Public Health
Seattle & King County

EMERGENCY MEDICAL SERVICES DIVISION

2024 ANNUAL REPORT
TO THE KING COUNTY COUNCIL

SEPTEMBER 2024

Medic One/Emergency Medical Services (EMS) serves
more than 2.3 million people in Seattle and King County and provides life-saving services
on average **every 2 minutes**.

It is available to everyone, whatever and wherever the emergency. Every year,
the Medic One/EMS System saves thousands of lives:

In **2023**,

Emergency Medical Technicians (EMTs)
responded to more than 250,000 calls regionwide.

Paramedics responded to more than
50,000 calls for advanced life support.

Compared to other communities, cardiac arrest victims are
two to three times more likely to survive
in Seattle and King County from
out-of-hospital cardiac arrest.

Strong, effective medicine
is the hallmark of the regional Medic One/EMS system.

Directors' Message & Executive Summary

Greetings from the Directors,

We are pleased to submit the **2024 Emergency Medical Services (EMS) Division Annual Report**, as required by King County Ordinance #12849.

The 2024 annual report provides a **basic overview** of the various operational, programmatic, and financial aspects of our Medic One/ EMS system that make it unique in the world. We have gotten to this place of recognition because of the system's commitment to our foundational principles that allow us to maintain such a critical service in our community:

- ✓ **Regional:** The Medic One/EMS system is based on partnerships that are built on regional, collaborative, and cross-jurisdictional coordination.
- ✓ **Tiered Medical Model:** The medical model, with its tiered system and intensive dispatch, EMT, and paramedic training and protocols, leads to success.
- ✓ **Equity Led:** We are equity-driven and committed to care that uplifts and safeguards the well-being of all King County communities.
- ✓ **Innovative, Efficient, and Effective:** State of the art science-based strategies, programmatic leadership, and operational effectiveness allows us to meet the needs and expectations of our varied communities and our system.
- ✓ **Funded by an EMS Levy:** The EMS levy is a reliable and stable source of funding for our world-renowned system.

We've sought to center these principles throughout our **regional EMS levy renewal process** initiated earlier this year. This process brought together representatives from across King County to discuss and determine how to best serve our community while recognizing the wide range of people, interests, and needs. We hope to share the details of our draft strategic plan later in the year.

In the meantime, we've **highlighted** a few notable findings, projects, and accomplishments since our last annual report. These include our ever-growing efforts to bring diversity into our workforce, our response to demands for increased support for EMS training, and the progress we've made in moving our regional Strategic Initiatives forward.

We would be remiss if we didn't acknowledge the extraordinary efforts of our EMS partners in maintaining established programs and developing new projects. The time, expertise, and collaborative efforts required of the EMS community demonstrate exactly why the EMS system in King County is so successful and serves as an international role model.

We appreciate the opportunity to share with you solid evidence of our continued commitment to excellence in the EMS system in King County, and thank you for your continued support and advocacy.

Dr. Faisal Khan,
Department Director,
Public Health – Seattle & King County

Michele Plorde, MPH
Division Director,
Emergency Medical Services
Public Health – Seattle & King County

Special thanks to our regional partners

Dispatch Centers

NORCOM - Northeast King County Regional Public Safety Communication Agency
Port of Seattle
Seattle Fire Alarm Center
Valley Communications Center

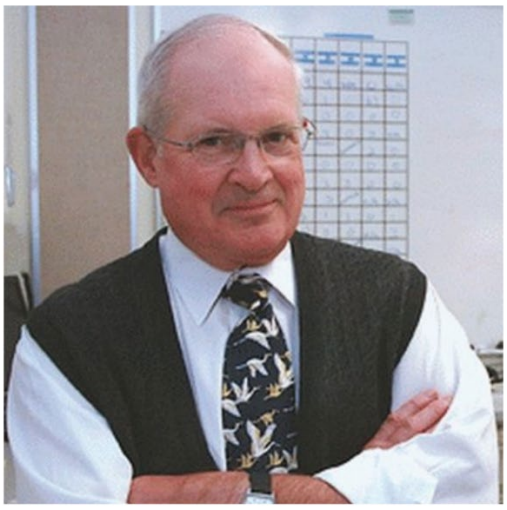
BLS Providers

Bellevue FD
Bothell FD
Eastside Fire & Rescue
Enumclaw FD
KCFD #2 (Burien)
KCFD #11 (North Highline)
KCFD #20 (Skyway/Bryn Mawr)
KCFD #27 (Fall City)
KCFD #47 (Kangley-Palmer)
KCFD #50 (Skykomish)
KCFD #51 (Snoqualmie Pass)
Kirkland FD
Mercer Island FD
Mountain View Fire & Rescue
Port of Seattle FD
Puget Sound RFA
Redmond FD
Renton RFA
Seattle FD
Shoreline FD
Snoqualmie Fire & Rescue
South King Fire
Valley RFA
Vashon Island Fire & Rescue

ALS Providers

Bellevue Medic One
King County Medic One
Northeast King County Medic One
Seattle Medic One
Shoreline Medic One

IN LOVING
memory of



DR. MICHAEL K. COPASS
March 30, 1938 - July 26, 2024

Acknowledgements

We would like to thank those who contributed to the EMS Division 2024 Annual Report, including the staff members of the EMS Division, King County Medic One, the University of Washington, and our regional partners. We recognize below those who contributed in various ways to the content, writing, design, and production of this document.

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It takes a SYSTEM to save a victim

In order to increase survival from out-of-hospital cardiac arrest (OHCA) and to ensure high quality patient care, King County EMS tracks a number of performance measures designed for continuous quality improvement.

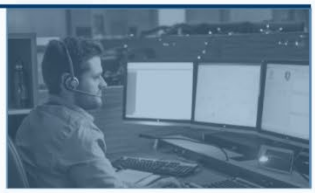
311 Lives saved from OHCA in 2023!

Community — 76%

76% of all out-of-hospital cardiac arrests received bystander CPR

63%: Proportion of bystander CPR attributed to telephone assisted CPR.

Dispatch — 96%



96% of all cardiac arrests were recognized by 9-1-1 operators

Basic Life Support — 5.2 min

Median BLS unit response time: 5.2 minutes

Average chest compression fraction: 89%

Advanced Life Support — 7.7 min

Median ALS unit response time: 7.7 minutes

Rate of successful first attempt intubations: 86%

System Performance — 51%

In 2023, the survival rate for witnessed VF cardiac arrest (widely recognized measure of EMS performance) in Seattle and King County was 51%.

EMS SYSTEM OVERVIEW

EMS Tiered Response System

Any time residents of Seattle and King County call 9-1-1 for a medical emergency, they are using the Medic One/EMS system. The internationally renowned regional system responds to an area of 2,134 square miles and serves a population of more than two million people. The system is managed by the Emergency Medical Services (EMS) Division, Public Health – Seattle & King County and relies on complex partnerships with fire departments, paramedic agencies, EMS dispatch centers, and hospitals for the program's success. The Medic One/EMS system in Seattle and King County is distinct from other systems in that it is medically based, regional, and uses a tiered system for out-of-hospital response. There are four major components in the tiered regional Medic One/EMS system, described below.

EMS System Access - A patient or bystander accesses the Medic One/EMS system by calling 9-1-1 for medical assistance. Bystander reactions and rapid responses to the scene can greatly impact the chances of patient survival.

Telecommunicator (Dispatcher) Triage - 9-1-1 calls are received and triaged by telecommunicators at one of four dispatch centers. Following medically approved guidelines, telecommunicators determine the most appropriate level of care needed and resource(s). Providing pre-arrival instructions for most medical emergencies, the dispatcher guides the caller through life-saving steps, including CPR/AED instructions until the Medic One/EMS provider arrives.

Tier One Response - Basic Life Support (BLS) Services - Emergency Medical Technicians (EMTs) respond to 100 percent of emergency medical services calls. Arriving on scene in 5.2 minutes on average, BLS provides advanced first aid to stabilize the patient. EMTs are certified by the state and are required to complete initial and ongoing education and training to maintain certification.

Tier Two Response - Advanced Life Support (ALS) Services - Paramedics usually arrive second on scene to provide emergency care for critical or life-threatening injuries or illness. Regional paramedic services are provided by five agencies operating 27 ALS units throughout King County, including fire departments in Bellevue (4), Redmond (3), Shoreline (3), Seattle (8), and King County Medic One (9).

2024 EMS DIVISON HIGHLIGHT: DEVELOPING THE NEXT MEDIC ONE/EMS LEVY

Regional Leadership: 2026-2031 Medic One/EMS Levy Reauthorization

The Medic One/EMS system serving Seattle and King County is primarily funded with a countywide, voter-approved EMS levy. Mandated by state law to be exclusively used to support emergency medical services, the levy is a reliable and secure source for funding our world-renowned system.

The current six-year levy expires December 31, 2025. To ensure continued emergency medical services in 2026 and beyond, King County must develop an EMS levy ballot measure for its voters to renew in 2025. Developing the next levy is a regional undertaking, one that brings together leaders, decision-makers, and EMS partners to assess the needs of the system, and collaboratively create a Medic One/EMS Strategic Plan and levy proposal to assure the system can thrive far into the future.

EMS Advisory Task Force

Overseeing the development and vetting of the Medic One/EMS levy is the *EMS Advisory Task Force.* This 20-body group consists of elected officials from the County, cities, and fire districts, and is charged with reviewing and endorsing Medic One/EMS program recommendations and a supporting levy rate to be put before King County voters. Representing those who administer, authorize, and are served by the system, the *Task Force* is invaluable in determining the right proposal and the financial implications it may have for its jurisdictions.

The *EMS Advisory Task Force* convened on February 15, 2024, officially "kicking off" the start of the 2026-2031 Medic One/EMS levy planning process. The meeting introduced *Task Force* members not just to the key components that contribute to the Medic One/EMS system's success, but also to nearly 40 EMS partners whose commitment to excellence make it possible for the system to excel.

Subcommittees

The *Task Force* formed four subcommittees to conduct the bulk of the program and cost analyses that will become the basis for the next Strategic Plan and levy rate proposal. The subcommittees focus on the different program areas and associated funding for Advanced Life Support (ALS), Basic Life Support (BLS), Regional Support Services (RSS), and Finance. Each is chaired by an *EMS Advisory Task Force* member and is comprised of EMS partners and subject matter experts from all aspects of Medic One/EMS system. These groups meet monthly and regularly report back to the *Task Force* on their accomplishments.

EMS partners have stressed the importance of workforce mental wellness programs, equitable services to the community, and continued support for Mobile Integrated Healthcare (MIH). Staffing shortages, challenges with recruitment and retention, and the firefighter/EMT increased workload rose to the top of emerging concerns.

The subcommittees are continuing to refine and finalize their draft Recommendations and individual Financial Plans. Next steps include updating the financials based on the August 2024 forecasts and calculating a levy rate based on those projections. This levy rate and finalized programmatic recommendations will go to the *Task Force* for review and feedback in late-September, with final adoption anticipated no later than October. Look for information on the adopted recommendations in the 2025 Annual Report.

2024 EMS DIVISON HIGHLIGHT: PROMOTING EQUITY, RACIAL AND SOCIAL JUSTICE

Regional Leadership: Equity, Racial and Social Justice/Diversity, Equity, & Inclusion (ERSJ/DEI)

The EMS Division is committed to integrating Equity, Racial and Social Justice (ERSJ) knowledge and practices into its day-to-day operations. Over the past year, the Division worked with EMS agencies and community organizations to focus on its goal of creating a workforce that more closely reflects the community. It also pursued creating and sustaining a more equitable workspace for its own staff through training, coaching, and employee-centered engagement.

In alignment with Public Health – Seattle & King County, the EMS Division has focused on three main ERSJ policy areas:

1. *Racism as a Public Health Crisis* policies and budget,
2. Workforce/workplace equity, and
3. Community partnerships.

This work uses a multi-faceted approach to combat systemic health discrimination faced by historically underserved communities in our county. It employs best practices in community-centered engagement and invites all staff to participate in anti-racist institutional organizing to create an equitable work environment.

The EMS Division ERSJ work plan emphasizes division leadership training and coaching, strengthening, and expanding the ERSJ Core Team, and inviting staff to incorporate ERSJ practices more deeply into their work.

Externally, the EMS Division continues to support the King County Fire Chiefs Association's (KCFCA) diversity and recruitment workshops, along with the Future Women in EMS and Fire program and the Strategic Training and Recruitment program. These programs allow EMS partners to expand and strengthen their ties to their diverse communities.

In addition, the EMS Division invested time and resources to strengthen and expand the community partnerships developed through the Vulnerable Populations Strategic Initiative (VPSI). This helps support EMS education in Black and brown communities and create a direct line of recruits from these community partner organizations.

Diversity & Recruitment Workshops

The King County Fire Chiefs Association (KCFCA), with the support of the EMS Division, hosted two Diversity and Recruitment Workshops over the past year. These workshops are designed to build a workforce that better represents the communities we serve. Specifically, they help potential Fire/EMS applicants navigate the hiring process and focus on potential applicants who may experience access or systemic barriers to becoming a firefighter/EMT.

Breakout sessions focus on preparing for the written and oral board interviews, physical and mental wellness, a day in the life of a firefighter, and medical and psychological assessments. The bi-annual workshops occur in the fall and spring and rotate among jurisdictions in King County. They are open to all potential candidates across the region. This past year, workshops were hosted by Eastside Fire & Rescue and Shoreline Fire with over 230 total participants in attendance.

