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1. Executive summary

The challenge: Curb misuse of the Memphis 911 EMS and improve the overall health of the city.

Context

- The Memphis Fire Department staffs 34 ambulances that are often all in use. Running out of resources routinely delays care and risks lives.
- The Memphis EMS spent \$37.4 million in fiscal year ending June 30, 2015 but only recovered \$20.8 million by billing ambulance services.
- Memphis ranks low in health indicators and has high readmission rates for acute conditions.
- With a poverty rate just under 30%, Memphis is one of the country's most economically disadvantaged areas.
- Several organizations have programs directed at improving the health and well-being of Memphians.

Findings

- The 911 EMS response process needs to ensure emergency vehicles are available.
- Several Memphis organizations work in silos and must learn to collaborate.
- Memphis needs to provide affordable healthcare options that are as convenient as using 911.
- Free transportation is one reason some citizens misuse 911 services.
- Incentives for changed behavior and legal disincentives for 911 abuse will eliminate many offenses.
- Health education needs to revert a deep-rooted and generational mind-set to ensure adoption of a new healthcare system.
- Many of the IBM team's recommendations have little to no cost. Where funding is necessary, Memphis has several potential sources for grants and sponsors.

Summary of recommendations



Drive collaboration among healthcare stakeholders

A cohesive leadership team will guide and monitor actions, as well as measure and promote success across the community



Innovate the 911 EMS response process

Improved medical care for everyone within the limits of a well-funded EMS system



Provide convenient service alternatives

Strategically based healthcare options and transportation assistance for low- and no-income households



Utilize impactful incentives and corrective actions

Significant reduction in abusive non-emergent 911 calls, with associated cost savings



Create and launch a citywide education campaign

Heightened awareness of the risks of 911 misuse will help change citizens' behaviors and reduce 911 calls for non-emergent care

Vision

Memphis faces a significant challenge in curbing misuse of its 911 EMS system and improving the overall health of its citizens. But the community's understanding of this critical issue, the appetite for innovation and the community leaders' level of commitment to improve the health of Memphians prove this is the perfect time for action.

2. Introduction

A. The Smarter Cities Challenge

By 2050, cities will be home to more than two-thirds of the world's population. They already wield more economic power and have access to more advanced technological capabilities than ever before. Simultaneously, cities are struggling with a wide range of challenges and threats to sustainability in their core support and governance systems, including transport, water, energy, communications, healthcare and social services.

Meanwhile, trillions of digital devices, connected through the Internet, are producing a vast ocean of data. All of this information — from the flow of markets to the pulse of societies — can be turned into knowledge because we now have the computational power and advanced analytics to make sense of it. With this knowledge, cities could reduce costs, cut waste and improve efficiency, productivity and quality of life for their citizens. In the face of the mammoth challenges of economic crisis and increased demand for services, ample opportunities still exist for the development of innovative solutions.

In November 2008, IBM initiated a discussion on how the planet is becoming “smarter.” By this it meant that intelligence is becoming infused into the systems and processes that make the world work — into things no one would recognize as computers: cars, appliances, roadways, power grids, clothes and even natural systems, such as agriculture and waterways. By creating more instrumented, interconnected and intelligent systems, citizens and policymakers can harvest new trends and insights from data, providing the basis for more-informed decisions.

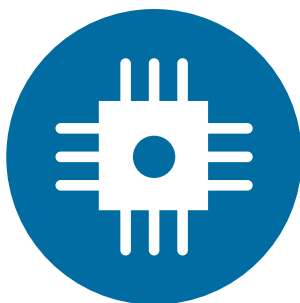
A Smarter City uses technology to transform its core systems and optimize finite resources. Because cities grapple on a daily basis with the interaction of water, transportation, energy, public safety and many other systems, IBM is committed to a vision of Smarter Cities® as a vital component of building a Smarter Planet®. At the highest levels of maturity, a Smarter City is a knowledge-based system that provides real-time insights to stakeholders and enables decision makers to manage the city's subsystems proactively. Effective information management is at the heart of this capability, and integration and analytics are the key enablers.

Intelligence is being infused into the way the world works.

The IBM Smarter Cities Challenge® contributes the skills and expertise of top IBM talent to address the critical challenges facing cities around the world. We do this by putting teams on the ground for three weeks to work closely with City leaders and deliver recommendations on how to make the city smarter and more effective. Over the past five years, more than 132 cities have been selected to receive grants. The Smarter Cities Challenge is the largest philanthropic initiative IBM has launched, with contributions valued at more than \$66 million to date.

The City of Memphis, Tennessee, was selected through a competitive process as one of 16 cities to be awarded a Smarter Cities Challenge grant in 2015 and 2016.

During a three-week period in February and March 2016, a team of five IBM experts worked in Memphis to deliver recommendations around key issues for Mayor Jim Strickland.



Instrumented

We can measure, sense and see the condition of practically everything.



Interconnected

People, systems and objects can communicate and interact with one another in entirely new ways.



Intelligent

We can analyze and derive insight from large and diverse sources of information to predict and respond better to change.

