



Division of Emergency Medical Services 2021 Annual Report



September 2021



Medic One/Emergency Medical Services (EMS) serves nearly 2.3 million people in Seattle & 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 saved thousands of lives:**

In **2020**,

Emergency Medical Technicians (EMTs) responded to approximately 200,000 calls regionwide.

Paramedics responded to approximately 42,000 calls for advanced life support.

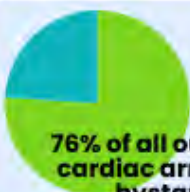
Compared to other communities, cardiac arrest victims are **two to three times more likely to survive** in Seattle & King County from out-of-hospital cardiac arrest.

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

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. Selected 2020 performance measures are highlighted below.

Community



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

76%

Dispatch



Performance measures for dispatch focus on accurate recognition of cardiac arrest.

97% of all cardiac arrests were recognized by 9-1-1 operators

95% of these calls were assigned the correct resource level

97%

Basic Life Support

Median BLS unit response time: 5.2 minutes

Average chest compression fraction: 91%



5.2 min.

Advanced Life Support



Median ALS unit response time: 7.7 minutes



Rate of successful first attempt intubations: 83%

7.7 min.

Overall, this means **234** lives were saved from OHCA in 2020!



39%



System Performance

In 2020, the survival rate for witnessed VF cardiac arrest (widely recognized measure of EMS performance) in Seattle and King County was 39%.

Directors' Message

We are pleased to present the Emergency Medical Services (EMS) Division 2021 Annual Report to the King County Council, per King County Ordinance #12849.

Last year, our Annual Report documented how our regional system banded together to respond to the once-in-a-lifetime public health and community crisis COVID-19 pandemic. The report was like no other we'd ever written, and the demands it placed on our EMS system and partners were like none other we'd ever experienced. Flash forward one year, and sadly COVID-19 is still commanding the headlines, controlling our everyday interactions, and keeping us on our toes about what's going to happen next.

Following breakthroughs in vaccine research, EMS personnel across King County once again stepped up to the plate in 2021, this time to lead vaccination efforts in our community. In collaboration with Public Health – Seattle & King County and dozens of local hospitals, many hundreds of EMS personnel staffed mass vaccination sites and mobile vaccination vehicles day after day for months on end; culminating in King County being one of the most highly vaccinated metropolitan areas in the entire country. We are ever so grateful for their efforts to protect and serve the elderly and vulnerable throughout our region.

By May 2021, we began to see the fruits of our labor when case counts started to decrease, businesses opened up, families reunited, and life's routines began to reappear. We hoped the focus of our 2021 report would be "Moving Forward Post Pandemic", and were excited to close this long chapter and begin a new one focused on rebuilding and recovery.

However, COVID-19 has proven yet again to be one step ahead of us, despite achieving the monumental task of fully vaccinating over 75% of our population. The arrival of the delta variant, and subsequent return of high infection rates, demands we return to the breakneck pace that has become our new normal since February of 2020. As a result, we have instead identified "Staying the Course" as the new theme of our report, and recognized the profound resilience needed to sustain it as a more appropriate characterization of the past year for the EMS Division and its regional partners.

We fully acknowledge the toll it's taking on our entire EMS system to sustain this intense level of performance for 18 months straight. And thus recognize that no words can adequately reflect the gratitude, admiration and deep respect we have for the thousands of individuals that comprise our EMS system. Your ability to remain flexible and adaptive in the moment for whatever comes their way has helped save so many lives - all while risking your own. We are indebted to each and every one of you, always and forever.



Dennis Worsham
Department Director,
Public Health – Seattle & King County



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

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Executive Summary

This year's report highlights the agility of the EMS Division and its partners to adapt to the enormous challenge of COVID-19's ongoing presence.

For 18 months, the COVID-19 pandemic has disrupted almost every aspect of life, with EMS being among the first to experience its impacts. Fortunately, the region is home to a resourceful, determined, and innovative group of EMS stakeholders who provide critical leadership as King County works creatively to serve the public's health. Their dedication to excellence and teamwork resulted in finding new ways to "work around" COVID-19 and serve the region's needs.

For instance, the Falls Program went virtual, which not only increased the number of clients in the program, but also had the added benefit of helping them feel supported and not so alone, particularly with social distancing requirements in place. When the virus threatened essential BLS in-person emergency clinical training, the region replaced it with an instructor-led patient scenario program, ensuring this integral training continued, but in a safe environment. With its participation in vaccination efforts, EMS was able to deliver hundreds of thousands of vaccines through a range of large-scale vaccination programs and more directed outreach to some of our most vulnerable King County citizens. And despite the pandemic's far reach, the region was able to implement the Whole Blood program that is one of the first of its kind in the United States.

While COVID-19 has tested the region's discipline and determination, it is the nature of EMS to efficiently adapt to serve the community's health. The past year has emphasized not just the clinical excellence and programmatic resourcefulness, but specifically the resilience of the EMS system here in King County.

Acknowledgements

We would like to thank those who contributed to the EMS Division 2021 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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System Overview

Any time residents of Seattle and King County call 9-1-1 for a medical emergency, they are using the Medic One/EMS system. This internationally renowned regional system responds to an area of 2,134 square miles and serves a population of over two million. The system is managed by the King County Emergency Medical Services (EMS) Division, 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.**



Medically-Based Model

The medical model is the core of the EMS program in King County. In essence, it asserts that direction and practice must be derived from the highest standards of medical training and medical care.

Accordingly, the EMS Division strives for emergency medical care founded on the highest standards of training, best medical practice, scientific evidence, and close supervision by physicians experienced in EMS.

The leadership of the King County and Seattle Medical Program Directors (MPD), Dr. Thomas Rea and Dr. Michael Sayre, ensures the success and the ongoing medical quality improvement of the EMS system. Activities such as the review of every cardiac arrest event for more than 40 years and patient protocol compliance audits, have supported the best possible care. The result of this ongoing quality improvement is enhanced patient outcomes and an excellent cardiac arrest survival rate that has been among the highest reported in the nation.



Regional Partnerships

Regional partners sustain uniformity and consistency across the entire EMS system. While each provider operates individually, the care provided to the patient operates within a “seamless” system. It is this continuum of consistent, standardized medical care and collaboration between 28 fire agencies, five paramedic agencies, four EMS dispatch centers, over 20 hospitals, the University of Washington, and the residents throughout King County that allows the system to excel in pre-hospital emergency care.



Tiered Out-Of-Hospital Response System

The use of a tiered response system ensures the most appropriate care provider responds to each 9-1-1 call. There are five major components in the tiered regional Medic One/EMS system, as described on the following page.

EMS System Access: A patient or bystander accesses the Medic One/EMS system by calling 9-1-1 for medical assistance. Bystanders' 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) (e.g., BLS, ALS, CMT or Nurseline) Providing pre-arrival instructions for most medical emergencies, dispatcher guide the caller through life-saving steps, including CPR and AED instructions until the Medic One/EMS provider arrives.

Tier One Response – Basic Life Support (BLS)

Services: EMTs respond to 100% of emergency medical calls and usually arrive first on scene. Approximately 4,600 EMTs are employed by 28 fire-based agencies. Arriving at the scene in 5.5 minutes on average, BLS provides advanced first aid, CPR and AED usage to stabilize the patient. EMTs are certified by the State of Washington and are required to complete initial and ongoing continuing education and training to maintain certification. In response to low acuity calls, CMT units may be dispatched to respond.

Tier Two Response – Advanced Life Support (ALS)

Services: Paramedics usually arrive second on scene to provide emergency care for critical or life-threatening injuries and illness. Regional paramedic services are provided by five agencies operating 28 ALS units throughout King County, including fire departments in Bellevue (4), Redmond (3), Shoreline (3), Seattle (8), and King County Medic One (9). A contract with Snohomish County Fire District 26 provides ALS services to the Skykomish and King County Fire District 50 area, from Baring to Stevens Pass. Paramedics are certified by the State of Washington and are required to complete intensive education and ongoing training to maintain certification.

Additional Medical Care - Transport to Hospitals or Clinics: Once a patient is stabilized, EMS personnel determine whether transport to a hospital or clinic for further medical attention is needed. Transport is provided by an ALS or BLS agency, private ambulance, or taxi for lower-acuity situations.

EMS Tiered Response System



Access to EMS System:

Bystander calls 9-1-1



Triage by Dispatcher:

Use of Emergency Medical Dispatch (EMD) Response Assessment Criteria



First Tier of Response:

All EMS service requests receive a first tier response from Basic Life Support (BLS) by firefighter/EMTs, CMTs, and Nurseline



Second Tier of Response:

Advanced Life Support (ALS) by paramedics



Additional Medical Care:

Transport to hospital

2021 EMS Division Highlight

The EMS System: COVID-19 Response Update - Staying the Course

The foundation of core strengths that helped us successfully lead through adversity in 2020 – the clinical expertise, ongoing surveillance, and coordination with regional partners – were further reinforced throughout 2021.

Our Medical Program Directors retained their integral role in guiding the region safely through the pandemic. Infection control standards and best practices enacted in 2020 became the norm, and were modified based on CDC guidelines and the fluctuating nature of the virus. The process for developing common Rules of Engagement for all first responders county-wide endured, as did those key groups of hospital and pre-hospital partners that were crucial for distilling critical clinical and operational information across the region.

Tools monitoring the impacts of COVID-19 on the EMS system became a mainstay. The daily surveillance started in 2020 that was so critical to understanding COVID-19 clinical manifestations was pared back to twice a week but still shared widely. Dashboards that track and monitor the virus' activity, impacts on our community, and provider PPE needs still inform decision-making. The regional standards and best practices derived from these data have been key to maintaining the proactive COVID-19 response throughout King County. In addition, the benefits of these data sharing tools expand far beyond the realm of the King County EMS system. The CDC has used EMS data to support syndromic surveillance; Harborview Medical Center's Regional COVID-19 Coordination Center relied on our resources to help identify locations with the greatest need for assistance; and EMS data informs an ongoing CDC-funded evaluation of the Economic, Social and Overall Health Impacts of COVID-19 in our region.

Focus remained on protecting responders. Symptom monitoring, quarantine and isolation decisions, and operating public safety testing sites were all strategies that supported the health of EMS personnel, thereby ensuring the health and safety of our patients and the public. New in 2021 was the implementation of the Point of Care COVID-19 Test (POCCT), which provides results within minutes, rather than hours. A generous supply of BinaxNOW™ (Abbott) COVID-19 antigen tests were given to EMS agencies to either screen personnel as they were coming on shift, or to confirm the ability to return to work after quarantine from an exposure. POCCT coincided with vaccine rollout, resulting in a helpful resource to limit exposures and outbreaks to fire departments, training activities and EMS workshops.

Additionally, the regional EMS system became a beacon of resourcefulness for our region's pandemic response, partnering with public health and medical providers to assume new responsibilities in 2021 to help the community.

The following story featured in the Public Health Insider (www.publichealthinsider.com) on 5/19/2021 highlights exceptional lengths to which our committed EMS workforce will go to answer the call of duty.

During the Pandemic, Emergency Medical Workers Step into New Roles to Keep Us Safe

By: Ben Stocking

For emergency medical workers, every day is an unusual day. The atypical is typical. They respond to fires, car crashes, street fights, overdoses, and a host of other unexpected events. The one thing they had never done: test for communicable diseases and deliver vaccine during a pandemic.

Most firefighters, said Aaron Tyerman, deputy chief of the Puget Sound Regional Fire Authority, had never delivered vaccines at all. Throughout the pandemic, emergency services workers have stepped up to deliver testing and vaccines to residents across King County.

“This has been very novel and extraordinary,” Tyerman said.

“But when the governor came out and said we needed to vaccinate hundreds of thousands of people, we were one of the few disciplines with a ready army of willing and capable men and women.”

Every year, King County’s Emergency Medical Services (EMS) providers work hard to keep us all safe. In this pandemic year, their role has been more important than ever.

From the beginning, they have been at the forefront of King County’s efforts to control COVID-19. They have administered many, many thousands of COVID-19 tests. And they have played a crucial role in getting more than a million shots into the arms of King County residents.

Here from Ground Zero

Since COVID-19 vaccines became available last winter, nearly 70 percent of King County residents 12 and older have received at least one dose and more than 50 percent are fully vaccinated.

When it comes to vaccine delivery, that places King County in the top tier of counties nationwide.

“Our EMS personnel have been instrumental in delivering vaccines,” said Deborah Schweikert, who manages Public Health – Seattle & King County’s mobile vaccination teams.

“We could not have done this work without them.” EMS has also been instrumental in bringing testing to south King County, the area hardest hit by COVID-19. They are the “swabbers” at the County’s high-volume sites in Auburn, Federal Way and Tukwila.

For King County EMS, the fight against COVID-19 began when first responders were called to the scene of the nation’s first deadly outbreak early last year at the Life Care Centers of Kirkland.



A “Mainstay” in King County Vaccination Efforts

When vaccines first became available, EMS staff were deployed to adult family homes across the county to vaccinate older county residents with disabilities – those most at risk of dying from the virus.

“They were critical to doing the vaccinations in all the long-term care facilities,” said Dr. Mark Del Beccaro, who helped lead the development of Public Health’s COVID-19 testing and vaccination strategies. “They have been the mainstay of that effort, and it has been a complete success story.”

Ninety-five percent of King County residents age 70 and above have received at least one dose and 90 percent are fully vaccinated.

Many healthcare agencies have contributed to that achievement, and the county’s network of fire departments has played a major role.

The high-volume testing and vaccination sites in Auburn have been staffed entirely by EMS personnel, Tyerman said. They did so in addition to their normal 48-hour shifts.

“Some of them were working 70-, 80- or 90-hour weeks to help out,” Tyerman said.

“We’re used to working in strange places and delivering care under challenging circumstances,” he continued. “So this wasn’t a big stretch for us.”

For that, the community thanks them.



“As King County became ground zero in the pandemic, they were the first ones out there on the front lines. It was a scary time, and it’s been exhausting. Our people have been amazing.”

– Helen Chatalas, Assistant Director of King County Emergency Medical Services Division

This story was originally featured in the Public Health Insider on 5/19/2021.

Healthy Washington – Roadmap to Recovery

Governor Inslee's COVID-19 recovery plan [“Healthy Washington — Roadmap to Recovery”](#), went into effect in early January. The plan used a phased approach to safely ease some restrictions so that the state could reopen the economy safely and as quickly as possible. The EMS Division updated its partners daily on the region's progress in meeting the metrics for returning to normalcy. After 15 months of restrictions and closures, Washington state reopened on June 30, 2021 allowing for many businesses and organizations to operate as they did prior to the arrival of COVID-19.

Despite many reasons to be hopeful, the road to recovery has been paved with uncertainties. We saw masks, social distancing and other interventions slow the spread of the virus and save lives. With vaccines available to us, we anticipated approaching herd immunity levels that would result in declining number of cases and deaths. However, we didn't predict the impact the delta variant would have on those that are unvaccinated, nor were we prepared to witness some of our own EMS providers experiencing vaccine breakthrough cases. Still, while it hasn't been 100% smooth sailing, we know that our foundation of COVID-19 protocols, procedures and process is solid and will allow us to continue protecting the health and safety of our patients, first responders, and the public.

Healthy Washington | Roadmap to Recovery



EMS Division Programs Overview

Background

The Medic One/EMS 2020-2025 Strategic Plan is the primary policy and financial document directing the Medic One/EMS system in its work. Defining the responsibilities, functions, and programs of the EMS system, the Plan presents a comprehensive strategy to ensure the system can continue to meet its commitments. It documents the system's current structure and priorities and outlines the services, programs and initiatives supported by the countywide, voter-approved EMS levy.

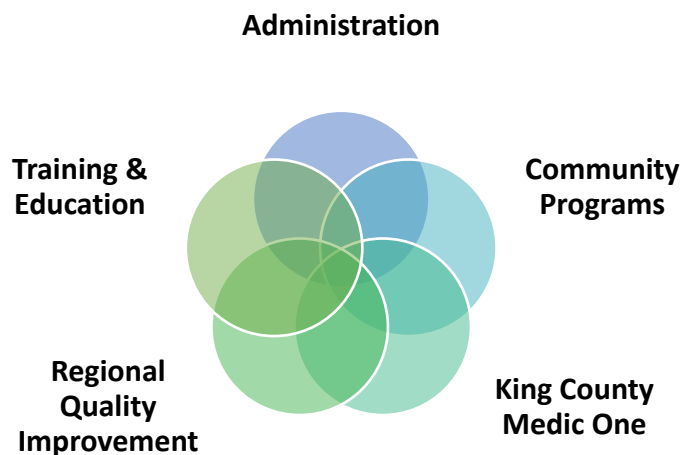
Overview

The King County EMS Division of Public Health - Seattle & King County works with its regional partners to implement the Strategic Plan. The Division manages the core Regional Services and Strategic Initiatives that support the key elements of the system. These programs help tie together the regional medical model by providing consistent regional medical direction, standardized EMT training and continuing medical education, uniform EMS training for emergency dispatchers, centralized data collection and expert analysis, paramedic service planning and evaluation, and financial management of the regional EMS levy fund. Coordinating these on the regional level ensures pre-hospital patient care is delivered at the same standards across the system; policies and practices reflecting the diversity of needs are maintained; and local area service delivery is balanced with centralized interests. All EMS Division programs are designed to enhance the integrated Medic One/EMS services and regional approach, and are developed through strong partnerships with other regional EMS agencies and innovative leadership in the emergency medical field.

COVID-19 interrupted the EMS Division's normal activities, requiring us to modify our programs along with our approach to them. While COVID-19 posed a number of challenges, it also brought opportunities to respond creatively while focusing on the safety and welfare of the community. This section of the report highlights the continued adaptability of many of the Division's programs – the modified approaches to delivering services to the community, the alternatives provided to train and educate our workforce, and the elevated efforts of quality improvement in providing more comprehensive situational awareness for our ongoing COVID-19 response.

For more information about other EMS regional programs, please refer to the EMS webpage:

www.kingcounty.gov/health/ems.aspx



Administration

The Administration Section provides regional leadership and financial oversight to internal and external customers to ensure the integrity and transparency of the entire EMS system. It actively engages with regional partners to implement the Medic One/EMS Strategic Plan, undertakes long-term programmatic and financial planning, manages contracts and operational activities, and is responsible for the continuity of business in collaboration with EMS Stakeholders.

Regional Groups and Meetings

The Medic One/Emergency Medical Services (EMS) system in King County is built on regional, collaborative and cross-jurisdictional partnerships to provide among the best pre-hospital emergency care in the nation. While EMS agencies operate individually and retain much autonomy, they all work within a seamless system to provide a continuum of standardized medical care across jurisdictions. It is our partners' commitment to working collectively that has allowed us to build and sustain a truly amazing system.

Integral to the system's success is the allegiance to cooperative decision-making. The EMS Division actively engages with its many Medic One/EMS Stakeholders to discuss policies and procedures, review economic forecasts and financial plans, oversee major governance issues, and implement the regional Strategic Plan. Whether through informal workgroups or established oversight committees, we aim to ensure partners have ample opportunities to help shape and direct the future of the EMS system.

The EMS Division convenes the following groups:

Group	Description
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.
EMSAC Financial Subcommittee	Budget and finance directors make up the EMS Advisory Committee (EMSAC) Financial Subcommittee, which advises EMSAC on fiscal and budget issues. Among other issues, the subcommittee reviews economic forecasts, proposed financial plans, requests for reserves, and policies/procedures.
ALS Working Group	The ALS Working Group is a forum for the region's five paramedic programs to share best practices and advice. While it initially began as a financial group, its scope has expanded to include discussion on operational needs, medic unit analyses, and clinical updates by the Medical Program Director, along with ongoing review of ALS costs.

