Werthman, MSN, RN

FY 2021 Annual Report

■ **Notable Accomplishments.** In FY 2021, the Johns Hopkins Burn Center addressed the multi-faceted needs of burn patients during the unprecedented COVID-19 pandemic. While many specialties saw declining patient volumes, the Burn Center saw an increase in burn patients requiring treatment. In addition to continuing to provide in-person burn care for hospitalized patients and patients presenting to the emergency room, the Burn Center began seeing patients through telehealth. Burn surgeons, nurses, social workers, and rehabilitation therapists collaborated to develop innovative, individualized plans of care to reduce length of stay.

While pivoting to meet the demands of providing care during a pandemic, the Burn Center continued its tradition of excellence in patient care with the continued support of vital programs rooted in evidence-based practice. Current initiatives to better serve the patients

of the Burn Center include quality improvement programs aimed at decreasing hospital acquired infections, decreasing pain, improving functional outcomes of burn patients, and improving fluid resuscitation in large burns. In addition, the research program of the Johns Hopkins Burn Center remains vital, with multiple peer-reviewed publications and presentations at both regional and national conferences. The Burn Center also serves a vital role in educating about burn care through educational offerings for prehospital and hospital-based clinicians, including students. This year, in light of precautions related to the COVID-19 pandemic, the Burn Center offered education and outreach virtually.

The Johns Hopkins Burn Center maintains American Burn Association (ABA) verification, thus making it the only adult ABA-verified burn center in the state of Maryland. In FY 2020, the ABA re-verified the Burn Center.

■ **Quality Management and Improvement.** The Burn Center maintains a system for tracking and responding to a variety of quality improvement metrics, including time to the operating room, hospital-acquired infections, wound infections, and pressure injuries, among others. These metrics are reported and discussed in a multidisciplinary format monthly. The Burn Joint Practice Committee examines trends in care and quality.

■ **Injury Prevention Programs and Initiatives.** The Johns Hopkins Burn Center realizes the importance of community outreach and education. Carrie Cox, MSN, RN, is the Community Outreach and Education Coordinator for the Burn Center. In FY 2021, the Burn Center was unable to participate in community-based outreach programs due to pandemic restrictions. However, Burn Center staff continued to provide burn prevention education and information for its in-patient families upon discharge. Community outreach activities, including statewide health and safety fairs and programs in burn prevention, will resume in the fall of 2021. In addition, burn staff will again be able to participate in outreach activities with burn survivors, including World Burn Congress, SOAR, and the JHBMC burn survivor support group.

■ **Prehospital/EMS/Nursing Continuing Education.** Clinical education for healthcare professionals who may encounter burn patients throughout the region is of vital importance for the Burn Center. Prehospital and clinician education includes Advanced Burn Life Support Courses coordinated at our institution biannually. These courses were held virtually this past year, but will resume in-person this October. The Burn Center offers an EMS/Firefighter Burn Course throughout the region for prehospital clinicians. We participate annually in Emergency Medical Technician ALS updates in many counties within Maryland. We

also lecture frequently at EMS Regional Conferences and offer education through our institution's EMS Care Conference. Outside hospital conferences and lectures are provided throughout the region upon request. In FY 2021, the Burn Center provided much of this education virtually. Onsite clinical training for medical, nursing, rehabilitation, psychology, and dietician students has resumed as of July 1, 2021. The Burn Center also provides educational presentations at many colleges and universities throughout the region for various health disciplines including, physician assistants, nurses, physical and occupational therapy, and prehospital clinicians.

■ **Research.** Currently, there are research collaborations with multiple disciplines including critical care, nursing, infectious disease, palliative care, rehabilitation, and psychology. The Burn Center is involved in sponsored clinical trials, federally funded multicenter trials, and investigator-initiated research. The Michael D. Hendrix Burn Research Laboratory actively studies the non-healing wound environment in animal models and is looking at ways to improve burn wound healing. Some of our research this past year includes: A National Survey of Public Burn Knowledge; multiple projects on Nerve Pain After Burn Injury; A Systematic Review of Suicidality after Burn Injury; Ablative Fractional Laser Treatment of Hypertrophic Burn Scars; Using pressure Mapping to Optimize Hospital-Acquired Pressure Injuries; Identifying Risk Factors for Cooking-Related Burns in an International Pediatric Population; A Systematic Review and Meta-analysis of Factors Associated with Mortality Following Burns Complicated by Necrotizing Skin and Soft Tissue Infections; A Novel Nursing Approach in Reducing Catheter-Associated Urinary Tract Infections; and Evaluating the Cost-Effectiveness, Efficacy, Safety and Tolerance of Silver Sulfadiazine dressings once daily versus twice daily in the Treatment of Partial Thickness Burns. The Burn Center publishes its findings and presents at various local, regional, and national conferences. In FY 2021, Burn Center staff were invited to present at the American Burn Association Conference, the Northeast Region Burn Conference, and the American Society of Plastic Surgeons meeting. Staff also wrote textbook chapters and published in various peer-reviewed journals, including *The Journal of Burn Care and Research*, *Burns*, *Burns & Trauma*, *Plastic and Reconstructive Surgery*, *Cureus*, and the *Annals of Plastic Surgery*.

■ **Fellowships/Residencies.** The Johns Hopkins Burn Center provides annual fellowship training for physicians in both general and plastic surgery tracks, and has been doing so for over 20 years. We also provide residency training in partnership with local hospitals

and universities, including Johns Hopkins University, ChristianaCare Health System, Union Memorial Hospital, St. Agnes Hospital, Hershey Medical Center, and Sinai Hospital.

■ **Rehabilitation.** The Johns Hopkins Burn Rehabilitation Department is dedicated to rehabilitating burn survivors. The staff includes two full-time occupational therapists (OT), two full-time physical therapists (PT), as well as three part-time PTs and one part-time OT.

Every patient admitted to the Burn Center is seen by a PT/OT within the first 24 hours. The Burn Center evaluated 262 inpatients this year. Most burn inpatients are treated on a daily basis in our onsite burn rehabilitation gym. This year, the Burn Center rehabilitation gym initiated a virtual reality headset to assist patients in their rehabilitation through reducing opioid use and increasing participation.

The rehabilitation staff work with case management and social work to discharge patients to appropriate levels of care. There is a close working relationship with the Johns Hopkins Specialty Hospital for inpatient rehabilitation. The burn rehabilitation staff have also provided in-services to outside therapy practices, where patients are going for therapy, and are always available for consultation. On average, a burn outpatient participates in therapy four days a week, for 1-1.5 hours of therapy each session.

Adult Burn Center

MedStar Washington Hospital Center

110 Irving Street, NW, Washington, DC

Adult Burn Center Staff

Adult Burn Medical Director:

Jeffrey Shupp, MD

Burn Outreach and Prevention Coordinator:

Angela White, BSHCM

The Burn Center at MedStar Washington Hospital Center is the adult regional burn center for Southern Maryland, Northern Virginia, eastern West Virginia, and Washington, DC. The Burn Center is verified by the American Burn Association as a regional Level 1 Burn Center in addition to level 1 Trauma Center by the Committee on Trauma of the American College of Surgeons.

MedStar Washington Hospital Center provides comprehensive, acute, and rehabilitative burn care through a multidisciplinary team approach. The burn surgeons are board-certified general surgeons with extensive experience in burn care, surgical treatment, and

burn reconstruction. The Burn Center has expanded the laser program for dyspigmentation and scar reduction. The burn team members—physicians, nurses, rehabilitation therapists, respiratory therapists, nutritionists, and social workers—are specially-trained and experienced to address the special needs of burn patients. The Burn Center is proud to announce that we have recently embedded a psychologist on our team to meet the psychological needs of our patients and their families.

The 20-bed facility features an intensive care unit with its own operating room and tanking facility, as well as an intermediate care/rehabilitation unit, both of which provide wound care and progressive rehabilitation. With 650 admissions (and an additional 680 patients evaluated and discharged from the Emergency Department) annually, the Burn Center provides care for an array of thermal, electrical, and chemical injuries, as well as soft-tissue lesions. The burn clinic provides outpatient burn care for more than 2,573 patients annually.

Pediatric Trauma Center

Johns Hopkins Children's Center

1800 Orleans Street, Baltimore, Maryland

Johns Hopkins Children's Center (JHCC) is a designated Level I Pediatric Trauma Center serving Maryland and the surrounding region. JHCC is a 205-bed, state-of-the-art hospital with an expansive pediatric emergency department equipped with dedicated pediatric trauma resuscitation bays, a 28-bed Pediatric Intensive Care Unit (PICU), and a pediatric operative suite with designated emergency operating rooms for pediatric trauma patients. According to the Maryland State Trauma Registry, the Pediatric Trauma Center at JHCC treated over 760 trauma-injured children from June 1, 2020, through May 31, 2021.

Mission

The mission of the Pediatric Trauma Center at the Johns Hopkins Children's Center is to make a positive difference in the lives of children through pediatric injury prevention, education, evidence-based research, and excellent care of injured children. Three overarching elements encompass the vision of the program:

- 1. To eliminate injury as the leading cause of death and illness among children by relentlessly pursuing comprehensive injury prevention, providing the highest level of injury care, and participating in injury prevention research;*
- 2. To establish and implement specific policies, procedures, and guidelines that ensure prompt and optimal care by pediatric professionals to the seriously injured pediatric patient;*

- 3. To evaluate the effectiveness of the trauma care delivered by ongoing evidence-based research and performance improvement programs.*

Pediatric Trauma Center Staff

Pediatric Trauma Medical Director: Isam Nasr, MD

Pediatric Trauma Program Manager (Interim):

Laura Rye, MS

Pediatric Trauma Coordinator:

Rebecca Gardner, BSN, RN, RNC

Pediatric Injury Prevention Coordinator:

Beatrice Braithwaite, MPH

FY 2021 Annual Report

■ **Notable Accomplishments.** The Johns Hopkins Hospital has been designated as a Magnet hospital four times. Magnet Designation is the highest and most prestigious designation a healthcare organization can achieve for nursing innovation, excellence, and quality patient care from the American Nurses Credentialing Center. The Johns Hopkins Children's Center continues to be *U.S. News & World Report's* #1 ranked Children's Hospital in Maryland, with multiple specialties ranking nationally.

■ **Quality Management and Improvement.** The pediatric trauma performance improvement (PI) program at JHCC had another productive year. Trauma statistics continue to be presented monthly at the PI Committee meeting. Monthly reports also include these additional metrics: Total Patients, Readmission, Primary Injury Type, Pre-Hospital Intubation, Average PICU Days, Deaths, and Average Hours in the ED. The team presents safety and quality dashboards monthly, reflecting metrics such as Surgeon and Anesthesiologist Arrival Time to Level I Traumas, CLABSIs, CAUTIs, PED Throughput for Trauma Admissions, and Time to Washout and Antibiotics for Open Long Bone Fractures. New metrics, such as Time to CT Head and Time to CT Abdomen, were added to FY 2021 monthly reports. The goal of sharing these data with the group is to increase transparency and provide an opportunity to identify areas of improvement in a timely fashion collaboratively.

The JHCC strives for a culture of reporting safety concerns encouraging openness, transparency, and learning. The Hopkins Event Reporting Online (HERO) is the forum used by all staff and faculty. The purpose of the HERO System is to learn from adverse events and near-misses to improve patient safety. Reporting of events can be anonymous, protecting staff from retaliation. Accountable leaders then receive the events for action and follow-up.

■ **Injury Prevention Programs and Initiatives.**

JHCC has a robust injury prevention program, offering

services to its patients, families, community, and staff. Multidisciplinary teams of child passenger safety technicians (CPSTs) can provide car seat fittings and assist with on-site installations. A grant from JHCC allowed the team to purchase standard and special needs car seats. As a result of COVID-19, most outreach efforts have been moved to a virtual platform or altered to adhere to recommended social distancing practices.

The Injury Prevention Program continues to provide car seat education and installation instruction to our admitted patients and their families using a portable demonstration seat at the patient's bedside. We've also expanded our partnerships and increased our online presence to reach more community members and expand our outreach during the pandemic. Over the last year, our program has created 1,500 tweets and has gained 315 followers on Twitter. On Gun Violence Awareness Day in June 2020, we made a short video with our Trauma and Burn team sharing why each team member advocates for gun violence prevention. This particular tweet received 2,619 impressions. Our injury prevention team submitted multiple blog posts for Maryland TraumaNet, which included "Halloween Safety", "Thanksgiving: A Pandemic Edition", "Celebrating the Holidays in a Pandemic", and "Fun in the Sun".

In November 2020, we participated in the Injury Free Coalition for Kids' Inaugural National Injury Prevention Day. On this day, we partnered with the Johns Hopkins Bloomberg School of Public Health to organize, plan, and promote various activities at a local site. Activities included: a Twitter chat and lighting of The JHH Dome and Baltimore City Hall green for this childhood Injury Prevention Day observance. A partnership with the JHCC Child Life department premiered fun injury prevention activities, such as poster contests. Also, the team utilized the hospital's closed-circuit television for games like "10-Second IP Rule Game" in June 2021. As COVID cases began to decline, we were able to plan a small helmet distribution for KIPP Baltimore students, consisting of virtual education and an in-person distribution hybrid model. Our program was able to reach over 40 students on the final days of the school year.

Our community outreach specialist attended the American Trauma Society's Injury Prevention Coordinator Course virtually throughout the last year. Our team has maintained all required certifications and attended various webinars and teleconferences on trauma topics such as Firearm Violence, Safe Sleep, Child Passenger Safety, and Hot Car Deaths.

■ **Interdisciplinary Pediatric Trauma Bootcamp/ Course for Fellows.** Designed to enhance the performance of the pediatric trauma team, the

Interdisciplinary Pediatric Trauma Bootcamp for Fellows emphasizes evidence-based trauma management and procedural training skills. The course supports the enhancement of pediatric trauma team dynamics during pediatric trauma activations. The development of the curriculum for this course places specific emphasis on ATLS implementation in the trauma bay. Our first Pediatric Trauma Boot Camp was in December 2020 and January 2021. It included 19 fellow-level trainees as participants and 12 faculty facilitators from General Pediatric Surgery, Pediatric Critical Care, and Pediatric Emergency Medicine. Learners participated in four simulated trauma scenarios (Blunt Trauma, Burn/Inhalation Injury, Penetrating Trauma, and Traumatic Brain Injury), each facilitated by faculty from two of the above departments. The goal of this design was to ensure that providers taught in a multidisciplinary way and emphasized one another.

The success of the two pilot courses last year resulted in a \$40,000 institutional grant (innovation grant), allowing us to organize a more comprehensive and inclusive program in the upcoming academic year. We have already set three dates and will conduct an extended all-day course, including pediatric ICU, Pediatric/Adult Emergency Medicine, General Surgery, and General Pediatric Surgery trainees. In addition to several trauma/burn simulations, we will conduct essential skills stations and a didactic component. Simulation is a frequently used tool to train physicians in pediatric trauma resuscitation. In addition to demonstrating improved knowledge, procedural skills, and non-technical skills, pediatric trauma centers that utilize a "high volume" of simulation training have shown lower risk-adjusted odds of mortality.

■ **Emergency Medical Services and Nursing Continuation Education.** JHCC offers monthly training to prehospital clinicians and students, including lectures, case reviews, and simulation. Maryland State Police paramedics train alongside pediatric anesthesiologists in the operating room to maintain comprehensive pediatric airway management competency. Trauma staff provides ongoing education and case reviews to referring facilities.

The Johns Hopkins Simulations Center is a fully accredited, state-of-the-art training facility that incorporates standardized patients and teaching associates, human patient simulation, virtual reality, task trainers, and computerized simulation to help clinicians with trauma education and preparedness.

■ **Fellowships and Residencies.** The Division of Pediatric Surgery at Johns Hopkins has a two-year fellowship program approved by the Accreditation Council for Graduate Medical Education (ACGME). A new fellow starts each year, allowing a junior and

senior fellow to train concurrently. Under the direction of the general pediatric surgery attending, fellows are responsible for managing all trauma patients. A collaboration with the University of Maryland Medical Center allows for a six months rotation at UMMS.

■ **Research.** Multidisciplinary collaboration among different specialties is of the utmost importance with an overarching goal of improving the care of our pediatric trauma patients.

Members of the JHCC Pediatric Trauma Program are involved in several cutting-edge research projects spanning from clinical outcomes and injury prevention to basic science research. A sample of some of the research in which the pediatric trauma program is involved includes:

- The Pediatric Trauma Program is part of a National Institutes of Health-funded, multi-institutional, five-year study that tackles the critical issue of drug and alcohol abuse in the pediatric trauma population. This study aims to understand better how nurses, social workers, and doctors within pediatric hospitals talk to their patients about alcohol and drug use. This study aims to implement a screening process and referral to treatment once identifying the relationship between adolescent drug and alcohol use and injury. We are currently in year two of this five-year study.
- Basic science trauma research is also an essential tenet of the program. Several investigators in different disciplines are actively studying the neuroinflammatory pathways involved in pediatric traumatic brain injury.
- Other research efforts include:
 - Examination of the adherence to a trauma checklist during our highest trauma activations;
 - Evaluation of the association of elevated white blood cell count and other clinically significant inflammatory markers in pediatric trauma patients; and
 - Assessment of the interplay between genetically influenced biologic processes and the environment concerning patient recovery after pediatric traumatic brain injury using MRI markers.
- Maryland Trauma Network provided a grant to assess how the COVID-19 pandemic, with social distancing and stay-at-home orders, has increased the risk for childhood injuries sustained in the home due to increased stress, changes in supervision, and possible increased use of alcohol and/or other substances. We will evaluate the prevalence and patterns of injuries

sustained in the home during the pandemic, including those that required medical care and those that did not. We also hope to describe the reasons that may have contributed to participant decisions to delay or avoid obtaining in-person medical care.

The team maintains an active role in national trauma meetings. Several team members have presented their research projects in these meetings, some following with manuscript submission and, ultimately, publication.

■ **Rehabilitation.** JHCC has a state-of-the-art pediatric rehabilitation program that offers both inpatient rehabilitation and comprehensive outpatient services. Therapists, in addition to our injury prevention coordinator, are certified child passenger safety technicians (CPSTs) and support the injury prevention program. JHCC collaborates with the Kennedy Krieger Institute (KKI) and Mount Washington Pediatric Hospital (MWPB) for children needing inpatient rehabilitation. The Commission on Accreditation of Rehabilitation Facilities (CARF) accredits both programs.

Dr. Stacy Suskauer directs the Brain Injury Clinical Research Center at KKI. She is a pediatric physiatrist and the pediatric rehabilitation medicine liaison to the Pediatric Trauma Center at JHCC. Dr. Suskauer's research program spans the range of severity of pediatric traumatic brain injury from concussion to severe brain injuries associated with disorders of consciousness. Her projects include developing and using sensitive behavioral measures to characterize outcomes, study brain-behavior relationships using functional and structural imaging modalities, and early clinical trials to optimize outcomes.

Pediatric Trauma Center **Children's National Hospital**

111 Michigan Avenue, NW, Washington, DC

Children's National Hospital (CNH) is a Pediatric Trauma Center established by a memorandum of understanding with MIEMSS that serves Washington, DC; multiple counties within Maryland, including Montgomery and Prince George's; Southern Maryland, and certain regions of adjacent states. CNH treated 1,188 trauma-injured children, including 827 of who reside in Maryland, from June 1, 2020, through May 31, 2021, according to the Maryland State Trauma Registry. (See pages 92 to 95 for additional patient data.) There were 385 children from Maryland treated in the Trauma Code Room. Pediatric trauma services at CNH are provided by the Division of Emergency Trauma and Burn Surgery.

Mission

At Children's National Hospital, we strive to excel in care, advocacy, and education. We demonstrate this by providing a quality healthcare experience for our patients and families, improving healthcare outcomes for children regionally, nationally, and internationally, and by leading the creation of innovated solutions to pediatric health challenges. The commitment of our staff, physicians, volunteers, students, and community partners to our mission permits us to maintain a tradition of quality care, which is the hallmark of Children's National Hospital.

Pediatric Trauma Center Staff

Pediatric Trauma Medical Director:

Randall S. Burd, MD, PhD

Pediatric Trauma Program Manager:

Jennifer Fritzeen, MSN, RN

FY 2021 Annual Report

■ **Notable Accomplishments.** With the increase in pediatric penetrating injury seen in Children's Hospitals locally and across the country, Children's National has improved availability of blood products for immediate use in the Emergency Department and Intensive Care units. In August 2020, blood refrigerators were commissioned for use in both the ED code rooms and Intensive Care unit. Decreasing a patient's time to initial blood by more than 50%. Six months later, thawed plasma was made immediately available in the Blood Bank.

Children's National received an FCC Grant to assist in funding system projects to improve care during the Pandemic. Funds from this grant were used to purchase and install two-way communication systems in the ED Code Rooms. This system allows the clinical trauma team to communicate with the administrative trauma team (e.g., entering orders, communicating with blood bank) without risk of exposure.

Children's National Hospital continued to have a national presence in the leadership of the Pediatric Trauma Society in FY 2021. Dr. Burd sits as the immediate past president for the Pediatric Trauma Society. Jennifer Fritzeen is the chairman of the Program Committee and Elizabeth Waibel is the chairman of the Advance Practice Committee and the Membership Committee.

■ **Quality Management and Improvement.** The Pediatric Trauma Center has a robust quality improvement program, which includes periodic submissions to the Pediatric Trauma Quality Improvement Program (TQIP), an initiative of the American College of Surgeons Committee on Trauma. The TQIP provides adjusted benchmarking for pediatric trauma centers

to track outcomes and improve patient care. Based on TQIP data, CNH is able to benchmark nationally and evaluate its patient care.

There were several quality initiatives undertaken by the Trauma Center in FY 2021. A high-impact example is the continued effort to improve Code Room Efficiency. Under this umbrella, special attention was given to door to blood time for children in hemorrhagic shock. This project focused pre-arrival preparedness in having the rapid infuser primed prior to patient arrival as well as improved time to vascular access. These are the leading causes for delay in blood products. There were other phased quality projects that were implemented throughout FY 2021 to provide efficient code room care; examples include time to CT scan, time in CT scan, and time to x-ray.

Children's National continues to improve outreach and follow-up efforts to outside hospitals and EMS agencies. Since January 2018, we have used a program that allows the Trauma and Burn Surgery Service to template individualized feedback sent through a protected server to transferring facilities or EMS units. The program has allowed CNH to communicate and have online dialog with 74% of our transferring centers. Our team published this work in the article "The Development and Implementation of a Transfer Follow-up Program at a Level I Pediatric Trauma Center", published in the September/October 2020 edition of *Journal of Trauma Nursing*.

■ **Injury Prevention Programs and Initiatives.** In FY 2021, Safe Kids DC's flagship initiative continued to be child passenger safety. In FY 2021, the BearPass Initiative was implemented to revisit, revise, and grow the child passenger safety program.

There were 400 children who presented to Children's National Hospital in FY 2021 with a fall injury. This includes the two pediatric fatalities from a fall injury. This equates to 39% of our trauma volume. In response, Children's National began a fall initiative that will continue in FY 2022. To date CNH has shared fall data and prevention tips in articles published in *The Guardian*, *WJLA*, and the *TraumaNet* website. The trauma team is partnering with SafeKids DC and CHAI to on a fall based spatial analysis project to determine hot spots for injury prevention. A video-based fall prevention program has been filmed and is in progress of a social media campaign targeting the areas of high fall injury volume. The increase in fall injury volume and acuity was presented in Montgomery County to assist in the passing of Bill 51-20 Landlord-Tenant Relations – Window Guards (Ezekiel's law).

In FY 2021, the Trauma Center continued its partnership with the Freddie Mac Child and Adolescent Protection Center to provide informed education to

the public on the effects and prevention of abusive head trauma. The Period of Purple Crying, a program designed to teach families the risk of inflicted abusive head trauma during infancy, was initially offered only to families admitted to CNH, birthing centers, prenatal clinics, parenting groups, and school systems in Washington, DC, furthering increasing outreach to the public. Additionally, CNH maintains a five-year old partnership with the Childhelp organization to provide intake call center services for the National Child Abuse Hotline.

■ **Emergency Medical Services and Nursing Continuing Education.** FY 2021 proved to be a year of virtual education allowing CHN to offer more educational opportunities to more individuals both internally in the hospital and to outside providers.

This year the trauma service developed a YouTube education channel allowing our team to provide live and recorded trauma education for nurses, physicians and paramedics covering topics such as Hemorrhagic shock, Neurogenic shock, Trauma arrest. Each video has opportunity for CNE hours. Views of the video can be tracked to provide statistics on outreach.