2024 EMS DIVISON HIGHLIGHT: PROMOTING EQUITY, RACIAL AND SOCIAL JUSTICE

Future Women in EMS and Fire (FWIEF) Workshops

Since 2018, the EMS Division has partnered with fire departments across King County to sponsor Future Women in EMS and Fire (FWIEF) workshops. These weekend events occur twice a year and aim to inspire and support women in pursuing careers in fire and EMS services. To date, we have successfully completed nine workshops, featuring interactive interview panels, hands-on stations, lectures, and real-life demonstrations.

Each workshop is entirely organized and conducted by women from more than 18 different fire departments, providing invaluable insight, advice, empowerment, and opportunities for aspiring female professionals. Host agencies alternate between the north, central, and south regions, allowing all departments to showcase their unique characteristics and culture.

Feedback from attendees has been overwhelmingly positive. Many participants have successfully navigated the testing process and secured positions with various agencies across the County. However, follow-up surveys reveal ongoing challenges that women face during testing, hiring, and the fire academy training process. We are committed to addressing these challenges and continuing our efforts to support women in their journey toward a career in fire and EMS services.

Strategic Training and Recruitment (STAR) Program

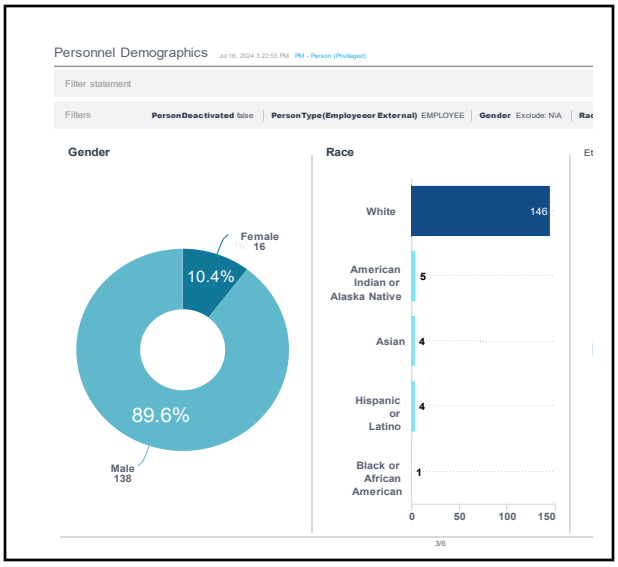
The Strategic Training and Recruitment (STAR) Program aims to create an EMS workforce that represents the communities we serve and provides training opportunities for individuals traditionally underrepresented in the EMS workforce. This goal is achieved through community education about the STAR program and EMS career opportunities, tuition coverage for the King County EMT training program, ongoing mentoring, and fostering an inclusive culture where STAR students feel they belong and can succeed, including mentorship, employment workshops, and study groups. These resources are designed to ensure students complete the class, pass the National Registry EMT exam, and secure employment in the EMS workforce.

Tracking Workforce Diversity Progress

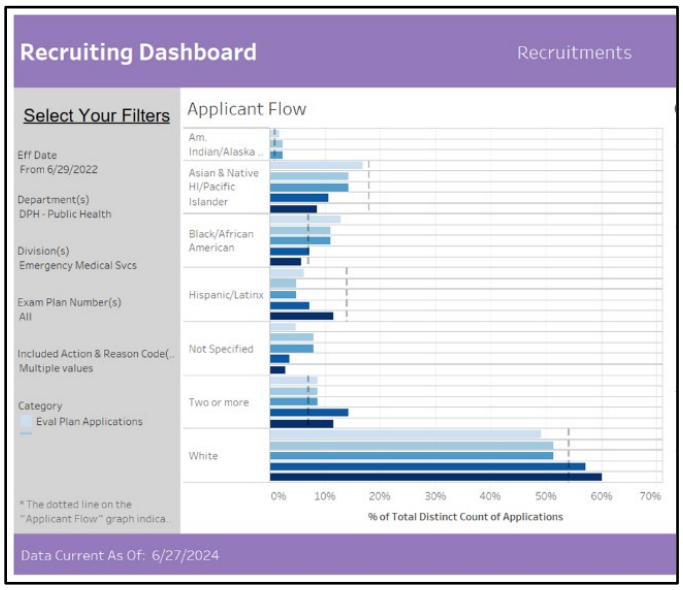
Since 2017, the EMS Division has purposefully collaborated with EMS agencies in King County to improve overall workforce diversity throughout the region. Countywide efforts have included promoting diversity trainings for leadership, hosting bi-annual Future Women in EMS and Fire and Diversity Recruitment workshops, and sponsoring EMT training for diverse candidates.

Although evidence has anecdotally shown some individual participant success, a simple, comprehensive method to track employee gender and race data across the more than two dozen EMS agencies in the County has proven to be elusive. In 2020, the EMS Division sponsored a regional survey to create a foundational starting point and showed *91 percent of the workforce was male and 84 percent white* – far from representing the community statistics for those categories. Furthermore, collection of applicant data is even more complicated since few EMS agencies have the capability or capacity to track this information.

In 2023, the EMS Division learned the medical record software system used by EMS agencies – ESO Solutions – started allowing EMS personnel to voluntarily enter their gender and race information. This has proven to be an incredibly efficient and, hopefully, far more effective way to track the progress of workforce diversity in the region. The current aggregate data is shown in the graph to the right. Unfortunately, it represents only a small percentage of the total workforce, but does show consistency with the 2020 survey data. The EMS Division plans to work with regional leadership and DEI advocates to improve the reporting percentage going forward.



In addition, Public Health – Seattle & King County began reporting applicant gender and race data for applicants, including King County Medic One (one of the five paramedic programs in the County). Those findings are shown in the bar graph below.



The bars from light blue to dark blue reflect the percentage of applicants by race as they move from the beginning of the process through onboarding (applied, eligible, referred for interview, hired, and onboarded).

Findings indicate that white applicants start the process as less than 50 percent of the total but are onboarded 60 percent of the time. Hispanic applicants also fare well in the process but are under-represented when compared to the general population. In contrast, just over half of Black/African American applicants are hired and no American Indian/Alaska Native applicants made it past the interview phase.

TRAINING OUR EMS WORKFORCE AND THE PUBLIC

Training Our EMS Workforce and the Public

The Medic One/EMS system serving Seattle and King County uses a tiered response system consisting of four major components - EMS system access, telecommunicator triage, Basic Life Support (BLS, or Firefighter/EMT) services, and Advanced Life Support (ALS, or paramedic) services. Dedicated to training a robust workforce across these different response components, the EMS Division supports comprehensive training and education initiatives that are continually evolving to ensure they meet the highest possible clinical standards.

Emergency Medical Dispatch Training

As the first point of contact with the public, Emergency Medical Dispatchers, also referred to as "telecommunicators," play a vital role in the EMS continual "Chain of Survival." They are trained by the EMS Division in Criteria Based Dispatch (CBD) so they can "triage" calls using specific medical criteria that are based on the signs and symptoms of the patient.

Prior to taking real 9-1-1 medical calls, regional telecommunicators complete a comprehensive 40-hour initial dispatch basic training that equips them with the knowledge and skills needed to effectively handle medical calls and assign appropriate resources. Training includes all CBD medical criteria response levels and dispatch codes, pre-arrival instructions such as telephone-assisted cardiopulmonary resuscitation (CPR), medical terminology, and actual 9-1-1 recordings of specific medical emergencies that telecommunicators may encounter.

In addition, the EMS Division provides eight hours of telecommunicator continuing education (CE) annually to refresh and enhance their knowledge of CBD guidelines and stay current with an everchanging EMS system. The EMS Division continues to invest in adult learner CE and recently partnered with regional and Washington State training offices to build a library of relevant, current, and appropriate online learning modules to help ensure a well-trained and informed telecommunicator workforce.

During the 2026-2031 Medic One/EMS levy reauthorization process, preliminary discussions included developing a dispatch advanced training curriculum to provide additional higher-level knowledge and skills to experienced telecommunicators. This could include supplementary knowledge of specific medical conditions and using our research activities to provide advanced understanding and training on 9-1-1 call handling and processing.

Emergency Medical Technician (EMT) Training

Both the fire-based and county-based Emergency Medical Technician (EMT) training programs equip individuals with the skills and knowledge needed to respond effectively to medical emergencies. Training methodologies combine classroom instruction, practical skills training, clinical experience, and supervised field internships, ensuring a comprehensive learning experience. Classroom instruction covers medical topics, including anatomy, physiology, medical terminology, and emergency procedures. Practical skills training allows trainees to develop proficiency in real-life emergency scenarios. Clinical experience provides valuable exposure to real patient care situations, while field internships help trainees apply their knowledge and skills in real-world situations.

Collaboration with regional partners helps maintain high training standards. These partnerships facilitate knowledge exchange, best practices, and standardized training across the region. Quality assurance measures, such as regular evaluations and feedback mechanisms, ensure continuous improvement of the training programs.

Ongoing education and skill enhancement are critical components of the EMS Division's training programs. **EMS Online** is an interactive, web-based teaching tool offering high-fidelity online learning to EMS partners. This platform allows users to access training modules at any time, meeting the instructional requirements for ongoing education and EMT recertification. The online courses cover state-mandated topics such as cardiovascular systems, patient assessment, and pediatrics, and are produced through regional collaboration and leveraging expertise from ALS/BLS agencies, regional Medical Program Directors (MPDs), and hospital systems. The STRIVE Initiative (see page 27) further enhances these offerings by providing a modern LMS that facilitates a more engaging and comprehensive learning experience.

EMT training benefits individual patients and the community by promoting life-saving skills and providing prompt and efficient emergency medical services. Well-trained EMTs contribute to a safer community, reducing response times and improving patient outcomes. Having supported the training of more than 400 new EMTs in 2023, the EMS Division helped its regional fire agencies address employment and retention needs.

Throughout the 2026-2031 Medic One/EMS levy reauthorization process, there was great support across the region for increased training opportunities. Hiring, retention, and ensuring a sufficient number of available instructors were all priorities cited by regional partners.

Paramedic Training

Paramedics in King County are among the most highly skilled paramedics in the world. As graduates of the intensive 10-month Paramedic Training program at Harborview Medical Center, they have undergone over 2,100 hours of rigorous training, which is nearly double the national recommendation. This includes classroom instruction, clinical rotations, and extensive field experience on Medic One paramedic units, all under the direct supervision of physicians and experienced paramedics. The EMS Division's support of paramedic training ensures paramedics are well-prepared to deliver high-level emergency medical care through the administration of Tuesday Series, the monthly Continuing Education training opportunity where paramedics and paramedic students interact with Harborview physicians, attend lectures, and complete a series of testing scenarios. The Division also partners with the program to incorporate field paramedics into the training curriculum to help teach and mentor up-and-coming paramedic students. Regional partners avidly supported continuing this program in the next levy span during the 2026-2031 Medic One/EMS levy reauthorization process.

Stronger Together

In 2021, the Washington State Legislature passed SB 5229, which requires all healthcare workers, including first responders, to receive training in implicit bias and healthcare disparities beginning Jan 1, 2024. The training is intended to help EMS responders better understand how implicit bias impacts patient care and enhance their knowledge and improve sensitivity regarding these issues. The ultimate goal is to ensure the highest level of care across the many diverse patient populations in the region.

Working with Equity Racial and Social Justice (ERSJ) experts, the EMS Division developed and rolled out a comprehensive training program that surpasses state requirements earlier this year. Titled **Stronger Together,** the training consists of three one-hour EMS Online modules to be completed in 2024, followed by the successful completion of an online exam and/or attestation of training. To maintain proficiency and reinforce this learning, our providers will be required to repeat the training every four years.

In addition to increasing awareness of implicit biases, this training promotes the equitable and respectful care for all patients regardless of background. It aims to improve cultural competency and sensitivity, and enhance skills in providing affirming healthcare to diverse patient populations. Importantly, it fosters continuous learning and adaptability while strengthening the reputation of EMS as compassionate and inclusive healthcare providers.

The Stronger Together training is an overall important step in empowering our EMS first responders to deliver equitable and compassionate care. Incorporating ERSJ concepts into patient care can help minimize and mitigate implicit bias in decision-making related to patient assessment. The training helps address commonly held medical misconceptions and promotes empathy, cultural awareness, and dignity in patient care. This allows us to take significant steps toward creating a more inclusive, equitable, and compassionate EMS environment, benefiting both providers and the communities they serve.

Public CPR and AED Training

The Medic One/EMS system in King County has a decades long track record of successfully educating local communities as a means of increasing the likelihood people survive a cardiac arrest. Teaching the public to perform CPR is a critical link in the "Chain of Survival," keeping a person experiencing a cardiac arrest alive until first responders are able to arrive on scene.

Thanks to the work of many community partners – including workplace organizations, school-based training, and a range of civic groups and individual initiatives – close to 75 percent of King County residents are trained in CPR and nearly 80 percent of all out-of-hospital cardiac arrests in King County received bystander CPR.

School CPR Program

Since 2013, Washington State law requires school districts operating a high school to provide CPR instruction as part of graduation requirements. The EMS Division partners with various King County school districts and fire departments to provide student CPR education and training using an EMS Division CPR training curriculum. The EMS Division also works with school districts to place AEDs in their facilities and register them with the King County AED Registry. Each year, thousands of students throughout the region are trained to provide CPR and AED usage on persons experiencing sudden cardiac arrest.