Group	Description
BLS Working Group	The BLS Working Group meets regularly to examine and develop policies related to providing BLS services and its seamless integration with ALS. Representing a broad range of regional providers of varying size, constituencies and needs, these partners identify opportunities to enhance the BLS system as a whole, while recognizing its members' separate funding sources and local decision making. Since its inception in 2015, the group has collaboratively developed the BLS Core Services and the Training and Medical Quality Improvement Initiatives, programs that support and engage BLS agencies while improving overall system effectiveness.
Dispatch Working Group (DWG)	The Dispatch Working Group (DWG) meets every other month with its partners to collaborate on ways to improve the crucial first component of the EMS system – the 9-1-1 call centers. Members of the DWG include representatives from each of the call centers supporting EMS in King County, EMS providers (fire departments), paramedic providers, and King County EMS. In addition to improving the system, the DWG looks at current topics, future planning, revising the King County Criteria Based Dispatch (CBD) Guidelines, and reviews calls and incidents that showcase the exceptional job our regional telecommunicators do on a daily basis.
Mobile Integrated Healthcare (MIH) Network	The Mobile Integrated Healthcare (MIH) Network is a learning community for EMS agencies involved and interested in MIH. Convened by the King County EMS Division, MIH Network meetings bring together partners to ask questions, share lessons learned and best practices, and collaborate on all things MIH.
ESO Oversight Committee	The ESO Oversight Committee meets quarterly to discuss topics and issues related to the use of the regionally used electronic health record system (ESO EHR) and health data exchange (ESO HDE). Representatives from BLS agencies, ALS programs, dispatch, hospital partners, and King County EMS Division meet to develop regional standards to inform best practices in the use of these systems to support quality improvement efforts to improve pre-hospital patient care.

The Impact of COVID-19 on Regional Meetings and Collaboration

Regional partnerships, meetings and collaboration carried on throughout 2021 despite the pandemic. Ongoing discussions acutely focused on EMS system operations outside of the COVID-19 response. Accommodations to state in-person trainings were developed, the idea of a mentoring EMT evaluators came to fruition (see page 27), and an in-depth study of future EMT hiring and training took root. Optimal medic unit placement and needs were reviewed, while partners weighed in on Strategic Initiatives' advancements and next steps. New and continuing MIH programs came together to discuss "lessons learned" and best practices while data, benchmarks and reports were shared across the region.

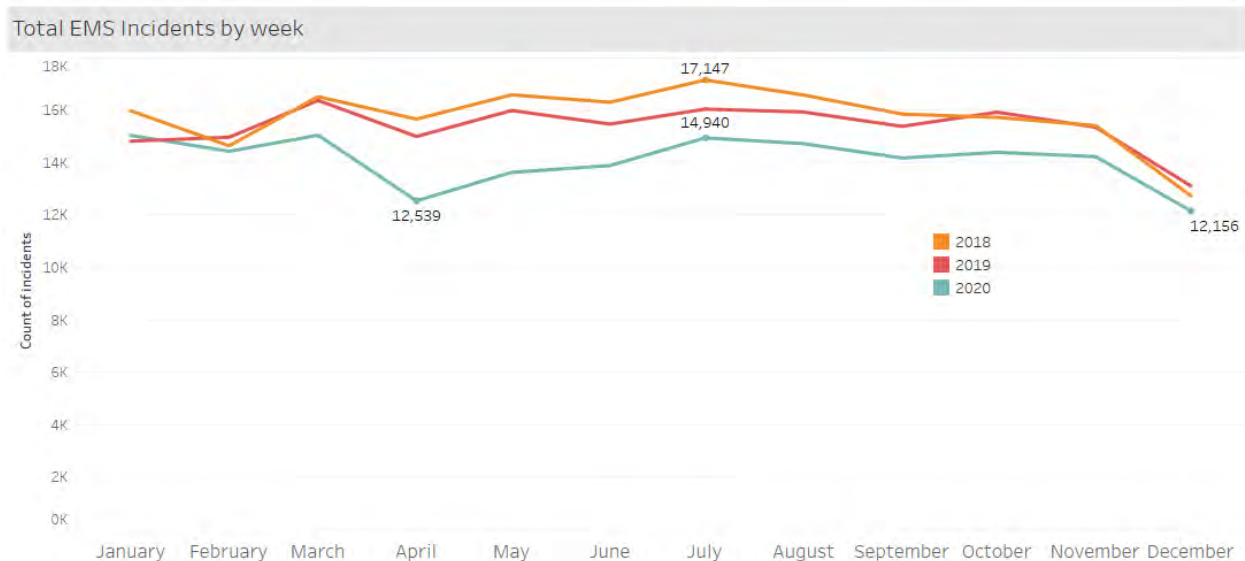
Regional Quality Improvement

The Impact of COVID-19 on EMS Conditions of Focus

Total EMS Incidents

Early on in the pandemic, the EMS Division developed dashboards to help visualize and understand the magnitude of the virus' impact across the region. The EMS Incidents and Operations Dashboard allowed the EMS Division to compare the frequency of calls during the pandemic to calls in 2018 and 2019.

A review of the total EMS incidents by month showed a steep decline in 9-1-1 EMS use in April 2020 (the time that the Governor's Stay at Home orders were issued), followed by a gradual increase in calls from May to December 2020. Even though calls increased, the number of EMS incidents decreased significantly in 2020 and did not surpass 2018 or 2019 call volumes, as the graph below shows.



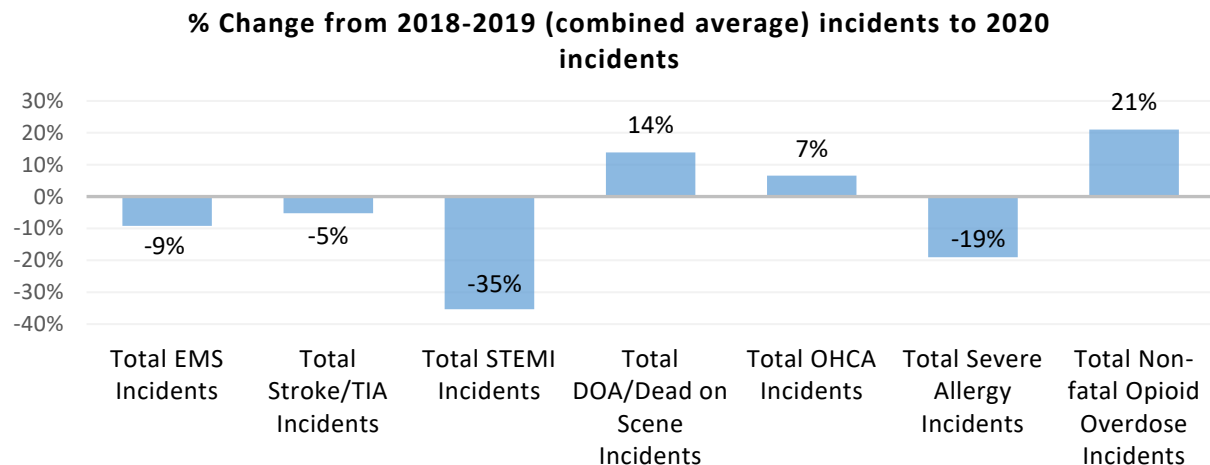
Pandemic Impact on EMS Incidents and Conditions of Focus

Of particular interest was more closely comparing the frequency of time-sensitive, serious emergency health conditions (referred to as **the EMS Conditions of Focus**) during the pandemic to previous years' call volume. A review showed a similar reduction in call volume for basic life support (10%) and advanced life support (7%) for the Conditions of Focus.

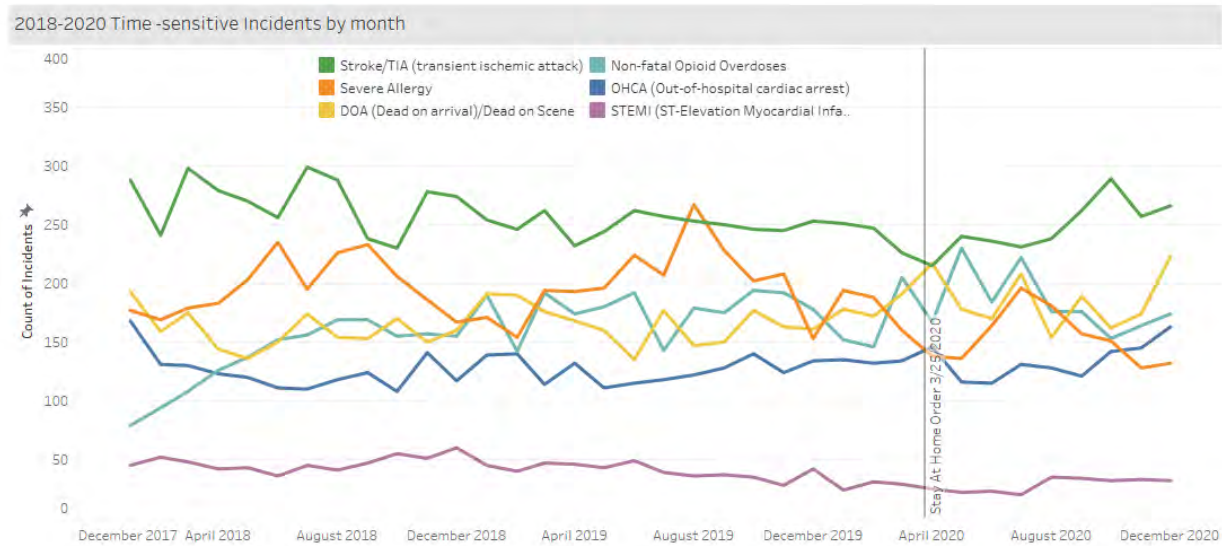
In reviewing clinical condition types, the most marked decrease during the pandemic occurred for patients with ST elevation myocardial infarction "heart attack" (35% decrease) and severe allergy or "anaphylaxis" (19% decrease). Conversely, there was a 14% increase in call volume among persons determined to have irreversible death upon initial EMS evaluation and a 21% increase among patients with suspected opioid overdose.

The causes for these temporal changes during the pandemic are likely attributed to multiple factors. For example, serious allergy is often caused by insect bites or food allergies. Since individuals spent less time outside or dining out, there were less opportunities for people to have severe allergic reactions. For STEMI, one hypothesis is that some patients avoided calling 9-1-1 because of their concern for possible COVID-19 infection at the hospital. The decline in STEMI calls may have resulted in a shift to more

increases in those dead upon initial EMS evaluation as the unattended heart damage of the STEMI progressed to death. The increase in EMS response for suspected opioid overdose is likely a consequence of complex interactions involving social and emotional realities caused in part by the pandemic. These trends are not unique to King County and have been observed across the United States².



Taken together, the findings highlight the profound health effects of the pandemic above and beyond the direct effects of COVID-19 infection, indicating that the pandemic caused multiple behavioral changes that affected health.



To help counter this, the King County Fire Chiefs, Washington Department of Health, and hospital leaders conducted a public information campaign to educate the public about the benefits of early activation of the EMS system for concerning symptoms.

Possible Reasons to Changes in EMS Use

Residents' changes in EMS utilization during the pandemic could be influenced by a variety of reasons including: fear of exposure to COVID-19 virus by utilizing services or by transport to emergency departments, avoidance or delays in care-seeking due to fear of the virus; a true reduction in the incidence of these conditions due to decreased activity during lockdown; increased use of telemedicine during the pandemic; unhealthy coping tendencies to deal with increased stress and social isolation due to the pandemic². While OHCA and stroke/TIA incidents rebounded a few months after the Stay-at-Home order, other conditions like STEMI persisted with lower than normal counts for the rest of the year.

To address the noted declines in some of these life-threatening conditions (i.e. cardiac arrest and strokes), King County hospitals, the Washington State Department of Health and the American Heart Association coordinated public education and awareness campaigns to remind Americans that the hospital remains the safest place to be when experiencing heart or brain emergencies. More research is needed to better understand the drivers behind the increase in non-fatal opioid overdoses and dead-on-arrival/dead-on-scene incidents responded to by EMS.

1. Holshue ML, DeBolt C, Lindquist S, Lofy KH, Wiesman J, Bruce H, Spitters C, Ericson K, Wilkerson S, Tural A, Diaz G, Cohn A, Fox L, Patel A, Gerber SI, Kim L, Tong S, Lu X, Lindstrom S, Pallansch MA, Weldon WC, Biggs HM, Uyeki TM, Pillai SK; Washington State 2019-nCoV Case Investigation Team. First Case of 2019 Novel Coronavirus in the United States. *N Engl J Med*. 2020 Mar 5;382(10):929-936. doi: 10.1056/NEJMoa2001191. Epub 2020 Jan 31. PMID: 32004427; PMCID: PMC7092802.
2. Janke AT, Jain S, Hwang U, Rosenberg M, Biese K, Schneider S, Goyal P, Venkatesh AK. Emergency department visits for emergent conditions among older adults during the COVID-19 pandemic. *J Am Geriatr Soc*. 2021 May 6. doi: 10.1111/jgs.17227. Epub ahead of print. PMID: 33955546.

Regional Quality Improvement

Research Studies and Publications

The EMS Division collaborates with the University of Washington faculty and other guest researchers to conduct research and analyses. In 2020 and 2021, King County EMS disseminated a range of research findings to wider national and international audiences through publications in peer-reviewed scientific and trade journals. For a full list of publications, refer to page 57, Appendix C: EMS Division Publications.

Risk for Acquiring COVID-19 among EMS Personnel Exposed to Aerosol-Generating Procedures (AGP)

The EMS Division evaluated risks of COVID-19 patients transmitting the disease to EMS providers who performed aerosol-generating procedures (AGP). The study reviewed 182 of 1,115 EMS incidents in King County involving AGP that occurred from February 16, 2020 to July 31, 2020. Of the 182 AGP incidents, only a single case attributed to a COVID-19 patient encounter involving an AGP.

In all, EMS providers in King County and Seattle observed a very low risk of COVID-19 infection from Patients. This finding supports maintaining established practices for treating life threatening conditions during the COVID-19 pandemic. Refer to the following link to access the CDC article: [Early Release - Risk for Acquiring COVID-19 Illness among Emergency Medical Service Personnel Exposed to Aerosol-Generating Procedures - Volume 27, Number 9—September 2021 - Emerging Infectious Diseases journal - CDC.](#)

Pre-hospital Tourniquet Use in King County

Tourniquets have been traditionally used in military settings for hemorrhage control, or to stop patients from bleeding. However, in 2018, King County and Seattle implemented using tourniquets by EMS in the pre-hospital setting. King County evaluated the use of tourniquets from January 2018 to June 2019, reviewing who applied the device (EMS, law enforcement, or layperson) and the patient outcome from each incidence when a tourniquet was applied. During this time frame, , a total of 168 patients had a tourniquet applied during a traumatic event such as a gunshot wound or car accident, requiring massive transfusion or surgery in the hospital setting. Among the tourniquets used, 18% were placed by EMS, 33% were placed by laypersons, and 48% were placed by law enforcement. The evaluation found that EMS use of tourniquets were proven to be effective and appropriate as evidenced by a single tourniquet used in 45% (n=61) events, a second tourniquet used in 20% (n=28) and 35% (n=48) of events where the tourniquet was removed without being replaced. Patient outcomes from hospital discharge were positive, with tourniquet limbs fully functional in 81% of all incidents, partially functional in 10%, and non-functional in only 9% of all incidents. This results of this evaluation emphasizes that there is a strong need for urgent hospital intervention through the use of early use of tourniquets in the pre-hospital setting, and that tourniquet use can provide true benefits to public health.

Regional Medical Quality Improvement

Opioid Overdose Surveillance

Opioid use and overdose remain major public health challenges in King County, much like the rest of the United States. This crisis has put repeated focus on Public Health - Seattle & King County's efforts to track and report opioid medical events so that it can better understand the epidemiology, increase outreach and improve care for those at risk.

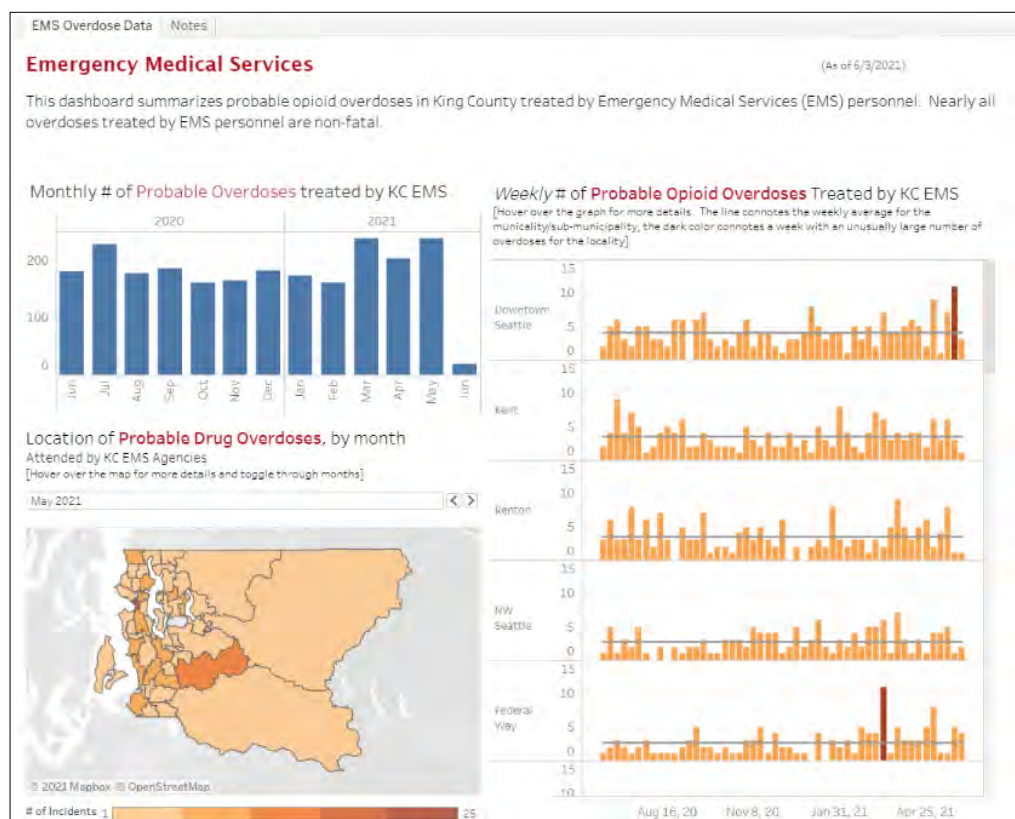
As reported in our 2020 Annual Report, Public Health developed a dashboard to display EMS responses to probable opioid overdose incidents, allowing for improved efforts to better track opioid overdose emergencies and target community efforts of prevention. The dashboard enables timely surveillance, identifies clusters and upticks in overdose, and detects trends over time and across King County. This dashboard has become a useful resource for monitoring, response, and planning. Because this is an outward-facing dashboard, it increases the visibility, transparency and availability of information to the public.

Since it went live in 2019, this opioid surveillance tool has successfully identified overdose clusters, and alerted us to emerging drug threats, such as the presence of fentanyl in non-prescription pills. Armed with this type of information, we are able to circulate public health alerts through EMS providers and help Public Health and its community providers better engage those at highest risk for overdoses.