The Annual Child Abuse Symposium was host to over 200 individuals from a variety of medical and non-medical backgrounds. This was augmented by the monthly Protection of Children Lecture Series, which covered topics such as mandated reporting, medical child abuse, and sex trafficking. The lecture series was attended by 601 individuals in FY 2021.

EMS education was provided to multiple EMS agencies in the state of Maryland on a monthly or quarterly bases. These education sessions occurred virtually and covered a variety of topics tailored to patients cared for by each agency.

■ **Research.** The Trauma Center maintains an active research program with multiyear studies in place. The trauma research team, in collaboration with teams from Drexel and Rutgers, have two major studies: a \$3 million, multiyear ROI grant to build an Intention-aware Recommender System for Improving Trauma Resuscitation Outcomes, and an NSF grant to recognize activities to reduce delays in fast-response teamwork.

CNH continued its research collaboration with the trauma centers in DC, initiated in FY 2020, to study gunshot wound recidivism and trauma in light of the COVID-19 pandemic.

Multiple research papers have been accepted and published by clinicians within the Trauma Surgery Service.

■ **Rehabilitation.** The Department of Physical Medicine and Rehabilitation at CNH consists of three divisions: Pediatric Rehabilitation Medicine, Physical Therapy, and Occupational Therapy. Physicians,

advanced practice nurses (APN), registered nurses, physical therapists, occupational therapists, and rehabilitation aides deliver interdisciplinary care to patients at the National Center for Children's Rehabilitation (acute inpatient medical care) and CNH, including regional outpatient centers (outpatient medical care). Physicians and APNs also provide consultation services in integrated equipment at a bracing clinic and a sub-acute rehabilitation facility.

Pediatric Burn Center

Johns Hopkins Children's Center

1800 Orleans Street, Baltimore, Maryland

Johns Hopkins Children's Center (JHCC), a 205-bed, state-of-the-art hospital with an expansive pediatric emergency department equipped with dedicated pediatric trauma resuscitation bays, a 28-bed Pediatric Intensive Care Unit (PICU), and a pediatric operative suite outfitted with dedicated emergency operating rooms for pediatric trauma patients, is verified by the American Burn Association and designated by the Maryland Institute of Emergency Service System as a level one Pediatric Burn Center. According to the Maryland State Trauma Registry, JHCC treated over 300 burn-injured children, including 138 admissions, from June 1, 2020, through May 31, 2021. JHCC follows patients in an outpatient burn clinic and, if necessary, continues treatment via referral to our burn late effects clinic. The late effects multidisciplinary clinic focuses on the physical and emotional recovery after a burn injury. Laser burn treatment is available for those patients who develop symptomatic scarring.

Mission

The mission of the JHCC pediatric burn center is to make a positive difference in the lives of children through pediatric burn injury prevention, education, evidence-based research, and excellent care of burned children. The center's vision is comprised of three elements:

- 1. To eliminate injury as the leading cause of death and illness among children by relentlessly pursuing comprehensive injury prevention, providing the highest level of injury care, and participating in injury prevention research;*
- 2. To establish and implement specific policies, procedures, and guidelines that ensure prompt and optimal care to the seriously burned pediatric patient by pediatric professionals;*
- 3. To evaluate the effectiveness of the burn care delivered by ongoing evidence-based research and performance improvement programs.*

Pediatric Burn Center Staff

Pediatric Burn Medical Director:

Alejandro Garcia, MD, FACS, FAAP

Pediatric Burn Associate Director:

Erica Hodgman, MD

Pediatric Burn Program Manager (Interim):

Laura Rye, MS

Pediatric Burn Performance Improvement (PI) Coordinator:

Rebecca Gardner, BSN, RN, RNC

Pediatric Injury Prevention Coordinator:

Beatrice Brathwaite, MPH

Pediatric Psychologist:

Carisa Parrish, PhD

FY 2021 Annual Report

■ **Notable Accomplishments.** With the continual growth of the pediatric surgical program and population, The Johns Hopkins Department of Surgery onboarded a new pediatric surgeon in FY 2021 – Dr. Erica Hodgman. Dr. Hodgman has expertise in pediatric burn care and management. Dr. Hodgman serves as the Associate Director of the Pediatric Burn Program. New, innovative methods for burn and wound care were introduced in FY 2021, improving care for burns of various etiologies.

■ **Quality Management and Improvement.** The Pediatric Burn Performance Improvement (PI) Committee is a multidisciplinary committee focused on overall program PI. The role of this committee is to:

1. Review programmatic data trends regarding performance;
2. Review existing policies, assess and implement new regulatory requirements and recommendations;
3. Develop and track implementation of action plans stemming from morbidity and mortality review; and
4. Develop and track implementation of additional action plans as raised from data trends and committee members.

The committee evaluates the progress of action plans until resolution and monitors for recurrence. Presentations, including burn statistics, occur monthly at the PI Committee Meeting. Monthly reports include metrics such as Total Patients, TBSA, Burn Etiology, Burn Consults, ED Length of Stay, Hospital Length of Stay, and Deaths. The total for the current year and the prior year's total are shared to review trends. The monthly presentations also include safety and quality, reflecting metrics such as Median Time to First Pain Medication, Median Time to Debridement, CLABSIs, and CAUTIs. Sharing these data points aims to facilitate transparency and the opportunity to identify areas of improvement in a timely fashion. The PI Coordinator reviews all

emergency department visits for burn patients. Once identified, burn patient charts are audited daily and tracked until discharge.

The pediatric burn team established the Pediatric Injury Quality Improvement Consortium (PIQIC), a network of four similar pediatric burn centers, in 2016. The collection of three years of data is available through this consortium, which will help determine best practices and benchmarks in pediatric burn care.

■ **Pediatric Psychology.** Pediatric psychology is an integral part of the pediatric burn team, providing inpatient and outpatient clinical services to patients and their families. Screenings from this team include standardized instruments to assess the child's quality of life and overall child and parent distress. Interventions, such as providing coping mechanisms for use during stressful experiences, support optimal adherence to medical recommendations and patient and family recovery. A dedicated burn psychologist at JHCC leads efforts to collaborate with other pediatric burn centers through PIQIC to establish psychosocial PI metrics. Through Hopkins' involvement in PIQIC, implementation of our standard psychology screening protocol is now across multiple sites.

■ **Injury Prevention Programs and Initiatives.** JHCC has a robust injury prevention program, offering services to its patients, families, community, and staff. The injury prevention team has established relationships with elementary schools, youth groups, religious institutions, and summer camps to provide burn prevention education. Using data from the burn registry, high-risk areas and common injury patterns are identified, allowing the team to provide highly relevant injury prevention education. Pediatric burn nurses and the injury prevention team historically participate in large community outreach events. However, most outreach events (health fairs, festivals, and sporting events) have been moved to a virtual platform or altered to accommodate smaller in-person audiences result of COVID-19 restrictions.

The Injury Prevention Team reviews the JHCC burn registry data to determine the most common etiology among pediatric patients and tailor our prevention and outreach efforts to those specific causes. The program provides burn clinic patients and families with home safety products during their visits and is currently planning several short public service announcement videos to increase awareness and promote burn prevention. We've also established a new school partnership with Carroll Lutheran School in Westminster, MD. Our community outreach specialist provided in-person burn education to elementary school students during Burn Awareness Week in February and fire safety education to middle school students in March. Our program actively

shares burn and fire prevention tips on our Twitter page and participates in related online activities such as the ABA's "A to Z of Burns" social media campaign.

■ **Emergency Medical Services and Nursing Continuing Education.** The JHCC Burn team provides burn education to referring hospitals, typically focused on evaluation and management of injuries. We also periodically review cases sent from referring centers with them to provide closed-loop feedback.

Continual offerings of monthly training to pre-hospital clinicians and students include lectures, case reviews, and simulation. Maryland State Police paramedics train alongside pediatric anesthesiologists in the operating room to maintain comprehensive pediatric airway management competency.

The Pediatric Base Station provides online medical direction to EMS clinicians and has an active QI plan for evaluation and feedback.

The Johns Hopkins Simulations Center is a fully accredited, state-of-the-art training facility that incorporates standardized patients and teaching associates, human patient simulation, virtual reality, task trainers, and computerized simulation to help clinicians with trauma education and preparedness.

■ **Fellowships and Residencies.** Johns Hopkins Pediatric Surgery has an Accreditation Council for Graduate Medical Education (ACGME) approved two-year fellowship program. After a competitive process, one fellow per year enters the program, allowing a junior and senior fellow to train concurrently. Under the direction of the general pediatric surgery attending, the fellows are responsible for managing all trauma and burn patients at JHCC. A collaboration with The University of Maryland Medical Center allows for a six-month rotation of the JHCC fellows. The pediatric psychology fellowship program includes an opportunity to train with burn patients. A psychology fellow and/or attending physician meets all burn patients while inpatient. Additionally, a burn fellow and/or attending physician staffs our outpatient clinic.

■ **Research.** The pediatric burn staff at JHCC continue to present their work in person or virtually at national meetings.

Current research initiatives include:

- Evaluating child quality of life and parent PTSD and depression symptoms following pediatric burn injury
- Parent perceptions of the pediatric burn healing process and need for support
- Drug and alcohol screening in teens
- Epidemiology of hot beverage scalds in children
- Attrition between emergency department care and outpatient clinic visits

- Follow up compliance of burn patients during the COVID-19 pandemic

■ **Rehabilitation Services.** A state-of-the-art pediatric rehabilitation program that offers inpatient rehabilitation and comprehensive outpatient services is available at JHCC. The hospital collaborates with Mount Washington Pediatric Hospital (MWPH) for burn patients needing continual inpatient rehabilitation. Accreditation for MWPH is by The Joint Commission (TJC) and The Commission on Accreditation of Rehabilitation Facilities (CARF) for the hospital's Comprehensive Integrated Inpatient Rehabilitation Program with a Pediatric Specialty Program.

Pediatric Burn Center

Children's National Hospital

111 Michigan Avenue, NW, Washington, DC

Children's National Hospital (CNH) is a Pediatric Burn Center established by a memorandum of understanding with MIEMSS that serves Washington, DC; multiple counties within Maryland, including Montgomery and Prince George's; Southern Maryland, and certain regions of adjacent states. CNH treated 381 burn-injured children who reside in Maryland from June 1, 2020, through May 31, 2021, according to the Maryland State Trauma Registry. (See pages 96 to 99 for additional patient data.) Of the 231 burn-injured children, 36 were admitted and two were readmitted as inpatients, and 195 were emergency department (ED) visits. There were an additional 710 burn clinic visits. Pediatric burn services at CNH are provided by the Division of Emergency Trauma and Burn Surgery.

Mission

At Children's National Hospital, we strive to excel in care, advocacy, and education. We demonstrate this by providing a quality healthcare experience for our patients and families, improving healthcare outcomes for children regionally, nationally, and internationally, and by leading the creation of innovated solutions to pediatric health challenges. The commitment of our staff, physicians, volunteers, students, and community partners to our mission permits us to maintain a tradition of quality care, which is the hallmark of CNH.

Pediatric Burn Center Staff

Pediatric Burn Medical Director:

Randall S. Burd, MD, PhD

Pediatric Burn Program Manager:

Jennifer Fritzeen, MSN, RN, PCNS

FY 2021 Annual Report

■ **Notable Accomplishments.** In FY 2021, the Burn Service welcomed two additional burn surgeons to the Burn Team, Dr. Taryn Travis and Dr. Sean Tejiram, bringing our number of burn surgeons from three to five. This expansion allows the service to provide more expeditious acute burn surgery and expand the laser and scar programs.

FY 2021 welcomed the hire of a part-time burn dedicated child life specialist. The burn CL is present for all burn clinics. She provides 1:1 support for the child and family during the process of the dressing change. Through this role we are working to continue to expand our ability to provide distraction therapy and create a holistic approach to care.

Burn patients require extended care as the burn injury heals and we start focusing on scar prevention, stretching, and post-wound care. Clinic visits in this post-acute phase are amenable through telehealth visits. These telehealth visits allow families to interact with a burn nurse practitioner, physical therapist, and psychologist (as needed) in the comfort of their home. Telehealth burn care decreases loss of work time for parents, and saves them the sometimes complex trip into the hospital. CNH initiated telehealth visits for our burn population in FY 2020 and has continued to expand the telehealth service in FY 2021, with a total of more than 300 patient visits for scar and laser therapy this year.

■ **Quality Management and Improvement.** The pediatric burn center has a robust quality improvement program. The PI program includes daily review of care for inpatient acute burns, and weekly multidisciplinary review and care planning for active patients (inpatient and outpatient) with complex wound treatment, risk for scarring/contractures, psychological needs or other complexities in care. Additionally, the burn team continues to work on improving care. Several projects in FY 2021 focused on the enhancement of burn care. In 2021, the main quality focus was pain management throughout the burn healing process. Interventions include a more liberal use of OR for early debridement and wound management, stratifying patients appropriate for clinic dressing changes versus an area of care with allowing for a higher level of sedation, and the implantation of a burn dedicated child life specialist.

CNH is one of five charter members of the Pediatric Injury Quality Improvement Consortium. This consortium has implemented five pediatric burn benchmarks with one year of data. This data will assist in the development of best practice protocol in burn care, and contribute to multicenter research in burn management.

■ **Injury Prevention Programs and Initiatives.** Burn prevention remains a top priority for the Burn

Service. In FY 2021, the burn prevention videos recorded with DC Firefighter funding were released in a social media campaign. This campaign allowed the hospital to use target areas within the catchment with a high number of burn patients. Parents and grandparents of young children can be identified through social media and targeted with the intervention videos. This mode of intervention can be tracked for views. To date, we have over 26,000 views, with more than 14,000 of those viewing watching to completion. The success of the social media campaign has led to the Burn Service being awarded an intramural grant for \$20,000 for continued social media presence.

■ **Emergency Medical Services and Nursing Continuing Education.** CNH offered over 55 hours in virtual continuing education in FY 2021. This virtual burn education has been offered through the Trauma and Burn YouTube site and weekly Trauma/Burn talks. The YouTube site contains both recorded didactic education as well as a burn podcast (Burncast). This site is available to our internal staff as well as externally. Trauma/Burn talks is a 30-minute virtual discussion focused on care provided to patient during the previous week. It is an opportunity for nurses to ask questions, receive education, and assist in improving processes. Over half of the FY 2021 Trauma talks were burn-focused.

Virtual education has allowed for CNH to expand outreach and educational opportunities. Children's Burn Service, in partnership with the Children's Emergency Department, has developed monthly education for multiple EMS departments in Maryland. The education provided is tailored to the specific needs of the EMS agency and patient situations encountered.

■ **Research.** The Burn Center maintains an active research program with multiyear studies in place. Through funds received from the National Institutes of Health and the Agency for Healthcare Research and Quality in FY 2018, the Burn Center continues to research automatic workflow capture and analysis using real-time, data-driven feedback to improve trauma resuscitation outcomes and trauma patient safety.

The Easy TBSA phone application developed in FY 2020 underwent evaluation for feasibility and reliability in FY 2021. This application was granted a copyright this year and a publication is pending. CNH is hopeful the Easy TBSA application will be available to all levels of burn care providers in FY 2022.

■ **Rehabilitation.** The Department of Physical Medicine and Rehabilitation at CNH consists of three divisions: Pediatric Rehabilitation Medicine, Physical Therapy, and Occupational Therapy. Physicians, advanced practice nurses (APN), registered nurses, physical therapists, occupational therapists, and reha-

bilitation aides deliver interdisciplinary care to patients at the National Center for Children's Rehabilitation (acute inpatient medical care) and CNH, as well as regional outpatient centers (outpatient medical care). Physicians and APNs also provide consultation services in integrated equipment at a bracing clinic and a subacute rehabilitation facility.

Children with burns are evaluated and treated by a dedicated OT/PT team during the inpatient stay, extending to the outpatient phase of care. The OT/PT team is available at both the main campus and the Friendship Heights campus to encompass compression measurement and evaluation.

Laser therapy is available through the Burn Service for burn patients in the subacute phase of care to minimize pigment changes and increase skin flexibility.

Eye Trauma Center

Wilmer Eye Institute at The Johns Hopkins Hospital

1800 Orleans Street, Baltimore, Maryland

The Wilmer Eye Institute's Eye Trauma Center (ETC), based at The Johns Hopkins Hospital (JHH) in East Baltimore, is the sole designated facility in Maryland specializing in the diagnosis, treatment, and long-term management of ocular trauma. Wilmer Eye Institute faculty, staff, and trainees collaborate with JHH adult and pediatric emergency departments and care teams across the enterprise to meet the comprehensive care needs of patient populations both within and outside of Maryland. Dedicated eye treatment rooms, operating rooms, diagnostic and procedural equipment and supplies, Pharmacy, Radiology, and Pathology support services; and on-call coverage in every subspecialty ensure that patients are treated at the highest standard of care, 24 hours per day.

Founded in 1925, the Wilmer Eye Institute is among the largest and most distinguished academic departments of ophthalmology in the United States. The Wilmer team is comprised of 170-plus full-time faculty members and more than 600 staff members. In FY 2021, the Wilmer clinical practice supported upward of 255,000 patient visits and 13,000 eye surgeries, even during the ongoing public health emergency.

Patient populations presenting to Wilmer span all age groups: neonates, pediatrics, adolescents, adults, and geriatrics. Core clinical areas of expertise include comprehensive eye care (medical, optometric, and optical services), cornea, glaucoma, laser vision correction, vision rehabilitation, neuro-ophthalmology, ocular immunology, ocular oncology, oculoplastics, pediatric ophthalmology and adult strabismus, retina; and trau-

matic eye injury, of course.

Consistent with prior years, patients from all across the State of Maryland as well as neighboring states presented to the Wilmer ETC in FY 2021. That patient base remained demographically diverse, with higher relative burden of eye trauma observed for racial and ethnic minority groups but overall represented across all populations. Patients ranged from 0 to 95 years in age. Approximately 44% of the total population fell below 30 years of age. Mean age was 36 years, and median age was 33 years. Eye injury rate observed in males was 2.8 times that for females within the ETC-visiting population.

Mission Statement

The mission of the Wilmer Eye Institute is to use and develop the finest scientific evidence to promote improved ophthalmic care and the reduction of visual disability in a collaborative environment that combines compassionate patient care, innovative research, and the training of future leaders in ophthalmology and visual sciences. The institute's core values are integrity, excellence, diversity and teamwork, innovation, and commitment to scientific rigor. The objectives of the Wilmer ETC remain optimal clinical management of severe ocular injuries, to conduct research into the natural history of eye trauma, to develop new treatments for ocular trauma, and to initiate and support eye trauma education and prevention activities.

Eye Trauma Center Staff

Fasika Woreta, MD, MPH, continues in her role as Director of the Wilmer ETC, along with Shailaja Chopde, MSN, RN, in the roles of Eye Trauma Program Coordinator and Nurse Manager of the Bendann Surgical Pavilion Prep/PACU Unit. Wilmer's Chief Resident (Assistant Chief of Service), appointed annually, serves as Associate Director for the Wilmer ETC: Ravi Pandit, MD, MPH, fulfilled this role in FY 2021, and Sophie Cai, MD, will follow him as ACS/Associate Director in FY 2022. Wilmer physician assistants Sara Warner and Adam Bussells also continue to assist with daytime consult coverage on behalf of Ophthalmology in JHH Emergency Department and other settings.

Key Activities in FY 2021 and Ongoing

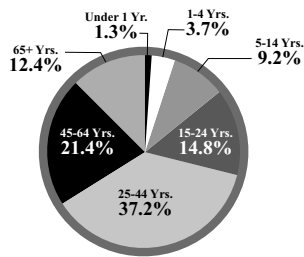
The Wilmer ETC continues to sustain close collaborations with other care teams, most frequently Johns Hopkins Emergency Medicine (JHH Adult & Pediatric Emergency Departments, EDs), Anesthesiology & Critical Care Medicine (ACCM), and Nursing, toward the goals of improved population access to ocular trauma services, streamlined pathways for more coordinated and timely care management, more value-

Wilmer Eye Institute at The Johns Hopkins Hospital Demographics

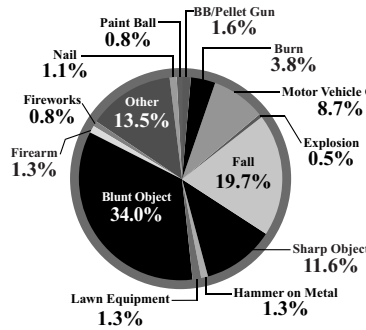
(June 2020 to May 2021)

Source: Maryland Eye Trauma Registry

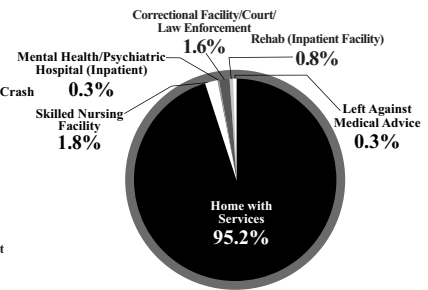
Age



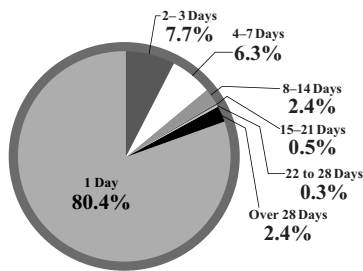
Injury Type



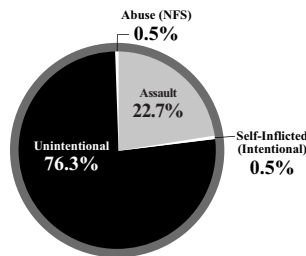
Final Disposition



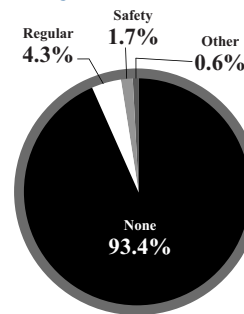
Length of Stay



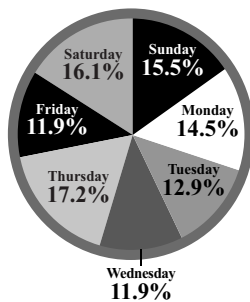
Intentionality



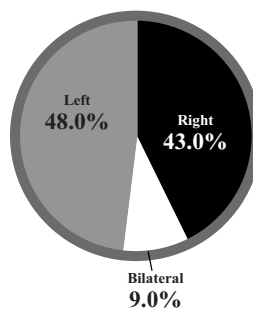
Eye Protection



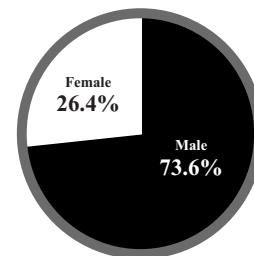
Day of Week



Eye Injured



Gender



driven models of healthcare delivery, and highest-quality experience and outcomes for our patients.

Dr. Woreta and Wilmer division chiefs previously collaborated with the American Academy of Ophthalmology on development of a surgical prioritization schema grouping comprehensive eye surgery case mix into categories of “emergent”, “urgent”, “semi-urgent”, “semi-elective”, and “elective” – a matrix that helped sustain surgical access throughout the COVID-19 pandemic and assure appropriate timing and resourcing for all cases.

After many months of planning in collaboration with the JHH Adult ED, Wilmer’s Patient Access Center for the Eye (PACE) clinic successfully launched

a same-day and same-week appointment program dedicated for Ophthalmology patients presenting to the ED with non-acute eye issues. This new resource, several slots daily, offers ED registrars the ability to direct schedule patients to a more appropriate venue of care for timely follow-up, which is anticipated to reduce ED wait times, improve access for ETC patients right within the ED setting through advanced triage of non-emergency visits, and promote more responsible use of healthcare resources.

Dr. Woreta continues to serve as Vice President of the re-established American Society of Ophthalmic Trauma (ASOT), a collective of ophthalmologist-leaders across the U.S. who are highly-engaged around

professional education, policy-setting, clinical and research collaboration, and next-generation training in this domain. ASOT has convened numerous virtual forums including an Annual Meeting and a previous trainee research competition.

In February 2021, leaders from The Johns Hopkins Hospital and Wilmer Eye Institute were honored to welcome Carole Mayes, RN, MS, representing MIEMSS and distinguished guest reviewers, Vivian Lane, RN, MS, and Ann Murchison, MD, MPH, for a first-ever virtual Eye Trauma Center re-designation survey. The Wilmer ETC is most grateful to the great many stakeholders who contributed throughout the process, for MIEMSS' thorough assessment of program and thoughtful recommendations that emerged from it, and for the continued privilege of specialty center designation in service to and alignment with the State of Maryland Trauma System.