Quick thinking and CPR learned at school helped save a friend need. Find the story online at: Shoreline Area News: Shoreline native credits King's High School and a television show for helping him save a friend's life

As the region worked to develop the 2026-2031 Medic One/EMS Strategic Plan and supporting levy, there was support for maintaining the School CPR Program and partnering with King County school districts to prevent potential health disparities through inequitable education and training to students in different school districts.

CPR in a Box – Hands-only CPR Education

To build upon bystander CPR success in King County and save even more lives, the EMS Division developed a self-guided CPR education kit called "CPR in a Box." These kits teach people how to do the most current training in hands-only CPR, emphasizing chest compressions only, with no rescue breaths. This ready-to-go training kit is an effective way for businesses and other partners to educate their staff and communities on CPR and reach more people.

Public Health Employee CPR Training

Public Health – Seattle & King County healthcare professionals serve all communities throughout the region, including underrepresented and underserved communities at higher risk for health disparities including cardiovascular disease and SCA. The EMS Division provides BLS CPR training to Public Health Department employees so they are prepared to respond to SCA emergencies when necessary. This is not just a hypothetical possibility - employees have performed lifesaving CPR to clients in various settings of their work, including health clinics, jail health services, and even during home visits.

USING ALTERNATIVE APPROACHES TO MEET PATIENT NEEDS

Using Alternative Approaches to Meet Patient Needs

Pursuing innovative strategies and operational efficiencies has long been a regional priority. This commitment to testing new concepts has allowed the regional EMS system to adapt to meet the needs and expectations of its users. One such approach is employing alternatives to dispatching a BLS unit for lower-acuity patients. Focusing on strategies to better serve non-emergency patients and callers helps ensure the most appropriate patient care is provided, connects patients to longer term care in their community, and contributes to the overall efficiency of service delivery.

Telephone Referral Program

The Telephone Referral Program (TRP) has been a regional service funded through the Medic One/EMS levy for more than 25 years. The program transfers low-acuity 9-1-1 calls to a 24-hour consulting nurseline for medical advice and care instructions in lieu of dispatching EMS resources. Doing so keeps the 9-1-1/EMS system available for call handling and dispatching of resources for higher acuity and life-threatening medical emergencies. Historically, this program has resulted in a transfer rate of approximately 1 percent of BLS run volumes to the nurseline, however recent trends indicate that the number of low-acuity 9-1-1 calls eligible for a nurseline are increasing, making the effectiveness of the TRP more important than ever.

In September 2023, the longstanding service provider for the TRP rescinded operations, resulting in an unanticipated opportunity to evaluate the program. Partners from local fire departments and regional communication centers, and medical directors agreed unanimously that maintaining a TRP was of the utmost importance to the region and is an effective strategy for managing system resources. Additionally, the incorporation of new capabilities, such as navigating callers away from emergency departments to other destinations (e.g., health clinics, primary care providers) and offering alternative transportation options, were identified as key improvement areas for TRP modernization. After a lengthy request for proposals process to identify a new service provider, the EMS Division selected Global Medical Response (GMR). The GMR Nurse Navigator program is the only scalable nurse-based telephonic enhanced screening and care navigation program specifically designed and implemented by a national EMS provider. Nurse Navigation currently contracts with the City of Seattle and is implemented in other counties across Washington State. The enhanced TRP is expected to be fully operational on October 1, 2024.

Taxi Transport Voucher Program

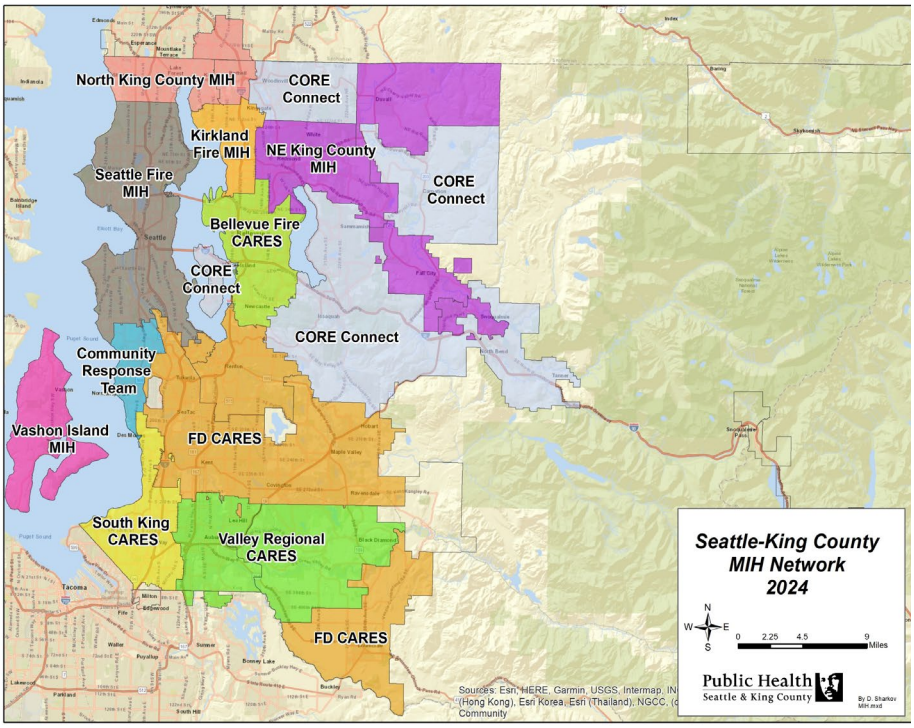
For more than a decade, the Taxi Transport Voucher Program (TTVP) has been providing an alternative transportation option for low-acuity patients who need non-emergent same-day treatment at a medical facility (e.g., urgent care or emergency department). During the current levy period, the program was expanded to allow Mobile Integrated Healthcare (MIH) units to use TTVP as an option for managing the care of their clients. This has resulted in the use of the TTVP more than doubling (724 vouchers in 2023 compared to 334 vouchers in 2019). The TTVP helps hundreds of community members throughout King County each year, from persons experiencing homelessness to high frequency EMS utilizers, and has broken barriers for many requiring healthcare services but who are unable to access them due to transportation needs.

Mobile Integrated Health (MIH): Providing the Most Appropriate Care for Patients

EMS agencies across King County experience 9-1-1 calls from individuals that require care but may not necessarily need or benefit from the traditional "lights and sirens" response. To better address the needs of these low-acuity callers, first responders are connecting 9-1-1 callers to appropriate health and social services through an alternative EMS service known as Mobile Integrated Healthcare (MIH).

Through MIH programs, multidisciplinary EMS teams work closely and extensively with frequent callers, lower-acuity callers, and patients requiring complex care to identify their root causes of need and navigate them to more appropriate longer-term health and social services. By having mobile, community-based care teams dedicated to connecting callers to more appropriate resources, the EMS system offers another option for a more meaningful intervention that truly impacts the patient's well-being.

As of 2024, there are 11 MIH programs providing service to 21 EMS agencies, collectively covering more than 1.8 million residents. Since 2020, more than 18,000 clients were referred to MIH for care management. Each MIH program is uniquely tailored to serve their community, with partnerships from local EMS agencies and supported regionally by the EMS Division. The Division convenes the MIH Network and Provider Huddle to regularly share best practices, establish regional guidelines, and assess and evaluate performance and community impact.



The current Medic One/EMS levy committed almost $28 million to implement a regional, cohesive, and community-specific MIH service, reflecting a strategic investment to optimize EMS availability and integrate EMS into the broader healthcare and social service systems. Looking forward, the 2026-2031 Medic One/EMS Levy Planning process supported the regional commitment to MIH services and enhancing capabilities. Doing so is essential to maintaining MIH's effectiveness and scalability across a diverse, growing, and increasingly complex region.

Regional Quality Improvement: Quarterly Audit Reports

Delivering the highest quality patient care requires establishing standardized protocols for EMS personnel, mechanisms for monitoring the delivery of care, and systematically identifying how patient care can be improved across the region. One way the EMS Division conducts regional quality improvement is through quarterly audits to evaluate how BLS and ALS respond to a wide variety of conditions. These audit report findings are distributed to all King County medical directors, EMS agency chiefs, training officers, dispatch center leaders, and hospital cardiac and stroke coordinators to encourage an ongoing culture of evaluating and improving patient care.

The following are summaries of two 2024 quarterly audit reports.

Pediatric Resuscitation: The Role of the 9-1-1 Telecommunicator

In King County, the telecommunicator at the communications center helps identify the cardiac arrest patient and coaches the caller in CPR, which is termed “T-CPR”. However, little is known about the telecommunicator’s involvement in, and impacts on, the relatively rare event of pediatric cardiac arrest.

This assessment reviewed nearly 200 9-1-1 calls for pediatric cardiac arrest that occurred prior to EMS arrival during a seven-year time period in Seattle and King County to understand how the telecommunicator interacts with the 9-1-1 callers and impacts T-CPR. The specific goals of this evaluation were to determine how often and how quickly telecommunicators help identify pediatric cardiac arrest and coach CPR.

The report found that the telecommunicator is integral to increase timely cardiac arrest recognition and bystander CPR, providing a key strategy to improve survival following pediatric cardiac arrest. These findings once again underscore the team effort involved in successful cardiac arrest resuscitation. We have long appreciated the important role of T-CPR in adult arrest, and this evaluation highlights similar impactful participation by the telecommunicator in pediatric arrest. The telecommunicator efforts help sustain patient physiology which in turn provides for more effective EMS treatment. Publication: https://www.ahajournals.org/doi/full/10.1161/JAHA.123.031740

Changing Modes of Personalized Transport: E-Scooters, Bikes, and the Helmet Law

The King County EMS Division tracks the frequency, mechanisms, and patterns of trauma. One type that is monitored involves personal modes of non-motorized transport. Historically, evaluations almost exclusively involved traditional, human-powered bicycles. However, with the rise of hybrid or fully electric powered personal vehicles like e-scooters and e-bikes, the EMS Division focused this surveillance on those modes of transportation to better understand the role of e-scooter injuries and the need for EMS response in the larger context of bike-related injury.

What's interesting to note is that arrival of e-scooters and e-bikes coincides with changes in bike helmet laws beginning in 2022. Although there is strong evidence that helmets prevent serious injury and death, consistent enforcement is challenging. This has led King County to replace the bike helmet law with a resolution recommending helmets, deferring some helmet laws to local jurisdictions. While some King County communities have maintained requirements for bike and scooter helmets, others have none.

About 1,000 persons die each year in the United States from bike crashes, and upwards of 40,000 suffer serious injury. However, relatively little is known about how e-scooters contribute to the challenge of traumatic injury. The EMS Division started tracking e-scooter-related 9-1-1 emergencies starting partway through 2022. The surveillance shows that EMS responses in King County for injuries related to bike and e-scooter crashes account for upwards of 1,000 calls per year, though with a striking seasonal dependence – the number of calls increases more than five-fold when comparing the summer months to winter season. In 2023, e-scooter injuries accounted for approximately 15 percent of these 9-1-1 calls, with nearly three quarters of calls occurring in men and about two-thirds <45 years of age. Approximately 10 percent required paramedic transport and over half required BLS transport, regardless of whether the vehicle was an e-scooter or a bike.

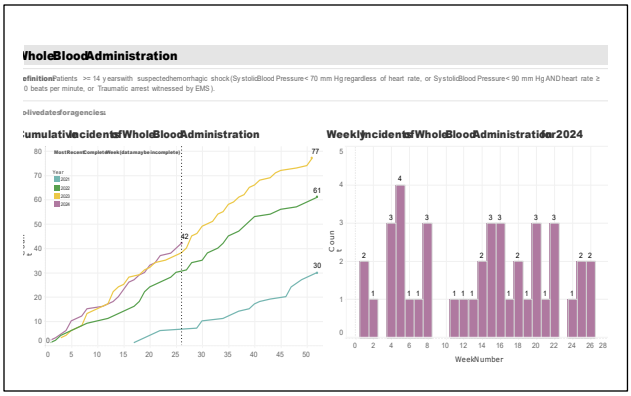
E-bikes and e-scooters are relatively new options that can provide more mobility but also potentially introduce new safety challenges. As we approach the summer months, there is interest in whether e-scooter injuries will simply replace some of the bike-related injuries or will be in addition to the count of bike injuries. There is more to learn as we track and evaluate the consequence of personal electric vehicles joining the byways and roadways. The full audit report can be found here.

KING COUNTY MEDIC ONE

King County Medic One (KCM1) is one of the five ALS paramedic agencies in the regional EMS system. Its 74 paramedics work side-by-side with local fire department personnel to provide the highest-quality, cost-effective emergency medical care to those in need, 24 hours a day, every day of the year. KCM1 serves approximately 557 square miles of south King County, including Vashon Island, with a population of around 750,000 people. In calendar year 2023, KCM1 responded to over 17,500 calls for advanced care, including cardiac emergencies, pediatric patients, mass casualty, and motor vehicle crashes.

Field Blood Transfusion

Long considered too challenging to implement due to logistical considerations, appropriate training and the safety and efficacy of administering outside of a controlled hospital environment, providing field transfusion to patients suffering hemorrhagic shock has become a reality. Thanks to technological progress and a partnership with Harborview Medical Center's Transfusion Service Lab, KCM1 has been able to provide this life saving measure since May 2021.



Whole blood requires a constant monitoring and control regimen. It must be maintained in a very narrow temperature range and is monitored continuously. To ensure it doesn't expire, the blood is swapped out weekly. Because of KCM1's commitment to proper storage temperatures, the blood not used in the field is returned to Harborview Medical Center for use for patients there.