Our Probable Opioid Overdose Dashboard can be accessed here:

<https://kingcounty.gov/depts/health/overdose-prevention/non-fatal.aspx>.

The dashboard provides timely data on EMS treated overdoses by month, location, and week with visual representation of week(s) with large number of overdoses. We continue to refine the data for this dashboard in order to improve data quality and completeness.



The age-adjusted rate of opioid-related deaths has increased from 6.5 deaths per 100,000 in 1999 to 11.2 deaths per 100,000 residents of King County in 2019 for residents of King County. This increase mirrors adverse trends seen both in Washington State and the United States. Although final 2020 cause-of-death determination is pending, preliminary data suggests that King County experienced an additional 20% increase in opioid overdose deaths between 2019 and 2020. The 2020 mortality increase represents an accelerating rate of deaths from opioids and coincides with both the growing availability of illicit (non-prescription) fentanyl in King County and the COVID-19 pandemic. The pandemic may have contributed directly and indirectly to the rise in fatal overdoses and increased substance use. Direct impacts may include COVID-19 related impairment of the respiratory system. Indirect impacts include more solitary drug use, less accessible harm reduction and treatment services, and financial instability and social isolation. King County EMTs and paramedics are trained and equipped to respond to potentially life-threatening opioid overdoses with life-saving care that includes rescue breathing with bag-valve mask ventilation and drug reversal treatment with naloxone. The key to initial EMS care is to first support the patient's breathing while considering whether naloxone may also help the patient. In 2020, EMS providers in King County administered naloxone in over one thousand incidents, an average of about three times every day in King County.

Preliminary data suggests that King County experienced a 20% increase in opioid overdose deaths between 2019 and 2020, with this same trend continuing into 2021.

The dashboard provides timely information about EMS treated overdoses according to location and date. The method can identify a surge in cases (highlighted by the dark colored bars) so that Public Health and other stakeholders can target additional resources where they are most needed. Patterns of geographic hotspots can help policy and program personnel plan strategic programs to reduce overdose.

Pilot Program to Engage Overdose Survivors

Survivors of overdose are at greater risk for future overdoses. Recent survivors can be more amenable to treatment, so it is important to increase outreach efforts to connect recent overdose survivors to addiction treatment, harm reduction, and social services. EMS encounters are a useful resource to identify those persons who are in need and may be amenable to outreach programs. Thus, the EMS Division Prevention Divisions of Public Health have collaborated to pilot a program designed to engage persons following their emergency care for overdose. In phase 1 of the pilot, those patient calls that meet criteria related to overdose received an attempted follow-up contact via phone from an experienced social worker who works to connect the individual with health resources. The first phase of implementation identified the challenge of contacting eligible persons from this clinical group as follow-up calls from the social worker often went unanswered.

A next phase effort is underway that incorporates lessons learned to leverage a text-message platform to achieve contact and expand the geographic catchment. The text platform enables more flexibility for persons to engage resources while still providing the opportunity to work directly with an experienced social worker. Although the activity is still in its formative stages, there have been some connections that have produced progress for survivors. A comprehensive evaluation of the program is ongoing to understand if and how the program might effectively and efficiently benefit this high-risk group.

Regional Medical Quality Improvement

Whole Blood Administration Program

Blood transfusion for persons suffering hemorrhagic shock can be lifesaving. Hemorrhagic shock occurs when the supply of oxygen is inadequate in meeting the demands of the body, which is caused by a rapid loss of blood. Early transfusion can help stem bleeding and promote clotting at the outset, reducing downstream needs for additional blood transfusion and potentially even preventing severe blood loss and death.

We know that early transfusion can fundamentally alter the trajectory of the patient’s clinical course and improve outcome. However, aside from the military battlefield, transfusion has largely been contained to hospital settings due to equipment and expertise challenges.

Emergency medical services leaders from Seattle and King County have partnered with hematology experts from the University of Washington to develop a program that can deliver lifesaving blood transfusion “in the field” prior to hospital arrival. The program is one of the first of its kind in the US and requires a high level of operational expertise and strong support from the Harborview Blood Bank. The program specifically uses whole blood – rather than the individual blood components such as plasma, platelets, and red cells – because the whole blood is the most effective means to promote clotting and provide circulation support.

The program was developed and piloted by the Seattle Fire Department (SFD) in the Fall of 2019. As of Spring 2021, all five paramedic agencies in King County are equipped with special refrigeration units and blood transfusion equipment so the whole blood can be safely stored and administered to patients with life-threatening bleeding.

The program requires careful monitoring. Tight coordination between paramedic agency and the blood bank ensures whole blood is rotated and that no blood is wasted. The SFD and EMS Division conduct surveillance of the program, tracking each unit of blood administered in the field. The course and care of each patient who receives whole blood in the field is reviewed by county medical directors and the paramedic agency medical director and designated personnel.

Once a threshold of patients receiving blood transfusions in the field is met, the program will undergo a rigorous evaluation assessing impacts in clinical course and outcomes. We are hopeful that the program will show great benefits to patients with life-threatening bleeding, and that our regional experience may become a model for other EMS system when implementing similar programs.



The ability to expand this beneficial program to all of King County in 2021 demonstrates the resiliency of our regional EMS system to implement a new program, even when challenged by a pandemic.

Refer to page 31 for more information on King County Medic One’s planning and implementation of whole blood administration.

Center for the Evaluation of EMS - Grant-Funded Programs

The Center for the Evaluation of Emergency Medical Services (CEEMS) undertakes rigorous evaluations to advance the science of pre-hospital emergency care. It provides a forum for leaders from King County EMS and Seattle Fire Department to review new developments in clinical care, understand regional implications, and consider gaps in our understanding. CEEMS projects span a spectrum of investigations including trauma care, cardiac arrest resuscitation, stroke identification and triage, and drug overdose.

In some instances, projects are supported by external grant funding, providing resources to accelerate specific areas of focus. Its impressive portfolio attracts wide-ranging leadership from across the field of emergency care. Collectively, CEEMS connects innovative ideas to a world-class EMS system to investigate promising approaches, translate scientific understanding into hands-on treatment and improve the delivery of pre-hospital care for King County citizens.

Sodium Nitrite to Improve Cardiac Arrest Resuscitation (SNOCAT)

During cardiac arrest, the brain can suffer irreversible damage due to lack of oxygen. Sodium nitrite is a cytoprotective substance that helps prevent cell damage, specifically damage to brain cells. The SNOCAT study evaluates whether providing sodium nitrite early in the care of cardiac arrest can improve resuscitation and increase survival. The study is conducted in conjunction with University of Washington investigators and supported by the National Institutes of Health. The investigation used a randomized design in which highly-skilled King County paramedics administered either the study drug or a placebo to evaluate the drug's clinical effectiveness.

The study's enrollment concluded in 2020, and its results were published in 2021 in the *Journal of the American Medical Association (JAMA)*. The study's findings indicated that sodium nitrite was safe but did not produce a measurable benefit in clinical outcome. Such results may very well redirect resources and energy toward other promising therapies, rather than continued investment in this sodium nitrite investigation.

Pediatric Emergency Care Applied Research Network (PECARN)

The Seattle Fire Department, King County EMS, and Children's Hospital are collaborating to participate in PECARN, a federally-funded pediatric emergency medicine research network. PECARN conducts high-priority, multi-institutional research on the prevention and management of acute illnesses and injuries in children. Several studies are in the planning and review process that would address strategies of seizure treatment, airway management, and cardiac arrest care. As part of pilot work, CEEMS investigators are evaluating the interface between the caller and emergency dispatch in pediatric cardiac arrest to understand the challenges of cardiac arrest identification and caller coaching for CPR.

Over the past year, CEEMS has partnered with academic organizations, EMS agencies and industry leaders to focus on a range of projects:

- Sodium Nitrite to Improve Cardiac Arrest Resuscitation (SNOCAT)*
- Pediatric Emergency Care Applied Research Network (PECARN)*
- The HeartRescue Program
- Precision Resuscitation to Improve Cardiac Arrest Care
- SCRIPT*
- Brain Oximetry during Cardiac Arrest
- New Strategies to Deliver Lifesaving CPR and Defibrillation: The AED Lifesaver Early Responder Trial (ALERT) Study

*New in 2021

The HeartRescue Program

King County involvement with the HeartRescue Project, a collaborative effort to increase cardiac arrest survival across the United States, spans ten years. Supported by the Medtronic Foundation and partnering with the country's leading emergency and resuscitation experts, the project focuses on systematically expanding successful strategies of resuscitation to regional and statewide levels, using quality improvement activities, monthly forums, publications, and stakeholder collaborations.

Great focus is placed on measuring care and outcomes to identify opportunities for improvement through all the links in the chain of survival. With the development of the Cardiac Arrest Registry to Enhance Survival (CARES), communities can access data and systematically monitor their performance and benchmark progress.

Both King County and greater Washington State have been recognized as consistent national leaders in resuscitation. Our region's programs of bystander CPR training, telephone directed CPR instruction by emergency dispatch, and high-performance CPR techniques featured by our EMS agencies have been highlighted as best practices.

Leveraging Technology to Advance Emergency Care

Precision Resuscitation to Improve Cardiac Arrest Care

Through a collaborative initiative supported by the American Heart Association and Philips Healthcare, CEEMS investigators are using advanced software processing techniques to evaluate the ECG during cardiac arrest to find clues about a patient's underlying physiological state. The overarching goal is to use these "ECG clues" to measure a patient's clinical status and deliver 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. One facet of the program is to use the ECG clues to try to explain survival differences between men and women following cardiac arrest.

SCRIPT

Seattle and King County paramedics are collaborating with the Seattle Fire Department and the University of Washington to evaluate an early warning system for blood loss.

One challenge in the care of injured patients is the early identification of intravascular volume loss before progression to hemorrhagic shock. Current volume resuscitation strategies in the setting of trauma are based on standard vital signs including blood pressure, heart rate and respiratory rate. However, the body has numerous mechanisms in place to compensate for blood loss making standard vital signs unreliable in the early stages of blood loss. As a result, unrecognized volume loss during the compensatory phase of hemorrhage can quickly lead to sudden, unexpected hemodynamic decompensation. The goal of this evaluation is to understand if we are able to recognize blood loss earlier which may lead to earlier interventions and enhanced triage decisions.

Brain Oximetry During Cardiac Arrest

In many cases of out-of-hospital cardiac arrest, the arrest victim succumbs even though the heart has been successfully resuscitated. Most often this is due to global anoxic brain injury (starving the brain of oxygen), which emphasizes just how important cerebral oxygenation (getting oxygen to the brain) is during CPR.



Recent advances in technology are allowing the King County EMS Division to monitor brain oxygen levels during CPR. A study undertaken by Puget Sound Regional Fire Authority and industry partners NONIN and Stryker showed promising results, indicating that the brain oximeter tool may be able to distinguish early-on who will recover brain function, and who may have serious anoxic injury. Phase 2 of this pilot study will enroll a larger group for monitoring to precisely determine the prognostic performance of the oximeter.

Ventilation in Pre-hospital Emergency Care

During cardiac arrest and other critical emergency conditions, EMS often uses a special ventilation bag to provide "rescue breaths" to patients unable to breath adequately on their own. The bag is placed on a special mask or an endotracheal "breathing" tube and squeezed to assist in the delivery of oxygen-rich breaths.

Airway management interventions involve differing levels of complexity and effectiveness that require different technologies and expertise. Novel technology from Philips Healthcare allowed the EMS Division and Bellevue Fire Department to evaluate the dynamics of these rescue breaths to optimize oxygen delivery and ventilation. While additional measurement and evaluation are ongoing, this study highlighted that such technology can be a useful tool to assess how different emergency breathing strategies affect a patient's pulmonary physiology

New Strategies to Deliver Lifesaving CPR and Defibrillation: The AED Lifesaver Early Responder Trial (ALERT) Study

The resuscitation of cardiac arrest relies on early CPR and early defibrillation. Even in communities with a mature emergency response, only about half of cardiac arrest victims receive CPR prior to EMS arrival, and less than 5% receive defibrillation prior to EMS arrival. Survival could be improved substantially if these formidable gaps in resuscitation care were addressed.



The AED Lifesaver Early Responder Trial (ALERT study) equips volunteer off-duty EMS professionals with an AED to respond to nearby cardiac arrests using the PulsePoint phone app, potentially at any time and to any location or setting. This is a new take on an earlier program where responses were limited to just public areas. The ability to respond to all areas - rather than just public locations – is significant, since approximately 80% of cardiac arrests occur in private residences, and has the potential to dramatically decrease time from collapse to chest compressions and/or defibrillation.

This project brings together stakeholders from the EMS Division, University of Washington, PulsePoint Foundation, and Philips Healthcare to work with capable communities across the US. Initial evaluation indicates the approach is safe and does have a measurable though modest impact in its current form. Ongoing efforts will evaluate if and how the strategy can be effectively expanded to other communities.

Mentorship and Collaboration

Each year, affiliate clinicians and researchers, such as medical students, physicians and EMS professionals engage in evaluation and research under the mentorship of CEEMS staff. One ongoing program brings together CEEMS and medical students from the University of Washington. As part of the experience, CEEMS provides a structured "project home" for UW medical students to undertake research and rigorous scientific evaluation methods. The projects undergo ethics review and approval and involve special sessions to learn about the important role of EMS and understand some of the research methods used in such investigation. Ultimately, each medical student is integrated as part of the evaluation team with the goal of completing the project to help inform EMS strategies here in King County and often beyond.

In the past year alone, several peer-reviewed publications have resulted from this collaboration, often advancing scientific understanding of critical illness and providing the means to improve outcomes. Recent projects with publications include:

- Pre-hospital tourniquet application: an evaluation of community application and outcome.
- Physiological evaluation of bystander CPR in cardiac arrest: Biological mechanisms of survival benefit.
- Airway generating procedures in the pre-hospital setting and the risk of COVID-19 exposure for EMS personnel.
- The quality of bystander CPR: opportunities to improve based on high-fidelity review.



Training & Education

The Training & Education Section is responsible for the initial training, continuing education, instructor training, and recertification oversight for the more than 5,000 Emergency Medical Technicians (EMTs) that practice throughout King County. It works collaboratively with its regional EMS stakeholders and the King County Medical Program Director (MPD) to develop and support the curricula to meet state, national and agency requirements. In addition, the Training & Education Section serves as the liaison between King County's 28 fire agencies that provide basic life support services and the Washington Department of Health (WA DOH) in regard to initial certification, training authorizations, certification renewals, and regulatory or policy updates affecting the delivery of EMS.

The Impact of COVID-19 on BLS Training

When COVID-19 threatened to interrupt competency-based training classes, continuing education and instructor training throughout the region, the Training & Education Section quickly pivoted to still provide required trainings while ensuring student safety. The following outlines adjustments made to these programs as a result of COVID-19, and how the Training and Education Section plans to move forward next.

Competency-Based Training (CBT)		
Usual practice until COVID-19	As a result of COVID-19 Current State	Moving Forward "Future State"
January of each year 3 weeks of "train-the-trainer" 1 weekend of "train-the-trainer" for local transport services Dr. Rea presents "State of the County" & "King County Conditions of Focus"	January of 2020 ✓ 3 weeks of "train-the-trainer" ✓ 1 weekend of "train-the-trainer" for local transport services ✓ "State of the County" & "King County Conditions of Focus" presented ✓ WA DOH implemented a new online recertification option for CBT Trainers	2021 All 2021 CBT classes canceled 2021 State of the County/Conditions of Focus delayed WA DOH determining if an online option should be maintained CBT training and State of the County/Conditions of Focus to resume in 2022

14-Week EMT Training sponsored by King County EMS Division		
Usual practice until COVID-19	As a result of COVID-19 Current State	Moving Forward "Future State"
2 times a year – Spring & Fall Varying # of students 6:1 student to instructor ratio 10 hours of emergency department (ED) clinical time	Spring 2020 course cancelled Fall 2020 course held, and included those from cancelled spring class Reduced class size (due to social distancing) Increased instructor use Replaced ED clinical time with instructor-led patient scenarios program Implemented COVID-19 best practices (self-reporting, tracking symptoms, mandatory mask requirement, own set of expendable medical equipment and supplies)	2 times a year – Spring & Fall Spring 2021 completed Fall 2021 course planning is underway Maximum class size at 36 students Maintain COVID-19 precautions until state/county deems otherwise

Regional 5-Week EMT Training sponsored by Host EMS Agencies		
Usual practice until COVID-19	As a result of COVID-19 Current State	Moving Forward "Future State"
2, 5-week EMT courses in Zone 1 and Zone 3 Opportunity for 2, 1-week EMT "bridge" courses Estimated 24 students per class 6:1 student to instructor ratio	2, 5-week EMT courses in Zone 1 and Zone 3 No bridge class opportunities in 2020 Varying number of students; based on current hiring Agencies implemented COVID-19 best practices (self-reporting, tracking symptoms, mandatory mask requirement, own set of expendable medical equipment and supplies)	6, 5-week EMT courses anticipated in 2021 No anticipated bridge classes Ongoing regional discussions re: additional 5-week academies to meet hiring needs Up to 32 students per class Maintain COVID-19 precautions until state/county deems otherwise

EMS Online Modules		
Usual practice until COVID-19	As a result of COVID-19 Current State	Moving Forward “Future State”
Modules released quarterly For 2020: 5 ALS courses 10 BLS courses	Modules released quarterly For 2021 & 2022: 1 ALS course 7 BLS courses Reduced number of modules due to limited subject matter expert (SME) interaction	Modules released quarterly Will follow King County OTEP plan Currently on schedule to meet WA DOH mandatory minimums

Meeting Future EMT Training Needs

Initial EMT Training Initiative update:

The region developed the Initial EMT Training Initiative (now program) to standardize and provide additional training options to all agencies. Through this program, King County EMS coordinates and reimburses "host agencies" that offer condensed five-week or one-week "Bridge" courses using King County's curriculum and materials.

Due to retirements, promotions and expansions, agencies are receiving a historical number of new recruits. This increased demand in training is now exceeding the anticipated level included in the 2020-2025 Strategic Plan. In late 2020, the region approved one-time “bridge” funding to cover additional courses intended to increase the number of student EMTs for 2020 and 2021. It also committed to reviewing future training needs and costs in 2021.

This region is currently engaged in a process that will identify the potential number of new EMT hires and training needs; review the logistics related to meeting the initial training needs; and develop a funding proposal to support increased training options and costs beyond anticipated levels. This will be presented to regional stakeholders and incorporated into future budget requests.

Developing the EMT Evaluator Mentorship Program

King County hires and trains regional providers as EMT evaluators and instructors for the upcoming generations of EMT students. Recognizing the need to diversify and increase the opportunities for EMTs who are interested in becoming educators, the EMS Division initiated the EMT Evaluator Mentorship program in 2021. This program pairs hires with seasoned evaluators – those with greater than 100 hours of experience - and exposes those newer and less experienced instructors to a greater practice of instructional strategies. In its first year, this mentorship opportunity successfully onboarded 80% of the new hire candidates that applied, engaging the adult learner in the EMT classroom and in their home department.