■ **Quality Management and Quality**

Improvement. Wilmer ETC core members – its director (Dr. Woreta), associate director (Dr. Ravi Pandit, for FY 2021), trauma program coordinator (Ms. Chopde), and assistant administrator (Rahul Shah) participated in ongoing surveillance of quality and performance metrics, escalation of and loop closure on prior trauma cases warranting special review, analysis of demographic and injury trends, assessment of operations and infrastructure needs, and generation of new ideas for trauma education, research, and outreach. They also participate with and report up through the Quality Improvement Committee of the Wilmer Eye Institute, which convenes on a quarterly basis, and is directly aligned with the overall quality and safety structure and institutional initiatives at JHH.

Members of the ETC team continue to meet with JHH Adult and Pediatric ED leaders on at least a quarterly basis for detailed review of any issues related to clinical coordination and co-management of patients. The candid discussions that occur in this forum have directly contributed to improvements in handoff communication, workflows, access, quality of care, and value of care. The ETC is presently working on further electronic health record-driven optimizations to its data reporting and review processes.

■ **Injury Prevention Programs and Initiatives.**

Dr. Woreta is continuing work with medical students, Ophthalmology residents, public health experts, and other collaborators in analyzing data and considering interventions for groups observed to have higher incidence of ocular trauma; one example of which is development of targeted workplace injury prevention content for Latinx populations employed in trades associated with higher exposure to hazards with eye injury potential. ETC leaders also partner with Wilmer's

internal Marketing and Communications team to produce social media messaging in line with the American Academy of Ophthalmology eye health monthly observances, including workplace eye wellness, sports eye safety, and eye injury risks to children from toys that are frequently gifted during holiday months. Each summer right before the Fourth of July holiday, the Johns Hopkins website features an article on fireworks safety co-authored by Dr. Woreta in partnership with Eileen McDonald, MS, Director of the Children's Safety Center of the Johns Hopkins Center for Injury Research and Policy.

■ **Continuing Education.** Each year, ETC physicians and nurses provide education on eye trauma identification and management to multidisciplinary care teams within JHH adult and pediatric EDs as well as across the Wilmer Eye Institute, all of which serve as primary points of entry for ocular trauma patients. Dr. Woreta also presents on ocular trauma across many regional, national, and international forums, including to other MIEMSS-designated centers. In 2020, she led three grand rounds on Ocular Trauma and Emergencies at JHH, MedStar Health, and Goutami Eye Institute in India (virtually). She has also contributed to two CME course offerings available through the American Academy of Ophthalmology online – “Repair of Open Globe” and “Imaging in Acute Ophthalmic Trauma”.

In parallel, nurse educators deliver eye trauma programs across JHH units to assure meeting of biannual education requirements, through learning modules that include article reviews, lectures and conferences, online continuing education, and new staff orientations. In May 2021, Wilmer held its Annual Nursing and Ophthalmic Technician conference virtually for the first time, which incorporated just over two hours of eye emergency content delivered by Dr. Woreta (“Diagnosis and Management of Traumatic Ophthalmic Injuries”), Akrit Sodhi, MD, PhD (“What is an Ocular Emergency?”), and Martha Conlon, RN, BSN (“Eye Trauma Update”).

■ **Fellowships and Residencies.** The Wilmer Eye Institute supports a now four-year ophthalmology residency program with recent integration of a medicine internship year, and accepts five residents per program year. Wilmer residents, alongside assistant chiefs of service, faculty attendings, and staff are highly active participants in the assessment and management of ETC patients in the EDs, on inpatient floors, in the clinic, and in the operating room. Virtually all clinical divisions of Wilmer also offer subspecialty fellowship/advanced specialty training programs. Additionally, Wilmer's robust research enterprise supports a large volume of research fellows each year.

■ **Rehabilitation Services.** The Wilmer ETC offers

its patients direct, in-house access to a full complement of clinical services and resources necessary for visual recovery or functional accommodation, in the case of irreversible injury. Wilmer's Low Vision & Vision Rehabilitation Division matches patients with assistive technologies that can enable their independence and participation in activities of daily living. Wilmer's Oculoplastics Division offers functional and cosmetic surgical services to limit the after-effects of traumatic eye injuries. ETC patients also have access to an ophthalmologist, an expert who is highly skilled in the creation and fitting of ocular prosthetics.

■ **Research.** Trauma-related publications by ETC faculty in FY 2021 covered the full spectrum of topics, from population health to policy and societal impacts to clinical innovation, and standard of care. One example was a 15-year study of relationship between severe visual acuity loss, traumatic brain injury, and ocular injury in military service members. The faculty at the Wilmer Eye Institute is principally comprised of clinician-scientists – prolific researchers, authors, and educators in addition to expert clinicians.

Hand/Upper Extremity Trauma Center

Curtis National Hand Center, MedStar Union Memorial Hospital

201 East University Parkway, Baltimore, Maryland 21218
Region III

Located in Baltimore City, the Curtis National Hand Center (CNHC) at MedStar Union Memorial Hospital (MUMH) serves as the state's referral center for the specialized care of injuries to the hand, wrist, forearm, and elbow. In FY 2021, the Hand Center's emergency department cared for 2,028 patients with acute hand injuries, nearly 23% of which were transported by public safety ambulance or medevac helicopter. The unique nature of the Hand Center's services also draws acutely injured patients from a broad geographic region, including Pennsylvania, Delaware, Virginia, West Virginia, and Washington, DC. Whether from within Baltimore City or as far as these other neighboring states, the onsite heliport facilitates reduced travel times and improves the speed of intervention for the most critically injured.

The Hand Center's expertise in management of challenging bone and soft-tissue trauma is supplemented by advanced microsurgery skill. The handling of fractures, complex soft-tissue coverage problems, and amputations requiring replantation continue to be the Curtis National Hand Center's major focus.

The acute trauma unit is staffed by specialists in orthopedic and plastic surgery with subspecialty train-

ing in hand and upper extremity surgery. The team is available 24/7/365 for the care of the trauma patient. Calls for transfer from the field are received immediately and accepted by the emergency physicians. Transfer requests from other emergency rooms for the treatment of hand trauma patients are received via the dedicated hand transfer line. This transfer center receives 1,113 calls/year for transfer or consultation. These are rapidly and efficiently routed to the hand surgeons on call. Call logs of these transfer requests demonstrate an acceptance rate of greater than 96% of these patients to the Curtis National Hand Center. The remaining cases (less than 4%) are determined to not require transfer emergently and are provided outpatient follow-up at the Hand Center or are referred for other specialty care due to associated injuries (e.g., burns, ophthalmologic injury, spine injury).

Mission

The Curtis National Hand Center at MedStar Union Memorial Hospital remains committed to handling acute injuries and providing reconstructive surgery for Maryland's trauma victims. The focus on complex hand, wrist, and elbow injuries has been part of the well-developed Maryland trauma care system since Dr. Raymond M. Curtis, the center's founder, collaborated with Dr. R Adams Cowley and others during the inception of the Shock Trauma Center and the Maryland EMS system.

Trauma Staff

*Trauma Medical Director: James P. Higgins, MD
Trauma Program Administrator: Timothy Beckman
Trauma Program Coordinator: Cynthia Johnson*

FY 2021 Annual Report

■ **COVID-19 Precautions and Trauma Management.** In FY 2021, the Hand Center initiated a myriad of operational and structural changes to successfully maintain uninterrupted trauma care for the state of Maryland. These included:

- Relocated and enlarged dedicated hand trauma suite in the MedStar Union Memorial Hospital (MUMH) emergency department. The suite provides greater efficiency for management of hand trauma patients with the ability to better isolate these patients from the rest of the ED. The suite is immediately adjacent to the operating room and enables the team to deliver the patients for operative care without overhead pages throughout the ED hallways.
- The MUMH ED created an isolation area for COVID-19 patients to best enable continued maintenance of other emergency services (including hand trauma).

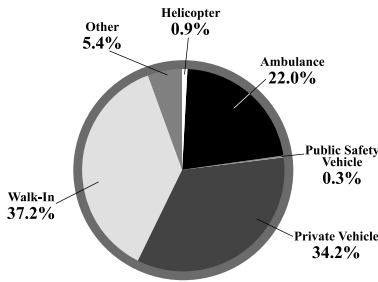
The Curtis National Hand Center at MedStar Union Memorial Hospital

(July 2020 to June 2021)

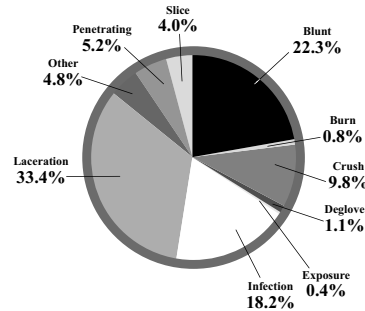
Source: The Curtis National Hand Center

n = 392

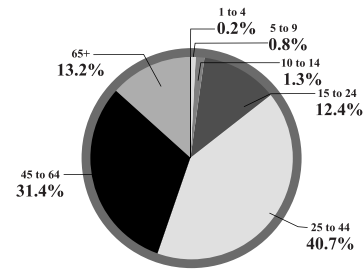
Transport Mode



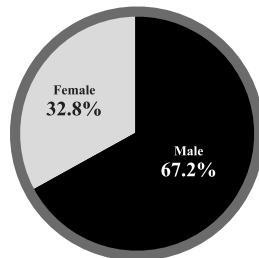
Injury Type



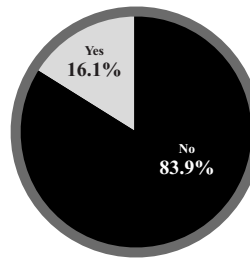
Age



Gender



Work-Related



- Rapid on-site COVID-19 testing was initiated for all trauma patients.
- The MUMH operating suite created COVID-specific rooms as well as preoperative, intraoperative, and postoperative protocols for the management of COVID-positive patients necessitating emergent trauma operative care.
- Our Hand Surgery clinic established telemedicine capability for the preoperative and postoperative care of patients appropriate for this platform. This was widely used for elective, urgent, and emergent postoperative and preoperative visits/consultation when possible.
- Hand Trauma team members were separated into platoons for the purposes of ensuring a healthy complement of providers throughout the course of the pandemic. In the event of a team member(s) becoming COVID-19-positive, isolation and quarantine of other members would be limited.
- Hand therapy visits for postoperative trauma patients were also provided virtually to minimize the risk of compromising function due to the pandemic restrictions.

■ **Professional Education.** The Hand Center expanded its academic offerings, increased collaboration with affiliated institutions, and increased

participation by colleagues and alumni around the region and country.

The Hand Center's dynamic Regional Hand Surgery Symposium has been enhanced, and the visiting lecture series has expanded to include impactful speakers who have challenged faculty and staff with new ideas related to innovations in arthroscopy, congenital surgery, osteocartilagenous arthroplasty, microsurgery, allotransplantation, brachial plexus surgery, and forearm and elbow pathology.

Much of the 2021 academic calendar was maintained virtually to ensure the safety of our providers and patients. The ease and accessibility of the virtual format resulted in the Hand Center having more guest speakers and events than ever before, with access to these events available to a wider number of learners nationally. MedStar provides enterprise-level secure video conferencing accounts that have supported all of our educational conferences and visiting speaker events even when distancing was required. It has enabled our team members to exchange ideas not only on surgical trauma management and technique, but also the evolving "best practice" topics surrounding care delivery in the era of a pandemic

■ **Quality Management and Improvement.** The Curtis National Hand Center maintains a formal

performance improvement process for timely problem identification, data-driven analysis, and resolution of issues within the quality framework of MedStar Union Memorial Hospital. At a monthly morbidity and mortality conference, challenging and readmitted cases are presented for evaluation and to review outcomes. The Hand Center has maintained efficient electronic data capture and data entry into the Maryland Trauma Registry, providing high quality and completeness in reporting. With expanded data and analytic capabilities, the Hand Center has launched quality improvement initiatives aimed at improving triage and transfer, evaluating processes of care delivery and how to optimize them across all services, and providing unique approaches to reduce patient burden after trauma.

■ **Injury Prevention Programs and Initiatives.** In FY 2021, the Hand Center initiated community and hospital visitor outreach via social media and hospital digital wall screens that provided injury prevention and safety information about falls, lawnmowers, fireworks, and snow blowers. The center's trauma coordinator participates each year in a statewide distracted driving injury prevention initiative. The Hand Center Trauma Medical Director, Dr. James P. Higgins, has been active with speaking engagements throughout the state and surrounding areas. Dr. Ryan Katz has been designated the hand center's trauma education liaison, meeting with field clinicians at statewide meetings and in community hospitals to improve communication and feedback on coordination of trauma transfers.

■ **Focused Services for Amputation Patients.** In line with many other large upper extremity trauma centers, we have initiated a focused clinic for patients that have suffered an upper extremity amputation. This clinic allows for coordination of care across hand surgery, orthotics/prosthetics, therapy, and social work/social services all at one clinic visit, providing efficient and high value care for amputees.

■ **Prehospital/EMS/Nursing Continuing Education.** The MUMH Continuing Medical Education Committee Hospital oversees the continuing medical education (CME) program at the Curtis National Hand Center. Routine CME events are provided for the attending hand surgeons, fellows and residents, hand therapists, mid-level practitioners, nursing, and ED staff. Hand trauma labs are scheduled on a regular basis, giving staff the opportunity to learn, practice, and update their skills.

Specialty labs are conducted for ED management of hand trauma that are available for Emergency department staff and first-call clinicians. Advanced surgical labs are conducted for surgical staff, hand fellows, and residents. Visiting speaker events are open to all staff across the system. Hand Surgeons provide lectures for

OR staff on specialty topics (i.e., digital replantation, microsurgery, free tissue transfer) as part of the OR weekly educational series.

■ **Fellowships/Residencies.** The Hand Center is one of the largest training centers for hand surgery. Our fellowship training program is highly sought after by the best plastic surgery and orthopedic surgery trainees in the world and prepares all our graduates for management of complex upper extremity problems. The surgeons of the Hand Center have contributed some of the most important and regularly referenced publications about care of the injured hand and upper extremity and continue to lecture worldwide on hand trauma.

■ **Research.** Aviram Giladi, MD, MS, a surgeon at the Curtis National Hand Center with additional training in statistics and research methodology, is the research director. With protected time and hospital support for research work, the investigative efforts across the Hand Center have grown exponentially in the past few years. With this focused committed time and excellent resources, there are numerous research and educational studies ongoing with frequent publications in the highest-impact specialty peer-reviewed journals.

Research projects, funded by internal and external sources, look at a wide range of issues, including microsurgery, peripheral nerve surgery and augmenting nerve recovery, bone and soft-tissue problems, evaluation and triage for traumatic injuries, and reconstruction after trauma. We have also expanded our focus on health services research, launching an expansive data collection initiative, participating in multiple clinical trials, and coordinating numerous research efforts evaluating policy and care quality issues around hand and upper extremity trauma. In August 2021, we are initiating a randomized trial of novel surgical treatments for post-amputation neuroma pain, sponsored by the Department of Defense. This is one of many studies aimed at reducing pain and improving return to work and function for our trauma patients. This is one example of how the focus of our research work centers on our role as a regional trauma center. We are also studying the impact of health policy changes on triage and transfers, how telehealth and video analyses can improve remote triage as well as post-operative follow-up, and various approaches to improving care quality in a regionalized hand and upper extremity trauma center. All these expanded efforts include collaborations with other experts, in our region and across the world, to promote expanded thinking and new developments across all our research.

■ **Rehabilitation.** The rehabilitation team at the Hand Center, and across the MedStar rehabilitation network, works closely with the hand surgeons at the Hand Center to establish a treatment plan for each patient.

With these well-crafted plans, our therapy team can facilitate supervised and independent therapy sessions for our patients based on everyone's situation and need.

Additionally, therapists teach and guide each patient to maximize use of the injured or otherwise limited extremity while preventing re-injury or worsening of their condition. Therapists educate patients on the disease process, the healing process, and the rationale for the prescribed therapy techniques, and regularly communicate with the primary surgeon should problems, issues, or challenges arise. In 2020, prior to the COVID-19 pandemic, our hand therapy teams began establishing tele-therapy visits. Since the start of the pandemic, these offerings have expanded substantially across the MedStar network. We have in-person as well as tele-therapy visits for our patients, so they can progress well in their recovery while maintaining proper precautions.

A complete suite of rehabilitation services is offered, including:

- Management of acute or chronic pain
- Protective splinting for immobilization and controlled motion, post-operatively or post-injury
- Exercise programs to restore motion, strength, and fine and gross motor coordination
- Home exercise programs
- Sensory re-education programs after nerve injury
- Thermal and electrical modalities to minimize pain and swelling, facilitate joint motion and tendon gliding, and decrease hypersensitivity
- Whirlpools to assist with wound healing
- Work hardening and functional testing
- Social worker consultations

Neurotrauma Center

R Adams Cowley Shock Trauma Center

22 S. Greene Street, Baltimore, Maryland

The Neurotrauma Center at the R Adams Cowley Shock Trauma Center, University of Maryland Medical Center, provides comprehensive management for patients with injuries of the brain, spinal cord, and spinal column. According to the Maryland State Trauma Registry, from June 1, 2020, to May 31, 2021, the Neurotrauma Center provided care to 2,315 patients with traumatic brain injuries, 438 patients with spinal column or spinal cord injuries, and 576 patients who suffered from both traumatic brain and spinal column or spinal cord injuries. (See pages 83 to 88 for additional patient data.)

A dedicated, highly trained, and experienced multidisciplinary clinical staff including physicians, nurses,

therapy services, case management, pain management, nutritional services, integrative medicine, social work and pastoral care staff, a designated patient advocate, and a substance abuse program are available at the Neurotrauma Center.

At the Neurotrauma Center, patients with severe brain injury receive a multisystem assessment with intracranial pressure parameters closely monitored so factors that may cause secondary brain injury are rapidly recognized and treated, optimizing patient outcomes. Neurosurgeons are readily available to intervene if necessary and perform craniotomies for hematoma evacuation, gunshot wound debridement, elevation of depressed skull fractures, decompressive craniectomies, and cranioplasties. Patients with spinal cord injuries, often with cervical spine injuries, are treated using sophisticated respiratory care protocols leading to successful weaning from mechanical ventilation for most patients.

The 12-bed Neurotrauma Critical Care Unit (NTCC) provides multidisciplinary care to critically ill patients who have sustained primarily central nervous system injury and may have other associated injuries or organ dysfunction. The NTCC operates with the required resources for critical care with the addition of specialized intracranial pressure monitoring, including fiber optic, intraparenchymal, and intraventricular.

The 24-bed Neurotrauma Intermediate Care Unit (NTIMC) provides multidisciplinary care to ill patients who have sustained primarily central nervous system injury and may have other associated injuries or resolving organ dysfunction. These patients still require frequent monitoring or intensive nursing care.

Mission

The R Adams Cowley Shock Trauma Center is a multidisciplinary clinical, educational, and research institution dedicated to world-class standards in the prevention and management of critical injury and illness. Its highly specialized medical personnel and dedicated resources are focused on a single mission: to eradicate preventable death and disability and thus reduce the personal tragedy and overall costs associated with severe injury. This mission is continuously pursued through state-of-the-art clinical care services, active research, didactic and hands-on clinical education, and prevention programs.

Neurotrauma Center Staff

Trauma Medical Co-Director:

Bizhan Aarabi, MD, FACS, FACSC

Trauma Medical Co-Director:

Gary Schwartzbauer, MD, PhD

FY 2021 Annual Report

■ **Notable Accomplishments.** During the COVID-19 pandemic, the R Adams Cowley Shock Trauma Center played a major role in the care of stricken Marylanders, with those patients with concomitant neurologic injury coming to the Neurotrauma Center. Due to the excellent planning and direction from the Hospital Incident Command System, Unit leadership and, very importantly, Nursing and Environmental Services in the front lines daily, we achieved great out-comes in the face of this crisis. Daily, weekly, and monthly debriefings were organized by nursing leadership to troubleshoot, ease stress and improve patient care. Despite the increased patient care demands, the Neurotrauma Center continued to achieve the notable accomplishments below:

- Samantha Adams, MSN, RN, Nurse Manager of Neurotrauma Critical care and Intermediate Care, was appointed to the Board of Directors of the Brain Injury Association of Maryland. Samantha was also appointed to the role of Treasurer for the Executive Committee for the Brain Injury Association of Maryland.
- Karen Memphis, BSN, RN, from the NTCC continues to serve as a member of the Brain Injury Association of Maryland Board of Directors.
- QI/EBP project on NTCC: Fecal Management to prevent CAUTIs.
- QI/EBP project on NTCC: Phlebitis prevention.

■ Publications.

- Scarboro M, McQuillan KA. Traumatic brain injury update. AACN Advance Crit Care. 2021, 32(1):29-50.
- 2020 – 2021 Karen McQuillan, MS, RN, CNS-BC, CCRN, CNRN, TCRN, FAAN. Expert panel member developing the *American College of Surgeons Trauma Quality Improvement Program Best Practice Guidelines for Spine Injury*. Author of the Decubiti section.

■ Presentations.

- Karen McQuillan, MS, RN, CNS-BC, CCRN, CNRN, TCRN, FAAN, presented “Management of Acute Cervical or High Thoracic Spinal Cord Injuries” for the 14th Annual Tacoma Trauma Conference 2020 virtual conference November 13, 2020.
- Maureen Scarboro, CRNP, presented a virtual educational seminar “Spinal Cord Injury: ASIA scale, Assessment Demonstration, Types of Cervical Injuries, and Injury Management”. This event was broadcast live, allowing members of our EMS community the opportunity to attend.
- March 18, 2021: Karen McQuillan, MS, RN, CNS-BC, CCRN, CNRN, TCRN, FAAN, served

as a speaker at a virtual public workshop on the “Acute-Stage Continuum of Care”, led by Dr. Thomas Scalea, MD, MCCM, for The National Academies’ Committee on Accelerating Progress in Traumatic Brain Injury Research and Care examining the landscape of TBI care and research and working to prepare a report that provides a roadmap for advancing the field over the next decade.

- TraumaCon 2021 – Society of Trauma Nurses Annual Conference, virtual conference, March 2021. “Interrater Reliability of the Agitation Behavior Scale in Critical Care and Intermediate Care”. Poster Presenters: Karen McQuillan, MS, RN, CNS-BC, CCRN, TCRN, FAAN; Sara LeMaitre, MS, RN; Paul Thurman, PhD, RN, ACNP, CCNS, CCRN; Alivia Stenzel, BSN, MS, RN, SCR, SCN I; Katelyn DeLauter, MS, RN, CNL, CN II; Nora Tamulevich, BSN, RN, CCRN, CN II; Amy Madren, BSN, RN, TCRN, SCN II
- Karen McQuillan, MS, RN, CNS-BC, CCRN, CNRN, TCRN, FAAN, presented “Neurologic Assessment” and “Spinal Cord Injury” for University of Maryland School of Nursing, Doctorate of Nursing Practice Advanced Practice Nurses, Baltimore, Maryland.
- Karen McQuillan, MS, RN, CNS-BC, CCRN, CNRN, TCRN, FAAN, presented “Neurotrauma” for CNRN Review Course offered at the National Institutes of Health Clinical Center, June 25, 2021.

■ **Research.** “Prevalence and Predictive Characteristics of Agitation in Patients with Traumatic Brain Injury with Traumatic Brain Injury in the Acute Care Setting” (2019 – 2021).

- Awarded \$14,987 grant from the Society of Trauma Nursing.
- Study completed and manuscript under development.
- Study Team: Karen McQuillan, MS, RN, CNS-BC, CCRN, TCRN, FAAN; Sara LeMaitre, MS, RN; Paul Thurman, PhD, RN, ACNP, CCNS, CCRN; Alivia Stenzel, BSN, MS, RN, SCR, SCN I; Katelyn DeLauter, MS, RN, CNL, CN II; Nora Tamulevich, BSN, RN, CCRN, CN II; Amy Madren, BSN, RN, TCRN, SCN II; Gary Schwartzbauer, MD, PhD, FPI, Neurosurgery; Mehrnaz Pajoumand, PharmD, BCPS, Pharmacy.
- Completed data collection and analysis. Those findings showed that 46% of our patients admitted to NTCC or NTIMC with a traumatic brain injury had at least one episode of agitation. This has prompted an interdisciplinary team to develop and implement a guideline to manage agitation in

patients with traumatic brain injury.