Figure 1: Instrumented, interconnected, intelligent

B. The challenge

In the early 1960s, America was falling in love with the automobile and taking to the nation's highways in droves. Americans were also increasingly subject to accidental injury. The National Highway Traffic Safety Administration responded to a 1966 report entitled "Accidental Death and Disability" by encouraging the establishment of what we know today as the Emergency Medical Services (EMS) system. EMS has evolved over almost 50 years into the *de facto* service for all of the nation's medical and traumatic emergencies.¹

EMS has endured and adapted to the increase in volume of calls, typically by adding more resources. But emerging challenges to EMS can no longer be addressed by simply scaling existing models of service. Medical care has become much more specialized and expensive, and primary care has become scarcer, which has limited the access and choices for many in American communities. EMS is emerging as the primary care safety net for the uninsured and underinsured. All the while, EMS departments are being asked to provide more-complex and time-sensitive services to those in dire need. Responding to every call for help without differentiation or regard for the impact on the well-being of the community at large puts lives at risk. EMS systems across the globe recognize they must now evolve from a one-size-fits-all response model to one that seeks to optimize the health and well-being of the entire community.

EMS, at its core, brings medical assistance to people in need. There are occasions when that need is extreme — a heart attack, a stroke or significant trauma, for example — and other occasions when an assessment and referral to nonurgent care would be most appropriate. Today, all calls to EMS result in the dispatch of a paramedic-level ambulance and the presumption of transport to a hospital. When resources in the system are slack, one might ask, "Why not respond?" Even in a system with extensive resources, those resources are geographically dispersed. If a unit is transporting a patient that has had a persistent cough for three days to a hospital and a call for a cardiac arrest comes in their coverage area, the extra five minutes for a unit from another station to arrive may reduce that victim's odds of intact survival by 50%.² The *community* is not best served by gratuitous use of EMS resources. The 911 EMS service is, by its nature, episodic. The patient with the cough will be treated for today's cough, but they are not establishing an enduring relationship with a primary medical caregiver who can address the underlying issues of their cough and provide ongoing follow-up care. The *individual*, in this case, is not best served through a 911 EMS response.

Through the Smarter Cities Challenge, the City of Memphis will receive a range of recommendations to help address the following key challenge:

Curb misuse of the Memphis 911 EMS and improve the overall health of the city.

3. Context, findings and roadmap

A. Context

Leadership. This Smarter Cities Challenge grant was awarded to the City of Memphis under the previous mayor, A.C. Wharton. While the planning was in process, the citizens chose new leadership, electing Mayor Jim Strickland. He immediately recognized the potential impact of the Smarter Cities Challenge grant and wholeheartedly supported it even before taking office. Early in his term, the mayor appointed Gina Sweat as the new Fire Director. She, too, has made it clear that her priorities align with those outlined in the mayor's challenge. The City is benefiting from fresh perspectives and a continuity of concern for the health and well-being of the people of Memphis.

EMS resources. The MFD staffs 34 paramedic-level ambulances across the city. On a regular basis, all of its units are in service on 911 calls. When this occurs, overflow calls are referred to private ambulance companies. All 911 calls are serviced, but the need to refer out calls when the system is overloaded can delay responses. The problem of running out of ambulances is not unique to Memphis, and cities address this condition in a variety of ways. Staffing more ambulances is an obvious response but not a scalable or sustainable solution — and would leave underlying issues unaddressed.

Finances. Memphis EMS had expenditures of \$37.4 million in the fiscal year that ended June 30, 2015. It was able to recover only \$20.8 million of those expenses by billing for ambulance services. Each additional staffed ambulance costs about a half million dollars per year to operate, and every trip to the hospital costs a little more than \$1,000, including amortization of capital costs.

Healthcare. Memphis boasts a number of world-class hospitals and a well-respected university health science center. There is a popular story about Apple Founder Steve Jobs coming to Memphis for an organ transplant that anecdotally supports the assertion of high-quality healthcare in the city. On the other side of the coin, Memphis perennially ranks low in health indicators, such as prevalence of obesity and type 2 diabetes, and has high readmission rates for acute conditions, such as pneumonia and congestive heart failure. Having world-class healthcare does not automatically confer good health onto a population with such a high rate of poverty and chronic health conditions.

Poverty. Health and wealth are, unfortunately, tightly correlated in the US. With a poverty rate just under 30%, Memphis is one of the most economically disadvantaged areas in the country. Poverty limits access to healthcare by denying individuals transportation, provider choice, therapeutic medications and healthy food and lifestyle options.

Community engagement. There are several for-profit and nonprofit organizations in the greater Memphis area that have programs directed at improving the health and well-being of the people of the city. Many of these organizations were identified as stakeholders in the Smarter Cities Challenge application, and many more have stepped up as the project has moved forward.



B. Findings

During a three-week period, the Smarter Cities Challenge team of executives and experts conducted more than 70 interviews with a wide variety of stakeholders, including representatives from the City of Memphis, government representatives, community organizations, nonprofit organizations, local businesses, health professionals, university departments and the faith-based community. The project also received a special grant of Twitter data, which provided analysis of historical and current social media data to help tackle the issue. While little discussion was found on social media about nonemergency 911 use, the team found that citizens *do* take to social media to express their concerns about 911 responses, lack of resources and public safety topics.