Community Programs Section

The Community Programs Section of the EMS Division makes countless connections throughout the EMS system and broader King County area. It offers a wide variety of public awareness and education program to an equally wide variety of communities, such as school aged children, adults, and EMS partners. This includes programs on Injury Prevention; Cardiopulmonary Resuscitation (CPR) and use of Automatic External Defibrillators (AEDs), recognizing medical emergencies and appropriately calling 9-1-1 for medical assistance, emergency medical dispatch training and quality improvement, and BLS response tier efficiencies that support referring patients to health and social services, transportation options for certain incidents, and other efforts to efficiently handle low-acuity calls.

The Impact of COVID-19 on the Community Programs Section

The coronavirus pandemic presented many and varied challenges for our community health programs, and fundamentally changed or halted work on several Community Programs Section activities. Restrictions on in-person gatherings disrupted our Falls Prevention program, CPR training, and community-based exercise activities. With the epicenter of the regional COVID-19 outbreak centered in long term care facilities, efforts to these facilities shifted from education and outreach to focusing on improving coordination and communication between Public Health, the State Department of Health, and our Fire/EMS partners. Dispatch centers and medical leadership worked seamlessly to frequently adjust and refine the approach for COVID-19 related 9-1-1 calls, allowing for best practices in patient care and EMS personnel safety.

COVID-19 exacerbated the health and social service needs of many individuals across King County, which resulted in most Mobile Integrated Health (MIH) programs seeing a consistent or increased demand on their services. Unfortunately, a number of services to which MIH would typically connect patients were closed or compromised, making it difficult to get patients the services they needed. With many of these community-based services on hold, MIH agencies turned to creative solutions to fill their communities' service gaps. This has included delivering needed supplies to clients' homes, coordinating with other community-based partners to amplify their outreach and services, addressing the heightened mental health needs of residents, and most recently, supporting COVID-19 vaccination.

Like the rest of the EMS system, MIH adapted their operations to keep their personnel safe. For a time, some programs modified who had contact with patients, responding only with EMTs, while case managers delivered services remotely. Other programs used PPE and limited in-person visits to occur outside. As the pandemic evolved and MIH personnel were vaccinated, in-person care resumed across all programs. Several agencies planning to implement new MIH programs this year have delayed their start dates due to the pandemic and its demand on EMS agencies.

Lasting Changes due to the COVID-19 Pandemic

One of the greatest adjustments over the past 18 months was shifting the trainings and meetings with staff, community partners and Stakeholders to an online, virtual environment. While it took some getting used to, this new way of hosting meetings allowed more partners and stakeholders to join the conversations. The option to participate in meeting virtually will remain in place and become standard procedure as the region moves forward with life after COVID-19. The One Step Ahead Fall Prevention Program went virtual with its client engagements and is now considering proceeding with a hybrid model that matches such "screened" initial visits with targeted in-home visits. This mixture of virtual and in-person appointments will allow staff to increase the number of client engagements each day.

Being forced to discover creative ways to accomplish work has resulted in staff uncovering steps to implement their activities more effectively.

MIH Program Overview

Mobile Integrated Healthcare (MIH) programs and systems are designed to connect individuals with a wide array of health and social services. Through MIH programs, EMS personnel 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 the appropriate health and social services. By having mobile, community-based care teams dedicated to connecting callers to the correct resources, EMS is given the tools to provide a meaningful intervention and truly impact the patient's well-being.

Objectives

Building on years of pilot projects testing these strategies, the regional approach to MIH during the 2020-2025 King County EMS levy focuses on the following objectives:

- Connecting community members to the most appropriate health and social services;
- Positioning EMS as an integrated and interconnected link in the broader health and social service systems; and
- Optimizing the availability of emergency services.

King County MIH Network Achievements

King County's MIH network currently consists of seven (7) programs throughout the region, with additional programs scheduled to launch in the coming years. Each program is comprised of an interdisciplinary care team and is tailored to meet its community's unique needs.

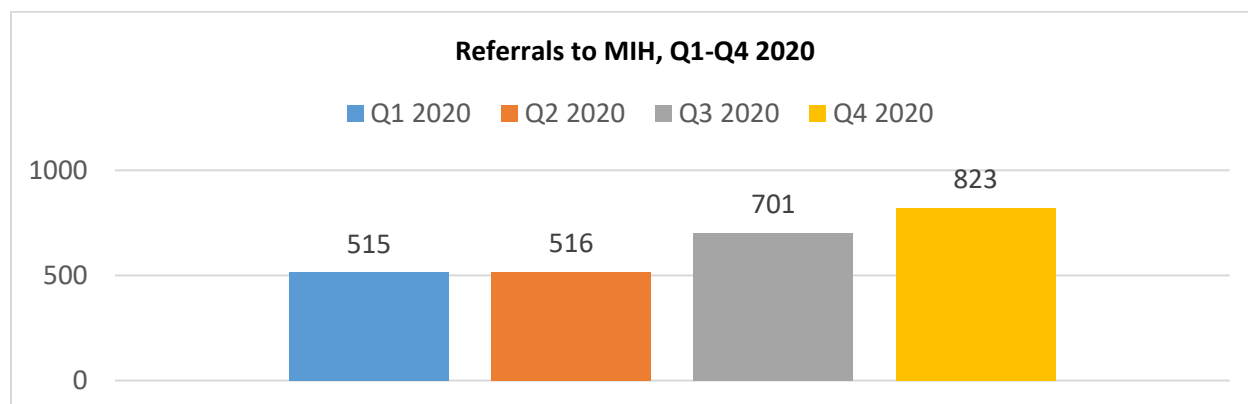
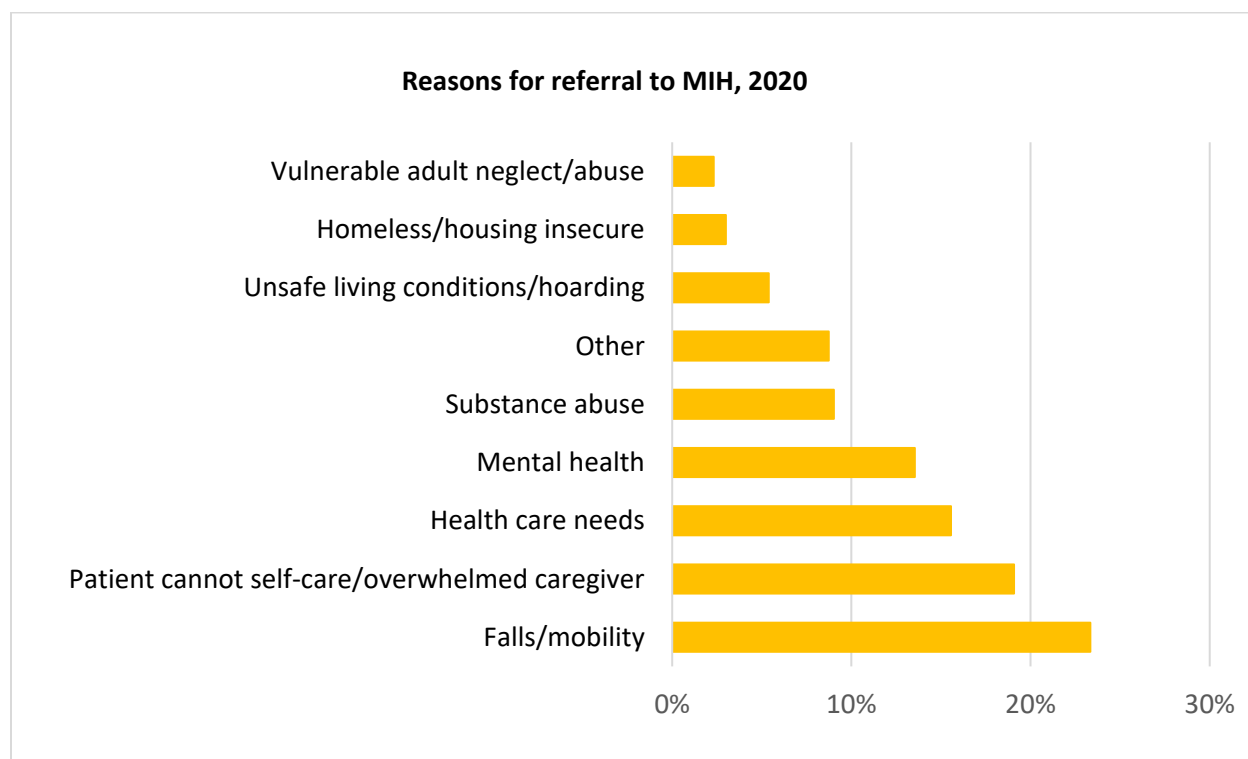
MIH Program	Operated by	Serving
Bellevue Fire CARES	Bellevue Fire	Bellevue and surrounding contract areas
CORE Connect	Eastside Fire & Rescue, partnering with the Issaquah Food and Clothing Bank	Issaquah, Sammamish, Carnation, North Bend, and surrounding areas
FDCARES	Puget Sound and Renton Regional Fire Authorities	Covington, Kent, Maple Valley, SeaTac, Renton, Skyway, and some unincorporated areas
Health One	Seattle Fire	Seattle
North King County MIH	Shoreline Fire	Shoreline, Kenmore, Lake Forest Park, Bothell, and Woodinville
Northeast King County MIH	Redmond Fire	Redmond, Duvall, and Snoqualmie
South King CARES	South King Fire & Rescue and Valley Regional Fire Authority	Federal Way, Des Moines, Algona, Auburn, Pacific, Black Diamond, and Enumclaw

The King County EMS Division regularly convenes MIH Network meetings, involving current and prospective programs. The MIH Network advises on regional guidelines, structure, and approaches to MIH, and serves as a learning community to support cross-program sharing of best practices. For example, the group has aligned behind common goals and target outcomes for regional assessment and began reporting key metrics to the EMS Division in 2020. The group has also standardized the way clients are referred to MIH. The EMS Division also brings together MIH direct service providers in monthly huddles to facilitate collaboration and resource sharing.

Regional Performance Metrics

Across the seven (7) MIH programs currently in operation, King County's MIH programs serve over 1.8 million residents (83%) of King County. Among the five (5) programs who reported key metrics to the EMS Division in 2020 (excluding Seattle's Health One and Eastside's CORE Connect), MIH had a marked impact across the County:

- **MIH on-scene incidents:** 2,642
- **Clients referred to MIH by EMS for follow-up care:** 2,555
- **Most frequent reasons for referral:** Falls/mobility, patient cannot self-care/overwhelmed caregiver, health care needs, and mental health needs
- **Most frequent resource connections (referrals from MIH to community services):** Mental health support, fall prevention, case management, and medical care



King County Medic One

King County Medic One (KCM1) is one of the five Advanced Life Support (ALS) paramedic agencies in the regional EMS system. KCM1 now serves approximately 557 square miles of south King County, including Vashon Island, with a population that is now close to 750,000 people. In calendar year 2020, KCM1 responded to over 15,000 calls for advanced care, including cardiac emergencies, pediatric patients, mass casualty, and motor vehicle crashes.

COVID-19 Response Update

Prior to the arrival of COVID-19 in the region, KCM1 was methodically reinforcing its preparedness and response plans to ensure the organization – and the region - could best provide EMS services during a time of disaster. It accumulated a substantial but practical cache of supplies, including medication and personal protective equipment (PPE), in case it became in short supply. Because of this, the agency was well situated to aid its EMS partners that were scrambling to find enough PPE, and also bridge the needs of its community partners by loaning them supplies. The agency had its vehicles equipped with Ultraviolet disinfectant system, which eased the decontamination process post COVID-19 calls. Uncertain how many KCM1 paramedics would need to be quarantined or be taken ill, the group brought together its partners to develop intricate tiered staffing plans so that there would always be enough paramedics to provide critical service.

In the face of rapidly evolving situation, KCM1 executed at a very high level. The agency successfully continued its mission without interruption or major impact to the organization. Despite seeing the highest number of COVID-19 positive patients in the region, not one paramedic became COVID-19 positive from a work-related exposure.

Since our last annual report, KCM1 paramedics have provided critical staffing at COVID-19 testing sites in Tukwila and Federal Way and administered vaccinations at the mass vaccination site in Auburn and working with Puget Sound, Renton, and Skyway Fire to provide mobile vaccinations in South King County. True to its commitment, KCM1 kept its people safe and its community well-served.

KCM1's Field Blood Transfusion Program

As highlighted on page 20, the region has implemented delivering blood transfusions "in the field" prior to arriving at the hospital. Transfusions for persons suffering hemorrhagic shock helps stems bleeding and promote clotting at the outset and can be live saving. While blood and blood products have long been a cornerstone of trauma resuscitation seen primarily in hospitals and by military, being used in the pre-hospital setting is a relatively novel treatment.

Seattle Fire Department pioneered this project in 2018, and the rest of the County has followed suit – with King County Medic One starting its field program in May 2021, this life-saving technique is now accessible throughout the entire region. KCM1's expects to use blood approximately once per week during the pilot program. If it is as successful as anticipated, they could reach up to 200 transfusions per year. Because specific medic units have extended transport times due to their location, this therapy could go a long way in helping save lives that would otherwise be lost.

There is always a critical need for blood donations in our region to help our communities.

Just like our EMS system depends on the public to initiate CPR for cardiac arrests, this program also relies on the public to donate blood to ensure there is enough supply. If you are interested in helping, please consider reaching out to Bloodworks Northwest to sign up to donate today (<https://www.bloodworksnw.org>). Type O blood is particularly important, and there are special reservation times available for such a patient.

2020-2025 Strategic Initiatives

VPSI, STRIVE, AEIOU QI

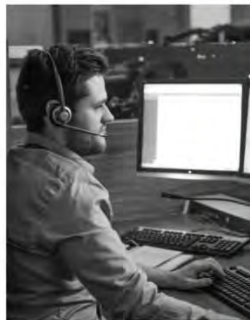
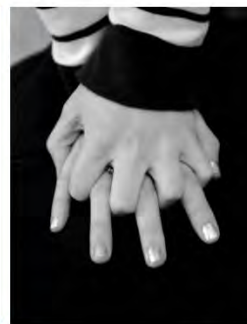
The Medic One/EMS 2020-2025 Strategic Plan continues and implements Strategic Initiatives that leverage previous investments made by the region to improve patient care and outcomes. Areas identified include sustaining focus on vulnerable populations, enhancing quality improvement capabilities, and modernizing the continuing medical education program.

Based on the regional needs and issues identified by stakeholders 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:

2020-2025 STRATEGIC INITIATIVES



AEIOU QI SI
*Accelerating
Evaluation and
Innovation: An
Unprecedented
Opportunity for
Quality
Improvement*



STRIVE SI
*Strategic
Transition in
Regionalized
Innovation,
Value, and
Education*



VPSI
*Vulnerable
Populations
Strategic Initiative*



Accelerating Evaluation and Innovation: An Opportunity for Unprecedented (AEIOU) Quality Improvement (QI) Strategic Initiative (New to the 2020-2025 levy period)

The AEIOU QI SI builds upon the technological work of the last decade among regional EMS partners to bolster the region's quality improvement capabilities. Key regional partners include dispatch centers, fire departments, hospitals, the University of Washington, and the King County EMS Division. This Initiative addresses the real challenge and demand to leverage the regional records management system and electronic data to generate meaningful clinical information intended to improve patient care.

The COVID-19 pandemic quickly launched the EMS Division's Regional Quality Improvement Section's efforts to use information from the regional records management system, web applications and data management tools like RedCap and Tableau to track the virus' activity in our community via COVID-19 dashboards that:

- Inform regional partners of the evolving situation;
- Identify and monitor key performance measures and
- Monitor trends and impacts of COVID-19 on the EMS system.

Additionally, they oversee efforts that:

- Conduct daily COVID-19 surveillance to assess potential exposures to EMS personnel; and
- Support the monitoring of EMS personnel health, safety and COVID-19 testing.

Throughout the COVID-19 response, these efforts have become an ongoing and integral part of our regional monitoring activities and will continue to evolve to meet the needs of our system.

EMS Online Strategic Transition in Regionalized Innovation, Value and Education (STRIVE) Strategic Initiative (New to the 2020-2025 levy period)

The STRIVE SI modernizes the online King County EMS continuing medical education (CME) platform, EMS Online, to meet the changing educational, data, and technological needs of the eLearning environment. This SI will address cross-platform functionality by implementing a Learning Management System (LMS), and extending the LMS functionality to agencies not yet using a LMS platform. The ability to export data would increase, allowing agencies to share and collaborate regionally as desired, and also customize training, based on needs. It would reduce duplication, increase efficiency, and support the region in meeting the eLearning expectations of our EMS workforce members.



Since our last report in November 2020, the EMS Division hired a consultant to conduct an options analysis. To date, the infrastructure technology and document reviews have been completed. Stakeholder engagement will occur over the next few months, with a report out on findings and future state recommendations in late 2021 or early 2022.

Vulnerable Populations Strategic Initiative (VPSI) *(Introduced in the 2014-2019 levy period)*

The **Vulnerable Populations Strategic Initiative (VPSI)** represents a unique collaboration between Public Health – Seattle & King County, the EMS Division, fire departments, community-based organizations, and the University of Washington. VPSI's activities focus on ensuring that EMS provides the best possible care to all King County residents regardless of race, ethnicity, age, socioeconomic status, culture, gender, or language spoken.

The communities of focus for VPSI have been some of the most affected by the primary and secondary impacts of COVID-19. At the same time, they are among the most resilient in supporting pandemic recovery.

Focal Areas & Objectives

VPSI includes five focal areas 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 King County EMS personnel
5. **Equity and Social Justice (ESJ):** Build career paths in EMS to promote a diverse workforce, and integrate ESJ values into the EMS workplace.



Education and Outreach

Community education and outreach efforts focus on reducing barriers for communities that are vulnerable to health disparities, including Limited English Proficient (LEP) individuals and seniors, to promote access to 9-1-1 and EMS systems. Community partners include Seattle Office of Emergency Management, the Somali Health Board, the Chinese Information & Service Center, Saint Vincent De Paul's Centro Rendu, and the University of Washington. The community partners develop and deliver culturally appropriate education in various languages on calling 9-1-1, performing bystander CPR, recognizing stroke, hypertension, and most recently, COVID-19. Throughout the COVID-19 pandemic, the community partners have been a key access point for LEP and other communities to receive accurate and timely information. Outreach and education transitioned from in-person to innovative virtual channels, including webinars and educational videos. At the same time, community partners adapted their activities to meet emergent community needs and support recovery, including by promoting equitable access to vaccination.



Fire-Based Pilot Studies

Over the past year and with the support of UW graduate students, VPSI was involved in a pilot study to test a new linkage between fire departments and Crisis Connections' single portal referral service, OneCall, for clients with mental health needs. The pilot study timeframe was extended due to COVID-19, and is now undergoing an evaluation to inform next steps.

University of Washington Partnership

Through an ongoing partnership between the UW School of Public Health and the EMS Division, VPSI connects students to capstone, thesis, and practicum opportunities. UW faculty and undergraduate students conduct outreach and education, primarily to seniors, about accessing the 9-1-1 and EMS systems. Graduate students support the study design and evaluation of VPSI fire-based pilots. Over the past year, UW shifted from door-to-door and in-person workshops to remote outreach. In response to the decrease in 9-1-1 calls during the COVID-19 pandemic, student interns sent letters and made phone calls to seniors who had contacted EMS previously with blood pressure measurements indicating increased risk of stroke. Students provided education to increase awareness of stroke and heart attack symptoms and encourage high risk adults to continue to call 9-1-1 for life-threatening emergencies. The innovative outreach pilot was successful, with a contact rate exceeding the previous door-to-door outreach program. UW will continue testing the viability of this outreach method with other topics.