■ **Quality Improvement/Evidence Based Practice.** Initiated a Performance Improvement project entitled, “Development and Implementation of an Agitation management Guideline to Reduce Agitation in Patients with Acute Traumatic Brain Injury”.

- Recipient of \$25,000 Innovation Award from the University of Maryland Medical Center.
- Team Members: Karen A. McQuillan, MS, RN, Nursing, Shock Trauma Center; Gary Schwartzbauer, MD, PhD, FPI, Neurosurgery; Mehrnaz Pajoumand, PharmD, BCPS, Pharmacy; Paul Thurman PhD, RN, Nursing, Shock Trauma Center; Alivia Stenzel MS, RN, Nursing, Shock Trauma Center; Madeline Marks, PhD, Psychiatry; Nora Tamulevich, RN, BSN, Nursing, Shock Trauma Center; Alexandra Hunt, MSN, CRNP, Nursing, Shock Trauma Center; Juli Carbone, OTR/L, CBIS, Rehabilitation Services; Amy Madren, BS, BSN, Nursing, Shock Trauma Center; Katelyn Delauter (Ruhe) MS, RN, Nursing, Shock Trauma Center; Sara Le Maitre, MS, RN, Perioperative Services; Samantha Latorre, MD, Psychiatry; Samantha Adams, MS, RN.
- The unit continues to review all hospital acquired infections and their findings were a catalyst for development of the fecal management guideline that was implemented in March 2020.
- Our quality initiatives continue to focus on reducing hospital acquired infections with emphasis on ensuring daily chlorhexidine treatments and preventing and treating diarrhea as outlined in our fecal management guideline which was rolled out this year. The NTCC unit has gone over nine months and NTIMC over 18 months without a CLABSI.
- As a result of an effort to reduce use of central lines, our incidence of peripheral line phlebitis has increased. We have collected data on patient who have experienced peripheral IV phlebitis and, based on analysis of the data, an action plan had been developed which will shortly be implemented.

■ **NTCC Donation Committee.** The nurse-driven Committee on Neurotrauma Critical Care focuses on honoring and improving care of our donor patients and their families through education and team engagement. Over the past year, the team has developed a binder that contains helpful information, such as brain death definitions, policies, checklists, and needed lab work that is readily available for providers on the unit. The team continues to keep lighted lanterns on when a donor is on the unit and perform the “Walk of Honor” as organ donors and their family leave the unit for donation.

They have also initiated the practice of draping the patient with a blanket that says “Hero” as they leave the unit.

- Karen Memphis, RN, SCNI
- Breana McKinnon, MPH, BSN, RN
- Sara Reihl, RN, BSN, TCRN, FNE-A
- Kathryn Miska, BSN, RN

■ **Injury Prevention Programs and Initiatives.** The Center for Injury Prevention and Policy (CIPP) aims to reduce preventable injuries and violence, and their consequences throughout Maryland. Several injury-prevention programs, listed on page 34, operate within CIPP.

■ **Emergency Medical Services and Nursing Continuing Education.** The Neurotrauma Center has a robust Trauma Theory course, which incorporates a number of simulations, including modules focusing on care of patients with spinal cord injury and traumatic brain injury.

■ **Research.** The Neurotrauma Center employs a multidisciplinary team of clinical experts that utilizes evidence-based treatment strategies designed to ensure immediate diagnostic and therapeutic access for patients with traumatic brain, spinal column and spinal cord injuries. The staff and faculty of the Neurotrauma Center avails its clinical and research expertise globally to healthcare providers. Trauma-related publications by Neurotrauma faculty in FY 2021 covered a variety of topics. Articles in peer-reviewed journals and Neurotrauma-related grant research projects have included advances in traumatic brain injury, role of anticoagulation for venous thromboembolism (VTE) following traumatic brain injury (TBI), safety of mean arterial pressure (MAP) elevation for spinal cord injury (SCI) patients with cord contusions, predictive features of paroxysmal sympathetic hyperactivity and treatment changes for traumatic brain injury among older adults in a trauma center. Newly activated and some of the relevant ongoing clinical trials include:

- Genetic analysis of trauma patients that will hopefully someday tailor trauma care;
- Optimizing brain oxygen supply and outcomes following TBI using a brain oxygen monitor;
- Assessing the utility of acupuncture for spinal cord injury patients;
- Delivering optimal oxygen therapy to TBI patients through hyperbaric oxygen;
- Cooling patients with spinal cord injury to improve outcomes;
- Using biomarkers to correlate to level of TBI and need for follow up CT scan;
- An exciting multicenter trial looking to treat TBI patients with a drug developed by a University of Maryland researcher and neurosurgeon.

The following members of the R Adams Cow-

ley Shock Trauma Center served on the Neurotrauma Delphi consensus panel as part of the National Trauma Research Action Plan (NTRAP) project: Sam Galvagno, DO, PhD, MS; Karen A. McQuillan, MS, RN, CNS-BC, CCN, CNRN, TCRN, FAAN; Gary Schwartzbauer, MD, PhD; and Daniel Gelb, MD. The panel is using an online Delphi protocol to determine where the primary research gaps exist for traumatic brain and spinal cord injuries. The NTRAP project is supported by a grant from the Department of Defense, managed by the Coalition for National Trauma Research (CNTR). When complete, the NTRAP will provide the framework for a coordinated research program that identifies critical gaps in trauma research and focuses research efforts across federal agencies and within the civilian and military medical sectors.

Karen McQuillan, MS, RN, CNS-BC, participates on the American College of Surgeons (ACS) Committee on Trauma (COT) Trauma Quality Program (TQP) development of the Spine Injury Best Practices Guidelines.

■ **Rehabilitation.** Part of the recovery process must start at the very instant patients arrive at the Neurotrauma Center, with the ultimate aim of stabilization of critical injuries followed by early rehabilitation.

The Neurotrauma Center’s emphasis on early patient mobilization as the beginning of the rehabilitative process helps to decrease morbidity associated with neurologic injury. Post-acute inpatient and outpatient services are primarily provided by the University of Maryland Rehabilitation & Orthopedic Institute.

Rehabilitation Services

Designated trauma centers within the Maryland EMS system are required to provide for the rehabilitation needs of their patients, whether provided in-house or by way of affiliation with other facilities. This service is a critical element of the continuum of care for patients who have survived traumatic injury. Initiation of rehabilitation services begins as soon as possible following admission. Rehabilitation services are both in-patient and outpatient.

Patients who experienced multiple trauma resulting from a motor vehicle crash, fall, sports-related injury, or assault and resulting in temporary or long-term disability benefit from a full range of rehabilitative services dedicated to enabling them to resume active, independent lives. The most frequent injuries requiring rehabilitation are spinal cord injury, traumatic brain injury, fractures, amputations, and gunshot wounds. The goal is to enable the patient to resume their highest level of functioning by regaining strength and range of motion. Individualized rehabilitative interdisciplinary treatment plans, developed with the patient, assist in meeting their needs and goals.

Top Destinations of Patients Who Went to Inpatient Rehabilitation Facilities (Aged 15 and Over) (June 2020 to May 2021)

Source: Maryland State Trauma Registry

Rehabilitation Center	Number
Adventist Health Care	89
Encompass Health Rehabilitation Hospital	141
Genesis Health Care	30
HCR Manor Care	18
Johns Hopkins Bayview Specialty Hospital Inpatient Rehabilitation	43
Inpatient Rehabilitation Unit at The JHH	34
MedStar National Rehabilitation Network	38
Sinai Rehabilitation Center	53
University of Maryland Capital Region Health Physical Rehabilitation Center & Stroke Specialty Program	18
University of Maryland Rehabilitation & Orthopaedic Institute	413

Note: Total patients aged 15 and over that went to rehabilitation centers = 1,456

Destinations of Patients Who Went to Inpatient Rehabilitation Facilities (Aged 14 and Under) (June 2020 to May 2021)

Source: Maryland State Trauma Registry

Rehabilitation Center	Number
The HSC Pediatric Center, DC	4
Kennedy Krieger Institute	9
Mt. Washington Pediatric Hospital	11
MedStar National Rehabilitation Hospital	3
Children’s Hospital of Philadelphia	1

Note: Total patients aged 14 and under that went to rehabilitation centers = 28

The initial rehabilitation team evaluates and monitors the patient, focusing on the prevention of morbidity associated with the patient’s immobility, positioning, and nutrition. Rehabilitation services within the hospital setting are also useful for future rehabilitation planning, prognosis, and care. Following the acute care phase, trauma centers help the patient and/or family determine

the most appropriate place to meet the patient's rehabilitation needs. Factors that affect the patient, such as functional outcomes, social needs, financial constraints, geographic location, and eligibility requirements, assist in consideration for rehabilitation placement.

There are three (3) main types of rehabilitation: physical, occupational, and speech therapy. The purpose of each rehabilitative therapy focuses on the patient's unique circumstances in order to enable the patient to resume the greatest level of functioning.

Physical Therapy

Physical Therapy goals are to relieve pain, improve movement, strength, balance, and flexibility following injury, and for teaching patients how to use devices to help the patient manage his or her mobility. A physical therapist visits the patient at the bedside or in a physical therapy setting while in the acute care hospital. Decreasing pain and limiting permanent disability ensures patients the best possible chance of returning to daily activities. Physical therapists assist patients following injuries to bones, muscles, nerves, the spinal cord, and the brain. Patients may continue to see a physical therapist at home or at an outpatient center after leaving the hospital.

Occupational Therapy

Occupational therapists focus on restoring a patient's ability to perform self-care, recreational activities, and everyday tasks such as getting dressed, eating, driving, and taking a shower. Occupational therapy may take place in the hospital and at home.

Speech Therapy

The goal of speech therapy is to combine speech mechanics with the use of language for enhancing patient outcomes for communication functioning. Speech therapy can help a wide variety of issues involving language, communication, voice, swallowing, and articulation. Frequently, speech therapies are employed following a traumatic brain injury. Speech therapists help patients to swallow, eat, and better comprehend language following an injury. Speech therapy takes place in the hospital, at home, or at an outpatient center, depending on a patient's condition and needs.

Maryland-National Capital Region Emergency Response System

Program Overview

The Maryland-National Capital Region Emergency Response System (MDERS) is a federally funded program administered by the Maryland Institute of Emergency Medical Services Systems (MIEMSS). The

organization integrates fire, rescue, emergency medical services, law enforcement, emergency management, public health, and health care systems to ensure a coordinated response to emergency incidents. The program provides direct support to the Maryland-National Capital Region (NCR), which includes Montgomery and Prince George's Counties, and works closely with its partner entities in Northern Virginia and Washington, D.C.

A significant portion of the annual program budget, which is provided through NCR Urban Area Security Initiative funds, is managed by MIEMSS. The agency is also the entity primarily responsible for employment of support personnel, contractual support from outside entities, and training and exercise initiatives.

MDERS was established to optimize responses to emergency incidents through communication, collaboration, and coordination of multiple agencies, disciplines, and jurisdictions. The MDERS Steering Committee, comprised of representatives from five core disciplines (emergency management, fire/EMS, hospitals, law enforcement, and public health), provides strategic direction for the program. The committee membership includes state officials in addition to representatives from Montgomery and Prince George's Counties.

The direction of the Steering Committee is carried out by a full-time staff of 11 that includes a director; program managers; planners; a financial administrator; and logistics, training, and exercise coordinators. The MDERS main office is co-located with MIEMSS Region V in College Park, and a supplementary office is located at the Montgomery County Public Safety Headquarters in Gaithersburg.

In FY 2021, MDERS continued to assist stakeholders with enhancing response capabilities by providing staffing to plan and develop policy; develop and deliver training and exercise opportunities; and acquire equipment to support the missions of its partner agencies.

Investment Overview

The NCR Homeland Security Executive Committee approves the MDERS budget, including these notable investments and regional projects.

■ **FirstWatch System Monitoring System.** MDERS manages the FirstWatch program for the NCR. The program is designed to provide real-time situational awareness, aggregate data sources, analyze data against target performance metrics, evaluate call-taking efficiency, and monitor patient care for quality assurance. This year, the project expanded, complementing the FirstWatch situational awareness software already operational in the NCR, including the expansion of triggers and reports for Montgomery County Fire and

Rescue Service, Prince George's County Fire/EMS, and implementation in additional Northern Virginia jurisdictions. This project continues to expand communication capability by providing real-time tracking of resource use and depletion, transportation decisions, and healthcare system stresses. In FY 2021, MDERS delivered the final phase of the implementation effort that spanned nearly seven years. Jurisdictions continue to internally implement the various system features, with full NCR-wide capability currently available.

■ **Medical Resource Officer for Public Health Emergency Preparedness.** MDERS funds two staff members, one in Prince George's County and one in Montgomery County, to coordinate the Medical Reserve Corps Volunteers. The activities of these employees include the oversight, administrative guidance, recruitment, credentialing, background clearances, training, exercise opportunities, deployment protocols, and development of emergency plans and tools to prepare volunteers for the vast range of activities they support. The goal of this program is to strengthen individual, community, and workplace preparedness for emergency events and foster volunteer participation. This year, the volunteers provided through this program contributed heavily to the COVID-19 emergency response, including clinical care, testing, and vaccinating. Both programs were also provided with trailers. These trailers, coupled with emergency response vehicles provided by MDERS in years past, will be used for on-site operations for medical surge, mass immunization, and point of distribution medication dispensing. The on-scene operations are further supported by laptops, software, access points, and other peripherals that were provided by MDERS to allow for local incident command.

■ **Small Unmanned Aerial Systems (sUAS) for Public Safety Agencies.** MDERS supports policy development, purchase, training, and maintenance programs for small, unmanned aerial systems (sUAS) for use by public safety agencies in Montgomery and Prince George's Counties. These resources provide responders with real-time situational awareness and scene assessments during complex and hazardous situations during which access is limited or direct observation by a responder is dangerous. The program also provided Prince George's County Police Department with a vehicle dedicated to sUAS deployment, which has workstations for pilots and observers, charging and maintenance areas, and storage compartments. MDERS staff assisted all recipient agencies in policy work, procurement processes, and planning with the Department of Homeland Security, Federal Emergency Management Agency (FEMA), and the State Administrative Agency. The program outcome is to integrate new and emerging sUAS policy, processes, and technology into the daily

routine of public safety agencies.

■ **Incident Command Support for the Montgomery County Fire and Rescue Service (MCFRS).** This project completed the infrastructure components for the MCFRS Command Officer Professional Development Instruction Laboratory. These labs offer the technical platform for providing a controlled environment that simulates an emergency scene. The labs feature multiple simulations of emergency incidents to include vehicle response, radio communications, personnel interactions, changing scene conditions, and responses to incident commander actions. MDERS supports this activity to develop safe, efficient, and effective behaviors by incident commanders to deploy interdepartmental, interjurisdictional, and regional partner resources to manage fire and rescue emergency incidents.

■ **Public Access Trauma Care.** Over the past several years, MDERS has invested heavily in Tactical Emergency Casualty Care. This program, which is a civilian version of military medicine, was designed to treat victims of life-threatening trauma, oftentimes induced by violence. This capability has been built into law enforcement, fire/rescue/EMS, and hospitals. Most recently, MDERS expanded this capability to include the entire continuum of care by providing bystanders with the tools and training to become immediate responders. This is a critical capability with these time-sensitive injuries, when traditional EMS will not have access or the quantity of patients will demand empowered civilians to assist. MDERS has provided and installed kits and cabinets in all 207 Montgomery County Public Schools (MCPS). MDERS has also worked with MCPS to develop a curriculum about how to respond to these critical emergencies and use the kits provided to the student. This training will begin to be delivered to all high school students in winter 2022. MDERS staff is also working with Prince George's County Public Schools to provide the same equipment and training. Simultaneously, MDERS is working with emergency managers in both counties to provide kits, cabinets, and training in administrative buildings, courts, libraries, community centers, and police stations.

■ **Mass Casualty Incident Response Support.** Since its inception, MDERS has provided support for mass casualty incident (MCI) response and management as one of its key capability targets. This year's funding focused on providing equipment and supplies to quickly outfit and deploy additional transport units during times of peak demand during disasters. The grant program provided MCFRS with additional patient-moving devices, including various stretchers and stair chairs, as well as sealed containers for storage of the equipment. Prince George's County Fire and EMS Department was provided with automated lockers that allow for 24/7

immediate access to the equipment, while maintaining control and security of the supplies. Each county has now been provided with equipment and supplies to outfit an additional 10 BLS and five ALS units during patient surges. Both counties utilized these resources during the height of increased patient demand during the COVID-19 pandemic. This allowed for real-world application of the equipment and processes, which demonstrated areas for improvement to more quickly and efficiently deploy these resources. MDERS continues to work with stakeholders to refine these processes to ensure an expedient surge capability for both EMS agencies.

■ **Tactical Medical Equipment for Law Enforcement.** MDERS supported new medical bags for all tactical medical clinicians in the Maryland-NCR, creating a uniform, interoperable platform that can be shared across clinicians and departments. Each agency was provided with sufficient supplies and equipment to completely refresh the tactical medical clinician cache and stock the new bags.

■ **Emergency Responder Decontamination Enhancement.** The Maryland-National Capital Region emergency response partners procured and operationalized first responder health and safety tools and equipment to protect responders from chemical, biological, and explosive threats. The project provided 120 decontamination kits for MCFRS and PGFD, including personal wipes, buckets, brushes, and nozzle kits. These kits are placed on the engine company for immediate after-the-fire gross decontamination. Additional equipment is focused on law enforcement personnel. These items include individual decontamination kits, a large backpack team decontamination kit, and portable showers. MDERS personnel worked with all public safety agencies to develop policies and procedures that guide the decontamination requirements and process.

■ **Hospital Disaster Preparedness.** In order to prepare a wide variety of injury patterns associated with mass casualty incidents, the 14 hospitals in the Maryland-NCR identified burn treatment as a gap in their current capabilities. Each hospital was provided with a burn cache, which allows every emergency department to provide life-sustaining care of burn patients that present following an MCI. These kits contain protective clothing for clinicians, basic bandaging and wet dressings, pharmaceuticals, hydration supplies, and other materials to treat these injuries. Hospitals were also provided with a number of trauma supplies, such as tourniquets and compression dressings, to augment their current supply. These materials are particularly important during MCIs, when patients oftentimes present to the closest hospital rather than a specialty center designed for traumatic injuries.

■ **Tactical Equipment for Law Enforcement.** MDERS continues to support Maryland-NCR Special Weapons and Tactics (SWAT) team members in Montgomery County and Prince George's County. This year, MDERS provided allocations to purchase a Tyler bench for the Prince George's County Police Department Aviation Section, which allows for aerial observation, rappelling, equipment delivery, and law enforcement operations. Funds also supported the purchase of a SWAT personnel transport van, low-light vision devices, breaching kits, helmet safety strobes and visors, and a self-contained breathing apparatus trailer for law enforcement operations. The program also provided a secure storage locker for rapid deployment of specialty equipment. MDERS also supported the purchase and installation of a water monitor on the Montgomery County Police Department armored vehicle to assist in active violence situations where fire is used as a weapon. These items are part of law enforcement capability response to terrorist events or complex coordinated attacks.

■ **Training and Exercise Program.** MDERS supports initiatives for training and exercises that encourage development of local critical incident response capabilities. The program follows the federal Homeland Security Exercise and Evaluation Program model to ensure consistent results and improvement plans that lead to increased readiness. As part of the capability development process, this program is responsible for sending stakeholders to several specialized trainings and conferences, including these events conducted in FY 2021:

- All-Hazard Incident Management Training
- Small Unmanned Aerial Systems Pilot Training
- Advanced Law Enforcement Rapid Response Training (ALERRT) at Texas State University
- Assessment and Training Solutions Live Tissue Lab Training
- Anatomy gift Registry Lab Training
- Direct Action Resource Center Basic Counterterrorism Training
- Direct Action Resource Center Advanced Operational Breach Techniques
- Direct Action Resource Center Breaching and Program Supervisors Training
- Direct Action Resource Center Supervisors and Managers Course
- Direct Action Resource Center Tactical Supervisors and Managers Course
- Federal Aviation Administration Unmanned Aerial Systems Symposium
- Forced Entry Tactical Training 8th Annual Breachers Circle
- Forced Entry Tactical Training Explosive Breaching Course

- Homeland Security Exercise and Evaluation Course Training
- International Association of Fire Chiefs Hazardous Materials Conference
- International Association of Emergency Managers Conference
- Joint Commission Emergency Preparedness Conference
- Large-Caliber Rifle Course
- High-Angle Shooter Course
- Aerial Sniper Course
- Maryland Emergency Management Association Conference
- National Healthcare Coalition Conference
- National Homeland Security Conference
- National Tactical Officers Association Command Class
- National Preparedness Leadership Initiative Seminar Series
- Pinnacle EMS Conference
- Project Management Course
- Professional Writers Course
- Special Operations Medical Association (SOMA) Conference
- Structural Collapse Rescue Course
- Tomahawk Tactical Entry Course
- Tomahawk Night Vision Course
- Special Weapons and Tactics (SWAT) Supervisor School

Additional Activities

■ **EMS Tabletop Exercises.** MDERS conducted the second phase of table-top exercises (TTX) with Emergency Medical Services Duty Officers from the Prince George's County Fire/EMS Department and Montgomery County Fire and Rescue Service (MCFRS). The goal of the exercises was to refine and assess the EMS Duty Officer's ability to effectively manage mass casualty and multi-patient incidents. A series of incidents were developed to challenge the personnel with increasing complexity. Both departments hosted multiple sessions creating a strong collaboration between the counties. The after-action report listed several key areas for development in policy, process, and activities to support the terrorist incident or complex coordinated attack. As COVID-19 emerged, the scenarios were adjusted to simulate managing multiple COVID-19 patients presenting simultaneously in a nursing home facility. Supervisors cited this training as essential to their management of these incidents as they presented throughout the pandemic.

■ **Support to regional workgroups.** MDERS staff support or led workgroups and initiatives and serve on various committees. As an example, MDERS leads a

Law Enforcement-EMS working group that assesses regional needs and builds target capabilities for integration of law enforcement and EMS.

■ **Representation in Regional Activities.** MDERS represents its stakeholders by holding positions on certain regional committees hosted through the Metropolitan Washington Council of Governments. As a conduit between the local jurisdictions and the larger NCR, MDERS minimizes the burden on participants while ensuring their interests are represented and supported through regional funding. MDERS staff members participate in meetings and activities, including involvement in Regional Emergency Support Function Committees; Regional Programmatic Working Groups; Regional Planning Guidance Working Group; the NCR Emergency Response System; the NCR Complex Coordinated Attack Workgroup; and the NCR Homeland Security Executive Committee, Policy Group, and Advisory Council.

Summary

Through its many programs and projects, MDERS facilitates collaboration of regional resources in responding to emergency incidents, including terror attacks. By way of regular communication, the MDERS Steering Committee assists local subject matter experts representing emergency response disciplines in defining their critical needs. Through a standard and cooperative method, capability gaps are closed in a comprehensive fashion that complements the missions and objectives of all partners. MDERS continues to build a collaborative community of all emergency response partners throughout the Maryland-NCR and beyond. Joint capabilities that transcend traditional jurisdictional and disciplinary boundaries continue to provide citizens with superior response during both routine and large-scale emergency incidents.

Department of Emergency Health Services, University of Maryland Baltimore County

The Department of Emergency Health Services (EHS) is a center of excellence for EMS and emergency public health education and research at the University of Maryland Baltimore County (UMBC). It provides undergraduate, master's, and doctoral level education to future and existing prehospital and emergency public health clinicians, emergency management, and disaster health leaders.

Since its formation in the 1980s as the research and education arm of MIEMSS, EHS has graduated an impressive number of students, many of whom have become federal, state, and local EMS leaders, physi-

cians, medical directors, researchers, and administrators. The 2020-2021 academic year saw a continued effort to respond to the challenges that COVID-19 has imposed upon the EMS and education systems, as the Department continued to strive to promote its mission of public service, education, and research for EHS during the COVID-19 pandemic and to graduate EHS professionals to continue to serve in Maryland and beyond. Faculty and students continued to function as clinicians and experts in the COVID-19 response.