KCM1 carries two units of whole blood in its supervisory vehicle that is staffed 24/7/365. Each ALS unit carries the necessary equipment to set up for transfusion including warming the blood (blood is stored cold). This allows for quick delivery of this life-saving resource without extraneous equipment/personnel exchanges that would needlessly delay transport to a hospital. KCM1's program has transfused a total of 107 patients in the first full three years of implementation, which has contributed to improved outcomes for critically injured patients. Each transfusion is scrupulously reviewed by KCM1's medical director for compliance with Patient Care Guidelines and regulatory controls.

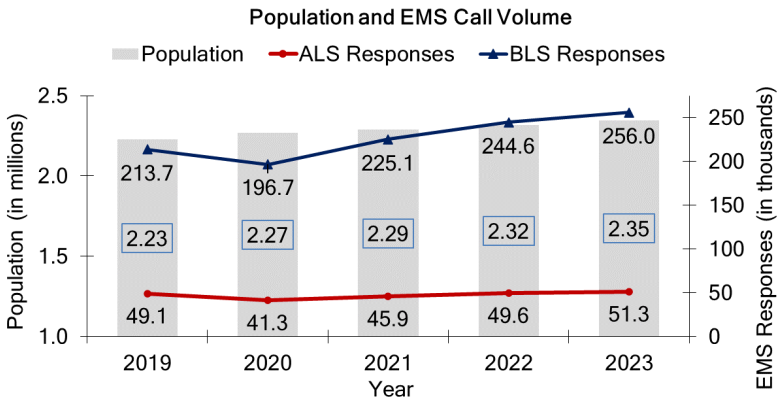
Quality Improvement Program

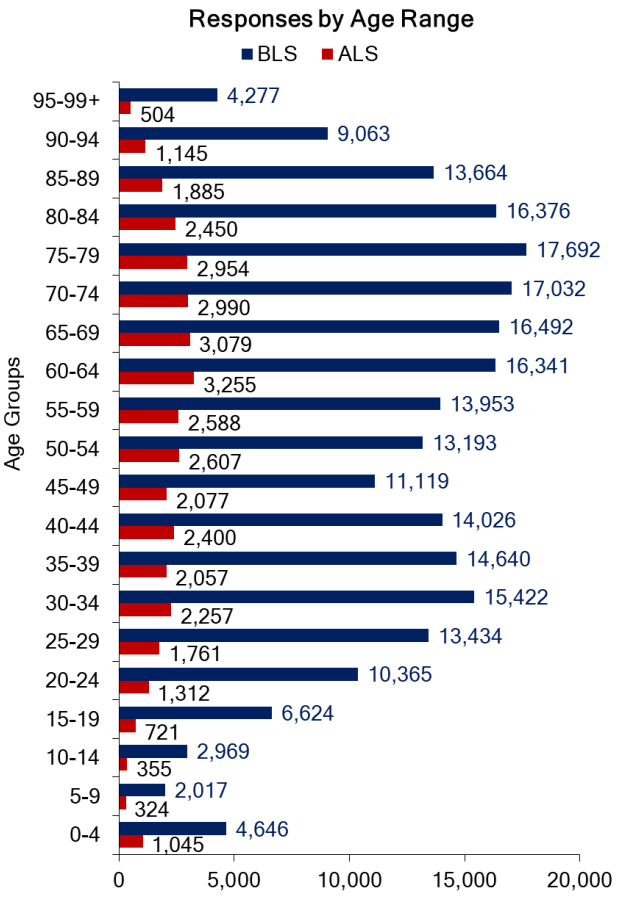
In collaboration with the South King County Fire Training Consortium, KCM1 implemented a robust quality improvement program in 2023. This included assigning 15 paramedics to provide critical clinical feedback and ALS/BLS interactive training to BLS colleagues throughout south King County. These paramedics review patient care records generated by BLS agencies across the zone and provide documentation and clinical feedback, lessons learned, and patient outcomes.

They also participate in virtual and in-person ALS/BLS interactive training events, which allow ALS and BLS crews to exchange critical information and training to continually improve patient care. Working together during these skills-based training sessions, ALS and BLS providers focus on improving patient care, reviewing high-risk/low-frequency patient presentations and continuing to build deeply trusted and respectful relationships across agencies. Although still in its nascent stages, this approach to QI has been well received by regional partners, indicating that KCM1 is headed in the right direction in providing this critical QI program for the regional EMS system.

EMS System Operational Statistics

Population serves as an important indicator to predict the trend in the number of emergency medical responses.[1] This means that the demographic profile of King County matters: When King County's population increases, the number of emergency medical responses and call volume typically increase.





In the tiered EMS response system, BLS responds to 100 percent of all EMS calls. Cancelled enroute calls accounted for approximately 25 percent (12,719) of all ALS calls compared to 4 percent of all BLS calls (11,198).

2023 STATS

256,037 Total EMS Responses

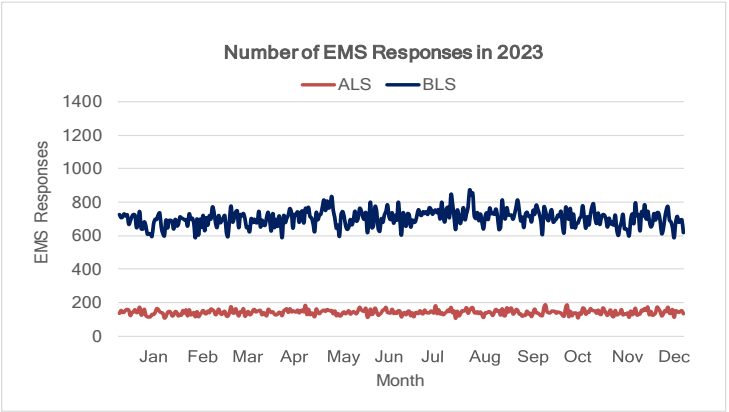
153,845 (75%) BLS-Only Responses

51,256 (25%) BLS & ALS Responses

Average # of Calls Per Month
21,336 BLS
4,271 ALS

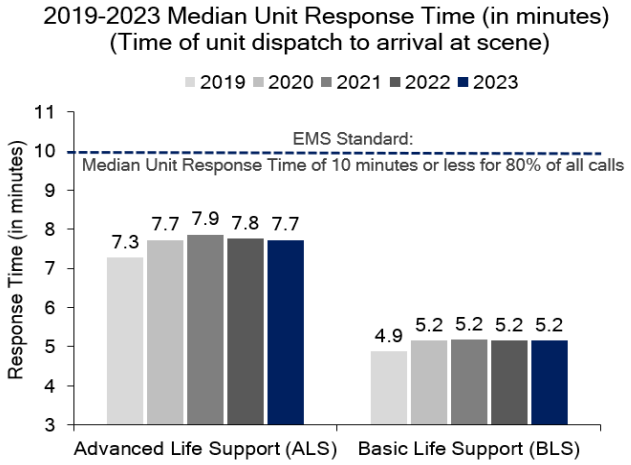
Average # of Calls Per Day
701 BLS
141 ALS

The following graph shows the patterns of ALS and BLS responses in 2023.



[1] https://ofm.wa.gov/sites/default/files/public/dataresearch/pop/april1/ofm_april1__poptrends.pdf

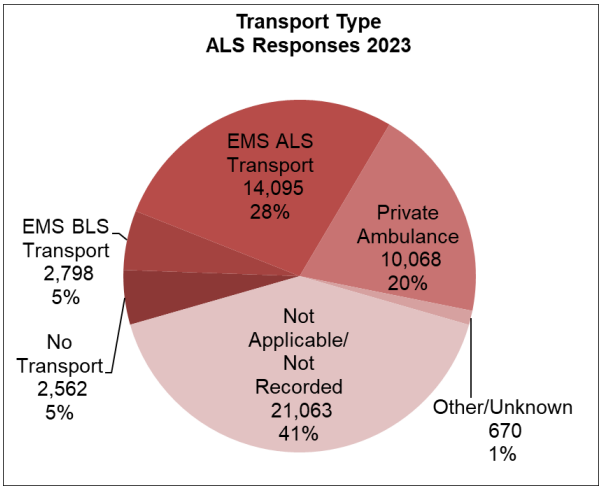
Unit response time serves as a key performance indicator of operational efficiency in any EMS system. Two important metrics include the total response time – the time between the 9-1-1 call being received by the dispatch center and the EMS unit's arrival on scene – and the unit response time. The unit response time is the time between the unit dispatched and EMS arrival on scene. Across the last five years, ALS consistently met the standard performance goal of a median response time of 10 minutes or less, and 80 percent of all calls within 14 minutes or less.

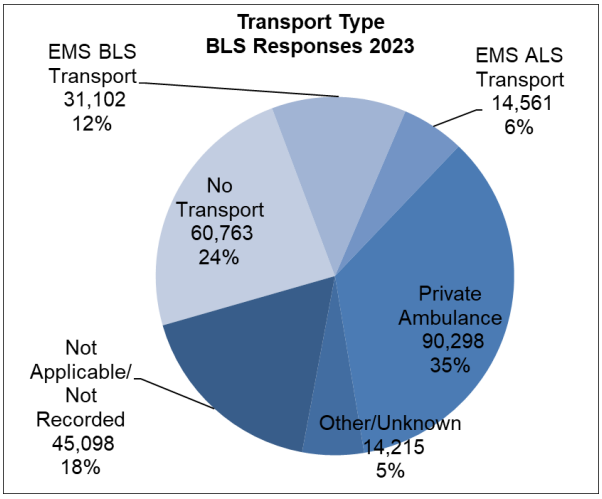


Transport Type is an important component of providing EMS care. Once a patient is stabilized, EMS personnel use their skills and knowledge to determine whether transporting the patient to a hospital is needed for further medical attention. Based on the clinical needs of the patient, a decision to identify the most appropriate transport resource is made. The charts shown below identify the transport types for EMS responses across 2023, broken into two categories for ALS and BLS responses.

EMS Call Types: EMS responds to a wide variety of emergency medical calls. In 2023, nearly 50 percent of ALS responses involved serious, life-threatening emergencies such as cardiovascular, respiratory, and neurological calls, with a higher percentage of calls to patients 65 years or older. BLS responds to 100 percent of all calls, which are comprised of nearly 20 percent involving trauma, with a higher percentage of patients who are 65 years or younger.

MEDICAL TYPE	ALS		BLS	
Cardiovascular	8,333	25.8%	15,764	7.1%
Respiratory	3,888	12.0%	14,293	6.4%
Behavioral/Psychological	3,309	10.2%	16,172	7.3%
Neurological	3,146	9.7%	20,460	9.2%
Alcohol/Drug	3,021	9.3%	22,502	10.1%
Trauma	2,417	7.5%	42,543	19.1%
Abdominal/Genito-Urinary	1,381	4.3%	16,942	7.6%
Endocrine/Metabolic	806	2.5%	2,975	1.3%
Infection	745	2.3%	1,888	0.8%
Allergy/Anaphylaxis	620	1.9%	5,587	2.5%
Obstetric/Gynecological	329	1.0%	992	0.4%
Environmental	96	0.3%	458	0.2%
Obvious Death	185	0.6%	2,920	1.3%
Other Medical	3,625	11.2%	40,253	18.1%
No Injury/Illness	452	1.4%	19,113	8.6%
Total Medical Calls	**32,353**	**98.6%**	**222,862**	**91.4%**





Cardiac Arrest Statistics – Seattle and King County 2023 Overview

Cardiac arrest is a public health challenge with stark health consequences. It occurs when a person's heart stops working suddenly, often without warning. As a consequence, blood stops circulating and the body is deprived of oxygen. The person collapses, loses consciousness, and their breathing becomes agonal (gasping) or stops completely. The sudden nature of cardiac arrest always leads to death unless there is rapid action by a series of rescuers.

The assistance during those immediate first few minutes of a cardiac arrest is the most critical. This quick and coordinated action has been described by the "links in the chain of survival" that include prompt recognition, early CPR (chest compressions to resume or improve blood circulation), and defibrillation (electrical shock to restore the heart's rhythm), and advanced EMS and hospital care. The actions taken by laypersons, law enforcement, telecommunicators and EMS personnel (firefighter/EMTs and paramedics), and hospitals influence the chances of a successful resuscitation. Success is defined when the arrest victim is resuscitated and ultimately discharged alive from the hospital. This measure of success is a key benchmark for a regional EMS system. Seattle and King County use a comprehensive surveillance system to capture and review each cardiac arrest as the foundation to continuously strive to improve patient care and health outcomes.

Cardiac Arrest Data Reporting

Cardiac arrest data reported each year combines both Seattle and the balance of King County, providing a snapshot of outcomes and treatment for two specific groups of cardiac arrest victims:

Overall Group	Utstein Group
Persons suffering arrest who are two years or older who received ALS treatment and had no advanced directives to limit care	Persons in the overall group whose cardiac arrests were witnessed by bystanders are primarily due to a medical condition of the heart with an initial heart rhythm that requires a defibrillator shock.

Although cardiac arrest calls comprise only about 1 percent of the total EMS call volume, performance and outcome are considered good proxies for the performance of an entire EMS system. This is because cardiac arrest resuscitation tests every component of the emergency response. The "Utstein" group provides a closer look at a specific population of cardiac arrest patients for whom each link in the chain of survival has special importance. This particular group was defined nearly three decades ago when the international community recognized a need for standardization for reporting about cardiac arrest to help compare performance across different systems. As a result, the Utstein cardiac arrest survival rate is considered the benchmark for EMS systems. Although special emphasis is placed on the Utstein group, both groups are informative and drive quality improvement initiatives and innovative practices to enhance care.