Workforce Mental Wellness

The COVID-19 pandemic has affected the mental wellness of many first responders. In response, VPSI has sponsored webinars and trainings for personnel across King County's EMS system to address stress and other emotional impacts of COVID-19, as well as resiliency in pandemic recovery. Mental wellness trainings have focused on leadership, administrators, peer support for Fire Department personnel, dispatchers, retired personnel, and families.

On May 27, 2021, the Mental Wellness Subcommittee of the King County Fire Chiefs Association sponsored a webinar on "Resiliency Under Stress: First Responder Adaptation During & After COVID-19" to support those who have provided sustained response during the prolonged pandemic.

Equity and Social Justice (ESJ)

To promote ESJ throughout EMS, VPSI focuses on building career paths to promote a diverse workforce. Through targeted outreach, recruitment, and training programs, such as the Strategic Training and Recruitment (S.T.A.R) program and Future Women in EMS and Fire (FWIEF), EMS aims to build a workforce that reflects the diverse communities it serves.

S.T.A.R Program

The S.T.A.R Program's goals are to foster an EMS workforce that reflects the demographic makeup of Seattle King County and to provide training opportunities for traditionally underrepresented diverse students. This is carried through in three objectives: 1) to bring awareness of the S.T.A.R program and opportunities to work in EMS to the community, 2) address the high cost of traditional EMT training programs and 3) creating a culture and environment for S.T.A.R students to feel like they belong and become successful. S.T.A.R students complete a 14 week EMT course alongside King County law enforcement and fire agencies. Mentorship, employment workshops, and study groups are made available to ensure successful completion of the class, passing the NREMT exam, and seeking employment in the EMS workforce.



Future Women in EMS and Fire (FWIEF) Workshop

The FWIEF workshop's goal is to provide women an opportunity to explore a career in EMS and Fire in King County through demonstrations, discussion panels, and hands on experience. This biannual, weekend experience is a collaboration amongst the various EMS and Fire departments throughout King County. This application-based workshop consists of 32 participants, over 40 instructors, and has representation from over 16 different agencies. All instructors are current providers in King County and offer great insight, advice, empowerment, and opportunities to answer questions women who are seeking a career in the service may have.

VPSI also focuses on the education of EMS leadership and staff in ESJ values by hosting trainings and workshops. This year, a diversity consultant completed a regional diversity toolkit with best practices to advance the recruitment and hiring of a diverse EMS workforce.



While some of the in-person outreach and training programs were disrupted by COVID-19, there were innovations to pivot this experience to ensure safety and continuation of activities until it was safe to return to in-person. Through its various focal areas, VPSI aims to embody multiple ESJ goals as reflected in the King County ESJ Strategic Plan, including:

- Investing in community-based partnerships where the needs are greatest;
- Creating an equitable and inclusive workplace with ESJ-focused workforce development; and
- Partnering with agencies who provide services to LEP and engage communities in ways that are inclusive and culturally responsive.

Next Steps

Promoting equitable access to EMS services is more important than ever during the COVID-19 pandemic recovery. VPSI will continue to assess and adapt to the changing landscape and community needs, particularly for communities that are vulnerable to health disparities and barriers to health care. Moving forward, VPSI will work with its regional partners to:

- Continue conducting community outreach and education through a variety of channels (in-person and virtual) to diverse communities, adapt to meet community needs and leverage resiliency, and expand to additional topics such as falls prevention.
- Evaluate the OneCall pilot's ability to facilitate effective EMS service for clients who call 9-1-1 with mental health needs.
- Improve access to mental wellness trainings and resources for EMS personnel to address the emotional impacts of COVID-19 and strategies to strengthen resiliency in recovery.
- Explore strategies to implement the regional diversity toolkit and other efforts to promote the recruitment and hiring of a diverse workforce across King County EMS agencies.

EMS Statistics: 2020 Operations & Key Performance Measures

2020 Overview

The EMS system experienced significant impacts with the emergence of the COVID-19 pandemic resulting in declining call volumes and response times. As we move forward post-pandemic in 2021, we are beginning to see a return to normal trends comparable to years prior to the pandemic. The operational metrics and key performance measures presented in our EMS Statistics section reflect data collected from January 1, 2020 to December 31, 2020. We continue to make investments in technology to collect and analyze data from 9-1-1 dispatch centers, EMS agencies, and hospitals due to the regional use of a single records management system and integration across technology platforms.

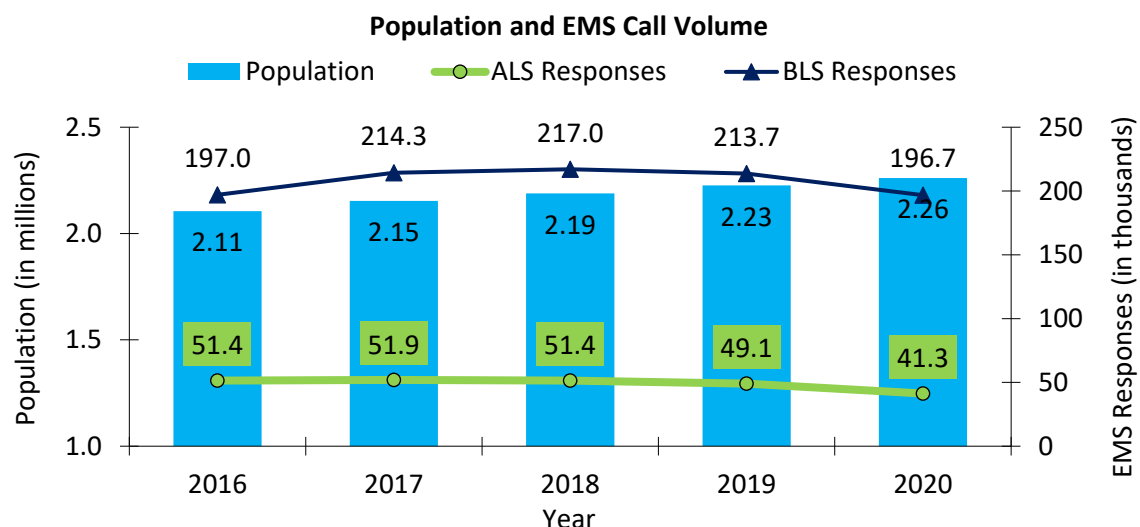
Population

King County is the largest metropolitan county in the State of Washington in terms of population, number of cities (39), and employment. Ranked the 13th most populous county in the United States, King County's population growth remained steady through 2019. Since 2010, King County's population increased by 15.3%, representing an increase of nearly 295,000 people. Spanning across a geographic region of 2,132 square miles and 1,713 square miles of unincorporated King County.

Year	Population	% Growth (Annualized)
1980	1,269,898	
1990	1,507,305	1.87%
2000	1,737,034	1.52%
2010	1,931,249	1.12%
2020	2,226,300	1.70%

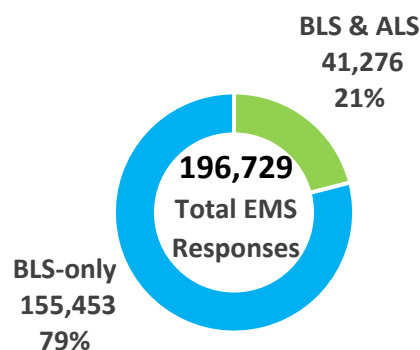
Population serves as an important indicator to predict the trend in the number of emergency medical responses. This means that the demographic profile of King County matters: When King County's population increases, the number of emergency medical responses (call volume) typically increases. As population decreases, EMS responses will typically decrease. Historically, calls for both BLS and ALS typically decrease during times of economic recession. The distribution of calls between ALS and BLS have also changed with revisions to criteria-based guidelines.

The graph below shows the strong correlation of population increases to the number of basic life support calls. ALS calls remained relatively stable across years 2016 to 2019, except for 2020, which decreased dramatically in due to COVID-19.



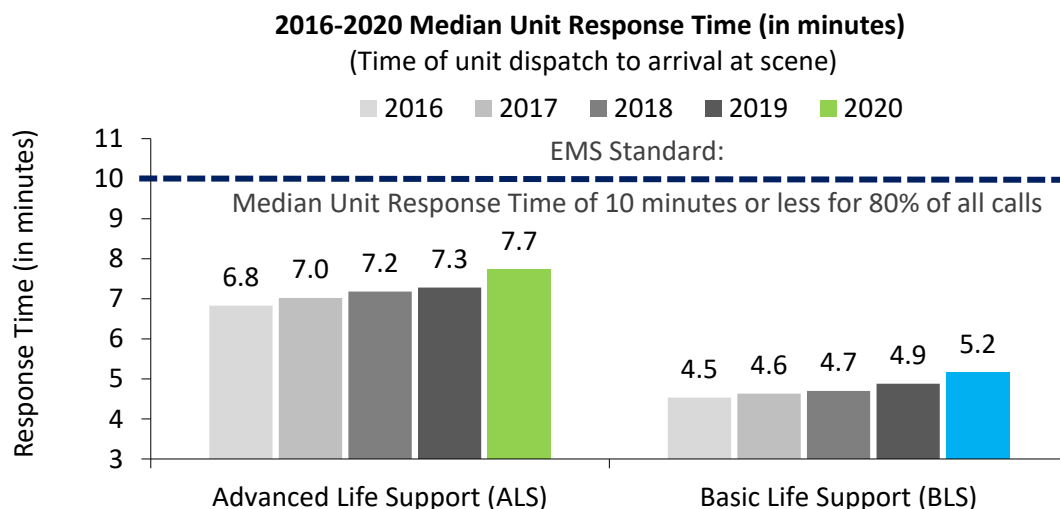
Call Volume

EMS responded to 196,729 calls in 2020 – a substantial 25% decline compared to 2019 calls (262,837). In the tiered EMS response system, BLS responds to 100% of all EMS calls. Of the total EMS responses, BLS-only responses accounted for 79% (155,453) of all total calls BLS and ALS jointly responded to 41,276 calls, representing 21% of all EMS responses. Cancelled enroute calls accounted for approximately 19.7% (7,982) of all ALS calls compared to 3.2% of all BLS calls (6,378).



Response Time

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 9-1-1 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% of all calls within 14 minutes or less.



ALS Median Response Times (RT)

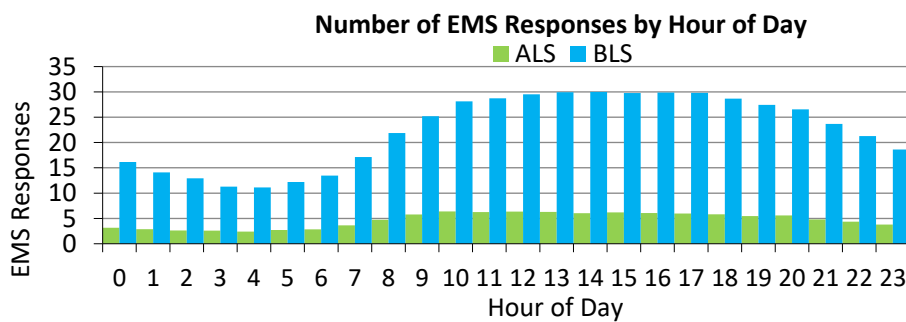
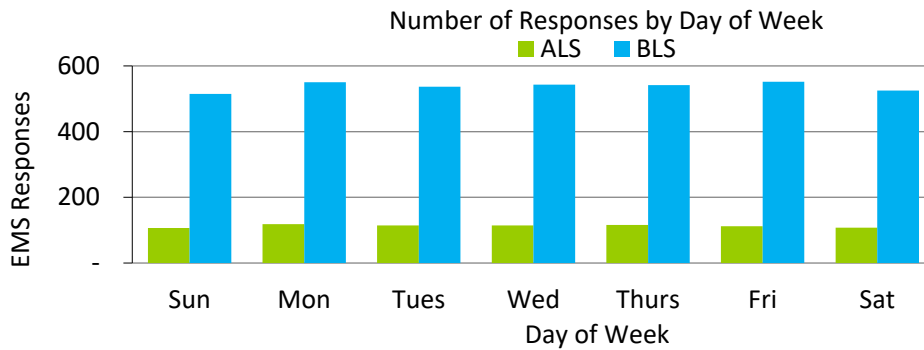
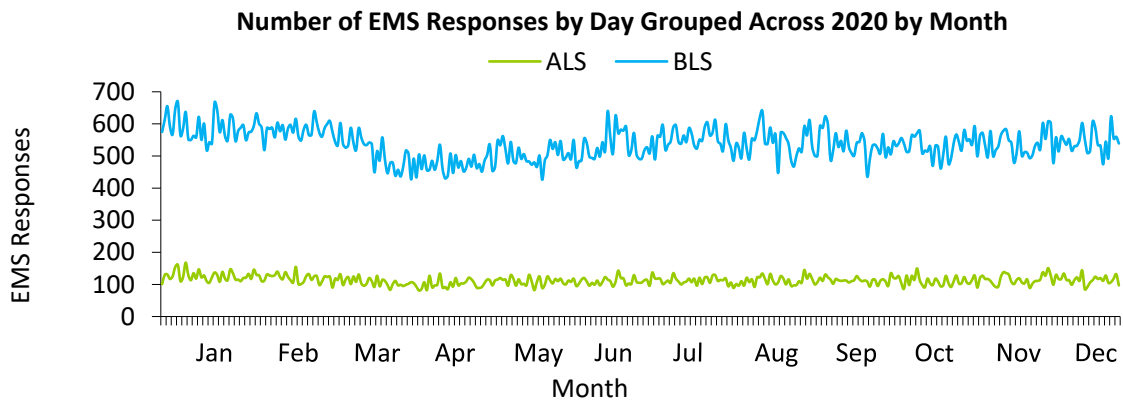
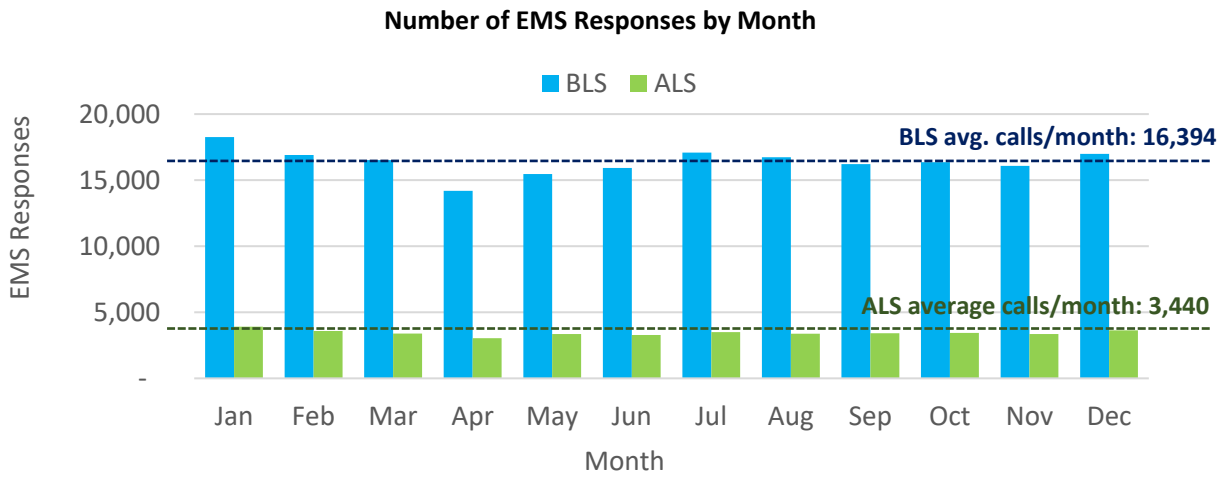
Measure	Dispatch Time	Unit RT	Total RT
Median Time (in minutes)	1.78	7.73	10.97
8 minutes or less	78.4%	53.7%	23.9%
10 minutes or less	82.0%	75.0%	42.3%
12 minutes or less	85.9%	87.2%	56.8%
14 minutes or less	89.2%	93.2%	66.4%

BLS Median Response Times (RT)

Measure	Dispatch Time	Unit RT	Total RT
Median Time (in minutes)	1.07	5.15	6.48
6 minutes or less	96.1%	65.1%	41.3%

Characteristics of Responses

The following graphs reflect the patterns of ALS and BLS responses in 2020:



EMS Call Types

EMS responds to a wide variety of emergency medical calls. In 2020, nearly 50% 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% of all calls which are comprised of nearly 20% involving trauma, with a higher percentage of patients who are 65 years or younger.

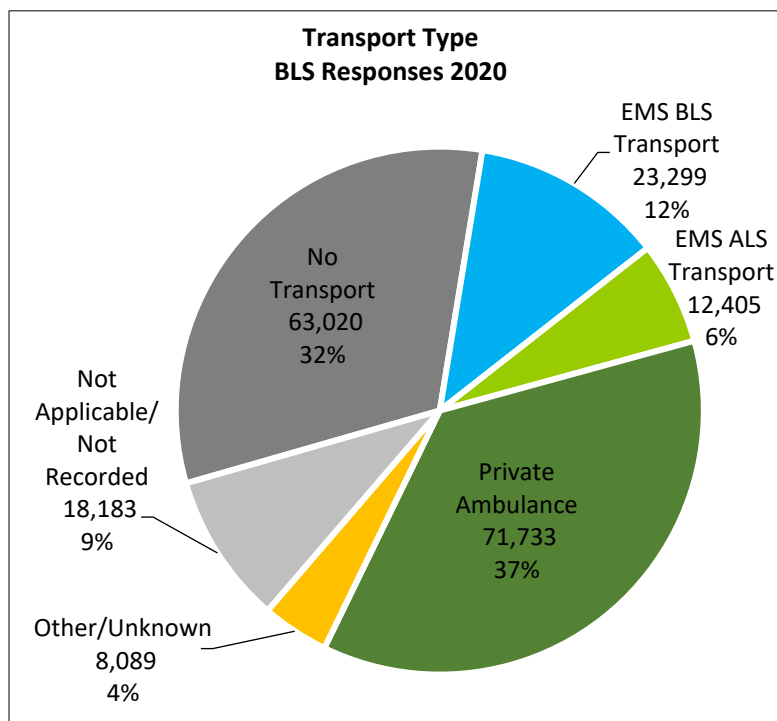
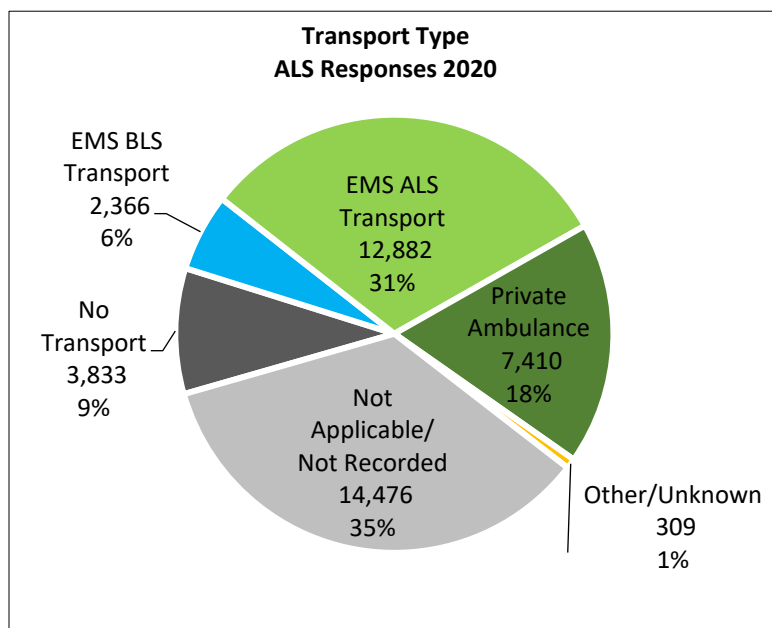
Medical Type	ALS	BLS	Age	ALS	BLS
Cardiovascular	7,635 (28.5%)	13,319 (7.5%)	0-4	666 (2.3%)	3,643 (2.0%)
Respiratory	3,252 (12.1%)	13,618 (7.6%)	5-9	207 (0.7%)	1,407 (0.8%)
Behavioral/ Psychological	2,834 (10.6%)	18,321 (10.3%)	10-17	510 (1.7%)	4,257 (2.4%)
Neurological	2,626 (9.8%)	16,050 (9.0%)	18-24	1,298 (4.4%)	11,320 (6.3%)
Trauma	2,034 (7.6%)	34,581 (19.4%)	25-44	5,294 (18.0%)	42,416 (23.4%)
Alcohol/Drug	1,519 (5.7%)	11,512 (6.5%)	45-64	8,872 (30.1%)	46,464 (25.7%)
Abdominal/ Genito-Urinary	1,117 (4.2%)	13,518 (7.6%)	65-84	9,350 (31.8%)	49,273 (27.2%)
Endocrine/ Metabolic	859 (3.2%)	2,685 (1.5%)	85+	3,241 (11.0%)	22,147 (12.2%)
Allergy/ Anaphylaxis	562 (2.1%)	1,437 (0.8%)	Total	29,438	180,927
Infection	482 (1.8%)	3,897 (2.2%)			
Pain	452 (1.7%)	5,172 (2.9%)			
Obstetric/ Gynecological	215 (0.8%)	838 (0.5%)			
Obvious Death	143 (0.5%)	2,234 (1.3%)			
Environmental/ Environmental Exposure	82 (0.3%)	383 (0.2%)			
Other Medical	2,983 (11.1%)	40,496 (22.7%)			
Total Medical Calls*	26,795 (100%)	178,061 (100%)			