The Department is very pleased to announce its new Chair and faculty member, Dr. Lauren Clay. Dr. Clay is a disaster scientist and public health researcher. Her research focuses on individual, household, and community recovery from disasters. She has studied Hurricanes Katrina, Sandy, Harvey, and Florence, the Deepwater Horizon Oil Spill, the 2013 Moore, Oklahoma, tornadoes, and the Camp Fire, among other disasters and public health emergencies. Her expertise is in disaster disruption to the local food environment and food insecurity. Currently, she has several studies underway examining long-term recovery and public health impacts from Hurricane Katrina, food insecurity following Hurricane Florence and the Camp Fire, and several studies looking at food access and security during the COVID-19 pandemic. She co-chairs the national Healthy Eating Research (a program of the Robert Wood Johnson Foundation)/Nutrition and Obesity Prevention Research and Evaluation Network (funded by CDC) COVID-19 Food and Nutrition Security Working Group and is an Ambassador for the NSF-funded Natural Hazards Engineering Research Infrastructure DesignSafe-Cyber Infrastructure cloud computing space for big data. From 2018-2020, she was an Early Career Research Fellow with the National Academies of Science, Engineering, and Medicine Gulf Research Program. She has a PhD in Disaster Science and Management from University of Delaware and a Master of Public Health from Drexel University.

Maryland Poison Center, University of Maryland School of Pharmacy

Mission

To decrease the cost and complexity of poisoning and overdose care while maintaining and/or improving patient outcomes.

A division of the University of Maryland School of Pharmacy, the Maryland Poison Center (MPC) is designated by MIEMSS as a specialty referral center and by the Maryland Department of Health (MDH) as a regional poison center for Maryland. MPC provides

24/7 emergency poison information to the public and health professionals across the state. MPC is accessed by calling the nationwide poison help telephone number, 800-222-1222, or via the Emergency Medical Resource Center (EMRC).

MPC is certified by the American Association of Poison Control Centers (AAPCC) as a regional poison center. It has provided poisoning treatment advice, education, and prevention services to Marylanders since 1972. Bruce D. Anderson, PharmD, DABAT, serves as MPC's executive director, and Joshua King, MD, is the medical director. The poison specialists who work at MPC are pharmacists and nurses who are certified as specialists in poison information (CSPI) by AAPCC. The 16 specialists at MPC have over 240 years of combined poison center experience, ensuring that callers have access to experienced, qualified, and well-trained staff.

In CY 2020, MPC managed more than 39,000 cases. While 31,000 of these cases involved a human exposure, the remaining 8,000 were requests for information or involved animal exposures. Children under the age of 6 accounted for 39% of poison exposures. The top five causes of poisoning were analgesics, household cleaners, cosmetics and personal care products, antidepressants, and sedatives/anti-psychotics. The large majority of the cases reported to MPC were managed at a site not providing health care, such as the home, school, or workplace. Maryland EMS clinicians consulted with MPC on 1,400 cases in CY 2020. In 13% of those cases, transportation by EMS to a healthcare facility was deemed unnecessary and avoided based on MPC advice. Safely managing patients at the site of the exposure avoids unnecessary health care costs and allows more efficient and effective use of limited health care resources.

MPC continues to work closely with the National Capital Poison Center and other state and national agencies to monitor for possible chemical and biological weapons exposures and public health events throughout Maryland and the Washington, DC, region. MPC's data-collection system allows data to be submitted in real time to a nationwide poison center surveillance system. In addition to the astute clinicians covering the service 24 hours a day, automated symptom and substance outlier detection strategies are used to help identify evolving patterns or emerging clusters of exposures.

The center also partners with MDH's Behavioral Health Administration and the Maryland Office of the Chief Medical Examiner to address the rise in opioid overdoses and deaths. MPC provides a vital service to the state's Overdose Response Program by directly managing overdose cases as well as helping the state document naloxone administration by the lay public

and law enforcement officers. In CY 2020, MPC was involved in over 700 reports of bystander naloxone administration. MPC shares its data with state and local health departments on a weekly basis to help them respond to the opioid epidemic.

MPC staff conduct research to advance the prevention, diagnosis, and treatment of poisonings. A sample of research published or presented at scientific meetings in CY 2020 included:

- COVID-19 Impacts and New Ways of Working - Panel Discussion, Johnson & Johnson Consumer Inc. Virtual. Sept. 30, 2020.
- Predictors of Opioid Adverse Events in Hospitalized Adults. American College of Medical Toxicology 2020 Annual Scientific Meeting Abstracts – New York, NY.
- Impact of a Drug Safety Communication on the Severity of Benzonatate Exposure Reported to Poison Centers. *Pharmacoepidemiology Drug Safety*. 2020 Sep 23. doi: 10.1002/pds.5136.
- Electronic Cigarettes and Vaping-Associated Lung Injury: Basic Information for Nurses. *Journal of Radiology Nursing*, 2020. DOI: 10.1016/j.jradnu.2020.11.002.
- An Assessment of the Severity of Copperhead Bites Based on Extremity (abstract). North American Congress of Clinical Toxicology. Virtual meeting, 2020.
- Analysis of Iatrogenic and In-hospital Medication Errors Reported to United States Poison Centers: A Retrospective Observational Study. *Drugs & Therapy Perspective*. doi: 10.1007/s40267-020-00723-z

A complete list of MPC research efforts can be found in the Maryland Poison Center 2020 Annual Report (<https://bit.ly/2020MPCAnnualReport>).

MPC's public education efforts are intended to help prevent poisonings from occurring and to increase awareness of the Center's services. Angel Bivens, BS Pharm, MBA, CSPI, is MPC's assistant director of operations and public education and Emily Paterson, BS, CHES®, is MPC's public education and communication specialist. In CY 2020, MPC attended 36 programs throughout Maryland, reaching approximately 3,502 people. Organizations that partnered with MPC to provide education included fire and police departments, hospitals, health departments, pharmacies, hospital perinatal education programs, Head Start, Healthy Start, and local health improvement coalitions. Seventeen county school systems and daycare centers used educational materials from MPC in their classrooms. More than 224,000 pieces of educational materials (brochures, magnets, telephone stickers, Mr. Yuk™

stickers, teachers' kits, and more) were distributed at programs, schools, health fairs, and by direct mailings.

National Poison Prevention Week (March 15-21, 2020) activities included mailings to emergency departments throughout the state. To provide Poison Prevention Week kits to elementary schools, MPC partnered with Safe Kids Baltimore City, Safe Kids Carroll County, Safe Kids Frederick County, Safe Kids Washington County, Cecil County Department of Emergency Services, and Wicomico County Health Department, in their respective counties, and 10 additional county school nurses to offer Poison Prevention Week Kits to elementary schools. Schools could choose from a list of activities to increase awareness of poison safety to the students and their families. In all, 187 schools participated, reaching over 86,000 students.

MPC publishes *Poison Prevention Press*, a bimonthly e-newsletter for the public that highlights poison safety topics. Articles published in 2020 included "Poison Safety and New Year's Resolutions"; "Don't Search...Just Call!"; "First-time Parent's Guide to Poison Proofing Your Home"; "Insect Repellents"; "Poison Emergency Preparedness"; and "Will Kids Really Eat That?". MPC's Facebook page shares content with the public on topics related to poison prevention and safety. In CY 2020, MPC generated 236 posts and saw an increase of 100 followers. MPC's Twitter account (@MDPoisonCtr) also shares content for the public. In CY 2020, MPC shared 243 tweets and saw an increase of 163 followers. In CY 2020, MPC's blog, e-Antidote, had 23 new posts and 2,000 visitors.

MPC's Twitter account for healthcare providers, @MPCToxTidbits, posts clinical and medical toxicology content. The account tweeted 123 times in CY 2020, garnering more than 97,000 impressions and 4,000 engagements.

Health professional education is coordinated by Eric Schuetz, BS Pharm, CSPI. Programs and materials are designed to help health professionals better assess and manage poisoning and overdose cases. In CY 2020, 10 programs were presented by MPC staff at hospitals, EMS/fire departments, colleges, professional conferences (state, regional, and national), and through online webinars. More than 498 physicians, nurses, EMS clinicians, pharmacists, physician assistants, and other health professionals attended these programs and webinars. MPC also provides on-site training for physicians, pharmacists, and EMS clinicians.

ToxTidbits is a monthly e-newsletter that covers important toxicology information, updates, and news for health professionals. Among the topics addressed in CY 2020 were "What's New with NAC?", "The Nutmeg Challenge", "Methadone and COVID-19",

“Oleandrin and Other Cardioactive Steroids”, “Milk-Alkali Syndrome”, and “*Novichoks*, Nerve Agents in the News”. *ToxTidbits* is emailed to subscribers and faxed to every emergency department in MPC’s service area.

Reason for Poisoning (CY 2020)

Circumstance	Number of Patients	Percentage
Unintentional	23,180	73.9
Intentional	6,611	21.1
Adverse Reaction	1,021	3.2
Other and Unknown	565	1.8
TOTAL	31,377	100.0

Medical Outcome of Poisoning (CY 2020)

Medical Outcome	Number of Patients	Percentage
No Effect/Minor Effect	25,900	82.5
Moderate Effect	2,328	7.4
Major Effect	1,094	3.5
Death	51	0.2
Other and Unknown	2,004	6.4
TOTAL	31,377	100.0

Location of Poisoning Exposure by MIEMSS Region (CY 2020)

Region	Number of Exposures	Percentage
Region I	678	2.2
Region II	2,417	7.7
Region III	18,440	58.8
Region IV	2,893	9.2
Region V*	3,514	11.2
Unknown County/ Other state	3,435	10.9
TOTAL	31,377	100.0

**Routing for the nationwide telephone number automatically connects most callers from Montgomery and Prince George’s Counties to the National Capital Poison Center in Washington, D.C. This report reflects calls to the Maryland Poison Center only. Additional human exposures in Maryland may have been reported to the National Capital Poison Center.*

National Study Center for Trauma and EMS

The Charles “McC.” Mathias, Jr., National Study Center for Trauma and EMS (NSC) was established at the University of Maryland by the US Congress in 1986. In 2007, to further basic, translational, and clinical studies in injury research, the University of Maryland School of Medicine (UMSOM) designated NSC as part of the Shock, Trauma, and Anesthesiology Organized Research Center (STAR-ORC). Professor of Anesthesiology and Vice-Chair for Translational Research Wei Chao, MD, PhD, FAHA, and Professor of Surgery and Director of Translational Research Rosemary A. Kozar, MD, PhD, lead the STAR-ORC. Dr. Kozar is also the interim director of the NSC. Dr. Chao, Dr. Kozar, Dr. Thomas Scalea from the R Adams Cowley Shock Trauma Center (STC), and Dr. Peter Rock from the UMSOM Department of Anesthesiology

form the STAR-ORC Executive Committee.

NSC continues to collaborate with Chenfeng Xiong, PhD, from the University of Maryland College Park, Department of Civil and Environmental Engineering and his students as part of the ongoing Transportation and Health Initiative (THI). In addition, Dr. Roumen Vesselinov, Dr. Margaret Lauerman, and Dr. Kartik Kaushik continue their roles as PI on the NSC projects.

Research Activities

NSC, in conjunction with the University of Maryland R Adams Cowley Shock Trauma Center, has been a leading participant in the Crash Injury Research and Engineering Network (CIREN) funded by the National Highway Traffic Safety Administration (NHTSA). During the 2020-2021 contract year, approximately 105 cases were enrolled into CIREN and a comprehensive investigation was conducted for each qualifying case. Monthly case reviews were held, and NSC virtually hosted NHTSA administrators and members of the Maryland Highway Safety Office (MHSO) on several occasions. CIREN cases are frequently used as part of biomechanics presentations at the STC. The CIREN team was invited to share its research at the Maryland State Firemen’s Association Convention in June 2021 and will be presenting at the Maryland Crash Reconstruction Committee Conference (MCRC) in September 2021.

The NSC continues working with the Crash Outcome Data Evaluation System (CODES), which is currently funded by MHSO. The CODES has been a continued data-collection endeavor to produce a census of motor vehicle related crashes in the state and complete the picture of the outcomes by linking together crash, EMS transport, hospital treatment, and judicial citations data.

NSC has compiled information from a variety of statewide databases to enable in-depth analyses of highway safety programs. The compiled CODES data sets are a valuable resource to Maryland’s highway safety and injury prevention community. Data provided through the Maryland CODES program is used for portions of the Maryland Strategic Highway Safety Plan (SHSP), Federal Highway Safety Plan, MHSO Annual Report, and to support several problem identification and program evaluation activities across the state. NSC staff members facilitate the Traffic Records Coordinating Committee and participate as data coordinators on SHSP Implementation and Emphasis Area Teams. Each year, NSC produces Problem Identification Reports and Program Area Briefs for local jurisdictions to aid in the development of Local Strategic Highway Safety Plans.

Under a grant from MHSO, NSC serves as a

key data analysis resource and partner for MHSO, MVA, and other state and local traffic safety partners. During the past year, NSC staff conducted analyses and provided presentable diagrams, graphs or slides on speeding, motorcycle helmet use, crashes involving unrestrained occupants, impaired driving, distracted driving, and pedestrian and bicyclist crashes. The NSC has also collaborated with the MHSO to create traffic safety surveys for multiple traffic-related program areas. These surveys were made available online in 2020 to Maryland residents to gain an improved perspective of current driver behaviors.

Recently, the NSC began creating a transformation of CODES to cover all injuries in the Injury Outcome Data Evaluation System (IODES). IODES is intended to produce a census and yield a complete picture for all injuries, including penetrating trauma such as gunshots and stabbings, and blunt trauma such as crashes, falls, and other injury producing incidents. IODES and CODES are both expected to benefit from recent data partners, including the Maryland Department of Transportation (MDOT) State Highway Administration (SHA), which will provide data on roadway infrastructure, including lighting, crosswalks and sidewalks, guardrails, pavement condition, etc., and the MITRE corporation, which will provide information on new technologies in vehicles, including automated crash avoidance systems, automatic lane keeping systems, automated advanced crash notification systems, etc. The data collected is anticipated to be far more comprehensive than available today and will supercharge the ability to pursue injury and life-saving practices in Maryland. Additionally, the NSC entered into an agreement with MITRE in FY 2020, allowing data sharing among the two organizations, with a goal to better understand Advanced Driver Assistance Systems (ADAS) and other modern technologies, and their impacts on transportation safety and equality.

The NSC concluded the Pedestrian Fatality Reviews in 2021, after reviewing 107 crashes involving 108 fatalities and producing a final report, to support the Pedestrian and Bicycle Emphasis Area Team (P-BEAT) as part of the State's Strategic Highway Safety Plan. The goal of the study was to review as many pedestrian-involved fatalities from 2016 as possible throughout the grant years (2019-2021), to identify related contributing factors and cause(s) of each pedestrian fatality and to identify potential countermeasures. Findings indicated that poor visibility of pedestrians (because of dark clothing or insufficient lighting) and impaired walking were primary contributors to fatalities, prompting urgent countermeasures in education and public outreach. The results were presented to P-BEAT in July 2021 and will be presented at the MCRC in September 2021.

For the ninth consecutive year, NSC supervised and reported findings of the Maryland Front Seat Belt Use Project, though the annual study was postponed two months, until August 2020, due to the COVID-19 pandemic. Results of the study were presented virtually at the Occupant Protection and Distracted Driving Emphasis Area Team Meeting of the MHSO in February 2021.

In September 2020, the NSC completed analysis of the Drug Recognition Expert (DRE) database and submitted a final report on "Drug Use Pattern Analysis" in Maryland. The report included results from a merge of DRE evaluations with citations issued by law enforcement officers. The results will be presented at the ATSP Traffic Record Forum in August 2021.

NSC continues its partnership with the University of Utah, the University of Kentucky, and Nationwide Children's Hospital (Ohio) on a Centers for Disease Control and Prevention (CDC) grant to use CODES data to examine the types and severity of injuries sustained by older occupants in motor vehicle crashes. This CDC CODES grant was awarded for three years and continued under a no-cost extension through May 2021. Based on linked Maryland crash and hospital data, an analysis was made of the cost of non-fatal motor vehicle crash injury in older adults (65 or older) for a future publication. In a separate study, toxicology findings obtained from the STC were integrated with the linked data to examine the types of drugs that are associated with crash and injury characteristics of older drivers. The results of the toxicology analysis were presented virtually at the 2020 Traffic Records Forum.

The NSC received a grant from NHTSA to study crash risk and toxicology prevalence among all roadway users. With the onset of the COVID-19 pandemic, the study has since expanded to include COVID-19 surveillance among the entire trauma population. This all-encompassing study has resulted in more than 2,000 collected blood samples, which are shipped daily to labs in South Carolina to conduct toxicology and SARS CoV-2 testing. Multiple platforms, such as the Maryland State Police Automated Crash Reporting System (ACRS), EPIC, and the Research Management System (RMS), are used to collect various data points. For every enrollment, data including demographics, mechanism of injury, EMS, treatments and outcomes, crash, and COVID-19 screening/testing are collected. Sample collection will be completed at the end of July 2021 with data collection to be completed by August 2021. In-depth analytical review will follow the completion of data collection.

The NSC recently completed a project funded by the Maryland Department of Health Behavioral Health Administration to examine the ratio of police-reported

traffic crashes occurring within one mile of a casino's location after it was opened, compared to the ratio occurring in the same area before it was opened. Results indicated that, after adjustment for impairment and day of the week, there was a significant association with crashes occurring close to the casino after its opening. These crashes were more likely to involve drivers younger than 40 years of age and occur on weekends. A manuscript describing these findings was published by the NSC in *Accident Analysis and Prevention* in 2020.

In FY 2020, NSC and Impact Research, LLC, initiated a study to model the relationship between changes in key behavioral, economic, policy, environmental, and demographic factors in Maryland with observed changes in serious and fatal injury crashes by county from 2010 to 2018. NSC statisticians identified appropriate data sources and variables to be compiled for use in the modeling instruments and, in FY 2021, added 2019 data. These models will provide a better understanding of factors playing a role in crash trends in Maryland. A website is currently under construction to allow decision-makers and other stakeholders to estimate the expected change in injury-involved crashes expected for a given change in each risk factor.

Through the THI, the NSC is funded by the USDOT to collaborate crash and safety data to the Safety Data Initiative (SDI) covering Vulnerable Road Users (VRU), which includes pedestrians, bicyclists, e-scooters, and other micromobility vehicle users. The NSC also submitted a proposal to mine the extensive CODES dataset to extract as much data as possible on small-engine two-wheelers to NHTSA, in response to the Two-Wheeler Safety RFP.

The NSC was funded for the third year by the Maryland Department of Health to take part in the CDC's multi-state medical records review, designed to develop injury case definitions using emergency department data. The NSC performed medical chart extractions on more than 8,300 records to analyze the use of specific ICD-10 codes for patients with self-inflicted injuries from UMMS-ED and STC admissions. The results from this project identified true positive rates among ICD-10 coding compared to the ED medical documentation.

The NSC is responsible for the extraction of data from the R Adams Cowley Shock Trauma Registry (STCTR) for research protocols with appropriate permissions. Over the past year, the NSC has written more than 30 SQL queries to the STCTR. Query topic areas have been very diverse, as demonstrated by the following limited list: whole blood for transfusion, aerodigestive injuries, management and outcomes, retrospective evaluation of pelvic binder utilization, strong ION Gap in trauma, and gunshot wounds to the head requiring a

decompressive craniectomy.

NSC provides statistical support for several research groups at UMB, including Acute Care Surgery and Lung Transplantation Survival Research, and for research grants funded by the National Institutes of Health (NIH), US Department of Defense, and US Army Medical research.

Technical Support

In addition to in-house preparation of peer-reviewed research papers, NSC staff offer grant proposal, abstract, and manuscript preparation support, including technical writing, research design, and data analysis for university, hospital, and trauma center researchers. Partner agencies and the public can submit a specific data request to NSC epidemiologists and data analysts using the data request form on NSC's website (<https://issomweb02.som.umaryland.edu/NSCTrauma/NSCData.aspx>). NSC staff members were instrumental in the publication of manuscripts on various trauma and injury related topics, such as ultrasound in critical care, fluid resuscitation in septic patients, emergency general surgery, and respiratory distress syndrome.

MIEMSS-NSC Memorandum of Understanding

In addition to staff from NSC, the Maryland Emergency Medical Services Systems Research Interest Group (MEMSS-RIG) is composed of members from MIEMSS, University of Maryland, and Johns Hopkins University. The group meets monthly to help further EMS research within Maryland and across the nation. Over the past five years, MEMSS-RIG members have published over 36 articles related to trauma and EMS. The group is currently working on a possible manuscript related to the epinephrine cardiac arrest study. NSC performed the analysis for two COVID-19 related manuscripts by authors from MIEMSS, Johns Hopkins University, and the Montgomery County Fire and Rescue Service.

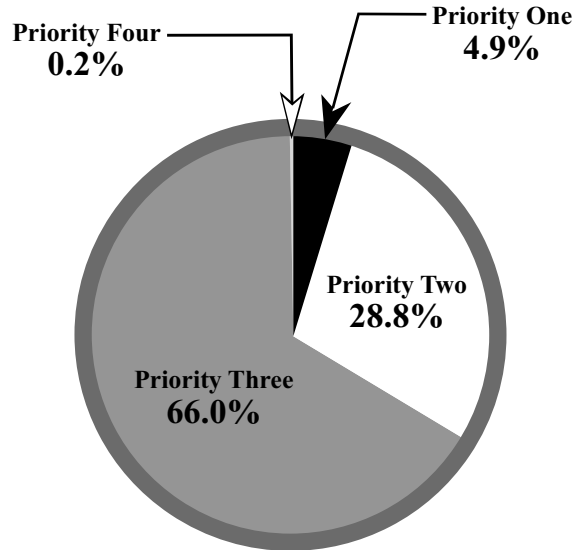
NSC members continue to serve on several MIEMSS committees and helps to advance the agency's mission.