The following page presents results from the cardiac arrest surveillance system from years 2019-2023 for Seattle and King County. The report presents 2023 results and five-year cumulative results. The five-year cumulative results provide the best general gauge of EMS system performance as there can be year-to-year variability caused by circumstances outside the EMS system control.

Overall number of cardiac arrests for which ALS resuscitation efforts were attempted for patients two (2) years or older with no advance directives to limit care:

Year	2019	2020	2021	2022	2023
Cardiac Arrests	1,308	1,350	1,499	1,598	1,669

1. 2022 Highlight: Overall survival to hospital discharge based on arrest before or after arrival of EMS personnel and initially monitored cardiac arrest rhythm:

Initial Cardiac Arrest Rhythm	Patients Treated	Patients Survived to Hospital Discharge	Percent Survived
Arrest Before Arrival of EMS	**1,448**	**249**	**17%**
Ventricular Fibrillation/Pulseless Ventricular Tachycardia (VF/pVT)	286	132	46%
Asystole	675	11	2%
Pulseless Electrical Activity (PEA)	345	52	15%
Not Shockable, unknown if PEA or asystole	109	25	23%
Pulses on First Check	30	29	97%
Paced	0	0	n/a
Unknown	3	0	0%
Arrest After Arrival of EMS	**221**	**62**	**28%**
Ventricular Fibrillation/ Pulseless Ventricular Tachycardia (VF/pVT)	45	25	56%
Asystole	39	7	18%
Pulseless Electrical Activity (PEA)	118	28	24%
Not Shockable, unknown if PEA or asystole	12	2	17%
Pulse on First Check	3	0	0%
Paced	0	0	n/a
Unknown	4	0	0%
Total	**1,669**	**311**	**19%**

2. Utstein Group: Survival to hospital discharge for non-traumatic arrests, witnessed by bystanders (excludes EMS-witnessed), with an initial rhythm of ventricular fibrillation/pulseless ventricular tachycardia (VF/pVT):

Year	2023	5-year Cumulative Total 2019-2023
Survival Rate	108/211 (51%)	492/1,026 (48%)

3. Overall CPR initiated by bystanders, limited to arrest before arrival of EMS personnel:

Year	2019	2020	2021	2022	2023
Bystander CPR	840/1,112 (76%)	880/1,157 (76%)	966/1,292 (75%)	976/1,378 (71%)	1,095/1,448 (76%)

Center for the Evaluation of EMS: Evaluation and Investigation

The Center for the Evaluation of Emergency Medical Services (CEEMS) undertakes rigorous evaluations aimed at advancing the science of pre-hospital emergency care. CEEMS research and quality improvement efforts involve collaborations between field providers, clinicians, and researchers. Collaborations include personnel from the EMS Division, the University of Washington, and other experts from around the world. This past year involved continuing investigations and important reports on the topics of cardiac arrest resuscitation combining best practices and advanced technologies with the goal of improving patient care and outcomes.

Machine Learning and Predictive analytics: Ongoing investigations utilize machine learning techniques to improve resuscitative efforts in the field. This includes the evaluation of the electrocardiogram (ECG) during cardiac arrest to better understand a patient's underlying physiological state to determine the optimal use of defibrillator technology and interventions during out-of-hospital cardiac arrest. The overarching goal is to use multiple inputs and predictive modeling to measure a patient's clinical status and help guide care specific to the individual patient's needs. This project connects the EMS Division with University of Washington emergency medicine, cardiology, bioengineering, and mathematics experts to achieve a "precision medicine" approach that can match the best treatment options to the individual patient. Publication: Prediction of Shock-Refractory Ventricular Fibrillation During Resuscitation of Out-of-Hospital Cardiac Arrest

Mechanistic evaluation of patient populations in cardiac arrest: Utilizing advanced statistical methods and our large cardiac arrest database, our collaborations were able to distinguish survival differences in populations based on age and sex separate from the underlying biologic mechanism determined by the ECG. Publication: Age, sex, and survival following ventricular fibrillation cardiac arrest: A mechanistic evaluation of the ECG waveform

First responder Airway & Compression rate Trial (FACT): FACT aims to evaluate clinically approved interventions in out-of-hospital cardiac arrest to understand if certain interventions lead to improved survival outcomes. This multi-year county-wide investigation will compare primary EMT airway interventions and EMT compression rates within AHA guidelines. 2023 marked the execution of planning, documentation, and training of all King County Agency EMTs on these interventions with the trial officially starting in Q1 of 2024.

> Additional ongoing collaboration and research topics include participation in the Pediatric Emergency Care Applied Research Network (PECARN), the Cardiac Arrest Registry to Enhance Survival (CARES) research network, brain oximetry during cardiac arrest, PulsePoint technology in cardiac arrest, and additional machine learning and waveform analyses to improve outcomes from cardiac arrest.

The EMS Division collaborates with medical program directors, EMS providers, and University of Washington faculty and other guest researchers to conduct research and analyses. In 2022 and 2023, the EMS Division disseminated research findings to wider national and international audiences through the following publications in peer-reviewed scientific and trade journals. This list includes all work published since the 2022 EMS Annual Report.

2020-2025 Strategic Initiatives

The Medic One/EMS 2020-2025 Strategic Plan includes Strategic Initiatives that leverage previous investments made by the region to improve patient care and outcomes. Areas identified include sustaining focus on vulnerable populations, enhancing quality improvement capabilities, and modernizing the continuing medical education program. Based on the regional needs and issues identified by partners over the course of levy planning, the following strategic initiatives are centered on using a solid regional approach to strengthen standardization, coordination, inter-connectedness, and partnerships.

Since its inception in 2014, the **Vulnerable Populations Strategic Initiative (VPSI)** has partnered with EMS agencies, community leaders, and organizations to reduce disparities in EMS access and foster positive health outcomes by providing EMS education and information to communities. VPSI is partnered with five community organizations, concentrating on communities that have distinct challenges accessing EMS care that include cultural disparities, communication difficulties, disabilities, language access, historical injustices, and racism. These include the Chinese Information and Service Center, St. Vincent de Paul's Centro Rendu, the Somali Health Board, the City of Seattle's Office of Emergency Management, and the University of Washington (UW) School of Public Health.

There are 5 main pillars of VPSI with the following objectives:

1. **Community Education and Outreach**: Conduct 9-1-1-related education and outreach activities in communities that are vulnerable to health disparities;
2. **Fire-Based Pilot Studies**: Conduct pilot studies on alternative EMS care delivery to populations requiring complex care;
3. **UW Partnership**: Support the collaboration between UW School of Public Health and VPSI;
4. **Mental Wellness**: Assess and address mental wellness needs among EMS personnel in King County, and
5. **Equity, Racial and Social Justice (ERSJ):** Build career paths in EMS to promote a diverse workforce and integrate ERSJ values into the EMS workplace.

VPSI will be transitioning to the new name EMS Community Health Outreach (ECHO) to reflect the growth of the program and more closely align to King County's equity, racial and social justice practices.

On-going discussions during 2026-2031 levy planning meetings are being conducted to garner continued support for VPSI/ECHO. Proposals introduced to build on the existing success of the program aim to further empower communities to actively engage with EMS agencies and reduce disparities in access to service. Key highlights of ECHO proposals include expanding our community partnerships, connecting local EMS agencies to these community-led organizations, and building on the success of the strategic initiative while addressing the needs identified by our community partners.

AEIOU QI Strategic Initiative

This Initiative builds upon the past decade's technological advancements of records management and electronic data to improve patient care. The objectives of this Strategic Initiative include:

1. **Accelerating case-based feedback** and outcome by improving the timeliness, quality, and access to data, investments in technology, and integration across platforms across the EMS system;

2. **Evaluating near real-time information** through systemwide regional quality improvement and surveillance. This allows us to monitor conditions of focus (e.g., cardiac arrest, stroke, opioids) and increase support to EMS agencies to conduct operational and clinical run reviews of EMS care and patient outcomes at the regional and local agency level;

3. **Innovation** by conducting pilot projects to strengthen quality improvement capabilities;

4. **Opportunities** to increase the EMS Division's coordination role by convening regional partners to lead quality improvement projects and address the need to meaningfully use the wealth of data available, and

5. **Unprecedented** ability to improve our approaches to quality improvement through training and education.

During the 2026-2031 levy reauthorization process, it was proposed that AEIOU Strategic Initiative move forward as the Pioneering Research for Improved Medical Excellence (PRIME) Strategic Initiative. This project is the next iteration of efforts to upgrade processes pertaining to data retrieval, collection, assessments, enhancements of the Division's overall data management capabilities, and potential integration with other data systems. By upgrading and improving its data infrastructure, the Division can ensure it remains efficient, accurate, and excellent in an increasingly data-centric world.

STRIVE Strategic Initiative

The **Strategic Transition in Regionalized Innovation, Value, & Education Initiative** modernizes the EMS Division's online continuing medical education (CME) platform – EMS Online – to meet the changing educational, data, and technological needs of the eLearning environment. This Initiative will:

1. **Address cross-platform functionality** by implementing a Learning Management System (LMS) and Learning Records System (LRS);

2. **Extend the functionality to all agencies** to access data, share and collaborate regionally as desired, customize training based on needs;

3. **Reduce duplication, increase efficiency**, and

4. **Support the region** in meeting the eLearning expectations of our EMS workforce members.

For the 2026-2031 levy span, the EMS Division has proposed that the ongoing operations and maintenance of these systems be integrated into Regional Support Services.

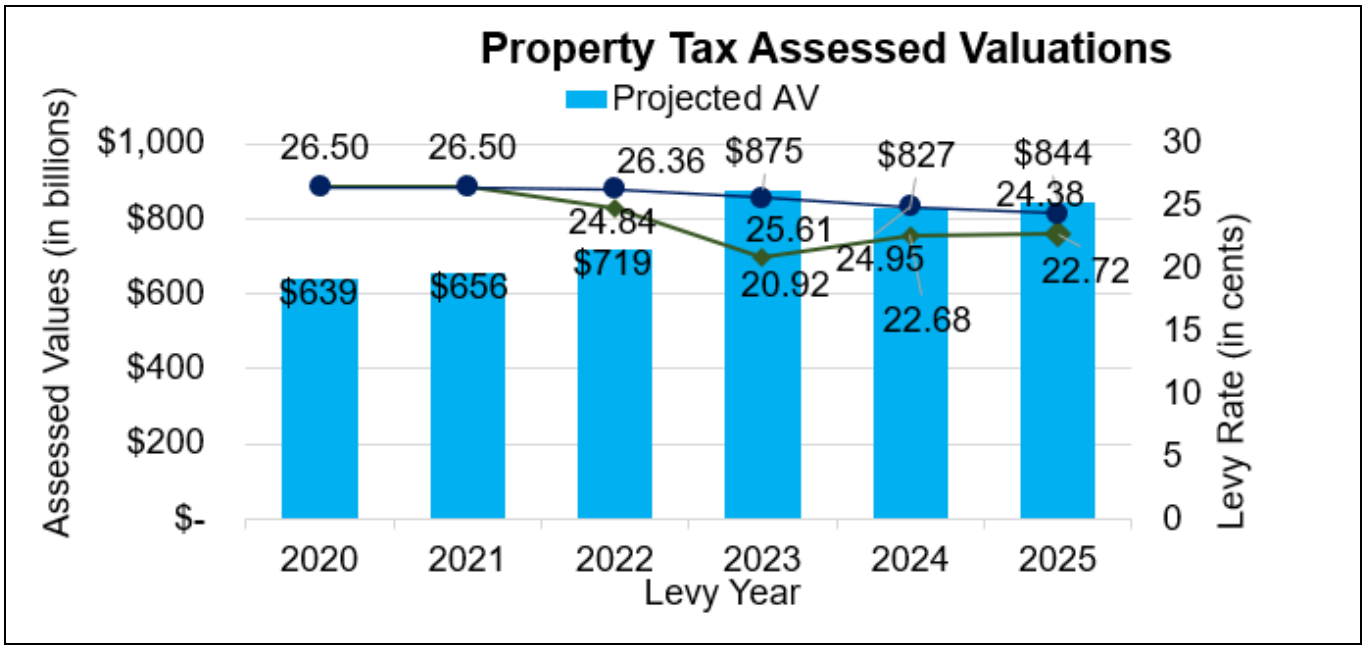
EMS Funding & 2023 Financial Plan Overview

The 2020-2025 EMS levy was planned in 2018, which was the ninth year of a historical economic expansion. The economy quickly changed with the emergence of COVID-19 in 2020, and the region has experienced economic changes through the 2020-2025 levy period. Overall property taxes and interest income have been higher than planned and have offset increased inflation as well as fund the expansion of programs supporting new EMTs and paramedics.

The financial information in this report is based on the March 2024 forecast by the King County Office of Economic and Forecast Analysis. An interlocal agreement between King County and the City of Seattle allows for EMS levy funds collected within the Seattle city limits to go directly to and be managed by the city. Therefore, this section focuses on funds within the King County EMS Fund.