*Total medical calls exclude non-medical calls (i.e., standby, cancelled)

Transport Type

An important component of providing EMS care is appropriate triage. 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 graphs shown to the below lists the transport types for EMS responses across 2020, broken into two categories for ALS and BLS responses:

- EMS ALS ground transport via medic units and ALS air transport (e.g., Airlift Northwest)
- EMS BLS transport by fire departments via aid cars
- Private ambulance partners (e.g., AMR, Tri-Med, Northwest Ambulance, Falck)
- Other methods which may involve private vehicles such as taxis, cabulances or transport by a family member or friend
- No transport may occur if a patient refuses transport, or if it is deemed that transport is not needed
- Not applicable or not recorded includes EMS responses that are cancelled enroute or at scene, and/or if a patient cannot be located, and is not present



Cardiac Arrest Statistics - Seattle & King County 2020 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 uses 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:

1. Overall Group: Persons suffering arrest who are two years or older who received ALS treatment and had no advanced directives to limit care, and
2. Utstein Group: 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% 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 2016-2020 for Seattle and King County. The report presents 2020 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.

Cardiac Arrest Statistics – Seattle & King County

- 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	2016	2017	2018	2019	2020
Cardiac Arrests	1,228	1,215	1,298	1,308	1,350

- 2020 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	Number Treated	Number Survived to Hospital Discharge	Percent Survived
Arrest Before Arrival of EMS:	1,157	176	15%
Ventricular Fibrillation/ Tachycardia (VF/VT)	288	100	35%
Asystole	520	8	2%
PEA	257	49	19%
Not Shockable, unknown if PEA or asystole	75	7	9%
Pulses on First Check	13	10	77%
Unknown	4	2	50%
Arrest After Arrival of EMS:	193	58	30%
Ventricular Fibrillation/Tachycardia (VF/VT)	34	26	76%
Asystole	34	5	15%
PEA	119	25	21%
Not Shockable, unknown if PEA or asystole	3	0	0%
Pulses on First Check	1	0	0%
Unknown	2	2	100%
Total	1,350	234	17%

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

Year	2020	5-year cumulative 2016-2020
Survival Rate	86/220 (39%)	545/1,026 (53%)

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

Year	2016	2017	2018	2019	2020
Bystander CPR	791/1,086 (73%)	763/1,084 (70%)	747/1,114 (67%)	840/1,112 (76%)	880/1,157 (76%)

Summary of Key Points for 2020

The EMS system successfully **resuscitated 17% of all EMS-treated cardiac arrest victims** in Seattle and King County, a success rate two to three times higher than most communities.

This 17% represents **234 lives saved by the EMS system**, most of whom return home to resume their lives with loved ones, friends, and colleagues.

Survival to hospital discharge was 39% for arrests among the Utstein group. Although lower than previous years, this rate represents an achievement rivaled by only a handful of exceptionally proficient EMS systems from around the world.

The **bystander CPR rate of 76% remained the same as 2019, the highest reported for the EMS system.** Bystander initiation of CPR is often due to the immense efforts of telecommunicators providing CPR instructions in challenging and highly stressful situations.

Cardiac Arrest Highlight: The Toll of the Pandemic on Out of Hospital Cardiac Arrest (OHCA)

Pandemics impact large geographical areas and groups of people, and can cause widespread disease, injury, and death. While it can impact anyone regardless of age, race, ethnicity, health status, or any other characterization of our community, the burden of the pandemic is often greatest among vulnerable populations.

Characteristics of sudden cardiac arrest (SCA) often parallel those of a pandemic. Responsible for hundreds of thousands of deaths in the US each year, it takes a large-scale toll on our public health. Like a pandemic, it disproportionately affects racial and ethnic groups and persons with chronic health conditions.

A SCA occurs when a person's heart stops beating, causing the person to become unconscious and unresponsive. Unless resuscitation is initiated early on, death will ensue. Survival following SCA is considered a performance benchmark for an EMS system because it requires a time-sensitive, coordinated, and expert response involving all tiers of the system - bystanders, 9-1-1 call-takers, law enforcement, EMTs, paramedics, and hospital specialists. Functionally, SCA tests the emergency response system much like the COVID-19 pandemic tested our public health response.

Reports from around the US and the world document the pandemic's adverse impacts on resuscitation, specifically lower rates of survival. Although some SCA may be attributed to COVID-19 illness, many of the care challenges and excess deaths are indirect consequences. The new international guidelines requiring a uniform approach using protective equipment have slowed response and inhibited nimble care for all patients. New social patterns have impacted bystander quick response to start cardiopulmonary resuscitation (CPR) or apply a public automated external defibrillator (AED).

In investigating the effects of the pandemic in the chain of survival regionally, the EMS Division has observed changes in both care and outcomes. Successful outcomes for persons experiencing SCA is associated with early care that is delivered quickly along the chain of survival¹.

Early access and recognition of sudden cardiac arrest enables timely care and dispatching of appropriate resources quickly, all designed to minimize the time the patient is not receiving resuscitative care from bystanders or first responders. Regional 9-1-1 communication centers continue to achieve a high level of identification - correctly identifying SCA patients (97% in 2020) and dispatching appropriate resources (95% in 2020). During the pandemic however, fewer SCA events were witnessed (42% in 2020 versus 47% in prior years). Not surprisingly, more SCA occurred in private residences during the pandemic (74% in 2020 versus 65% in prior years), setting up a circumstance where early identification and care is more difficult.

Early CPR yielded a slight decrease in 2020 (76%) compared to prior years (79%). This is important because a person in SCA requires circulatory support as their heart has stopped beating or is inadequately beating (or quivering).

Early defibrillation is achieved when bystanders and/or law enforcement apply an automated external defibrillator (AED) to a SCA patient who has a shockable rhythm and resets the heart's electrical rhythm with a shock. However, in 2020, the proportion of persons having an AED placed on them was lower (10%) compared to previous years (13%), removing the potential impact this link provides for a successful resuscitation attempt.

Early and expert EMS care involves EMS timely response, critical decision making, and excellent clinical skills. Although EMS has worked especially hard to respond quickly, required COVID-19 safety precautions have meant extra steps to don additional personal protective equipment and have slowed the response by up to a minute to achieve patient contact and care. In post-resuscitative phase of care,

hospitals have also been challenged by the pandemic. In some instances, PPE requirements cause delays. In other circumstances, hospital resources have been stretched thin to care for the large numbers of persons who required hospitalization due to COVID-19. Often, these factors culminate to challenge efforts to improve SCA resuscitation.

King County has a longstanding history of excellence in resuscitation and is a leader on this front. Nonetheless, a region's ability to adapt to changes stemming from a pandemic and still maintain excellent patient care shows what a resilient EMS system can accomplish. Facing unprecedented times, the number of SCA survivors in King County was nearly identical between 2020 (234 survivors) and 2019 (253 survivors). However, more death was also observed which was an unfortunate experience for many EMS systems this past year during the height of the COVID-19 pandemic. True to our system's mantra, we will continue to measure and improve, with efforts to slow down and reverse death from those experiencing SCA.

EMS Funding and the 2021 Financial Plan

Overview

When the 2020-2025 EMS levy was planned in 2018, the region was in the ninth year of a historical economic expansion, the second longest period of expansion on record. Seattle and King County local economic signals were solid with strong job growth, low unemployment, and rising rent and home prices. The economic forecast called for continued growth through the 2020-2025 levy period, although at a reduced pace. In the time leading up to the new levy, Assessed Valuations (AV) and new construction grew significantly. Increased property taxes from new construction resulted in carrying forward \$26 million into the new levy; and AV growth allowed the region to start with a significantly lower levy rate (26.5 cents/\$1,000 AV compared to 33.5 cents/\$1,000 AV in 2014).

Despite the healthy outlook, King County leaders insisted on including appropriate reserves in the levy to ensure the system could weather an economic downturn. The final levy plan included Rainy Day and Supplemental reserves to accommodate a potential change in economic conditions.

The sound foundation of the 2020-2025 Strategic Plan created resiliency for EMS finances when faced with both the challenges of providing services during pandemic and potential reduction in the main revenue source, property taxes. This year's financial section documents this path – a good start to the levy going into pandemic related challenges in the first year of the levy, to the current projection approximating the original financial plan.

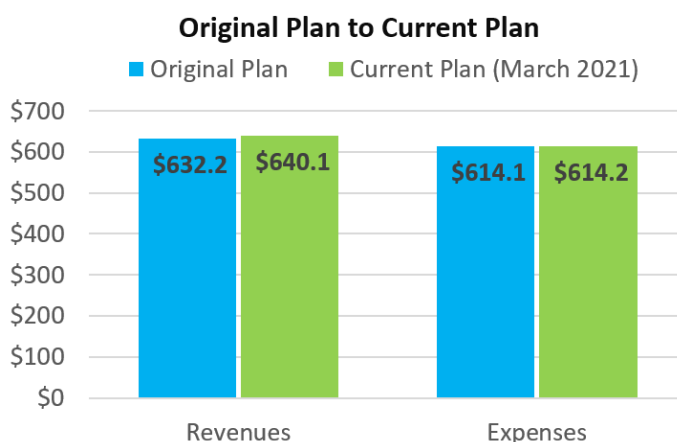
The following financial information is based on the March 2021 forecast by the King County Office of Economic and Forecast Analysis (OEFA). An update is planned late in the summer (after this report produced). Because an inter-local agreement between King County and the City of Seattle allows for EMS levy funds collected within the Seattle city limits to go directly to, and be managed separately by, the city, this section focuses on funds within the King County EMS Fund.

General Update

The first year of the new levy began with good news -- economic forecasts were slightly better than planned. Two key levy components, starting levy AV and forecast new construction, were higher than forecast. This resulted in a slight increase to projected property tax revenues over the levy period.

When COVID-19 arrived, King County saw reduced sales tax and related revenues. While property taxes are more stable than other revenues, initial projections indicated that the EMS system's primary funding would be negatively affected.

The updated forecast shows projected revenues and expenses close to the original plan. While the levy started with lower inflation than anticipated, current forecast of cumulative inflation over time very similar to original plan.



2020 Expenditures (EMS Levy Fund)

EMS levy revenues support Medic One/EMS operations related to direct service delivery and support programs:

Advanced Life Support (ALS) Services (paramedics) – covers all eligible ALS costs

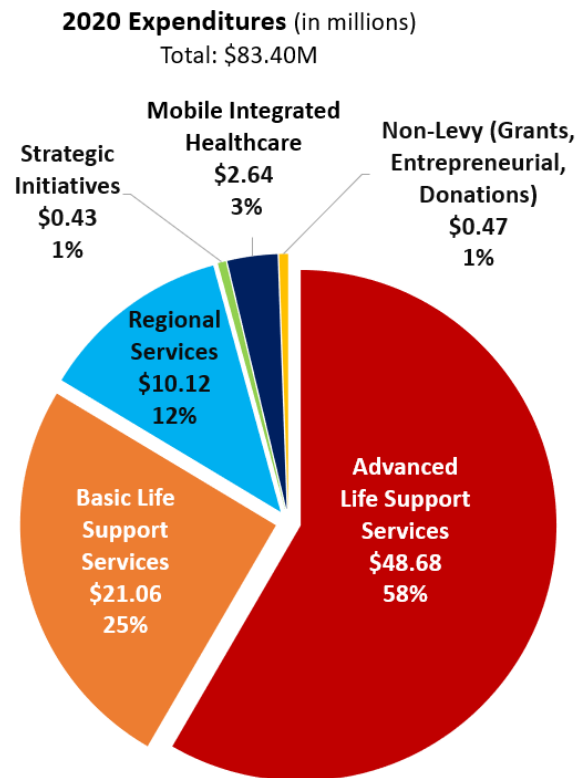
Basic Life Support (BLS) Services (emergency medical technicians (EMTs)) – contributions toward BLS services

Regional Support Services (RSS) - core programs critical to providing high quality out-of-hospital emergency care

Strategic Initiatives (SI) – support for pilots and projects focused on improving the system

Mobile Integrated Health (MIH) - expands implementation of community focused MIH into region

Non-Levy (Grants, Entrepreneurial and Donations) – grants related to the Center for Evaluation of EMS (CEEMS), donations and last year of entrepreneurial program.



2020-2025 Strategic Initiatives (SIs)

The 2020-2025 Strategic Plan includes three Strategic Initiatives: 1) The Vulnerable Populations Strategic Initiative (VPSI); 2) Accelerating Evaluation and Innovation: An Opportunity for Unprecedented Quality Improvement (AEIOU); and 3) The EMS Online Strategic Transition in Regionalized Innovation, Value and Education (STRIVE). All were implemented in 2020. While responding to COVID-19 contributed to moving the Initiatives forward, total Strategic Initiative spending was lower than projected. The region also continued its work on an Emergency Medical Dispatch Strategic Initiative, funded in the 2008-2013 Strategic Plan, to modernize dispatch centers' electronic CBD dispatch interface, and enhance dispatch quality improvement. For more information on strategic initiatives, see pages 32.

STRATEGIC INITIATIVES EXPENDITURES	
VPSI	\$356,166
AEIOU QI SI	\$5,445
STRIVE SI	\$2,805
2020-2025 Strategic Initiative Expenditures	\$364,416
Emergency Medical Dispatch SI (2008-2013 Strategic Initiative)	\$68,740
Total Strategic Initiative Expenditures	\$433,156

2020 Revenues

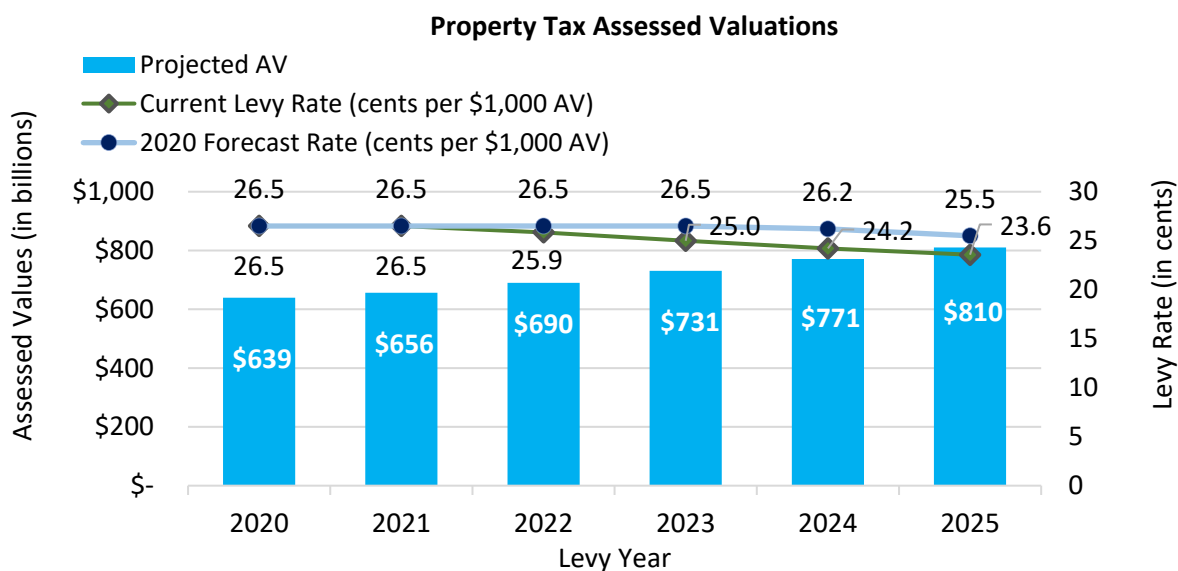
Property taxes accounted for over 98% of EMS Fund revenues. The remaining 2% is received from other income sources, including: interest income, revenues related to property taxes, charge for services, grants, and entrepreneurial funds. FEMA reimbursed costs were accounted for in a different fund.

Revenues	2020 Actuals
Property Taxes	\$100,554,077
Other Income	\$1,608,451
Total Revenues	\$102,162,528

Updated Financial Forecast

Assessed Valuations (AV) in the Region

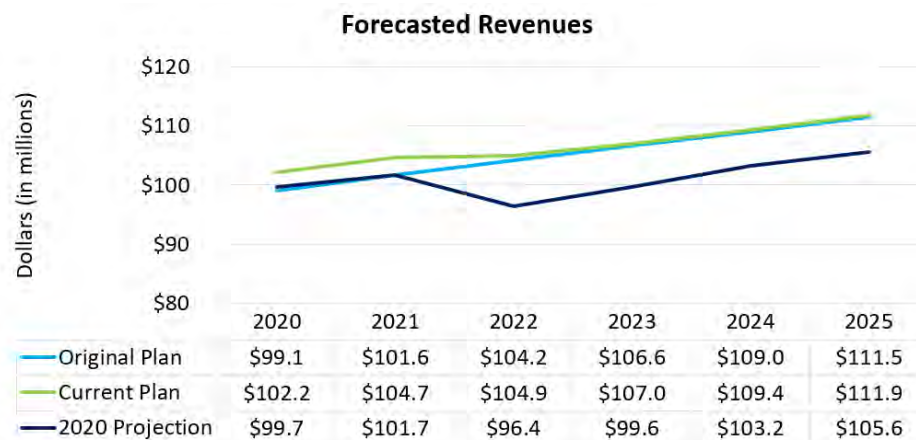
Per the Revised Code of Washington (RCW), the total EMS property taxes collected per year is limited to 1% plus new construction. Because of this, when AV increases at a rate higher than 1% per year, levy rates must decrease to remain within the legal limit. Due to increased AV during the 2014-2019 levy, the levy rate decreased from 33.5 cents/\$1,000 AV in 2014 to 21.7 cents/\$1,000 AV in 2019.