MARYLAND EMS STATISTICS

Types of EMS Calls

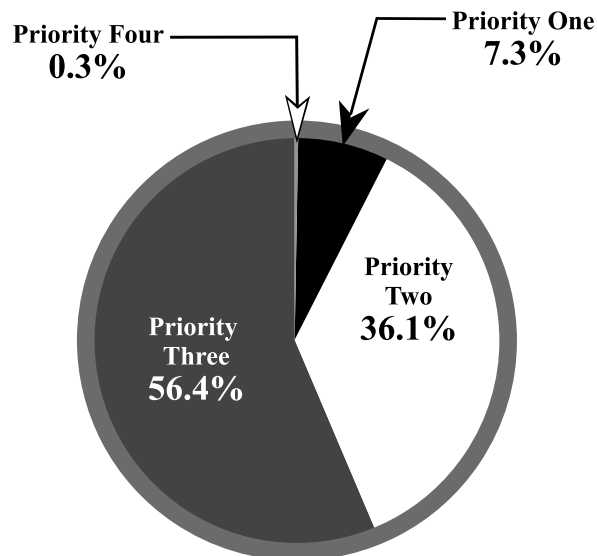
Patient Priority For Injury Transports

Fiscal Year 2021



Patient Priority For Medical Transports

Fiscal Year 2021



Source: electronic Maryland EMS Data System (eMEDS®)

Priority 1 - Patient critically ill or injured (immediate / unstable)
Priority 2 - Patient less serious (urgent / potentially life-threatening)

Priority 3 - Patient non-urgent
Priority 4 - Patient does not require medical attention

**Cardiac Arrest Registry to Enhance Survival (CARES)
CY 2020 Registry Data**

Demographic Information	Maryland	National
Mean Age (years)	62.6	62.3
% Males	60.6%	62.1%
% Females	39.4%	37.9%

Arrest Witnessed?	Maryland	National
Witnessed by Bystander	30.9%	37.1%
Witnessed by 9-1-1 Provider	12.9%	12.8%
Unwitnessed	56.2%	50.1%

Who Initiated CPR?	Maryland	National
Bystander	42.4%	40.8%
First Responder	23.4%	28.2%
Emergency Medical Services (EMS)	34.2%	31.0%

Who First Defibrillated the Patient?	Maryland	National
Not Applicable	76.2%	71.6%
Bystander	1.2%	1.3%
First Responder	2.8%	5.1%
Emergency Medical Services (EMS)	19.8%	22.0%

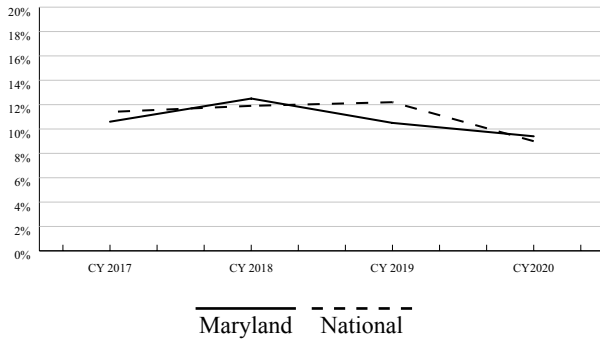
***Bystander Intervention Rates are calculated as follows:**

Bystander CPR: Arrests that occurred before the arrival of 9-1-1 and that did not occur in a nursing home, health care facility, physician’s office, clinic, or hospital, in which CPR was initiated by lay persons, out of all arrests that occurred before the arrival of 9-1-1 and that did not occur in a nursing home, health care facility, physician’s office, clinic, or hospital

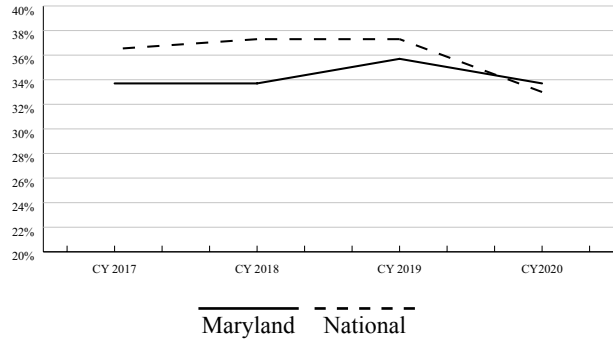
Bystander AED Use: Arrests that occurred before the arrival of 9-1-1 and that did not occur in a nursing home, health care facility, physician’s office, clinic, or hospital, in which AEDs were initially applied by lay persons out of all arrests that occurred before the arrival of 9-1-1 and that did not occur in a nursing home, health care facility, physician’s office, clinic or hospital

Cardiac Arrest Registry to Enhance Survival (CARES) CY 2017 through CY 2020 (Source: CARES Registry)

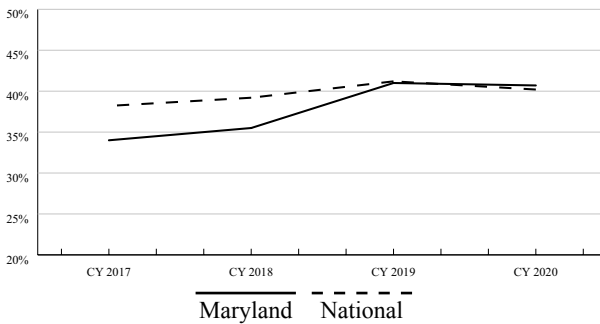
Maryland and National Public AED Use Rates



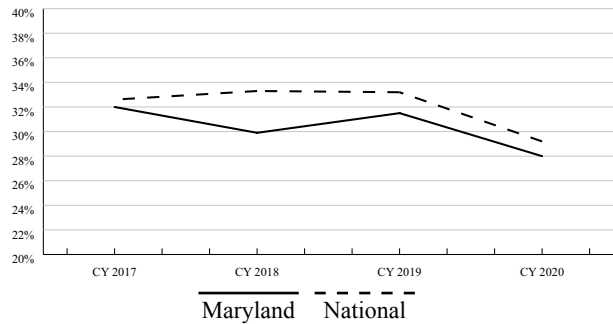
Survival Rates for Patients with Out of Hospital Cardiac Arrests With First Arrest Rhythms That Were Shockable and Witnessed by Bystanders and Bystanders Either Performed CPR and/or Applied AEDs



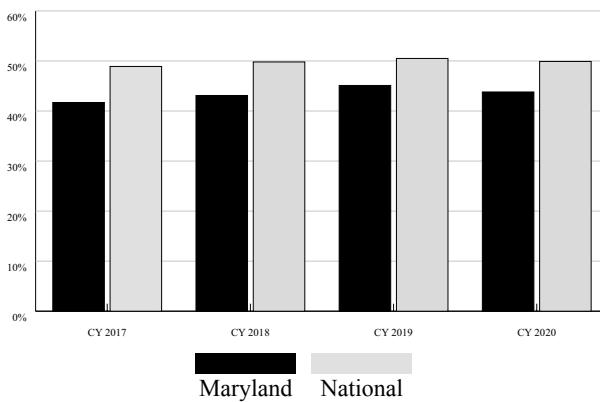
Maryland and National Bystander CPR Rates



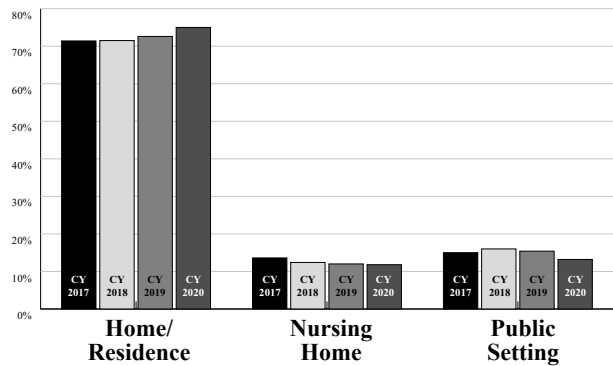
Survival Rates for Patients with Out of Hospital Cardiac Arrests That Were Witnessed by Bystanders and Had First Arrest Rhythms That Were Shockable



Percentage of Cardiac Arrests That Were Witnessed by Bystanders and/or 9-1-1 Responders by Calendar Year



Location of Cardiac Arrest



*See page 78 for intervention rate formulas.

Public Safety EMS Units

Patient Transportation Vehicles

Region	Ambulances				Ambu Buses		
	BLS		ALS		Type I	Type II	Type III
	Total Equipped	Staffed 24/7	Total Equipped	Staffed 24/7	20 + Pts	10 - 19 Pts	< 10 Pts
Region I	0	0	27	13	0	0	0
Region II	30	26	23	12	1	0	0
Region III	35	10	185	136	0	1	3
Region IV	28	2	126	48	0	1	4
Region V	156	76	52	38	3	0	7
STATEWIDE TOTAL	249	114	413	247	4	2	14

Source: Vehicle data reported by the EMS Operational Programs

Patient Transportation Vehicle Definitions:

Basic Life Support (BLS) Transport Vehicle: A vehicle equipped to carry and treat a patient per EMT Protocols

Advanced Life Support (ALS) Transport Vehicle: A vehicle equipped to carry and treat a patient per Cardiac Rescue Technician (CRT, CRT99) or Paramedic protocols

Total Equipped: Includes units that are equipped as either BLS or ALS and that are available for staffing in the event of system surge

Staffed 24/7: EMS providers assigned and ready to respond to a 9-1-1 call

Ambu Bus: A passenger bus configured or modified to transport as many as 20 patients on stretchers

Public Safety/Non-Transportation Vehicles

Region	Non-Transport Support					Disaster Supplies**		
	BLS First Response	Suppression BLS First Response	ALS Chase			MCSU Type I (100+ Pts)	MCSU Type II (50 Pts)	MCSU Type III (25 Pts)
			Non-Supervisory	Supervisory	ALS Engines			
Region I	6	36	5	1	0	0	2	1
Region II	18	53	11	4	0	0	1	2
Region III	26	278	0	25	24	1	2	8
Region IV	23	67	7	6	0	0	1	5
Region V	10	239	4	10	4	3	2	4
STATEWIDE TOTAL	83	673	27	46	69	4	7	20

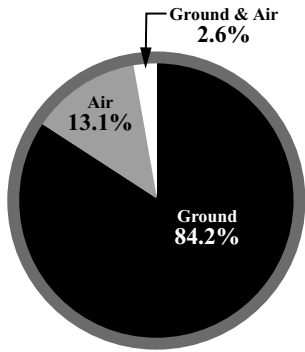
Source: Vehicle data reported by the EMS Operational Programs

**MCSU = Mass Casualty Support Unit

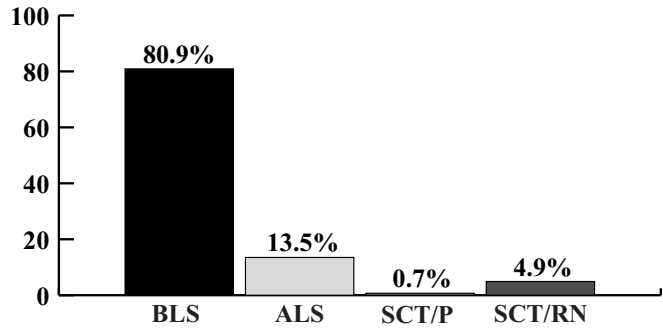
Maryland-Licensed Commercial Ambulance FY 2021 Statistics

Source: MIEMSS Commercial Ambulance Licensing System

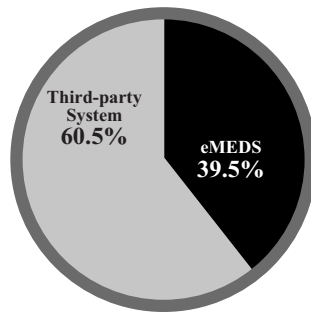
Total Number of Services
n = 38



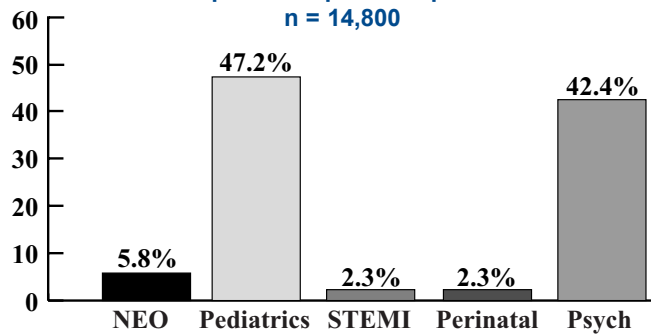
Transports by Type
n = 193,332



ePCR Reporting Software Platform
n = 38



Transports of Special Populations
n = 14,800



Patient Care Reporting Records Submitted to MIEMSS by Maryland Jurisdictions

The electronic Maryland EMS Data System (eMEDS®) is a third generation system, hosted by MIEMSS, that enables Maryland's EMS providers to document, submit, and produce an electronic patient care record (ePCR). Additionally, it serves as a primary resource to query data about EMS demand, response, and outcome. All 24 jurisdictional EMSOPs in Maryland use eMEDS® to document their call information. The EMSOPs can enter data either via a local device with internet connectivity or via a dedicated website. The table below displays the quarterly record volume for FY 2021.

eMEDS® Records Submitted to MIEMSS per Fiscal Year 2021 Quarter¹						
Reporting Between: 7/1/2020 - 06/30/2021						
Jurisdiction	Elite Implementation ²	1st Qtr. FY 2021	2nd Qtr. FY 2021	3rd Qtr. FY 2021	4th Qtr. FY 2021	Total
Allegany County	5/7/2018	4,030	3,993	3,724	4,198	15,945
Anne Arundel County*	5/29/2018	19,743	19,585	19,124	21,654	80,106
Baltimore City	12/3/2018	59,770	51,858	51,017	59,639	222,284
Baltimore County*	7/24/2018	31,925	32,477	32,046	35,647	132,095
Calvert County	8/28/2018	5,277	4,955	4,685	4,574	19,491
Caroline County	6/11/2018	1,679	1,650	1,614	1,596	6,539
Carroll County	1/2/2019	4,592	4,863	4,952	5,273	19,680
Cecil County	8/1/2018	7,348	7,566	7,224	7,820	29,958
Charles County	6/1/2018	7,017	7,114	7,523	7,416	29,070
Dorchester County	5/21/2018	1,981	1,811	1,878	1,944	7,614
Frederick County	10/1/2018	11,411	11,714	11,359	12,651	47,135
Garrett County	5/7/2018	1,179	1,144	1,033	1,124	4,480
Harford County*	3/30/2018	7,987	8,572	8,106	8,910	33,575
Howard County	12/11/2018	5,816	5,809	5,897	6,374	23,896
Kent County	6/11/2018	1,439	1,163	1,359	1,230	5,191
Montgomery County	9/4/2018	19,193	18,728	18,918	20,143	76,982
Prince George's County	10/1/2018	40,291	45,000	43,918	46,101	175,310
Queen Anne's County	12/18/2017	1,877	1,842	1,860	1,949	7,528
Somerset County	7/16/2018	827	805	785	786	3,203
St. Mary's County	7/16/2018	5,396	5,390	5,407	5,682	21,875
Talbot County	12/18/2017	1,912	1,670	1,820	1,881	7,283
Washington County	6/25/2018	7,885	7,952	7,562	8,493	31,892
Wicomico County	5/14/2018	4,273	4,255	4,217	4,491	17,236
Worcester County*	5/14/2018	4,039	2,425	2,201	3,730	12,395
Jurisdictional Total		256,887	252,341	248,229	273,306	1,030,763

*Jurisdictional EMSOPs not listed separately but incorporated herein include Aberdeen Proving Ground Fire Department, Annapolis City, BWI Airport Fire & Rescue, Ft. Meade Fire Department, US Naval Academy EMS, Martin State Airport, and Ocean City.

¹The number of records submitted to MIEMSS does not necessarily represent the number of individual patients treated. Duplicate records can be submitted for the same patient if more than one EMS company responds to treat that patient.

²MIEMSS has upgraded to ImageTrend's Elite Platform to support the eMEDS® patient care reporting system.

MARYLAND TRAUMA AND BURN STATISTICS

Age Distribution of Patients Treated at Pediatric or Adult Trauma Centers (3-Year Comparison)

Source: Maryland State Trauma Registry

Age Range	June 2018 to May 2019	June 2019 to May 2020	June 2020 to May 2021
Under 1 year	244	208	243
1 to 4 years	441	416	487
5 to 9 years	474	459	548
10 to 14 years	510	530	554
15 to 24 years	3,290	3,385	3,218
25 to 44 years	6,870	6,387	6,932
45 to 64 years	5,131	5,052	5,324
65+ years	5,204	6,464	7,514
Unknown	23	14	16
TOTAL	22,187	22,915	24,836

For children who were burn patients at Children's National Hospital or Johns Hopkins Pediatric Trauma Center, see Maryland Pediatric Burn Statistics.

MARYLAND ADULT TRAUMA STATISTICS

Legend Code

Johns Hopkins Bayview Medical Center	BVMC	Suburban Hospital – Johns Hopkins Medicine	SUB
The Johns Hopkins Hospital	JHH	TidalHealth Peninsula Regional	THPR
Meritus Medical Center	MMC	University of Maryland	
R Adams Cowley Shock Trauma Center	STC	Capital Region Health	UMCRH
Sinai Hospital	SH	UPMC Western Maryland	UPMCWM

Total Cases Reported by Trauma Centers (3-Year Comparison)

Source: Maryland State Trauma Registry

Trauma Center	June 2018 to May 2019	June 2019 to May 2020	June 2020 to May 2021
The Johns Hopkins Bayview Medical Center	2,503	4,044*	3,813
The Johns Hopkins Medical System	1,703	1,603	1,717
Meritus Medical Center	1,729	1,979	2,426
R Adams Cowley Shock Trauma Center	6,202	5,843	5,951
Sinai Hospital of Baltimore	1,943	2,016	2,272
Suburban Hospital – Johns Hopkins Medicine	1,446	1,255	1,890
TidalHealth Peninsula Regional	1,360	1,160	1,663
University of Maryland Capital Region Medical Center	3,408	3,094	3,011
UPMC Western Maryland	500	525	506
TOTAL	20,794	21,519	23,249

*Note: Implementation in February 2019 of a new Tier 3 Emergency Department Response activation (ED response of the Trauma Team) for Johns Hopkins Bayview Medical Center.

* Maryland Trauma Statistics are based on patient discharge data from June 2020 to May 2021.

**Occurrence of Injury by County:
Scene Origin Cases Only**

(June 2020 to May 2021)

Source: Maryland State Trauma Registry

County of Injury	Number
Allegany County	346
Anne Arundel County	846
Baltimore County	3,649
Calvert County	166
Caroline County	49
Carroll County	247
Cecil County	44
Charles County	209
Dorchester County	97
Frederick County	430
Garrett County	34
Harford County	675
Howard County	409
Kent County	29
Montgomery County	1,683
Prince George's County	1,895
Queen Anne's County	66
St. Mary's County	210
Somerset County	102
Talbot County	41
Washington County	1,527
Wicomico County	513
Worcester County	358
Baltimore City	4,482
Virginia	94
West Virginia	127
Pennsylvania	249
Washington, DC	218
Delaware	83
Other	17
Not Indicated	827
TOTAL	19,722

Note: Scene origin cases represent 84.8% of the total trauma cases treated statewide.

**Residence of Patients by County:
Scene Origin Cases Only**

(June 2020 to May 2021)

Source: Maryland State Trauma Registry

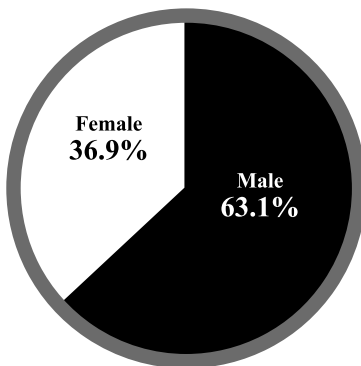
County of Residence	Number
Allegany County	313
Anne Arundel County	933
Baltimore County	3,703
Calvert County	189
Caroline County	53
Carroll County	286
Cecil County	66
Charles County	209
Dorchester County	100
Frederick County	390
Garrett County	27
Harford County	690
Howard County	373
Kent County	23
Montgomery County	1,677
Prince George's County	1,672
Queen Anne's County	59
St. Mary's County	188
Somerset County	103
Talbot County	30
Washington County	1,647
Wicomico County	473
Worcester County	213
Baltimore City	4,098
Virginia	315
West Virginia	193
Pennsylvania	466
Washington, DC	530
Delaware	195
Other	294
Not Indicated	214
TOTAL	19,722

Note: Scene origin cases represent 84.8% of the total trauma cases treated statewide.

**Gender Profile:
Primary Admissions Only**

(June 2020 to May 2021)

Source: Maryland State Trauma Registry



Note: "Primary Admissions" refers to all patients except those treated and released from the emergency department within 6 hours of emergency department arrival.

**Patients with Protective Devices at Time of
Trauma Incident: Primary Admissions Only**

(3-Year Comparison)

Source: Maryland State Trauma Registry

Protective Device	June 2018 to May 2019	June 2019 to May 2020	June 2020 to May 2021
None	21.3%	22.9%	24.0%
Seatbelt	14.0%	11.6%	9.7%
Airbag and Seatbelt	38.2%	38.4%	37.3%
Airbag Only	11.4%	11.8%	13.3%
Infant/Child Seat	0.2%	0.2%	0.1%
Protective Helmet	14.4%	14.7%	15.1%
Padding/Protective Clothing	0.1%	0.1%	0.1%
Other Protective Device	0.1%	0.1%	0.2%
Unknown	0.3%	0.2%	0.2%
TOTAL	100.0%	100.0%	100.0%

Note: Patients were involved in motor vehicle, motorcycle, bicycle, and sports-related incidents only. "Primary Admissions" refers to all patients except those treated and released from the emergency department within 6 hours of emergency department arrival.

Mode of Patient Transport to Trauma Centers: Scene Origin Cases Only

(June 2020 to May 2021)

Source: Maryland State Trauma Registry

Modality Type	BVMC	JHH	MMC	THPR	CRMC	SH	STC	SUB	WM	TOTAL
Ground Ambulance	94.9%	83.1%	76.0%	93.3%	84.5%	88.7%	79.0%	91.0%	79.9%	85.5%
Helicopter	0.1%	1.6%	0.8%	4.7%	11.4%	0.6%	19.0%	0.1%	1.8%	6.2%
Other	5.0%	15.3%	23.2%	2.0%	4.1%	10.7%	2.0%	8.9%	18.3%	8.3%
TOTAL	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Note: Only patients brought directly from the scene to a trauma center are included in this table.

Origin of Patient Transport to Trauma Centers

(June 2020 to May 2021)

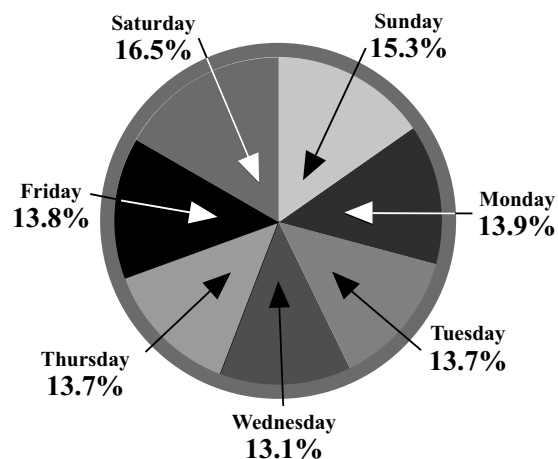
Source: Maryland State Trauma Registry

Origin Type	BVMC	JHH	MMC	THPR	CRMC	SH	STC	SUB	WM	TOTAL
Scene of Injury	92.9%	83.5%	96.5%	73.3%	90.9%	92.7%	68.9%	93.5%	97.0%	84.9%
Hospital Transfer	0.2%	6.1%	0.8%	2.9%	3.1%	6.2%	31.1%	4.9%	0.6%	10.1%
Other	6.9%	10.4%	2.7%	23.8%	6.0%	1.1%	0.0%	1.6%	2.4%	5.0%
TOTAL	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Emergency Department Arrivals by Day of Week: Primary Admissions Only

(June 2020 to May 2021)

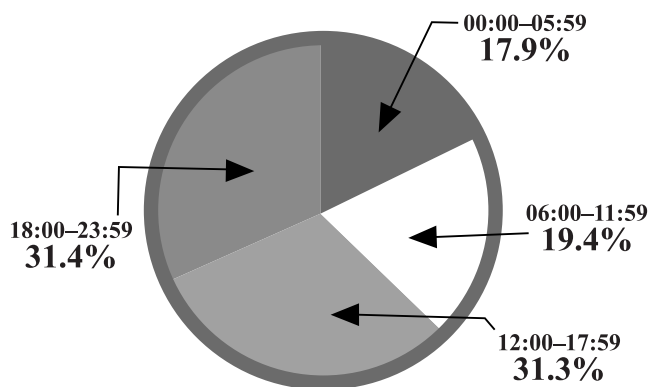
Source: Maryland State Trauma Registry



Emergency Department Arrivals by Time of Day: Primary Admissions Only

(June 2020 to May 2021)

Source: Maryland State Trauma Registry



Note: "Primary Admissions" refers to all patients except those treated and released from the emergency department within 6 hours of emergency department arrival.

Number of Deaths by Age
(3-Year Comparison)
Source: Maryland State Trauma Registry

Age	June 2018 to May 2019	June 2019 to May 2020	June 2020 to May 2021
Under 1 year	1	0	1
1 to 4 years	1	0	1
5 to 14 years	3	2	1
15 to 24 years	109	150	130
25 to 44 years	255	260	276
45 to 64 years	177	138	168
65+ years	262	280	294
Unknown	12	9	9
TOTAL	820	839	880
Deaths Overall as a Percentage of the Total Injuries Treated	3.9%	3.9%	3.8%

Note: Only pediatric patients who were treated at Adult Trauma Centers are included in this table. For patients treated at Pediatric Trauma Centers, see Maryland Pediatric Trauma Statistics.

Number of Injuries by Age
(3-Year Comparison)
Source: Maryland State Trauma Registry

Age	June 2018 to May 2019	June 2019 to May 2020	June 2020 to May 2021
Under 1 year	57	38	64
1 to 4 years	119	90	104
5 to 14 years	217	206	215
15 to 24 years	3,174	3,270	3,083
25 to 44 years	6,869	6,385	6,929
45 to 64 years	5,131	5,052	5,324
65+ years	5,204	6,464	7,514
Unknown	23	14	16
TOTAL	20,794	21,519	23,249

Note: Only pediatric patients who were treated at Adult Trauma Centers are included in this table. For patients treated at Pediatric Trauma Centers, see Maryland Pediatric Trauma Statistics.

Number of Injuries and Deaths by Age
(June 2020 to May 2021)
Source: Maryland State Trauma Registry

Age	Number of Injured Patients		Number of Deaths	
	Total	Maryland Residents	Total	Maryland Residents
Under 1 year	64	55	1	1
1 to 4 years	104	88	1	0
5 to 14 years	215	171	1	1
15 to 24 years	3,083	2,707	130	104
25 to 44 years	6,929	6,012	276	223
45 to 64 years	5,324	4,724	168	150
65+ years	7,514	6,985	294	273
Unknown	16	9	9	5
TOTAL	23,249	20,751	880	757

Note: Only pediatric patients who were treated at Adult Trauma Centers are included in this table. For patients treated at Pediatric Trauma Centers, see Maryland Pediatric Trauma Statistics.