Updated Levy Forecast

Assessed Valuations (AV) in the Region. Per the Revised Code of Washington, the total increase in EMS property taxes collected per year is limited to 1 percent plus new construction. Because of this, when AV increases at a rate higher than 1 percent per year, levy rates decrease to stay within the legal limit. Forecasted increases in AV project that 2020-2025 levy rates will decrease from 26.5 cents/$1,000 AV in 2020 to 22.7 cents/$1,000 AV by 2025.



EMS Fund 1190 Reserves & Contingencies. The 2020-2025 Medic One/EMS Strategic Plan included reserves and contingencies to mitigate financial risk. Reserves consist of a 90-day Rainy Day Reserve, an ALS Reserve, and Supplemental Reserve, all of which provide fiscal stability to the EMS system. Rainy Day Reserves are fully funded and EMS continues to increase the funding level of the Supplemental Reserves (which can be used to buy down the next levy rate). The EMS Advisory Committee recommended using contingency in 2023 to fund two new programs: ALS Support for BLS Activities which supplements existing BLS QI funding (at $570,000) and Support of Initial Paramedic Training at Harborview (at $250,000). Both programs were successfully implemented in 2023 and will continue through this levy period, as well as the next one.

Financial Plan

The following financial plan provides an overview of the EMS Fund 1190, including a summary of revenues, expenditures, fund balance, and reserves and designations based on 2023 actuals and a 2024 estimated forecast. In alignment with King County's strategic goal of financial stewardship, this Plan is regularly reviewed by EMS regional partners to ensure sound financial management.

EMS FUND 1190 FINANCIAL PLAN/		
	2023 Actuals	2024 Estimate
BEGINNING FUND BALANCE (A)	**92,886,145**	**109,779,858**
REVENUES		
Property Taxes	118,227,596	115,006,466
Interest Earnings/Miscellaneous Revenue	4,581,624	4,650,725
TOTAL REVENUES (B)	**122,809,220**	**119,657,191**
EXPENDITURES		
Advanced Life Support Services	64,543,065	67,126,968
Basic Life Support Services	25,754,124	26,954,221
Regional Services	11,513,860	12,287,189
Strategic Initiatives	1,235,260	4,018,111
Mobile Integrated Healthcare	4,844,301	6,655,934
Grants, Entrepreneurial & Donations	378,990	306,000
TOTAL EXPENDITURES (C)	**108,269,600**	**117,348,423**
TOTAL REVENUES LESS TOTAL EXPENDITURES (D)	***14,539,620***	***2,308,768***
Other Fund Transactions (E)	2,354,093	(2,354,093)
ENDING FUND BALANCE (A+D+E=F)	**109,779,858**	**109,734,533**
RESERVES AND DESIGNATIONS		
Designations (including Program Balances)	45,705,049	38,901,184
Reserves	64,074,809	70,833,349
TOTAL RESERVES AND DESIGNATIONS (G)	**109,779,858**	**109,734,533**
ENDING UNDESIGNATED FUND BALANCE	**-**	**-**

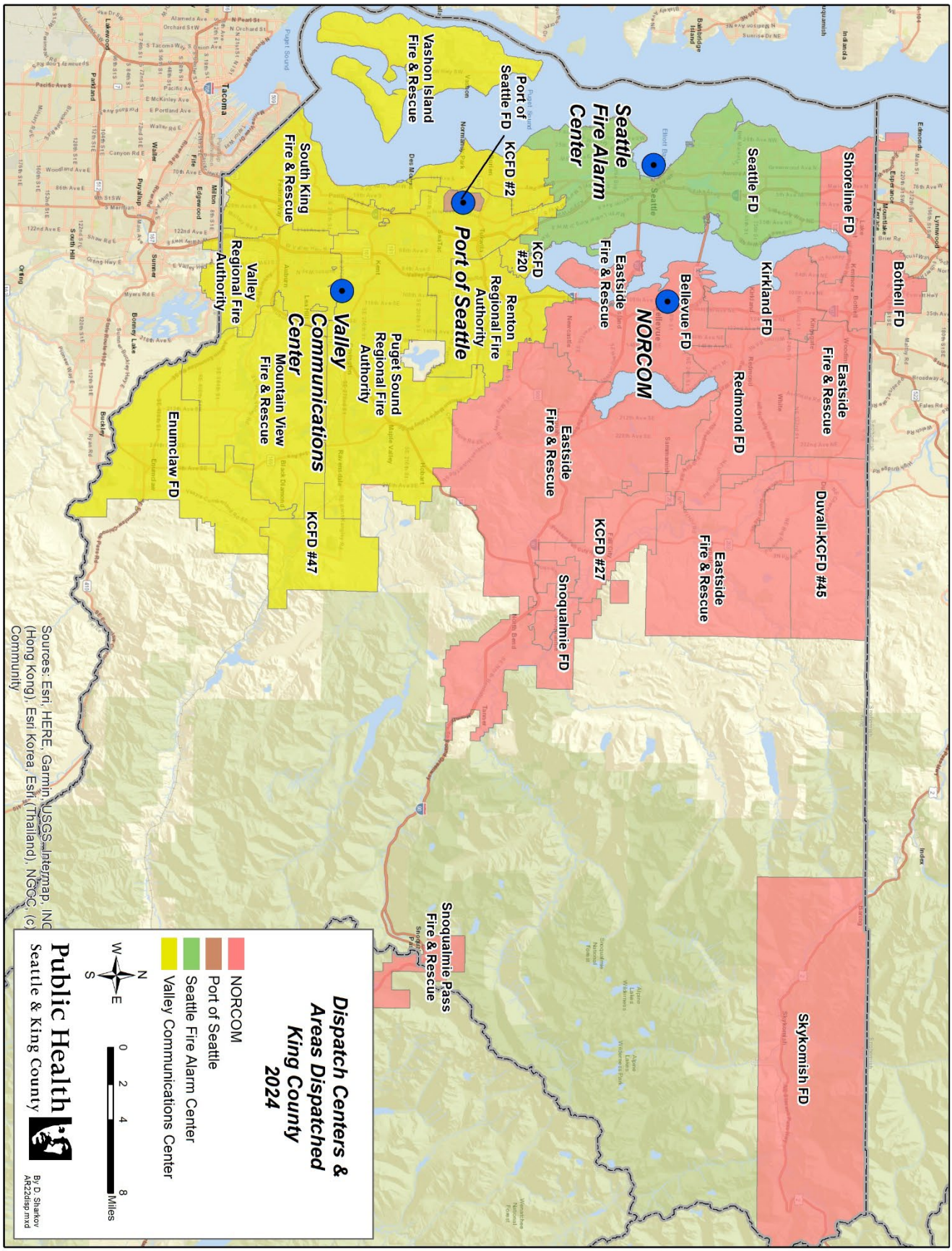
Conclusion

The structure of the EMS levy, which includes elements to address unforeseen financial risks, continues to accommodate changing economic conditions and emerging needs. Increased property taxes and interest income are covering inflationary increases, and planned contingencies and reserves are available to fund unanticipated needs.

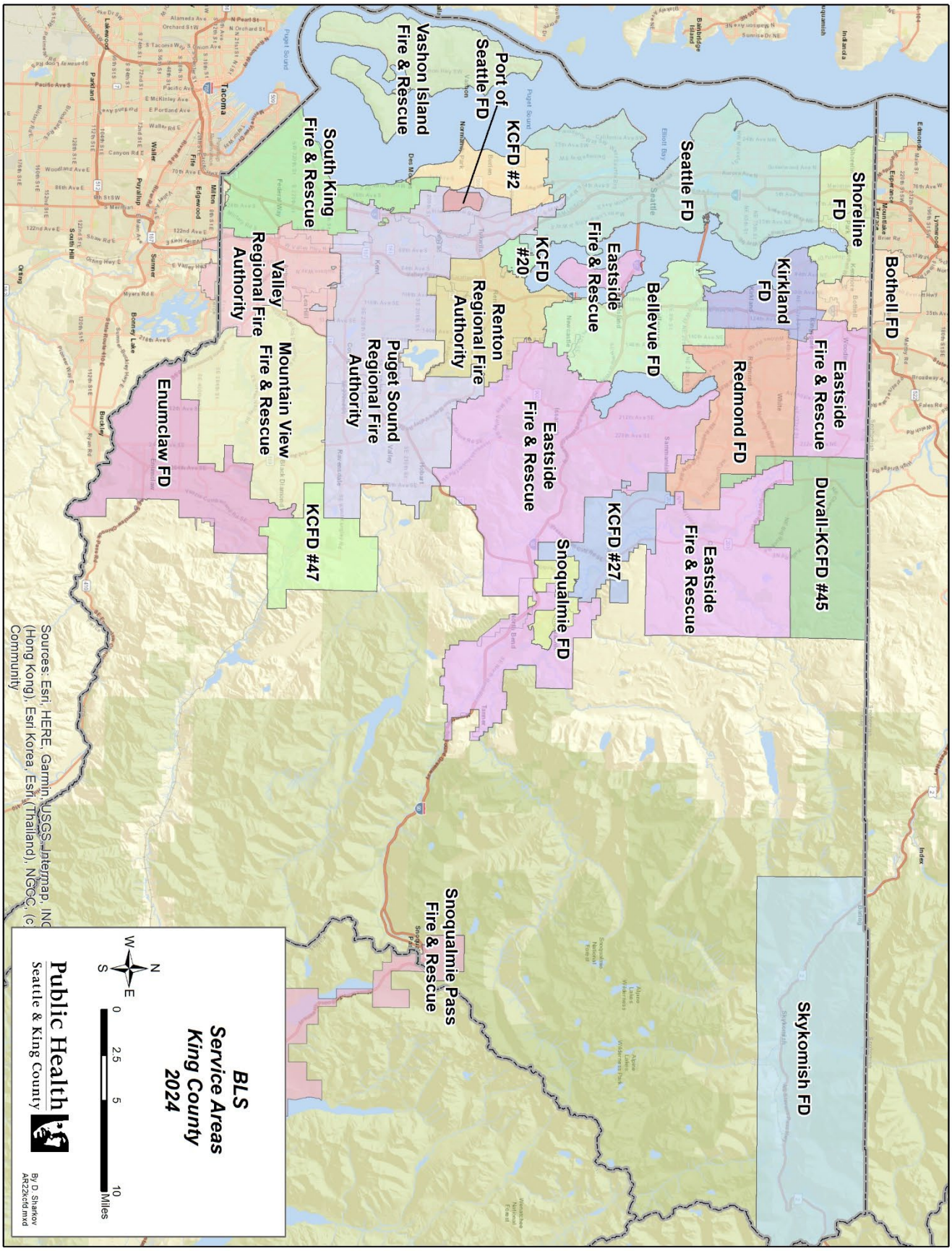
Appendix A: EMS Performance Measures

Resource Category	Performance Measure & Definition	2023 Results
Systemwide	**Rate of cardiac arrest survival (Utstein)** % of patients discharged alive from hospital for all non-traumatic bystander witnessed cardiac arrests with an initial arrest rhythm of VF/VT	51%
Bystander	**Rate of bystander CPR in cases of cardiac arrest** % bystander CPR provided for cardiac arrest cases where the arrest occurred before arrival of EMS personnel. Includes only non-traumatic etiology that received ALS care in patients 2 years of age or older	79%
Dispatch	**Rate of correctly identified cardiac arrest by telecommunicators** % of confirmed cardiac arrest cases that were correctly identified by dispatcher when provided opportunity to assess	96%
	% of bystander CPR resulting from telecommunicator-assisted CPR instructions % bystander CPR provided in cases for cardiac arrest where the arrest occurred before arrival of EMS personnel and CPR was not initiated until after telecommunicator instructions were delivered	63%
	Rate of correctly transferred T-IDC calls % of T-IDC calls that were sent to the Nurseline versus received a BLS response	77%
Basic Life Support (Emergency Medical Technicians)	**% that response time standards are met for emergency BLS calls** Urban response areas: 10 minutes or less, 80 % of all calls Suburban response areas: 20 minutes or less, 80% of all calls Wilderness response areas: As soon as possible	Urban: 4.5 Suburban: 5.8 Rural: 6.5 Wilderness: -
	Rate of EMTs documenting FAST and glucometry for suspected stroke patients* % of EMS-suspected stroke patients with EMT documentation of FAST exam and glucometry results	73%
	Rate that "on scene time" standards are met % of suspected CVA and suspected TIA patients with < 15-minute BLS scene time	36%
	Rate of taxi transported patients % of taxi transports of all BLS transports	<1% 724 vouchers issued
	Compression fraction during resuscitation attempts % of time that compressions are actively applied to the chest, until efforts are ceased, or until sustained ROSC is achieved (whichever event comes earliest)	90%
Advanced Life Support (Paramedics)	**% that response time standards are met** Respond on average 10 minutes or less, 14 minutes or less, 80% of all calls	=<10 min. 75% =<14 min. 94% Median time 7.7 min.
	Rate of paramedics documenting a 12-lead ECG for STEMI patients % of suspected STEMI cases where paramedics documented use of a 12-lead ECG	91%
	Rate that "on scene time" standards are met % of suspected STEMI patients with < 15 minute on scene time	30%
	Rate of paramedics documenting Glasgow Coma Scale for trauma patients % of trauma patients transported to Harborview Medical Center by paramedics where GCS was documented	88%
	Rate of scene time for trauma patients % of trauma patients taken to Harborview Medical Center by paramedics with < 15 minutes ALS scene time	51%
	Rate of successful first attempt intubations % of successful first attempt intubations	86%
Regional	**Rate of cancelled enroute ALS calls** % of cancelled enroute ALS calls to all ALS calls	25%
	% of calls where no upgrade or downgrade was needed % of calls where ALS was not cancelled and not requested from scene	51%
	Rate of ALS requests from scene % of BLS requests for ALS from scene of all ALS calls	24%
	# of mandatory overtime hours for paramedics # of non-voluntary hours that paramedics were required to work to fully staff medic units	9,050 hours