When AV declines, the levy rate can increase up to its statutory level (the EMS levy rate that was on the ballot). The previous 2020 forecast projected reductions in AV, resulting in a levy rate of 26.5 cents through 2023 and reduced property tax revenue. The most current forecast shows continued increases for the remainder of the levy period, highlighting the resiliency in county wide property values.

Revenue Forecast & Trends

The 2020 forecasted AVs included reductions limiting the EMS levy to the statutory rate of 26.5 cents/\$1,000 AV for most of the levy period and reduced revenue from 2022 through 2025.



The current forecast (as of March 2021) includes moderate growth in AV beginning in 2022. This growth, along with increased revenue in the first year of the levy (due to a higher beginning AV rate than planned), results in revenue forecasts for 2022 through 2025, very close to the original levy plan. The current forecast puts the levy on a path to fully fund required reserves at the end of the 2021-2022 biennium.

Expenditure Forecast & Trends

CPI-W is used to inflate most EMS allocations. While the average CPI-W over the levy period is similar to the original plan, the reduced CPI-W in 2020 resulted in a slight reduction in forecast expenditures during the levy period.

The current plan shows small increases in expenditures that are related to the use of program balances. This includes Regional Services using \$3 million in program balances to support regional COVID-19 testing, and Strategic Initiatives using program balances to enhance the VPSI scope and carryforward emergency medical dispatch (EMD) initiatives.

Expenditure Area	Original Plan	Current Plan
Advanced Life Support	\$362.8	\$359.0
Basic Life Support	\$139.8	\$138.5
Regional Services	\$78.5	\$80.6
Strategic Initiatives	\$6.7	\$7.5
Mobile Integrated Healthcare	\$26.2	\$25.9
Non-Levy	\$0.0	\$2.7
Total Expenditures	\$614.1	\$614.2

Reserves

The 2020-2025 Medic One/EMS Strategic Plan included contingencies and reserves to mitigate financial risk. Contingencies to cover significant increases in operating costs are budgeted at \$1 million a year (\$6 million overall). The original Financial Plan included the levels of Rainy Day Reserve and Programmatic Reserves at \$43. By the end of 2020, we were well on our way to funding the planned reserves.

Reserve Balances	2020
90-Day Rainy Day Reserve	\$20,565,507
ALS Reserves	\$7,074,752
Total Reserves	\$27,640,259

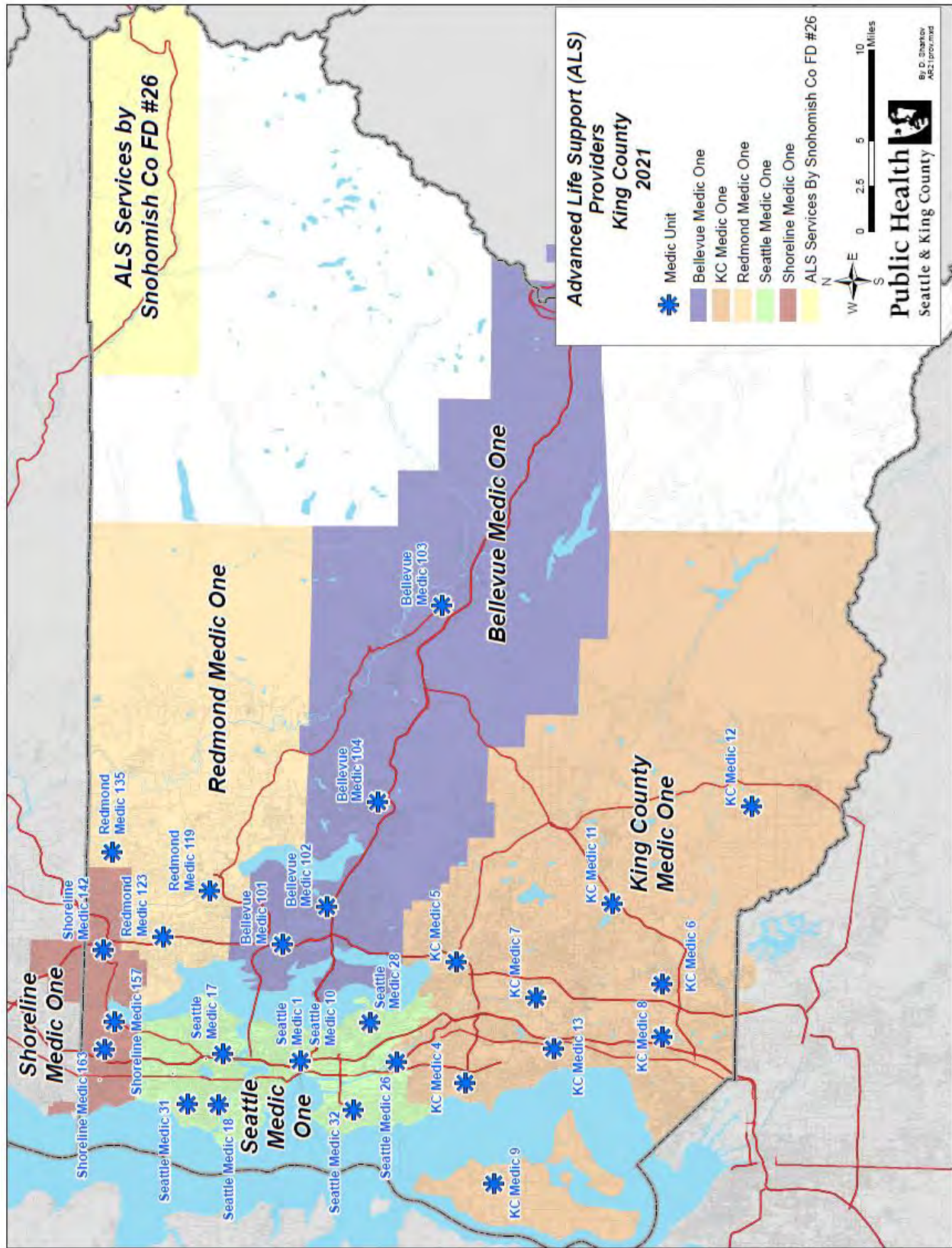
The use of reserves is subject to review and recommendation by both the EMSAC Financial Subcommittee and the full EMSAC. One request to use reserves has been recommended and approved in 2021.

Use of Reserves	2020 Actuals	2021 Approved
ALS Facility Reserves	\$0	\$180,000
Total Use of Reserves	\$0	\$180,000

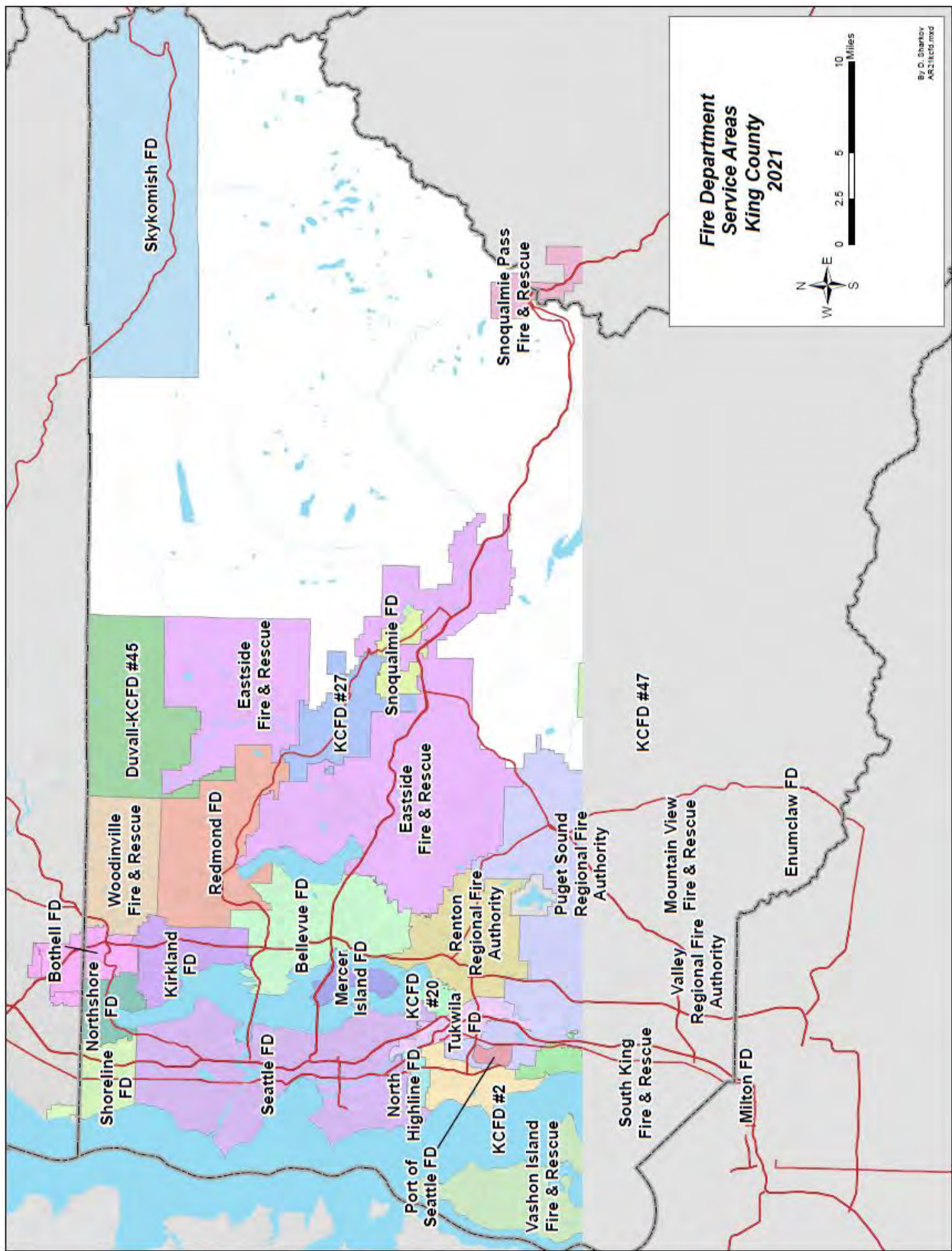
Conclusion

The previous 2020 forecast of reduced EMS revenues in 2020 has been updated with projections similar to the original plan. While this is good news, there are still several years remaining in the current levy period. Fortunately, safeguarding the EMS system from unforeseen financial risk was one of the most discussed topics during the levy planning process. As a result, the EMS strategic and financial plans include sufficient reserves should a similar downturn occur in the future. This safeguarding allows the EMS system to continue moving forward and implementing the current Strategic Plan.

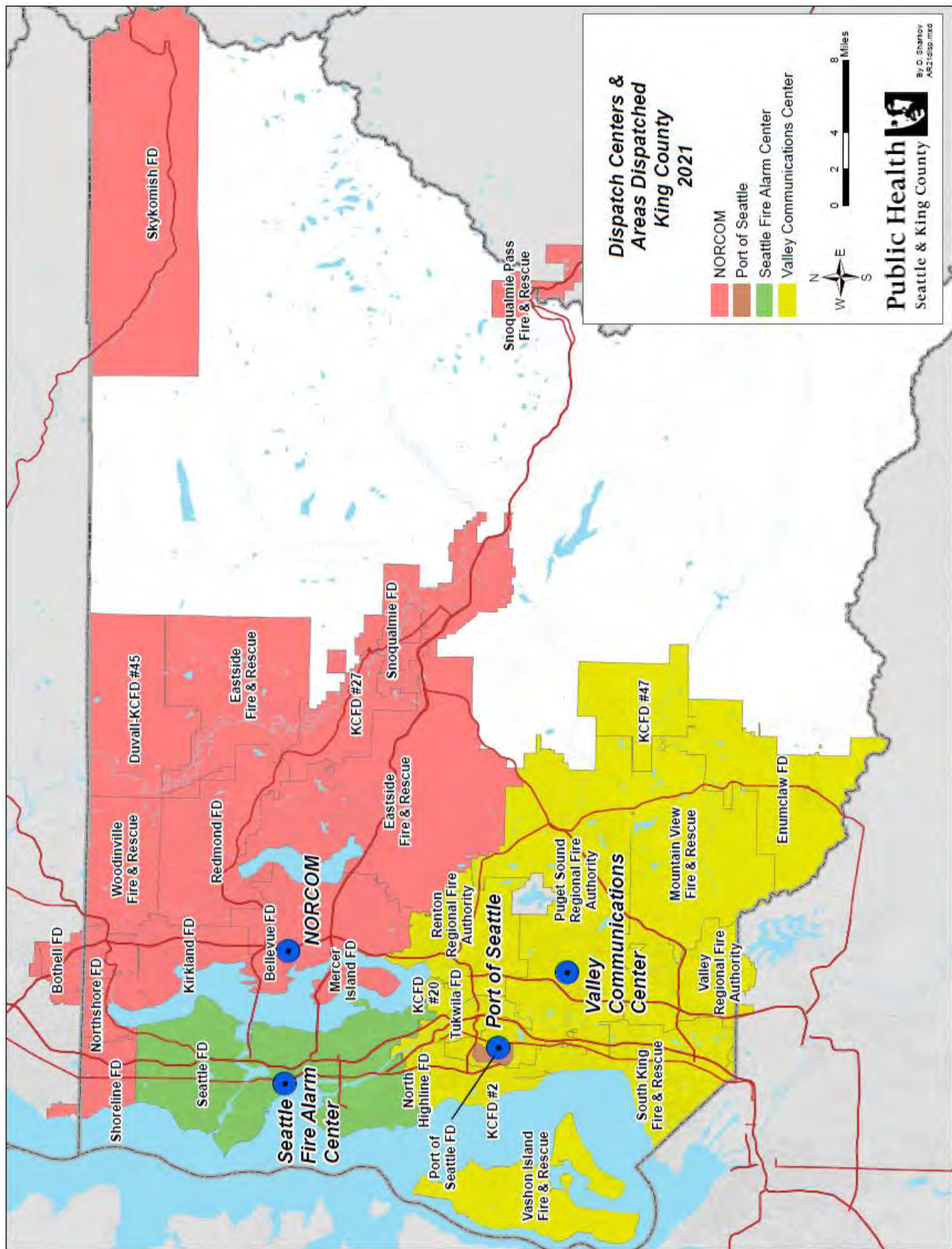
Appendix A – Regional Maps Advanced Life Support (ALS) Provider Areas



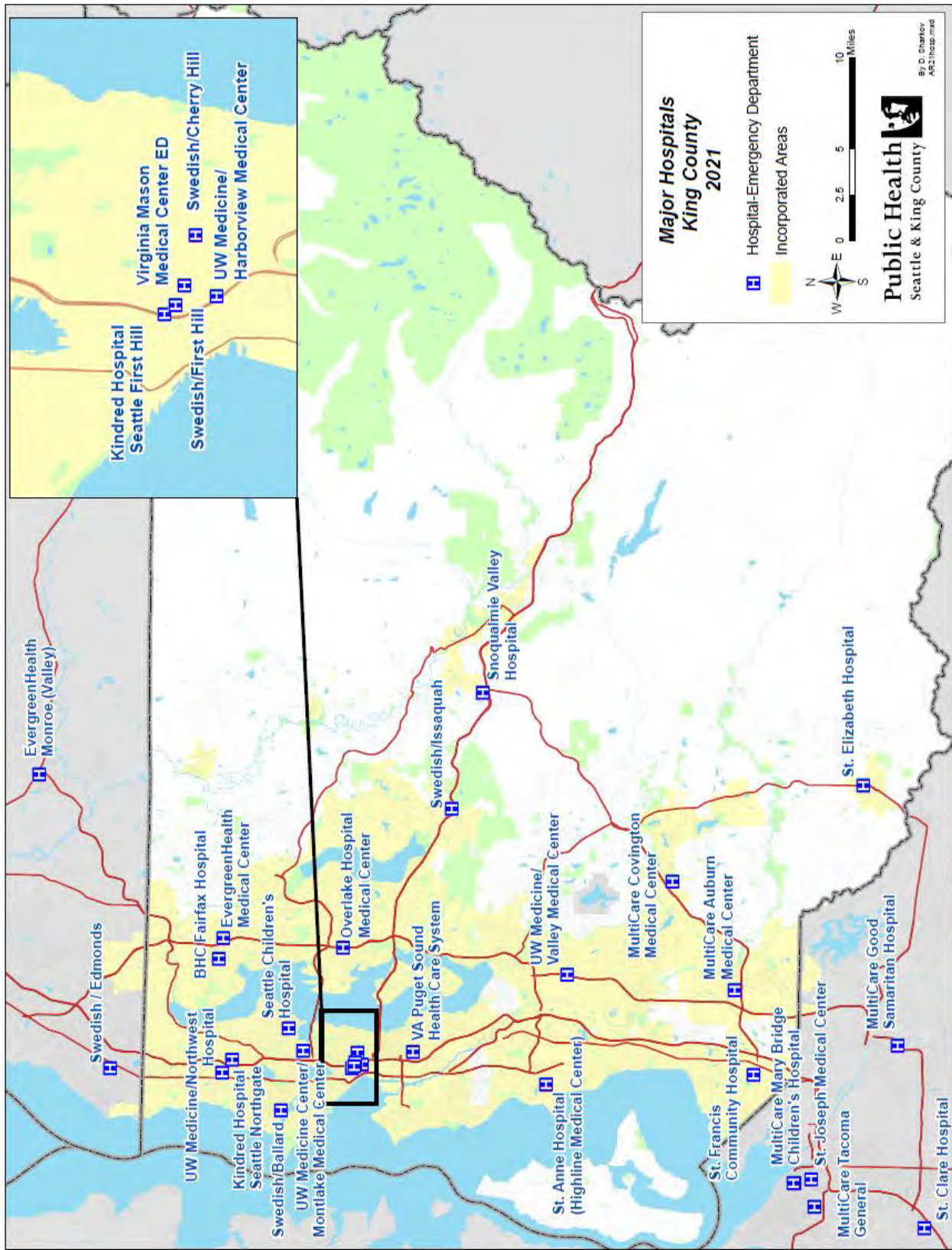
Appendix A – Regional Maps
Basic Life Support (BLS) Provider Areas