**Etiology of Injuries:
Primary Admissions Only**
(3-Year Comparison)

Source: Maryland State Trauma Registry

Etiology	June 2018 to May 2019	June 2019 to May 2020	June 2020 to May 2021
Cut or Pierce	5.7%	6.1%	5.2%
Drowning/Submersion	0.0%	0.1%	0.1%
Fall	38.4%	43.3%	45.4%
Fire or Flame	0.4%	0.4%	0.3%
Hot Object or Substance	0.2%	0.1%	0.2%
Firearm	7.6%	7.7%	8.1%
Machinery/Mechanical	0.5%	0.7%	0.7%
Motor Vehicle Crash	26.0%	22.9%	23.0%
Motorcycle Crash	3.8%	3.3%	3.8%
Pedal Cycle Crash	2.0%	1.9%	1.9%
Pedestrian Incident	5.5%	4.6%	4.4%
Other Transport	0.1%	0.1%	0.1%
Natural or Environmental	0.3%	0.5%	0.4%
Poisoning	0.5%	0.3%	0.3%
Struck by or Against	7.7%	6.8%	4.9%
Other	1.3%	1.2%	1.2%
TOTAL	100.0%	100.0%	100.0%

Note: "Primary Admissions" refers to all patients except those treated and released from the emergency department within 6 hours of emergency department arrival.

**Blood Alcohol Content of Patients
Primary Admissions Only**
(3-Year Comparison)

Source: Maryland State Trauma Registry

Blood Alcohol Content	June 2018 to May 2019	June 2019 to May 2020	June 2020 to May 2021
Negative	22.9%	28.6%	33.4%
Positive	15.8%	14.9%	14.3%
Undetermined	61.3%	56.5%	52.3%
TOTAL	100.0%	100.0%	100.0%

Note: "Primary Admissions" refers to all patients except those treated and released from the emergency department within six hours of department arrival.

Etiology of Injuries by Age: Primary Admissions Only
(June 2020 to May 2021)

Source: Maryland State Trauma Registry

Age	Motor Vehicle Crash	Motorcycle	Pedestrian	Fall	Gunshot Wound	Stab Wound	Struck by/ Against	Pedal Cyclist	Other	Total
Under 1 year	0.1%	0.0%	0.0%	0.2%	0.0%	0.1%	0.2%	0.0%	1.4%	0.2%
1 to 4 years	0.2%	0.0%	0.3%	0.2%	0.1%	0.0%	0.4%	0.0%	2.7%	0.3%
5 to 14 years	0.5%	0.0%	1.0%	0.5%	0.3%	0.2%	0.4%	2.1%	2.6%	0.6%
15 to 24 years	19.0%	18.4%	10.5%	2.2%	33.2%	16.8%	12.4%	9.0%	11.2%	11.2%
25 to 44 years	41.6%	46.0%	40.0%	9.3%	54.5%	54.9%	44.4%	24.2%	35.3%	28.3%
45 to 64 years	24.5%	29.7%	33.1%	21.6%	10.5%	23.1%	33.4%	45.4%	31.7%	23.6%
65+ years	14.1%	5.9%	15.1%	66.0%	1.4%	4.9%	8.8%	19.3%	15.1%	35.8%
TOTAL	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Note: "Primary Admissions" refers to all patients except those treated and released from the emergency department within 6 hours of emergency department arrival. Only pediatric patients who were treated at Adult Trauma Centers are included in this table. For patients treated at Pediatric Trauma Centers, see Pediatric Trauma Center tables and graphs.

Etiology Distribution for Patients with Blunt Injuries: Primary Admissions Only
(June 2020 to May 2021)

Source: Maryland State Trauma Registry

Etiology	Percentage
Cut or Pierce	0.2%
Fall	52.7%
Machinery/Mechanical	0.7%
Motor Vehicle Crash	26.7%
Motorcycle Crash	4.4%
Pedalcyclist Crash	2.2%
Pedestrian Incident	5.1%
Other Transport	0.1%
Natural or Environmental	0.2%
Struck by or Against	5.6%
Other	1.2%
Not Valued	0.9%
TOTAL	100.0%

Note: "Primary Admissions" refers to all patients except those treated and released from the emergency department within 6 hours of emergency department arrival.

Etiology Distribution for Patients with Penetrating Injuries: Primary Admissions Only
(June 2020 to May 2021)

Source: Maryland State Trauma Registry

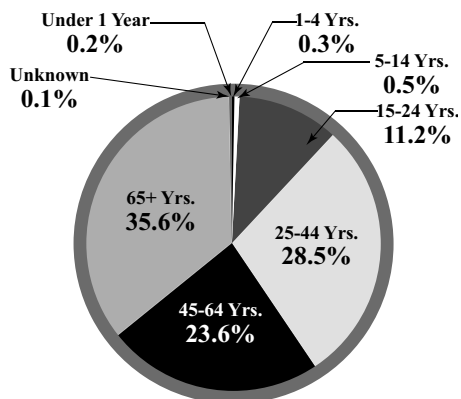
Etiology	Percentage
Cut or Pierce	37.2%
Fall	0.5%
Firearm	60.2%
Machinery/Mechanical	0.3%
Motor Vehicle Crash	0.1%
Other Transport	0.2%
Struck by or Against	0.3%
Other	0.1%
Not Valued	1.1%
TOTAL	100.0%

Note: "Primary Admissions" refers to all patients except those treated and released from the emergency department within 6 hours of emergency department arrival.

Age Distribution of Patients: Primary Admissions Only

(June 2020 to May 2021)

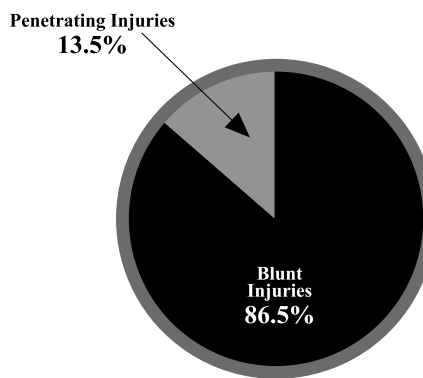
Source: Maryland State Trauma Registry



Injury Type Distribution of Patients: Primary Admissions Only

(June 2020 to May 2021)

Source: Maryland State Trauma Registry



Note: "Primary Admissions" refers to all patients except those treated and released from the emergency department within 6 hours of emergency department arrival. Only pediatric patients who were treated at Adult Trauma Centers are included in this table. For patients treated at Pediatric Trauma Centers, see Pediatric Trauma Center tables and graphs.

Note: "Primary Admissions" refers to all patients except those treated and released from the emergency department within 6 hours of emergency department arrival.

**Final Disposition of Patients:
Primary Admissions Only
(3-Year Comparison)**
Source: Maryland State Trauma Registry

Final Disposition	June 2018 to May 2019	June 2019 to May 2020	June 2020 to May 2021
Inpatient Rehab Facility	7.5%	7.4%	8.4%
Skilled Nursing Facility	9.7%	10.5%	10.8%
Residential Facility	0.9%	1.3%	1.2%
Specialty Referral Center	4.2%	4.2%	4.4%
Home with Services	5.5%	6.3%	7.8%
Home	57.4%	56.3%	52.7%
Acute Care Hospital	3.1%	2.6%	3.0%
Left Against Medical Advice	2.3%	2.5%	3.2%
Morgue/Died	5.5%	5.3%	5.0%
Left without Treatment	0.1%	0.0%	0.0%
Hospice Care	0.5%	0.7%	0.9%
Jail	1.5%	1.2%	1.0%
Psychiatric Hospital	1.3%	1.3%	1.2%
Elopement	0.4%	0.3%	0.3%
Other	0.1%	0.1%	0.1%
TOTAL	100.0%	100.0%	100.0%

Note: "Primary Admissions" refers to all patients except those treated and released from the emergency department within 6 hours of emergency department arrival.

**Injury Severity Scores of Patients with
Penetrating Injuries: Primary Admissions Only
(3-Year Comparison)**
Source: Maryland State Trauma Registry

ISS	June 2018 to May 2019	June 2019 to May 2020	June 2020 to May 2021
1 to 12	72.0%	69.9%	68.9%
13 to 19	11.3%	12.1%	12.6%
20 to 35	12.5%	12.8%	13.7%
36 to 75	4.2%	5.2%	4.8%
TOTAL	100.0%	100.0%	100.0%

Note: "Primary Admissions" refers to all patients except those treated and released from the emergency department within 6 hours of emergency department arrival.

**Injury Severity Scores (ISS) by Injury Type:
Primary Admissions Only
(June 2020 to May 2021)**
Source: Maryland State Trauma Registry

ISS	Blunt	Penetrating	Total
1 to 12	78.0%	68.9%	76.8%
13 to 19	12.3%	12.6%	12.3%
20 to 35	8.3%	13.7%	9.0%
36 to 75	1.4%	4.8%	1.9%
TOTAL	100.0%	100.0%	100.0%

Note: "Primary Admissions" refers to all patients except those treated and released from the emergency department within 6 hours of emergency department arrival.

**Injury Severity Scores of Patients with
Blunt Injuries: Primary Admissions Only
(3-Year Comparison)**
Source: Maryland State Trauma Registry

ISS	June 2018 to May 2019	June 2019 to May 2020	June 2020 to May 2021
1 to 12	76.8%	78.1%	78.0%
13 to 19	13.2%	12.3%	12.3%
20 to 35	8.6%	8.3%	8.3%
36 to 75	1.4%	1.3%	1.4%
TOTAL	100.0%	100.0%	100.0%

Note: "Primary Admissions" refers to all patients except those treated and released from the emergency department within 6 hours of emergency department arrival.

**Injury Severity Scores of Patients with Either Blunt or
Penetrating Injuries: Primary Admissions Only
(3-Year Comparison)**
Source: Maryland State Trauma Registry

ISS	June 2018 to May 2019	June 2019 to May 2020	June 2020 to May 2021
1 to 12	76.1%	76.9%	76.8%
13 to 19	12.9%	12.3%	12.3%
20 to 35	9.2%	8.9%	9.0%
36 to 75	1.8%	1.9%	1.9%
TOTAL	100.0%	100.0%	100.0%

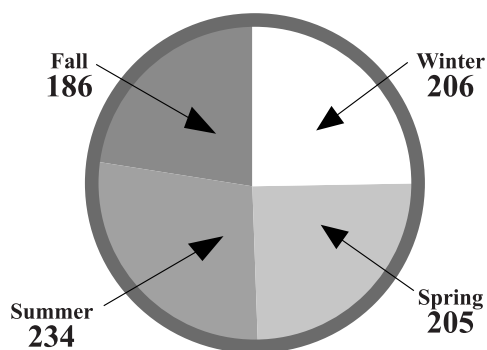
Note: "Primary Admissions" refers to all patients except those treated and released from the emergency department within 6 hours of emergency department arrival.

MARYLAND ADULT BURN STATISTICS

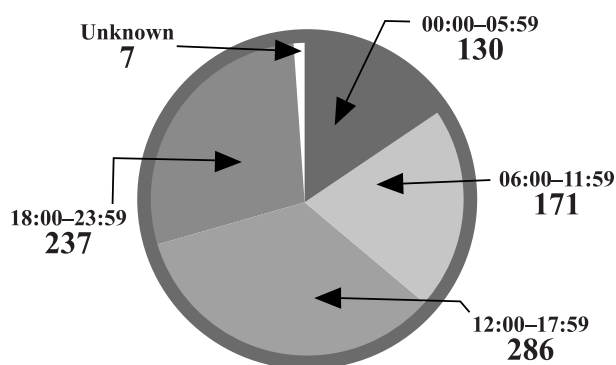
Total Number of Adult Burn Cases
*Patients Aged 15 and Older Treated at
 Johns Hopkins Burn Center at Bayview
 (3-Year Comparison)*
 Source: Maryland State Trauma Registry

Institution	June 2018 to May 2019	June 2019 to May 2020	June 2020 to May 2021
Johns Hopkins Burn Center at Bayview	795	754	831

Season of Year Distribution
*Patients Aged 15 and Older Treated at
 Johns Hopkins Burn Center at Bayview
 (June 2020 to May 2021)*
 Source: Maryland State Trauma Registry



Time of Arrival Distribution
*Patients Aged 15 and Older Treated at
 Johns Hopkins Burn Center at Bayview
 (June 2020 to May 2021)*
 Source: Maryland State Trauma Registry



Place of Injury
*Patients Aged 15 and Older Treated at
 Johns Hopkins Burn Center at Bayview
 (June 2020 to May 2021)*
 Source: Maryland State Trauma Registry

Place of Injury	Number
Non-Institutional Private Residence	539
Institutional Private Residence	9
School, Other Institution and Public Administrative Area	19
Street/Highway	26
Trade and Service Area	69
Industrial and Construction Area	27
Other Places	27
Unspecified Places	115
TOTAL	831

Occurrence of Injury by County

*Patients Aged Fifteen and Older Treated at
Johns Hopkins Burn Center at Bayview
(June 2020 to May 2021)*

Source: Maryland State Trauma Registry

County of Injury	Number
Anne Arundel County	54
Baltimore County	177
Calvert County	5
Caroline County	3
Carroll County	20
Cecil County	20
Charles County	2
Dorchester County	6
Frederick County	16
Harford County	39
Howard County	28
Montgomery County	6
Prince George’s County	12
Queen Anne’s County	6
Somerset County	2
Talbot County	3
Washington County	27
Wicomico County	8
Worcester County	4
Baltimore City	253
Virginia	2
West Virginia	9
District of Columbia	1
Pennsylvania	17
Delaware	4
Other	3
Not Valued	104
TOTAL	831

Residence of Patients by County

*Patients Aged 15 and Older Treated at
Johns Hopkins Burn Center at Bayview
(June 2020 to May 2021)*

Source: Maryland State Trauma Registry

County of Residence	Number
Anne Arundel County	61
Baltimore County	201
Calvert County	5
Caroline County	4
Carroll County	24
Cecil County	25
Charles County	2
Dorchester County	5
Frederick County	17
Harford County	54
Howard County	35
Montgomery County	10
Prince George’s County	15
Queen Anne’s County	6
Somerset County	3
Talbot County	3
Washington County	30
Wicomico County	9
Worcester County	4
Baltimore City	265
Virginia	1
West Virginia	8
District of Columbia	3
Pennsylvania	20
Delaware	6
Other	15
TOTAL	831

Mode of Patient Transport

*Patients Aged 15 and Older Treated at
Johns Hopkins Burn Center at Bayview
(June 2020 to May 2021)*

Source: Maryland State Trauma Registry

Modality Type	Number
Ground Ambulance	407
Helicopter	34
Other*	381
Not Valued	9
TOTAL	831

**Note: The category “Other” includes patients who were brought in by fixed wing ambulance, private or public vehicles, or were walk-ins.*

Etiology of Injuries by Age

Patients Aged 15 and Older Treated at Johns Hopkins Burn Center at Bayview
(June 2020 to May 2021)

Source: Maryland State Trauma Registry

Age Range	Electrical	Chemical	Thermal			Inhalation	Other Burn	Other Non-Burn	Not Valued	Total
			Flame	Contact	Scald					
15 to 24 years	0	0	32	10	44	0	2	2	14	104
25 to 44 years	8	5	102	47	127	7	1	2	47	346
45 to 64 years	7	12	86	37	87	7	1	2	30	269
65 years and over	0	3	29	23	43	2	0	0	12	112
Total	15	20	249	117	301	16	4	6	103	831

Final Disposition of Patients

Patients Aged 15 and Older Treated at Johns Hopkins Burn Center at Bayview
(3-Year Comparison)

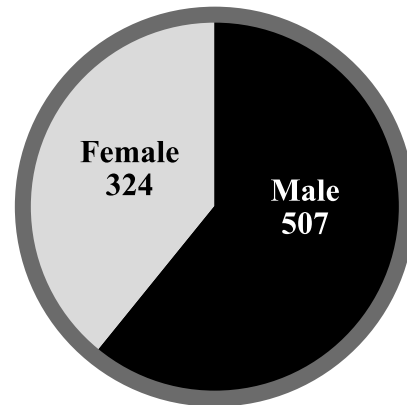
Source: Maryland State Trauma Registry

Final Disposition	June 2018 to May 2019	June 2019 to May 2020	June 2020 to May 2021
Home	632	592	685
Home with Services	74	78	64
Transfer to Another Acute Care Facility	2	0	1
Discharged to Extended Care Facility	1	1	0
Discharged to Foster Care	1	0	0
Discharged to Alternate Caregiver	2	0	1
Rehabilitation Facility	7	5	5
Skilled Nursing Facility	29	23	20
Psychiatric Hospital	3	5	6
Morgue/Died	11	12	7
Left Against Medical Advice or Discontinued Care	19	21	21
Jail	4	6	3
Hospice	1	2	4
Other	2	0	2
Not Valued	7	9	12
TOTAL	795	754	831

Gender Profile

Patients Aged 15 and Older Treated at Johns Hopkins Burn Center at Bayview
(June 2020 to May 2021)

Source: Maryland State Trauma Registry



Number of Injuries by Age

Patients Aged 15 and Older Treated at Johns Hopkins Burn Center at Bayview
(3-Year Comparison)

Source: Maryland State Trauma Registry

Age Range	June 2018 to May 2019	June 2019 to May 2020	June 2020 to May 2021
15 to 24 years	120	103	104
25 to 44 years	320	310	346
45 to 64 years	250	237	269
65 years and over	105	104	112
TOTAL	795	754	831

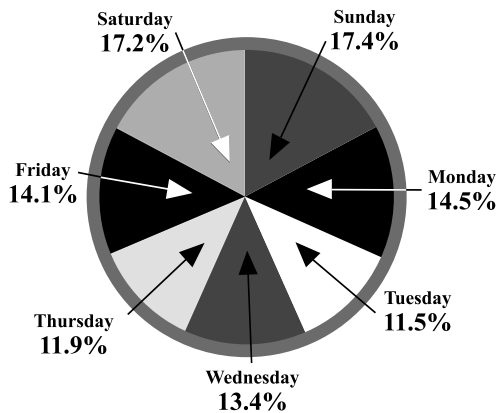
MARYLAND PEDIATRIC TRAUMA STATISTICS

Legend Code	
Children's National Health System	CNHS
Johns Hopkins Pediatric Trauma Center	JHP

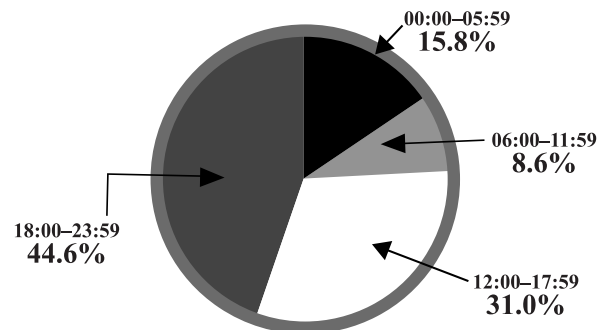
Total Cases Treated at Pediatric Trauma Centers (3-Year Comparison) Source: Maryland State Trauma Registry			
Trauma Center	June 2018 to May 2019	June 2019 to May 2020	June 2020 to May 2021
CNHS	637	689	824
JHP	756	707	763
TOTAL	1,393	1,396	1,587

Note: For children who were treated at Adult Trauma Centers, see Maryland Adult Trauma Statistics. Children's National Health System data include patients residing in Maryland and/or injured in Maryland. For children who were burn patients at each hospital, see Maryland Pediatric Burn Center Statistics.

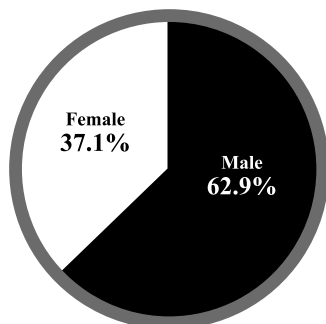
**Emergency Department Arrivals by Day of Week:
Children Treated at Pediatric Trauma Centers**
(June 2020 to May 2021)
Source: Maryland State Trauma Registry



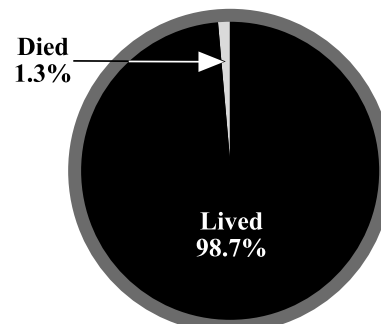
**Emergency Department Arrivals by Time of Day:
Children Treated at Pediatric Trauma Centers**
(June 2020 to May 2021)
Source: Maryland State Trauma Registry



**Gender Profile: Children Treated at
Pediatric Trauma Centers**
(June 2020 to May 2021)
Source: Maryland State Trauma Registry



**Outcome Profile: Children Treated at
Pediatric Trauma Centers**
(June 2020 to May 2021)
Source: Maryland State Trauma Registry



Note: For children who were treated at adult trauma centers, see Maryland Adult Trauma Report. Children's National Hospital data include patients residing in Maryland and/or injured in Maryland. For children that were burn patients at each hospital, see Maryland Pediatric Burn Center Statistics.

**Mode of Patient Transport by Center:
Scene Origin Cases Only**

*Children Treated at Pediatric Trauma Centers
(June 2020 to May 2021)
Source: Maryland State Trauma Registry*

Modality Type	CNHS	JHP	Total
Ground Ambulance	64.6%	71.0%	68.4%
Helicopter	20.6%	11.9%	15.4%
Other	14.8%	17.1%	16.2%
TOTAL	100.0%	100.0%	100.0%

Note: Only patients brought directly from the scene to a Trauma Center are included in this table. For children who were treated at Adult Trauma Centers, see Maryland Adult Trauma Statistics. Children's National Hospital data include patients residing in Maryland and/or injured in Maryland. For children who were burn patients at each hospital, see Maryland Pediatric Burn Center Statistics.

Origin of Patient Transport by Center

*Children Treated at Pediatric Trauma Centers
(June 2020 to May 2021)
Source: Maryland State Trauma Registry*

Origin	CNHS	JHP	Total
Scene of Injury	41.8%	68.7%	54.7%
Hospital Transfer	46.5%	27.8%	37.5%
Other	11.7%	3.5%	7.8%
TOTAL	100.0%	100.0%	100.0%

Note: For children who were treated at Adult Trauma Centers, see Maryland Adult Trauma Statistics. Children's National Hospital data include patients residing in Maryland and/or injured in Maryland. For children who were burn patients at each hospital, see Maryland Pediatric Burn Center Statistics.

Injury Type

*Children Treated at Pediatric Trauma Centers
(3-Year Comparison)
Source: Maryland State Trauma Registry*

Injury Type	June 2018 to May 2019	June 2019 to May 2020	June 2020 to May 2021
Blunt	94.4%	92.2%	85.5%
Penetrating	3.1%	4.5%	6.5%
Near Drowning	1.2%	0.9%	1.1%
Hanging	0.1%	0.0%	0.3%
Ingestion	0.0%	0.0%	0.1%
Crush	0.1%	0.0%	0.2%
Animal Bite/Human Bite	1.0%	2.4%	6.3%
Other	0.1%	0.0%	0.0%
TOTAL	100.0%	100.0%	100.0%

Note: For children who were treated at Adult Trauma Centers, see Maryland Adult Trauma Statistics. Children's National Hospital data include patients residing in Maryland and/or injured in Maryland. For children who were burn patients at each hospital, see Maryland Pediatric Burn Center Statistics.

Mechanism of Injury

*Children Treated at Pediatric Trauma Centers
(3-Year Comparison)
Source: Maryland State Trauma Registry*

Mechanism of Injury	June 2018 to May 2019	June 2019 to May 2020	June 2020 to May 2021
Cut/Pierce	1.9%	2.9%	3.0%
Drowning/Submersion	1.2%	0.9%	0.9%
Falls	40.8%	37.6%	36.2%
Fire/Flame	0.0%	0.1%	0.0%
Firearm	1.4%	1.4%	3.0%
Machinery/Mechanical	0.4%	0.4%	0.4%
MVT - Occupant	22.7%	23.2%	21.5%
MVT - Motorcyclist	0.6%	0.3%	0.6%
MVT - Pedal Cyclist	3.9%	6.5%	7.3%
MVT - Pedestrian	8.7%	6.9%	6.6%
Other Transport	0.4%	0.0%	0.3%
Natural/Environmental	1.7%	3.2%	7.0%
Struck by/Against	7.0%	7.8%	6.4%
Abuse	5.1%	5.2%	4.7%
Other	2.2%	1.4%	1.0%
Not Valued	2.0%	2.2%	1.1%
TOTAL	100.0%	100.0%	100.0%

Note: For children who were treated at Adult Trauma Centers, see Maryland Adult Trauma Statistics. Children's National Hospital data include patients residing in Maryland and/or injured in Maryland. For children who were burn patients at each hospital, see Maryland Pediatric Burn Center Statistics.