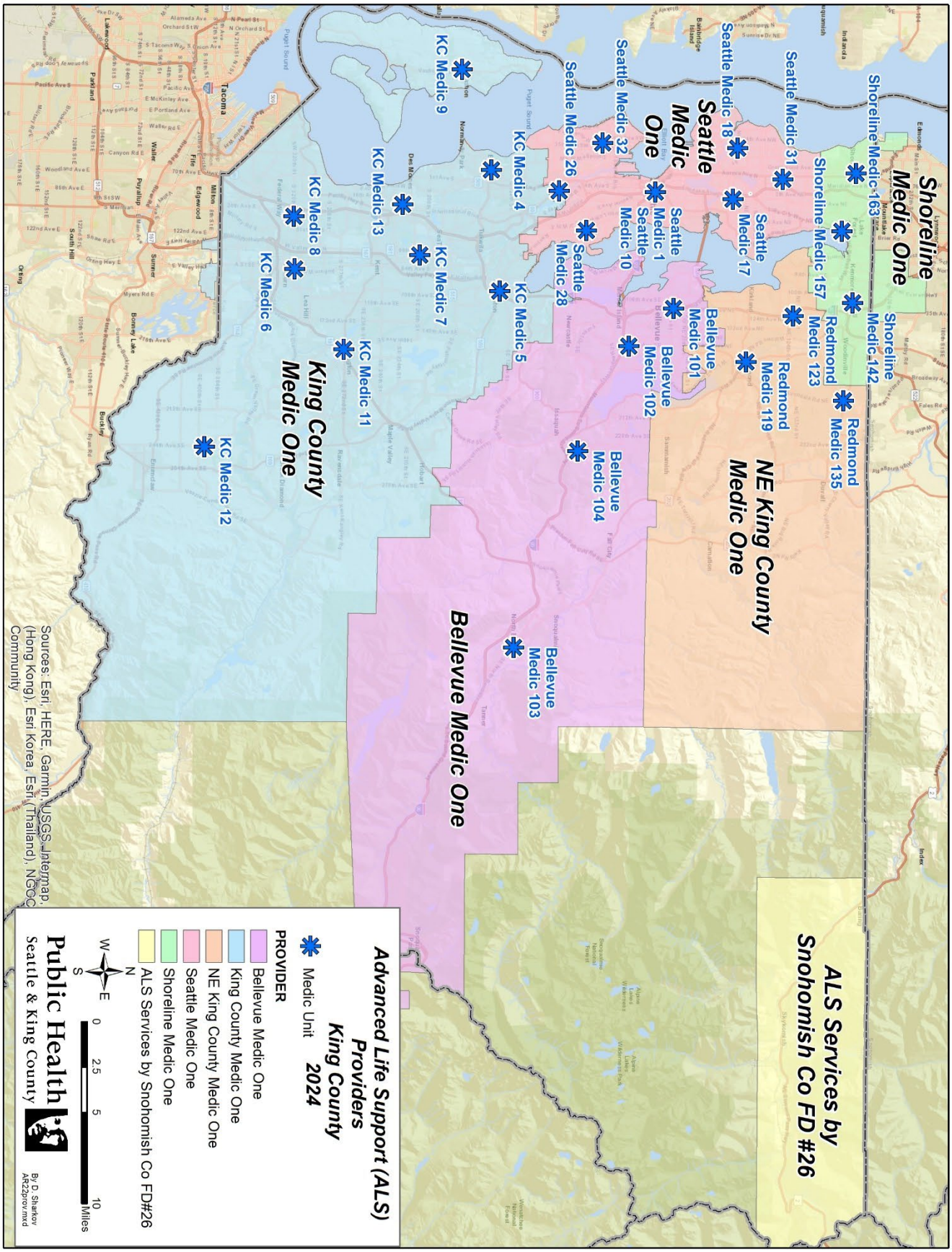
Appendix B: Regional Dispatch Centers



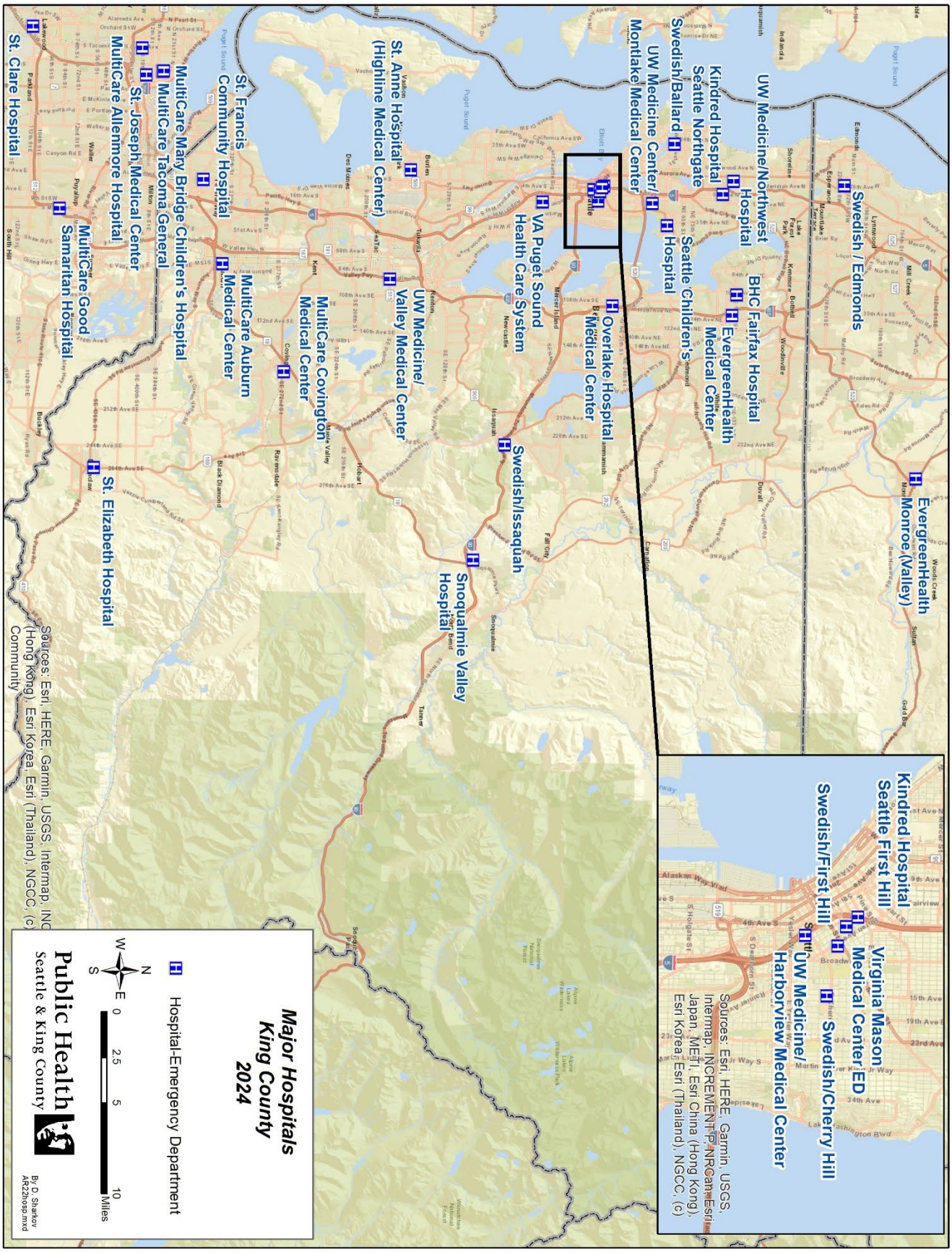
Appendix C: Basic Life Support (BLS) Service Areas



Appendix C: Advanced Life Support (ALS) Service Areas



Appendix E: Major Hospitals



Appendix F: EMS Advisory Committee (EMSAC)

Formed in 1997, the EMS Advisory Committee (EMSAC) monitors the uniformity and consistency of the Medic One/EMS system. It consists of approximately 20 members representing all aspects of the EMS system and provides key counsel to the EMS Division regarding regional Medic One/EMS policies and practices in King County. Members convene on a quarterly basis to review implementation of the Strategic Plan as well as other proposals put forth, including Strategic Initiatives, consolidations and medic unit recommendations.

Name	Representation	Title/Organization
Michele Plorde, Chair	Emergency Medical Services Division	Director
Faisal Khan	Public Health - Seattle & King County	Director
Jay Hagen	ALS Providers - Bellevue	Chief, Bellevue Fire Department
Andrea Coulson	ALS Providers - KC Medic One	Chief, King County Medic One
Adrian Sheppard	ALS Providers - Redmond	Chief, Redmond Fire Department
Harold Scoggins	ALS Providers - Seattle	Chief, Seattle Fire Department
Matt Cowan	ALS Providers - Shoreline	Chief, Shoreline Fire Department
Brad Thompson	BLS in Cities > 50,000 (Auburn)	Chief, Valley Regional Fire Authority
Jason Gay	BLS in Cities > 50,000 (Burien)	Chief, Fire District #2
Dave Van Valkenburg	BLS in Cities > 50,000 (Federal Way)	Chief, South King Fire & Rescue
Brian Carson	BLS in Cities > 50,000 (Kent)	Chief, Puget Sound Regional Fire Authority
Joe Sanford	BLS in Cities > 50,000 (Kirkland)	Chief, Kirkland Fire Department
Steve Heitman	BLS in Cities > 50,000 (Renton)	Chief, Renton Regional Fire Authority
Ben Lane	BLS in Cities > 50,000 (Sammamish)	Chief, Eastside Fire & Rescue
Dr. Tom Rea	King County	Medical Program Director
Dr. Peter Kudenchuk	Chair, Medical Directors' Committee	Medical Program Director, King County Medic One
Dr. Michael Sayre	Seattle	Medical Program Director
Anita Sandall	KC Fire Commissioner's Assn. - Rural	Fire Commissioner, Eastside Fire & Rescue
Vacant	KC Fire Commissioner's Assn. - Urban	
Ryan Simonds	Labor - BLS	Renton Regional Fire Authority
Steve Perry	Labor - ALS	Paramedic, King County Medic One
Vonnie Mayer	Dispatch	Director, Valley Communications Center
Brant Butte	Private Ambulance	American Medical Response
Ed Plumlee	Citizen Representative	
Vacant	Health Care System	

Appendix G: Bibliography

1. Berg KM, Bray JE, Ng KC, Liley HG, Greif R, Carlson JN, Morley PT, Drennan IR, Smyth M, Scholefield BR, Weiner GM, Cheng A, Djärv T, Abelairas-Gómez C, Acworth J, Andersen LW, Atkins DL, Berry DC, Bhanji F, Bierens J, Bittencourt Couto T, Borra V, Böttiger BW, Bradley RN, Breckwoldt J, Cassan P, Chang WT, Charlton NP, Chung SP, Considine J, Costa-Nobre DT, Couper K, Dainty KN, Dassanayake V, Davis PG, Dawson JA, de Almeida MF, De Caen AR, Deakin CD, Dicker B, Douma MJ, Eastwood K, El-Naggar W, Fabres JG, Fawke J, Fijacko N, Finn JC, Flores GE, Foglia EE, Folke F, Gilfoyle E, Goolsby CA, Granfeldt A, Guerguerian AM, Guinsburg R, Hatanaka T, Hirsch KG, Holmberg MJ, Hosono S, Hsieh MJ, Hsu CH, Ikeyama T, Isayama T, Johnson NJ, Kapadia VS, Kawakami MD, Kim HS, Kleinman ME, Kloeck DA, Kudenchuk P, Kule A, Kurosawa H, Lagina AT, Lauridsen KG, Lavonas EJ, Lee HC, Lin Y, Lockey AS, Macneil F, Maconochie IK, Madar RJ, Malta Hansen C, Masterson S, Matsuyama T, McKinlay CJD, Meyran D, Monnelly V, Nadkarni V, Nakwa FL, Nation KJ, Nehme Z, Nemeth M, Neumar RW, Nicholson T, Nikolaou N, Nishiyama C, Norii T, Nuthall GA, Ohshimo S, Olasveengen TM, Ong YKG, Orkin AM, Parr MJ, Patocka C, Perkins GD, Perlman JM, Rabi Y, Raitt J, Ramachandran S, Ramaswamy VV, Raymond TT, Reis AG, Reynolds JC, Ristagno G, Rodriguez-Nunez A, Roehr CC, Rüdiger M, Sakamoto T, Sandroni C, Sawyer TL, Schexnayder SM, Schmölzer GM, Schnaubelt S, Semeraro F, Singletary EM, Skrifvars MB, Smith CM, Soar J, Stassen W, Sugiura T, Tijssen JA, Topjian AA, Trevisanuto D, Vaillancourt C, Wyckoff MH, Wyllie JP, Yang CW, Yeung J, Zelop CM, Zideman DA, Nolan JP, Collaborators. 2023 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science With Treatment Recommendations: Summary From the Basic Life Support; Advanced Life Support; Pediatric Life Support; Neonatal Life Support; Education, Implementation, and Teams; and First Aid Task Forces. **Circulation**. 2023 Dec 12;148(24):e187–e280. PMCID: PMC10713008