Appendix A – Regional Maps Dispatch Center Service Areas



Appendix A – Regional Maps Regional Hospitals in Seattle & King County



Appendix B – EMS Advisory Committee (EMSAC) Members

Name	Representation	Title/Organization
Michele Plorde, Chair	Emergency Medical Services Division	Director, EMS Division
Dennis Worsham	Public Health - Seattle & King County	Interim Director, PHSKC Department
Jay Hagen	ALS Providers - Bellevue	Chief, Bellevue Fire Department
Keith Keller	ALS Providers - KC Medic One	MSA, 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
Jeff Clark	BLS in Cities > 50,000 (Sammamish)	Chief, Eastside Fire & Rescue
Mike Marrs	BLS in Cities > 50,000 (Burien)	Chief, Fire District #2
Joe Sanford	BLS in Cities > 50,000 (Kirkland)	Chief, Kirkland Fire Department
Matthew Morris	BLS in Cities > 50,000 (Kent)	Chief, Puget Sound Regional Fire Authority
Steve Heitman	BLS in Cities > 50,000 (Renton)	Chief, Renton Regional Fire Authority
Vic Pennington	BLS in Cities > 50,000 (Federal Way)	Chief, South King Fire & Rescue
Vacant	BLS in Cities > 50,000 (Auburn)	Chief, Valley Regional Fire Authority
Dr. Tom Rea	King County Medical Program Director Chair, Medical Directors' Committee	Medical Program Director
Dr. Peter Kudenchuk	Medical Director, KCM1	Medical Director, KCM1
Dr. Michael Sayre	Seattle Medical Program Director	Medical Program Director, Seattle
Anita Sandall	KC Fire Commissioner's Assn. - Rural	Fire Commissioner, Eastside Fire & Rescue
John Rickert	KC Fire Commissioner's Assn. - Urban	Fire Commissioner, South King Fire & Rescue
Ryan Simonds	Labor - BLS	Renton Regional Fire Authority
Steve Perry	Labor - ALS	Paramedic, KCM1
Lora Ueland	Dispatch	Director, Valley Communications Center
Brandt Butte	Ambulance	American Medical Response
Ed Plumlee	Citizen Representative	
Vacant	Health Care System	

Appendix C: EMS Division Publications

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 2020, King County EMS disseminated research findings to wider national and international audiences through the following publications in peer-reviewed scientific and trade journals:

1. Published online June 1, 2021:e021764. doi:10.1161/JAHA.121.021764. Murphy DL, Danielson KR, Knutson K, Utarnachitt RB. Management of Acute Aortic Dissection During Critical Care Air Medical Transport. *Air Med J.* 2020;39(4):291-295. doi:10.1016/j.amj.2020.04.017
2. Drennan IR, Geri G, Brooks S, et al. Diagnosis of out-of-hospital cardiac arrest by emergency medical dispatch: A diagnostic systematic review. *Resuscitation.* 2021;159:85-96. doi:10.1016/j.resuscitation.2020.11.025
3. Yang BY, Barnard LM, Emert JM, et al. Clinical Characteristics of Patients With Coronavirus Disease 2019 (COVID-19) Receiving Emergency Medical Services in King County, Washington. *JAMA Netw Open.* 2020;3(7):e2014549. doi:10.1001/jamanetworkopen.2020.14549
4. Vitturi DA, Maynard C, Olsufka M, et al. Nitrite elicits divergent NO-dependent signaling that associates with outcome in out of hospital cardiac arrest. *Redox Biol.* 2020;32:101463. doi:10.1016/j.redox.2020.101463
5. Stangenes SR, Painter IS, Rea TD, Meischke H. Delays in recognition of the need for telephone-assisted CPR due to caller descriptions of chief complaint. *Resuscitation.* 2020;149:82-86. doi:10.1016/j.resuscitation.2020.02.013
6. Philippe A, Gendron N, Bory O, et al. Von Willebrand factor collagen-binding capacity predicts in-hospital mortality in COVID-19 patients: insight from VWF/ADAMTS13 ratio imbalance. *Angiogenesis.* Published online May 11, 2021. doi:10.1007/s10456-021-09789-3
7. Panchal AR, Bartos JA, Cabañas JG, et al. Part 3: Adult Basic and Advanced Life Support: 2020 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. *Circulation.* 2020;142(16_suppl_2):S366-S468. doi:10.1161/CIR.0000000000000916
8. Otto CM, Kudenchuk PJ, Newby DE. Cardiovascular professional societies fall short in providing impartial, clear and evidence-based guidelines. *Heart.* Published online February 26, 2021. doi:10.1136/heartjnl-2021-319176
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10. Olasveengen TM, Mancini ME, Perkins GD, et al. Adult Basic Life Support: 2020 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science With Treatment Recommendations. *Circulation.* 2020;142(16_suppl_1):S41-S91. doi:10.1161/CIR.0000000000000892
11. Murphy DL, Barnard LM, Drucker CJ, et al. Occupational exposures and programmatic response to COVID-19 pandemic: an emergency medical services experience. *Emerg Med J.* 2020;37(11):707-713. doi:10.1136/emmermed-2020-210095

12. Meischke H, Beaton R, Lilly M, Tu A, Revere D. A Revised Ecological Model of Occupational Stress: Applications to 9-1-1 Telecommunicators. *Workplace Health Saf.* 2020;68(10):460-467. doi:10.1177/2165079920934316
13. McMichael TM, Currie DW, Clark S, et al. Epidemiology of COVID-19 in a Long-Term Care Facility in King County, Washington. *N Engl J Med.* 2020;382(21):2005-2011. doi:10.1056/NEJMoa2005412
14. McMichael TM, Clark S, Pogojans S, et al. COVID-19 in a Long-Term Care Facility - King County, Washington, February 27-March 9, 2020. *MMWR Morb Mortal Wkly Rep.* 2020;69(12):339-342. doi:10.15585/mmwr.mm6912e1
15. Latimer AJ, Harrington B, Counts CR, et al. Routine Use of a Bougie Improves First-Attempt Intubation Success in the Out-of-Hospital Setting. *Ann Emerg Med.* 2021;77(3):296-304. doi:10.1016/j.annemergmed.2020.10.016
16. Kwok H, Coult J, Blackwood J, Bhandari S, Kudenchuk P, Rea T. Electrocardiogram-based pulse prediction during cardiopulmonary resuscitation. *Resuscitation.* 2020;147:104-111. doi:10.1016/j.resuscitation.2019.11.021
17. Kurz MC, Bobrow BJ, Buckingham J, et al. Telecommunicator Cardiopulmonary Resuscitation: A Policy Statement From the American Heart Association. *Circulation.* 2020;141(12):e686-e700. doi:10.1161/CIR.0000000000000744
18. Kragholm K, Hansen CM, Dupre ME, et al. Care and outcomes of urban and non-urban out-of-hospital cardiac arrest patients during the HeartRescue Project in Washington state and North Carolina. *Resuscitation.* 2020;152:5-15. doi:10.1016/j.resuscitation.2020.04.030
19. Kimball A, Hatfield KM, Arons M, et al. Asymptomatic and Presymptomatic SARS-CoV-2 Infections in Residents of a Long-Term Care Skilled Nursing Facility - King County, Washington, March 2020. *MMWR Morb Mortal Wkly Rep.* 2020;69(13):377-381. doi:10.15585/mmwr.mm6913e1
20. Kim F, Maynard C, Dezfulian C, et al. Effect of Out-of-Hospital Sodium Nitrite on Survival to Hospital Admission After Cardiac Arrest: A Randomized Clinical Trial. *JAMA.* 2021;325(2):138-145. doi:10.1001/jama.2020.24326
21. Johnson NJ, Danielson KR, Counts CR, et al. Targeted Temperature Management at 33 Versus 36 Degrees: A Retrospective Cohort Study. *Crit Care Med.* 2020;48(3):362-369. doi:10.1097/CCM.0000000000004159
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24. Grunau B, Kime N, Leroux B, et al. Association of Intra-arrest Transport vs Continued On-Scene Resuscitation With Survival to Hospital Discharge Among Patients With Out-of-Hospital Cardiac Arrest. *JAMA.* 2020;324(11):1058-1067. doi:10.1001/jama.2020.14185

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27. DeCou CR, Huppert T, Kume K, Veras P, Comtois KA, Rea T. Pre-hospital Patient Care Protocols for Suicidality in Washington State. *Prehosp Emerg Care*. 2021;25(3):432-437. doi:10.1080/10903127.2020.1771489
28. Daya MR, Leroux BG, Dorian P, et al. Survival After Intravenous Versus Intraosseous Amiodarone, Lidocaine, or Placebo in Out-of-Hospital Shock-Refractory Cardiac Arrest. *Circulation*. 2020;141(3):188-198. doi:10.1161/CIRCULATIONAHA.119.042240
29. Cuschieri J, Robinson B, Lynch J, et al. The COVID-19 Pandemic: Lessons Learned for Sustained Trauma Preparedness and Responses. *Ann Surg*. 2021;273(6):1051-1059. doi:10.1097/SLA.0000000000004695
30. Counts CR, Blackwood J, Winchell R, et al. Emergency Medical Services and Do Not Attempt Resuscitation directives among patients with out-of-hospital cardiac arrest. *Resuscitation*. 2021;158:73-78. doi:10.1016/j.resuscitation.2020.11.015
31. Coult J, Rea TD, Blackwood J, Kudenchuk PJ, Liu C, Kwok H. A method to predict ventricular fibrillation shock outcome during chest compressions. *Comput Biol Med*. 2021;129:104136. doi:10.1016/j.compbimed.2020.104136
32. Coult J, Blackwood J, Rea TD, Kudenchuk PJ, Kwok H. A Method to Detect Presence of Chest Compressions During Resuscitation Using Transthoracic Impedance. *IEEE J Biomed Health Inform*. 2020;24(3):768-774. doi:10.1109/JBHI.2019.2918790
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34. Chocron R, Lewis M, Rea T. Telecommunicator Cardiopulmonary Resuscitation-A Strategy Whose Time Has Come for the Other Pandemic. *JAMA Netw Open*. 2021;4(6):e217187. doi:10.1001/jamanetworkopen.2021.7187
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41. Blewer AL, Schmicker RH, Morrison LJ, et al. Variation in Bystander Cardiopulmonary Resuscitation Delivery and Subsequent Survival From Out-of-Hospital Cardiac Arrest Based on Neighborhood-Level Ethnic Characteristics. *Circulation*. 2020;141(1):34-41. doi:10.1161/CIRCULATIONAHA.119.041541
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43. Barnard LM, Guan S, Zarmer L, et al. Pre-hospital tourniquet use: An evaluation of community application and outcome. *J Trauma Acute Care Surg*. 2021;90(6):1040-1047. doi:10.1097/TA.0000000000003145
44. Arons MM, Hatfield KM, Reddy SC, et al. Presymptomatic SARS-CoV-2 Infections and Transmission in a Skilled Nursing Facility. *N Engl J Med*. 2020;382(22):2081-2090. doi:10.1056/NEJMoa2008457

Appendix D: EMS Performance Measures

Resource Category	Performance Measure	Definition	2020 Results
Systemwide	Rate of cardiac arrest survival (Utstein)	% discharged alive from hospital for all non-traumatic bystander witnessed cardiac arrests with an initial arrest rhythm of VF/VT	40%
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	76%
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	97%
	Rate of correctly identified resource used by telecommunicators	% of total number of reviewed calls that received correct EMS resource	95%
	Rate of correctly transferred T-IDC calls	% of T-IDC calls that were sent to the Nurseline versus received a BLS response	68%
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: 5.2 Suburban: 6.1 Rural: 7.8 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	95%
	Rate that "on scene time" standards are met	% of suspected CVA and suspected TIA patients with < 15-minute BLS scene time	45%
	Rate of taxi transported patients	% of taxi transports of all BLS transports	% not available (312 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)	91%

*Modified measure to look at EMS-suspected stroke patients instead of hospital-confirmed stroke patients to better align with WA state Key Performance Indicators 6.1 and 6.2 (reference: <https://www.doh.wa.gov/Portals/1/Documents/Pubs/530189February2017.pdf>).

Resource Category	Performance Measure	Definition	2020 Results
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. 75.0% =<14 min. 93.2% Mean time 8.6 min.
	Rate of paramedics documenting a 12-lead ECG for STEMI patients	% of suspected STEMI cases where paramedics documented to 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	29%
	Rate of paramedics documenting Glasgow Coma Scale for trauma patients	% of trauma patients transported to Harborview Medical Center by paramedics where GCS was documented	90%
	Rate of scene time for trauma patients	% of trauma patients taken to Harborview Medical Center by paramedics with < 15 minutes ALS scene time	50%
	Rate of successful first attempt intubations	% of successful first attempt intubations	83%
Regional	Rate of cancelled enroute ALS calls	% of cancelled enroute ALS calls to all ALS calls	24%
	% of calls where no upgrade or downgrade was needed	% of calls where ALS was not cancelled and not requested from scene	53%
	Rate of ALS requests from scene	% of BLS requests for ALS from scene of all ALS calls	23%
	# of paramedic hours above planned 2 paramedic staff per unit	# of paramedic hours above planned two (2) paramedic unit staffing	295 hours
	Rate of satisfied customers	% of satisfied or very satisfied customers as reflected in survey results	Not available

Appendix E: EMS Division Contact Information

The EMS Division consists of four (4) sections and King County Medic One.

Emergency Medical Services Division

Public Health – Seattle & King County

401 Fifth Avenue, Suite 1200

Seattle, WA 98104

Website: <http://www.kingcounty.gov/health/ems.aspx>

Phone: (206) 296-4693

Fax: (206) 296-4866

Administration Section

Contracts

Finance

Strategic Planning

Phone: (206) 263-8549

Community Programs Section

Communities of Care Program

CPR/AED Training Programs

Emergency Medical Dispatch (EMD)

Injury Prevention - One Step Ahead Fall Prevention Program

Mobile Integrated Healthcare

Phone: (206) 263-1457

Regional Quality Improvement Section

Center for the Evaluation of EMS (CEEMS)

Regional Medical Control and Quality Improvement

Regional Data Collection and Analysis

Phone: (206) 263-8057

Training and Education Section

EMS Online

Basic Life Support Training

Advanced Life Support Training

Phone: (206) 263-8054

King County Medic One

20811 84th Avenue S., Suite 102

Kent, WA 98032

Phone: (206) 296-8550

Fax: (206) 296-0515

Appendix F: EMS Fund 1190 Financial Plan

	2020 Actuals	2021 Forecast
BEGINNING FUND BALANCE (A)	40,010,894	62,103,714
REVENUES		
Property Taxes	100,554,077	103,677,429
Interest Earnings/Miscellaneous Revenue	1,608,452	1,026,298
TOTAL REVENUES (B)	102,162,529	104,703,727
EXPENDITURES		
Advanced Life Support Services	48,683,877	56,770,664
Basic Life Support Services	21,056,505	21,875,012
Regional Services	10,122,018	15,216,740
Strategic Initiatives	433,156	1,442,121
Mobile Integrated Healthcare	2,636,115	4,230,401
Grants, Entrepreneurial & Donations	472,888	404,118
TOTAL EXPENDITURES (C)	83,404,559	99,939,056
TOTAL REVENUES LESS TOTAL EXPENDITURES (D)	(18,757,970)	(4,764,671)
Other Fund Transactions (E)	334,850	334,850
ENDING FUND BALANCE (A+D+E=F)	62,103,714	67,203,235
RESERVES AND DESIGNATIONS		
Designations (including Program Balances)	(34,463,455)	(25,069,496)
Reserves*	(27,640,259)	(42,133,739)
TOTAL RESERVES AND DESIGNATIONS (G)	(62,103,714)	(67,203,235)
ENDING UNDESIGNATED FUND BALANCE	-	-

*Refer to page 51 for additional details on reserves

Appendix G: Ordinance 12849 – Evaluation of Countywide EMS

09/05/97 9:56 AM

Introduced By:

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EMSrvw3/cgh/js/we

Proposed No.:

97-554

ORDINANCE NO.

12849

AN ORDINANCE directing the Executive to evaluate the provision of county-wide emergency medical services and to establish an EMS Financial Planning Task Force, and declaring an emergency.

PREAMBLE:

Emergency medical services are among the most vital services provided by the county to its residents. Since its initial development in 1977, the county's emergency medical services program has become a model for similar programs world-wide and is now a firmly established regional system on which citizens rely.

The county council fully supports the continued provision of this invaluable service and believes it should be afforded a long-term, stable funding source. The current, near total reliance on a six-year voter-approved levy puts the program's funding in regular jeopardy and connotes that the county considers it an optional program. Emergency medical services are among the county's most highly demanded and respected services and, because of the crucial, life-saving aid provided, are not considered optional. These services are critical and deserve a secure funding base that supports an appropriate level of service.

The county council is committed to researching more secure, permanent funding sources for this important program and, therefore, is directing that a Task Force be established to fully analyze potential funding alternatives. In addition, in order to help guide the development of this program, the county council is directing the executive to evaluate and pursue various means to better educate citizens on the use of emergency medical services as well as to report annually on various factors related to the provision of emergency medical services, including trends that might affect demand and financial estimates for the upcoming years.

BE IT ORDAINED BY THE COUNCIL OF KING COUNTY:

1 SECTION 1. Findings. Because the directives contained in this ordinance are so closely
2 tied to the proposed emergency medical services levy as outlined in proposed ordinance 97-392,
3 the county council finds it necessary to approve this ordinance in conjunction with proposed
4 ordinance 97-392. Proposed ordinance 97-392 must be effective by September 19, 1997 in order
5 to meet the deadline for the November 1997 ballot. Therefore, it is necessary to enact this
6 ordinance as an emergency so that it may be effective at the same time as proposed ordinance 97-
7 392.

8 SECTION 2. Annual Review. By September 1 of each year that the county-wide EMS
9 levy is collected, the executive shall prepare and present to the council an evaluation of the
10 following:

11 A. implementation status of the policies, plans and strategic initiatives included in the
12 Emergency Medical Services Strategic Plan;

13 B. trends in the health care industry that might affect demand for emergency medical
14 services, including, but not limited to, enrollment criteria for and service provided by the state's
15 basic health plan;

16 C. emergency medical services provided to special populations including the elderly and
17 citizens who are not fluent in english; and

18 D. estimated expenditure levels and revenue assumptions for the upcoming levy year and
19 the associated levy rate.

20 SECTION 3. User Education. The executive shall evaluate whether specific
21 population groups rely on emergency medical services for non-emergency health care,
22 and shall develop and implement an educational outreach plan and materials designed to
23 better inform citizens of the various health care options available to them other than
24 emergency medical services. This evaluation and plan shall be presented to the county
25 council in conjunction with the first annual review outlined in section 2 of this ordinance.

1 SECTION 4. EMS Financial Planning Task Force. The executive shall appoint a fifteen-
2 member EMS financial planning task force, to be confirmed by the county council. This task force
3 will work in cooperation with the EMS advisory committee recommended by the 1998-2003
4 Emergency Medical Services Strategic Plan.

5 A. By December 31, 1998, this task force will present to the county council an analysis of
6 long-term funding alternatives that would allow the county to reduce its reliance on property tax
7 levies to support emergency medical services.

8 B. This task force shall consist of the director of the Seattle-King County division of
9 public health, the medical program director for the King County emergency medical services
10 division, the director of the office of budget and strategic planning, the director of the department
11 of finance, two representatives from the county council, 1 representative from each city within the
12 county with a population over 50,000, two representatives from smaller cities appointed by the
13 Suburban Cities Association, two fire district commissioners and two citizens-at-large from the
14 unincorporated area.

12849

1
2 SECTION 5. Emergency. For the reasons set forth in section one of this ordinance, the
3 county council finds as a fact and declares that an emergency exists and that this ordinance is
4 necessary for the immediate preservation of public peace, health, or safety or for the support of
5 county government and existing public institutions.

6 INTRODUCED AND READ for the first time this 8th day of
7 September, 1997

8 PASSED by a vote of 13 to 0 on this 8th day of September, 1997

9 KING COUNTY COUNCIL
10 KING COUNTY, WASHINGTON

11 [Signature]
12 Chair

13 ATTEST:

14 [Signature]
15 Clerk of the Council

16 APPROVED this 8th day of September, 1997

17 [Signature]
18 King County Executive
19

20 Attachments: None

The Clerk of the King County Council
does hereby certify that the attached
is a true and correct copy of the
original.

Witness my hand and official seal this
9th day of Sept., 1997

Clerk of the King County Council

By [Signature]