Etiology of Injuries by Age

*Children Treated at Pediatric Trauma Centers (June 2020 to May 2021)
Source: Maryland State Trauma Registry*

Age	Motor Vehicle Crash	Motorcycle	Pedestrian	Fall	Gunshot Wound	Cut/Pierce	Struck by/ Against	Pedal Cyclist	Other	Total
Under 1 year	5.3%	0.0%	0.0%	17.6%	0.0%	0.0%	4.0%	0.0%	24.4%	11.3%
1 to 4 years	23.7%	10.0%	21.0%	31.1%	14.9%	27.1%	20.8%	4.3%	22.1%	24.1%
5 to 9 years	28.9%	30.0%	39.0%	30.6%	17.0%	10.4%	15.8%	27.6%	25.2%	27.9%
10 to 14 years	31.9%	40.0%	32.4%	16.4%	57.5%	47.9%	25.7%	56.9%	25.2%	28.0%
15+ years	10.2%	20.0%	7.6%	4.3%	10.6%	14.6%	33.7%	11.2%	3.1%	8.7%
TOTAL	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Note: For children who were treated at Adult Trauma Centers, see Maryland Adult Trauma Statistics. Children's National Hospital data include patients residing in Maryland and/or injured in Maryland. For children who were burn patients at each hospital, see Maryland Pediatric Burn Statistics.

Number of Injuries and Deaths by Age

Children Treated at Pediatric Trauma Centers
(June 2020 to May 2021)

Source: Maryland State Trauma Registry

Age	Number of Injured Patients		Number of Deaths	
	Total	Maryland Residents	Total	Maryland Residents
Under 1 year	179	172	3	3
1 to 4 years	383	359	5	4
5 to 9 years	441	410	2	1
10 to 14 years	446	414	8	8
15+ years	138	127	2	2
TOTAL	1,587	1,482	20	18

Note: For children who were treated at Adult Trauma Centers, see Maryland Adult Trauma Statistics. Children's National Hospital data include patients residing in Maryland and/or injured in Maryland. For children who were burn patients at each hospital, see Maryland Pediatric Burn Center Statistics.

Number of Injuries by Age

Children Treated at Pediatric Trauma Centers
(3-Year Comparison)

Source: Maryland State Trauma Registry

Age	June 2018 to May 2019	June 2019 to May 2020	June 2020 to May 2021
Under 1 year	187	170	179
1 to 4 years	322	326	383
5 to 9 years	376	376	441
10 to 14 years	391	407	446
15+ years	117	117	138
TOTAL	1,393	1,396	1,587

Note: For children who were treated at Adult Trauma Centers, see Maryland Adult Trauma Statistics. Children's National Hospital data include patients residing in Maryland and/or injured in Maryland. For children who were burn patients at each hospital, see Maryland Pediatric Burn Center Statistics.

Number of Deaths by Age

Children Treated at Pediatric Trauma Centers
(3-Year Comparison)

Source: Maryland State Trauma Registry

Age	June 2018 to May 2019	June 2019 to May 2020	June 2020 to May 2021
Under 1 year	3	3	3
1 to 4 years	4	7	5
5 to 9 years	5	4	2
10 to 14 years	12	0	8
15+ years	4	0	2
TOTAL	28	14	20

Note: For children who were treated at Adult Trauma Centers, see Maryland Adult Trauma Statistics. Children's National Hospital data include patients residing in Maryland and/or injured in Maryland. For children who were burn patients at each hospital, see Maryland Pediatric Burn Center Statistics.

Final Disposition of Patients

Children Treated at Pediatric Trauma Centers
(3-Year Comparison)

Source: Maryland State Trauma Registry

Final Disposition	June 2018 to May 2019	June 2019 to May 2020	June 2020 to May 2021
Inpatient Rehab Facility	3.3%	1.7%	1.8%
Skilled Nursing Facility	0.1%	0.0%	0.0%
Specialty Referral Center	0.2%	0.1%	0.1%
Home with Services	0.4%	0.3%	0.6%
Home	92.7%	95.1%	93.8%
Acute Care Hospital	0.1%	0.6%	0.8%
Left Against Medical Advice	0.0%	0.0%	0.1%
Morgue/Died	2.0%	1.0%	1.3%
Foster Care	0.8%	0.7%	1.0%
Intermediate Care Facility	0.0%	0.0%	0.1%
Jail	0.2%	0.0%	0.0%
Psychiatric Hospital	0.1%	0.4%	0.4%
Elopement	0.1%	0.0%	0.0%
Other	0.0%	0.1%	0.0%
TOTAL	100.0%	100.0%	100.0%

Note: For children who were treated at Adult Trauma Centers, see Maryland Adult Trauma Statistics. Children's National Hospital data include patients residing in Maryland and/or injured in Maryland. For children who were burn patients at each hospital, see Maryland Pediatric Burn Center Statistics.

Etiology of Injuries by Age

Children Treated at Pediatric Trauma Centers or Adult Trauma Centers (June 2020 to May 2021)

Source: Maryland State Trauma Registry

Age	Motor Vehicle Crash	Motorcycle	Pedestrian	Fall	Gunshot Wound	Cut/Pierce	Struck by/Against	Pedal Cyclist	Other	Total
Under 1 year	7.0%	0.0%	0.0%	20.1%	0.0%	2.0%	7.4%	0.0%	23.4%	13.2%
1 to 4 years	24.7%	20.0%	23.3%	31.8%	19.2%	28.0%	30.9%	5.2%	26.6%	26.5%
5 to 9 years	29.8%	40.0%	41.7%	31.4%	17.3%	16.0%	25.9%	33.0%	25.9%	30.0%
10 to 14 years	38.5%	40.0%	35.0%	16.7%	63.5%	54.0%	35.8%	61.8%	24.1%	30.3%
TOTAL	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Note: Children's National Hospital data include patients residing in Maryland and/or injured in Maryland. For children who were burn patients at each hospital, see Maryland Pediatric Burn Center Statistics.

**Occurrence of Injury by County:
Scene Origin Cases Only**

*Children Treated at Pediatric Trauma Centers
(June 2020 to May 2021)*

Source: Maryland State Trauma Registry

County of Injury	Number
Anne Arundel County	47
Baltimore County	138
Calvert County	18
Caroline County	9
Carroll County	10
Cecil County	4
Charles County	31
Dorchester County	3
Frederick County	19
Harford County	34
Howard County	26
Kent County	6
Montgomery County	64
Prince George's County	162
Queen Anne's County	4
St. Mary's County	37
Somerset County	1
Talbot County	4
Washington County	8
Wicomico County	2
Worcester County	3
Baltimore City	211
Washington, DC	11
Pennsylvania	2
Not Indicated	15
TOTAL	869

Note: For children who were treated at Adult Trauma Centers, see Maryland Adult Trauma Statistics. Children's National Hospital data include patients residing in Maryland and/or injured in Maryland. Scene origin cases represent 54.8% of the total cases treated at Pediatric Trauma Centers. For children who were burn patients at each hospital, see Maryland Pediatric Burn Center Statistics.

**Residence of Patients by County:
Scene Origin Cases Only**

*Children Treated at Pediatric Trauma Centers
(June 2020 to May 2021)*

Source: Maryland State Trauma Registry

County of Residence	Number
Anne Arundel County	53
Baltimore County	126
Calvert County	21
Caroline County	5
Carroll County	10
Cecil County	3
Charles County	23
Dorchester County	3
Frederick County	17
Harford County	37
Howard County	23
Kent County	4
Montgomery County	59
Prince George's County	147
Queen Anne's County	4
St. Mary's County	30
Somerset County	1
Talbot County	4
Washington County	8
Wicomico County	2
Worcester County	2
Baltimore City	216
Virginia	8
Pennsylvania	13
Washington, DC	36
Delaware	3
Other	11
TOTAL	869

Note: For children who were treated at Adult Trauma Centers, see Maryland Adult Trauma Statistics. Children's National Hospital data include patients residing in Maryland and/or injured in Maryland. Scene origin cases represent 54.8% of the total cases treated at Pediatric Trauma Centers. For children who were burn patients at each hospital, see Maryland Pediatric Burn Center Statistics.

Children with Protective Devices at Time of Trauma Incident

*Children Treated at Pediatric Trauma Centers
(3-Year Comparison)*

Source: Maryland State Trauma Registry

Protective Device	June 2018 to May 2019	June 2019 to May 2020	June 2020 to May 2021
None	45.0%	41.4%	45.1%
Seatbelt	6.6%	4.8%	4.5%
Airbag & Seatbelt	16.3%	20.0%	15.3%
Airbag Only	8.0%	5.9%	10.1%
Infant/Child Seat	16.7%	15.1%	12.9%
Protective Helmet	7.4%	12.6%	11.8%
Padding/Protective Clothing	0.0%	0.2%	0.3%
TOTAL	100.0%	100.0%	100.0%

Note: Children were involved in motor vehicle, motorcycle, bicycle, and sports-related incidents only. For children who were treated at Adult Trauma Centers, see Maryland Adult Trauma Statistics. Children's National Hospital data include patients residing in Maryland and/or injured in Maryland. For children who were burn patients at each hospital, see Maryland Pediatric Burn Center Statistics.

MARYLAND PEDIATRIC BURN STATISTICS

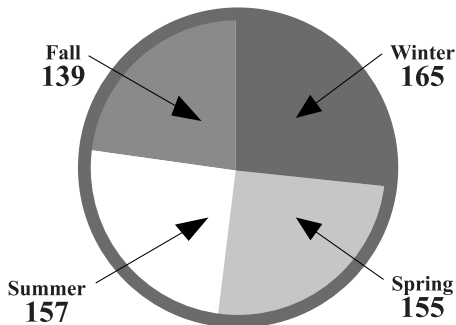
Total Number of Pediatric Burn Cases
Patients Treated at Pediatric Burn Centers and Patients Less Than Age 15 Treated at Johns Hopkins Burn Center at Bayview (3-Year Comparison)
 Source: Maryland State Trauma Registry

Institution	Legend Code	June 2018 to May 2019	June 2019 to May 2020	June 2020 to May 2021
Children's National Health System Pediatric Burn Center	CNHSPBC	235	232	279
Johns Hopkins Pediatric Burn Center	JHPBC	345	355	336
Johns Hopkins Burn Center at Bayview	JHBC	56	38	1
TOTAL		636	625	616

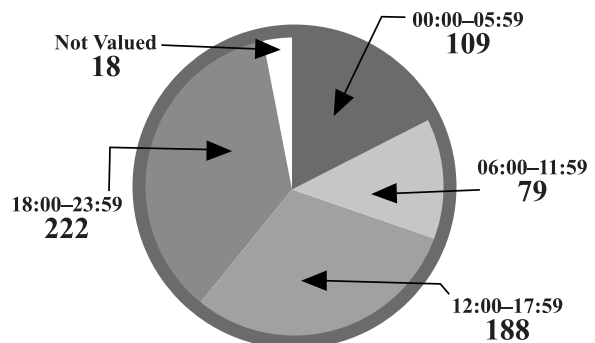
Place of Injury
Patients Treated at Pediatric Burn Centers and Patients Less Than Age 15 Treated at Johns Hopkins Burn Center at Bayview (June 2020 to May 2021)
 Source: Maryland State Trauma Registry

Place of Injury	Number
Non-Institutional Private Residence	552
Institutional Private Residence	3
School, Other Institution and Public Administrative Area	7
Street/Highway	7
Trade and Service Area	6
Farm	1
Other Places	21
Unspecified Places	19
TOTAL	616

Season of Year Distribution
Patients Treated at Pediatric Burn Centers and Patients Less Than Age 15 Treated at Johns Hopkins Burn Center at Bayview (June 2020 to May 2021)
 Source: Maryland State Trauma Registry



Time of Arrival Distribution
Patients Treated at Pediatric Burn Centers and Patients Less Than Age 15 Treated at Johns Hopkins Burn Center at Bayview (June 2020 to May 2021)
 Source: Maryland State Trauma Registry



Occurrence of Injury by County

Patients Treated at Pediatric Burn Centers and Patients Less Than Age 15 Treated at Johns Hopkins Burn Center at Bayview (June 2020 to May 2021)

Source: Maryland State Trauma Registry

County of Injury	Number
Anne Arundel County	25
Baltimore County	70
Calvert County	7
Caroline County	1
Carroll County	9
Cecil County	6
Charles County	16
Frederick County	9
Garrett County	1
Harford County	15
Howard County	22
Montgomery County	86
Prince George's County	143
St. Mary's County	7
Talbot County	1
Washington County	9
Wicomico County	4
Worcester County	4
Baltimore City	123
Virginia	1
West Virginia	5
Pennsylvania	3
Washington, DC	1
Delaware	2
Other	1
Not Valued	45
TOTAL	616

Residence of Patients by County

Patients Treated at Pediatric Burn Centers and Patients Less Than Age 15 Treated at Johns Hopkins Burn Center at Bayview (June 2020 to May 2021)

Source: Maryland State Trauma Registry

County of Residence	Number
Anne Arundel County	29
Baltimore County	78
Calvert County	8
Caroline County	1
Carroll County	11
Cecil County	10
Charles County	16
Frederick County	9
Harford County	17
Howard County	21
Montgomery County	94
Prince George's County	144
St. Mary's County	7
Talbot County	1
Washington County	14
Wicomico County	5
Worcester County	1
Baltimore City	128
Virginia	2
West Virginia	2
Pennsylvania	5
Washington, DC	2
Delaware	2
Other	8
Not Valued	1
TOTAL	616

Mode of Patient Transport to Burn Center

Patients Treated at Pediatric Burn Centers and Patients Less Than Age 15 Treated at Johns Hopkins Burn Center at Bayview (June 2020 to May 2021)

Source: Maryland State Trauma Registry

Modality Type	CNHSPBC	JHPBC	JHBC	Total
Ground Ambulance	105	160	0	265
Helicopter	7	10	0	17
Other*	167	161	1	329
Not Valued	0	5	0	5
TOTAL	279	336	1	616

**Note: The category "Other" includes patients who were brought in by fixed wing ambulance, private or public vehicles, or were walk-ins.*

Origin of Patient Transport by Burn Center

Patients Treated at Pediatric Burn Centers and Patients Less Than Age 15 Treated at Johns Hopkins Burn Center at Bayview (June 2020 to May 2021)

Source: Maryland State Trauma Registry

Origin Type	CNHSPBC	JHPBC	JHBC	Total
Scene of Injury	101	142	0	243
Hospital Transfer	75	123	0	198
Other	93	35	0	128
Not Valued	10	36	1	47
TOTAL	279	336	1	616

Etiology of Injury by Age of Patients

Patients Treated at Pediatric Burn Centers and Patients Less Than Age 15
Treated at Johns Hopkins Burn Center at Bayview
(June 2020 to May 2021)

Source: Maryland State Trauma Registry

Age Range	Electrical	Chemical	Thermal			Inhalation	Other Burn	Other Non-Burn	Unknown	Total
			Flame	Contact	Scald					
Under 1 year	0	2	0	22	38	0	4	0	5	71
1 to 4 years	3	6	7	143	144	1	11	1	14	330
5 to 9 years	2	0	16	49	42	5	3	0	4	121
10 to 14 years	0	0	13	24	32	3	1	0	1	74
15 years and over	0	0	3	5	8	1	1	0	2	20
Total	5	8	39	243	264	10	20	1	26	616

Final Disposition of Patients

Patients Treated at Pediatric Burn Centers and
Patients Less Than Age 15 Treated at
Johns Hopkins Burn Center at Bayview
(3-Year Comparison)

Source: Maryland State Trauma Registry

Final Disposition	June 2018 to May 2019	June 2019 to May 2020	June 2020 to May 2021
Home	573	576	580
Home with Services	35	18	20
Transfer to an Acute Care Facility	13	5	0
Rehabilitation Facility	10	10	4
Skilled Nursing Facility	0	2	2
Morgue/Died	0	1	1
Left Against Medical Advice	0	3	1
Alternate Caregiver	2	2	4
Foster Care	2	5	2
Transfer to Inpatient Psychiatric Facility	0	1	1
Not Valued	1	2	1
TOTAL	636	625	616

Total Body Surface Area (TBSA) Burned by Length of Stay in Days

Patients Treated at Pediatric Burn Centers and
Patients Less Than Age 15 Treated at
Johns Hopkins Burn Center at Bayview
(June 2020 to May 2021)

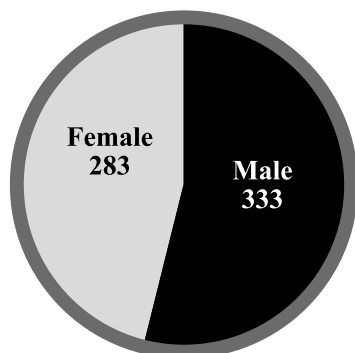
Source: Maryland State Trauma Registry

Length of Stay	Less Than 10% TBSA	10 - 19% TBSA	20% or Greater TBSA	Not Valued	Total
1 Day	431	5	1	61	498
2 - 3 Days	29	4	0	6	39
4 - 7 Days	20	9	1	1	31
8 - 14 Days	4	3	2	1	10
15 - 21 Days	2	2	0	0	4
22 - 28 Days	1	2	0	0	3
Over 28 Days	2	1	3	0	6
Not Valued	23	0	0	2	25
TOTAL	512	26	7	71	616

Gender Profile

Patients Treated at Pediatric Burn Centers and
Patients Less Than Age 15 Treated at
Johns Hopkins Burn Center at Bayview
(June 2020 to May 2021)

Source: Maryland State Trauma Registry



Number of Injuries by Age

Patients Treated at Pediatric Burn Centers and
Patients Less Than Age 15 Treated at
Johns Hopkins Burn Center at Bayview
(3-Year Comparison)

Source: Maryland State Trauma Registry

Age Range	June 2018 to May 2019	June 2019 to May 2020	June 2020 to May 2021
Under 1 year	71	79	71
1 to 4 years	329	329	330
5 to 9 years	114	117	121
10 to 14 years	101	83	74
15 years and over	21	17	20
TOTAL	636	625	616

**Number of Patients Treated at the Pediatric Burn Clinics at
Johns Hopkins Pediatric Center and
Children's National Hospital**

(3-Year Comparison)

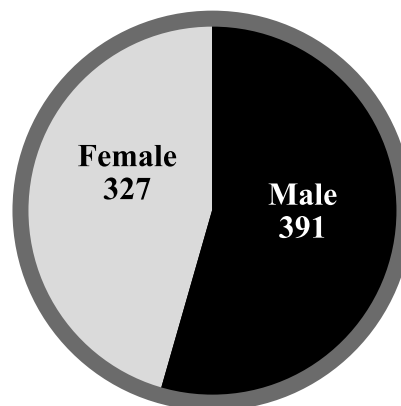
Source: Maryland State Trauma Registry

	June 2018 to May 2019	June 2019 to May 2020	June 2020 to May 2021
Unique Patients	759	709	718
Total Pediatric Burn Clinic Visits	1,533	1,416	1,381

Gender Profile

*Patients Treated at the Pediatric Burn Clinics
at Johns Hopkins Pediatric Center and
Children's National Hospital
(June 2020 to May 2021)*

Source: Maryland State Trauma Registry



**Number of Patients by Age Treated at the Burn Clinics
at Johns Hopkins Pediatric Center and
Children's National Hospital**

(3-Year Comparison)

Source: Maryland State Trauma Registry

Age Range	June 2018 to May 2019	June 2019 to May 2020	June 2020 to May 2021
Under 1 year	84	78	70
1 to 4 years	381	373	381
5 to 9 years	157	133	146
10 to 14 years	112	103	92
15 years and over	25	22	29
TOTAL	759	709	718

Etiology of Injuries by Age

Patients Treated at the Pediatric Burn Clinics

At Johns Hopkins Pediatric Center and Children's National Medical Center (June 2020 to May 2021)

Source: Maryland State Trauma Registry

Age Range	Electrical	Chemical	Thermal			Inhalation	Other Burn	Unknown	Total
			Flame	Contact	Scald				
Under 1 year	0	0	0	24	43	0	2	1	70
1 to 4 years	1	2	10	182	165	0	10	11	381
5 to 9 years	1	1	17	68	52	2	3	2	146
10 to 14 years	0	0	14	33	42	0	1	2	92
15 years and over	0	0	2	9	16	0	0	2	29
Total	2	3	43	316	318	2	16	18	718

GOVERNOR OF MARYLAND

Larry Hogan

LIEUTENANT GOVERNOR

Boyd K. Rutherford

MARYLAND EMS BOARD (July 2020-June 2021)

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Chairperson
Career Firefighter

Sherry B. Adams
Vice-Chairperson
Secretary, Maryland Department of Health, Designee

James Scheulen, PA, MBA
Hospital Administrator

Stephan Cox
Volunteer Firefighter

William Frohna, MD
Emergency Medical Services Physician

E. Albert Reece, MD, PhD, MBA
Board of Regents, Designee

Sally Showalter, RN
Public at Large <175,000

Mary Alice Vanhoy, MSN, RN, CEN, CPEN, NREMT-P
Emergency Medical Services Nurse

Dany Westerband, MD, FACS
Trauma Physician

Wayne Tiemersma, NRP
Chairperson, Statewide EMS Advisory Council

Public at Large – Vacant

STATEWIDE EMS ADVISORY COUNCIL (July 2020-June 2021)

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Representing EMS Region I
Advisory Council

Eric Smothers, NREMT-P
Vice Chairperson
Representing EMS Region II
Advisory Council

Kristie Snedeker, DPT
Representing R Adams Cowley
Shock Trauma Center

Timothy J. Kerns, PhD
Maryland Department of Transportation

Timothy Burns
Representing Professional Fire Fighters
of Maryland

Chief John Filer
Representing Metropolitan Fire Chiefs

Chief James U. Matz
Representing EMS Region III
Advisory Council

Scott A. Haas, NREMT-P
Representing Region IV EMS
Advisory Council

Chief Brian Frankel
Representing EMS Region V
Advisory Council

Michael W. DeRuggiero
Representing Helicopter Pilots

Linda Dousa, CRT-I
Representing Maryland State Firemen's
Association

Michael Cox
Representing Maryland Fire and Rescue
Institute

Rosemary Kozar, MD, PhD
Representing National Study Center for
Trauma and Emergency Medical Systems

Jeffery L. Fillmore, MD
Representing the EMS Regional Medical
Directors

Michael J. Rosellini
Representing Maryland Commercial
Ambulance Services

Jeffrey S. Sagel, DO
Representing MedChi, The Maryland State
Medical Society

Major Michael Tagliaferri, Commander
Representing Maryland State Police
Aviation Command

Katherine Burroughs, MS, PA-C
Maryland Hospital Association

Wayne Dyott
Representing General Public in a county
with a population of < 175,000

Lisa C. Tenney, RN
Representing General Public

Kathleen Grote, NREMT-P
Representing General Public

Karen Vogel, RN, CEN
Representing the Maryland Emergency
Nurses Association

Melissa E. Meyers, RN, BSN, MBA, TCRN
Representing Maryland TraumaNet

Jennifer Anders, MD, FAAP
Representing American Academy of
Pediatrics, Maryland Chapter

Michael G. Millin, MD, MPH,
FACEP, FAEMS
Representing American College of
Emergency Physicians, Maryland Chapter

Habeeba Park, MD
American College of Surgeons,
Maryland Chapter

Justin L. Orendorf
Volunteer Field Providers

Murray Kalish, MD, MBA
Representing Maryland Society
of Anesthesiologists

Wynee Hawk, RN, JD
Maryland Board of Physicians

American Association of Critical Care
Nurses, Maryland Chapter – Vacant

State Emergency Number Systems
Board – Vacant

Maryland Institute for Emergency Medical Services Systems (MIEMSS)

Theodore R. Delbridge, MD, MPH, FACEP, FAEM – Executive Director
653 W. Pratt Street, Baltimore, MD 21201-1536



Maryland Institute for Emergency Medical Services Systems
653 W. Pratt Street, Baltimore, MD 21201-1536
www.miemss.org