2. Blackwood J, Daya MR, Sorenson B, Schaeffer B, Dawson M, Charter M, Nania JM, Charbonneau J, Robertson J, Mancera M, Carbon C, Jorgenson DB, Gao M, Price R, Rosse C, Rea T. Characterization of non-cardiac arrest PulsePoint activations in public and private settings. **BMC Emerg Med**. 2023 Jul 27;23(1):79. PMCID: PMC10375779

3. Branch KRH, Gatewood MO, Kudenchuk PJ, Maynard C, Sayre MR, Carlbom DJ, Edwards RM, Counts CR, Probstfield JL, Brusen R, Johnson N, Gunn ML. Diagnostic yield, safety, and outcomes of Head-to-pelvis sudden death CT imaging in post arrest care: The CT FIRST cohort study. **Resuscitation**. 2023 Jul;188:109785. PMID: 37019352

4. Branch KR, Nguyen ML, Kudenchuk PJ, Johnson NJ. Head-to-pelvis CT imaging after sudden cardiac arrest: Current status and future directions. **Resuscitation**. 2023 Oct;191:109916. PMID: 37506817

5. Chandrasekhar A, Xie L, Mathew MS, Fletcher JG, Craker K, Parayil M, Messiah SE. Academic and Attendance Outcomes after Participation in a School Breakfast Program. **J Sch Health**. 2023 Jun;93(6):508–514. PMID: 36941022

6. Chatterjee NA, Rea TD. Shortening time to defibrillation in shockable cardiac arrest matters: how do we do it? **Heart**. 2023 Aug 24;109(18):1344–1345. PMID: 37169552

7. Coult J, Yang BY, Kwok H, Kutz JN, Boyle PM, Blackwood J, Rea TD, Kudenchuk PJ. Prediction of Shock-Refractory Ventricular Fibrillation During Resuscitation of Out-of-Hospital Cardiac Arrest. **Circulation**. 2023 Jul 25;148(4):327–335. PMID: 37264936

8. Hood JE, Aleshin-Guendel S, Poel A, Liu J, Collins HN, Sadinle M, Avoundjian T, Sayre MR, Rea TD. Overdose and mortality risk following a non-fatal opioid overdose treated by Emergency Medical Services in King County, Washington. **Drug Alcohol Depend**. 2023 Dec 1;253:111009. PMCID: PMC10842336

9. Hood JE, Aleshin-Guendel S, Poel A, Liu J, Collins HN, Sadinle M, Avoundjian T, Sayre MR, Rea TD. Corrigendum to “Overdose and mortality risk following a non-fatal opioid overdose treated by Emergency Medical Services in King County, Washington” [Drug Alcohol Depend. 253 (2023) 111009]. **Drug Alcohol Depend**. 2024 Apr 1;257:111135. PMID: 38453547

10. Idris AH, Aramendi Ecenarro E, Leroux B, Jaureguibeitia X, Yang BY, Shaver S, Chang MP, Rea T, Kudenchuk P, Christenson J, Vaillancourt C, Callaway C, Salcido D, Carson J, Blackwood J, Wang HE. Bag-Valve-Mask Ventilation and Survival From Out-of-Hospital Cardiac Arrest: A Multicenter Study. **Circulation**. 2023 Dec 5;148(23):1847–1856. PMCID: PMC10840971

11. Jaureguibeitia X, Coult J, Sashidhar D, Blackwood J, Kutz JN, Kudenchuk PJ, Rea TD, Kwok H. Instantaneous amplitude: Association of ventricular fibrillation waveform measures at time of shock with outcome in out-of-hospital cardiac arrest. **J Electrocardiol**. 2023;80:11–16. PMID: 37086596

12. Latimer AJ, Counts CR, Van Dyke M, Bulger N, Maynard C, Rea TD, Kudenchuk PJ, Utarnachitt RB, Blackwood J, Poel AJ, Arbabi S, Sayre MR. THE COMPENSATORY RESERVE INDEX FOR PREDICTING HEMORRHAGIC SHOCK IN PREHOSPITAL TRAUMA. **Shock**. 2023 Oct 1;60(4):496–502. PMID: 37548651

13. Lee MO, Wall J, Saynina O, Camargo CA, Wang NE. Characteristics of Pediatric Patient Transfers From General Emergency Departments in California From 2005 to 2018. **Pediatr Emerg Care**. 2023 Jan 1;39(1):20–27. PMID: 36440988

14. Liu JZ, Counts CR, Drucker CJ, Emert JM, Murphy DL, Schwarcz L, Kudenchuk PJ, Sayre MR, Rea TD. Acute SARS-CoV-2 Infection and Incidence and Outcomes of Out-of-Hospital Cardiac Arrest. **JAMA Netw Open**. 2023 Oct 2;6(10):e2336992. PMCID: PMC10559182

15. Liu L, Karatasakis A, Kudenchuk PJ, Kirkpatrick JN, Sayre MR, Carlbom DJ, Johnson NJ, Probstfield JL, Counts C, Branch KRH. Scoping review of echocardiographic parameters associated with diagnosis and prognosis after resuscitated sudden cardiac arrest. **Resuscitation**. 2023 Mar;184:109719. PMID: 36736949

16. Lu DW, Shin J, Wan C, Rea TD, Crowe RP, Meischke HW, Counts CR. Burnout and Workplace Incivility Among Emergency Medical Services Practitioners: A Preliminary Report. **Prehosp Emerg Care**. 2023;27(4):413–417. PMID: 36749661

17. Missel AL, Drucker CJ, Kume K, Shin J, Hergert L, Neumar RW, Kudenchuk PJ, Rea T. Association between bystander physical limitations, delays in chest compression during telecommunicator-assisted cardiopulmonary resuscitation, and outcome after out-of-hospital cardiac arrest. **Resuscitation**. 2023 Jul;188:109816. PMID: 37146672

18. Perman SM, Bartos JA, Del Rios M, Donnino MW, Hirsch KG, Jentzer JC, Kudenchuk PJ, Kurz MC, Maciel CB, Menon V, Panchal AR, Rittenberger JC, Berg KM, American Heart Association Emergency Cardiovascular Care Committee, Council on Cardiovascular Surgery and Anesthesia; Council on Clinical Cardiology; Council on Cardiovascular and Stroke Nursing; Council on Peripheral Vascular Disease; Council on Cardiopulmonary, Critical Care, Perioperative and Resuscitation, and Stroke Council. Temperature Management for Comatose Adult Survivors of Cardiac Arrest: A Science Advisory From the American Heart Association. **Circulation**. 2023 Sep 19;148(12):982–988. PMID: 37584195

19. Rea TD. Resuscitation From Out-of-Hospital Cardiac Arrest: Location, Location, Location. **J Am Coll Cardiol**. 2023 Oct 31;82(18):1789–1791. PMID: 37879783

20. Saidinejad M, Duffy S, Wallin D, Hoffmann JA, Joseph M, Schieferle Uhlenbrock J, Brown K, Waseem M, Snow SK, Andrew M, Kuo AA, Sulton C, Chun T, Lee LK, AMERICAN ACADEMY OF PEDIATRICS, Committee on Pediatric Emergency Medicine, Conners GP, Callahan J, Gross T, Joseph M, Lee L, Mack E, Marin J, Mazor S, Paul R, Timm N, AMERICAN COLLEGE OF EMERGENCY PHYSICIANS, Pediatric Emergency Medicine Committee, Dietrich AM, Alade KH, Amato CS, Atanelov Z, Auerbach M, Barata IA, Benjamin LS, Berg KT, Brown K, Chang C, Chow J, Chumpitazi CE, Claudius IA, Easter J, Foster A, Fox SM, Gausche-Hill M, Gerardi MJ, Goodloe JM, Heniff M, Homme JJL, Ishimine PT, John SD, Joseph MM, Lam SHF, Lawson SL, Lee MO, Li J, Lin SD, Martini DI, Mellick LB, Mendez D, Petrack EM, Rice L, Rose

EA, Ruttan T, Saidinejad M, Santillanes G, Simpson JN, Sivasankar SM, Slubowski D, Sorrentino A, Stoner MJ, Sulton CD, Valente JH, Vora S, Wall JJ, Wallin D, Walls TA, Waseem M, Woolridge DP, EMERGENCY NURSES ASSOCIATION, Pediatric Committee, Brandt C, Kult KM, Milici JJ, Nelson NA, Redlo MA, Curtis Cooper MR, Redlo M, Kult K, Logee K, Bryant DE, Cooper MC, Cline K, POLICY STATEMENT, Organizational Principles to Guide and Define the Child Health Care System and/or Improve the Health of All Children, This article is being jointly published in Pediatrics, Annals of Emergency Medicine, and Journal of Emergency Nursing. The Management of Children and Youth With Pediatric Mental and Behavioral Health Emergencies. **Ann Emerg Med**. 2023 Sep;82(3):e97-e105. PMID: 37596031

21. Snyder BD, Van Dyke MR, Walker RG, Latimer AJ, Grabman BC, Maynard C, Rea TD, Johnson NJ, Sayre MR, Counts CR. Association of small adult ventilation bags with return of spontaneous circulation in out of hospital cardiac arrest. **Resuscitation**. 2023 Dec;193:109991. PMID: 37805062

22. Tunc EM, Utarnachitt RB, Latimer A, Calhoun A, Gamache D, Wall J. Air Medical Transport of a 12-Year-Old Girl With Cerebral Gas Embolism Due to Helium Inhalation. **Air Med J**. 2023;42(5):377-379. PMID: 37716812

23. Wyckoff MH, Greif R, Morley PT, Ng KC, Olasveengen TM, Singletary EM, Soar J, Cheng A, Drennan IR, Liley HG, Scholefield BR, Smyth MA, Welsford M, Zideman DA, Acworth J, Aickin R, Andersen LW, Atkins D, Berry DC, Bhanji F, Bierens J, Borra V, Böttiger BW, Bradley RN, Bray JE, Breckwoldt J, Callaway CW, Carlson JN, Cassan P, Castrén M, Chang WT, Charlton NP, Phil Chung S, Considine J, Costa-Nobre DT, Couper K, Couto TB, Dainty KN, Davis PG, de Almeida MF, de Caen AR, Deakin CD, Djärv T, Donnino MW, Douma MJ, Duff JP, Dunne CL, Eastwood K, El-Naggar W, Fabres JG, Fawke J, Finn J, Foglia EE, Folke F, Gilfoyle E, Goolsby CA, Granfeldt A, Guerguerian AM, Guinsburg R, Hirsch KG, Holmberg MJ, Hosono S, Hsieh MJ, Hsu CH, Ikeyama T, Isayama T, Johnson NJ, Kapadia VS, Kawakami MD, Kim HS, Kleinman M, Kloeck DA, Kudenchuk PJ, Lagina AT, Lauridsen KG, Lavonas EJ, Lee HC, Lin YJ, Lockey AS, Maconochie IK, Madar J, Malta Hansen C, Masterson S, Matsuyama T, McKinlay CJD, Meyran D, Morgan P, Morrison LJ, Nadkarni V, Nakwa FL, Nation KJ, Nehme Z, Nemeth M, Neumar RW, Nicholson T, Nikolaou N, Nishiyama C, Norii T, Nuthall GA, O'Neill BJ, Gene Ong YK, Orkin AM, Paiva EF, Parr MJ, Patocka C, Pellegrino JL, Perkins GD, Perlman JM, Rabi Y, Reis AG, Reynolds JC, Ristagno G, Rodriguez-Nunez A, Roehr CC, Rüdiger M, Sakamoto T, Sandroni C, Sawyer TL, Schexnayder SM, Schmölzer GM, Schnaubelt S, Semeraro F, Skrifvars MB, Smith CM, Sugiura T, Tijssen JA, Trevisanuto D, Van de Voorde P, Wang TL, Weiner GM, Wyllie JP, Yang CW, Yeung J, Nolan JP, Berg KM. 2022 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science With Treatment Recommendations: Summary From the Basic Life Support; Advanced Life Support; Pediatric Life Support; Neonatal Life Support; Education, Implementation, and Teams; and First Aid Task Forces. **Pediatrics**. 2023 Feb 1;151(2):e2022060463. PMID: 36325925

24. Yang BY, Bulger N, Chocron R, Counts CR, Drucker C, Yin L, Parayil M, Johnson NJ, Sotoodehenia N, Kudenchuk PJ, Sayre MR, Rea TD. Analysis of Epinephrine Dose, Targeted Temperature Management, and Neurologic and Survival Outcomes Among Adults With Out-of-Hospital Cardiac Arrest. **JAMA Netw Open**. 2022 Aug 1;5(8):e2226191. PMCID: PMC9372792

25. Yogeswaran V, Drucker C, Kume K, Poel A, Yarid N, Leyde S, Rea TD, Chatterjee NA. Presentation and Outcomes of Adults With Overdose-Related Out-of-Hospital Cardiac Arrest. **JAMA Netw Open**. 2023 Nov 1;6(11):e2341921. PMCID: PMC10630895

26. Younis A, Bodurian C, Arking DE, Bragazzi NL, Tabaja C, Zareba W, McNitt S, Aktas MK, Polonsky B, Lopes CM, Sotoodehnia N, Kudenchuk PJ, Goldenberg I. Genetic variant annotation scores in congenital long QT syndrome. **Ann Noninvasive Electrocardiol.** 2023 Sep;28(5):e13080. PMCID: PMC10475886