The IBM team identified numerous findings consolidated into seven major categories and grouped the findings to provide a clear focus on specific issues and activities to improve misuse of 911, as well as the overall health of Memphis.

Category 1: 911 EMS response process. The need to optimize the 911 EMS response process to ensure capacity of emergency vehicles for overall emergent care is a major part of the team's findings. The City needs a clearer flow for appropriate services to ensure that citizens with emergency needs are attended to by 911 and that citizens with nonemergency needs are attended to by the appropriate alternative service. Responding to every call for help without differentiation puts lives at risk. Memphis EMS has a number of improvements in process or pilot, but metrics need to be developed and reviewed to support continuation of improvements. The IBM team heard several cases in which offload time to hospital emergency rooms was a factor in the unavailability of emergency vehicles. Memphis EMS should have more autonomy in determining the best and closest hospital during periods of high call volume.

Category 2: Collaboration. The City of Memphis has a number of entities that work in silos to address healthcare needs. These entities must collaborate to address misuse of the City's 911 service and citizens' healthcare needs productively. The EMS team and health professionals need to develop a single view of the person, which will assist them in making appropriate referrals, tracking a family's progress and creating personal connections with individuals seeking help from different services. Memphis EMS should encourage the use of the Delayed Offload of Patients to the Emergency Department procedure and potentially expand its scope. Health records of individuals are not consistently used, and the need for electronic health records (EHRs) is evident. The City should also develop a comprehensive listing of healthcare and social service offerings that are available to the community.

Category 3: Gaps in services. Feedback from interviewed stakeholders points to gaps in current services that ultimately result in citizens using 911 as their only means to receive care. Memphis needs to provide affordable healthcare options that are as convenient as 911, as a replacement for non-emergent care. Some citizens utilize 911 as a means to fill prescriptions. Alternative healthcare options are not always available during non-peak hours. Stakeholders cited long wait times and lack of capacity in the Emergency Department. Medical personnel interviewed noted the community has a shortage of nurses and medical personnel.

Category 4: Transportation. Free, door-to-door transportation is one key reason some citizens misuse 911 services. Several stakeholders interviewed noted that some patients call 911 for prescription refills or to get to a desired destination. In the past, transportation vouchers have been used sparingly in Memphis, with mixed reviews of their effectiveness. Other US cities have successfully implemented transportation vouchers, ride sharing and volunteer transportation services.

Category 5: Incentives and disincentives. The IBM team heard consistently that misuse of 911 is deep-rooted and based on a generational mind-set. Once a clear outline of services is established and communicated, incentivizing citizens with a "reward" will help to change behavior. Implementing corrective actions for proven cases of intentional 911 abuse, targeted primarily at a specific group of frequent offenders, could help eliminate a significant set of calls and curtail future misuse. Memphis should investigate the legalities of enabling EMS to use more autonomy when making decisions on service and transport. Overall, the City Risk Management Office should reevaluate overall risk to improve the use of healthcare services.

Category 6: Education. During interviews, the IBM team consistently recognized the need for reeducation to revert a deep-rooted and generational mind-set. Once a system is established that is as convenient and affordable as 911 EMS, education will ensure its adoption. Education on using primary care and establishing a healthy lifestyle is essential to improving the overall health of the community, which will reduce the likelihood of repeated emergency cases. The messaging and education should be delivered through a variety of venues (print, radio and social media, for example) and from a variety of sources (such as faith-based organizations and schools).

Category 7: Funding. Many of the IBM team's recommendations are low to no cost. Memphis is a passionate community, where citizens actively engage in volunteer opportunities. Where funding is needed, Memphis has a variety of potential sources, such as grants, Chamber of Commerce, local corporations (FedEx and International Paper, for example), university assets, sponsors, crowdsourcing, insurers, hospitals and faith-based organizations.

C. Roadmap

Just as the IBM team's findings proved to be interrelated, the recommendations are as well. A collaborative healthcare Steering Committee should be chartered quickly to oversee implementation of these actions, with diverse stakeholders having a seat at the table to drive change, evaluate effectiveness and foster continuing collaboration over the months and years that significant change will take. This Steering Committee will have the authority to charter subcommittees to either support overall initiatives, such as a communications subcommittee, or to implement a single recommendation.

A number of these recommendations include the suggestion to start small via a pilot program to evaluate effectiveness, modify the approach if necessary and then scale over time at an acceptable speed and level to complete implementation.

The IBM team's overarching recommendation is to also implement the associated performance measures for these detailed recommendations to evaluate effectiveness, cost reduction and service benefit. If piloting certain recommendations demonstrates no appreciable benefits, then community efforts and urgency should be redirected to those recommendations that do show such benefits.

The following roadmap shows the five overall recommendations and the actions proposed within them. The timeline is notional, but demonstrates that, with a concerted effort, significant change can be well underway by the end of 2016. It also recognizes that some recommendations, such as a wellness campaign, will run over time to influence gradual health improvement for Memphians.

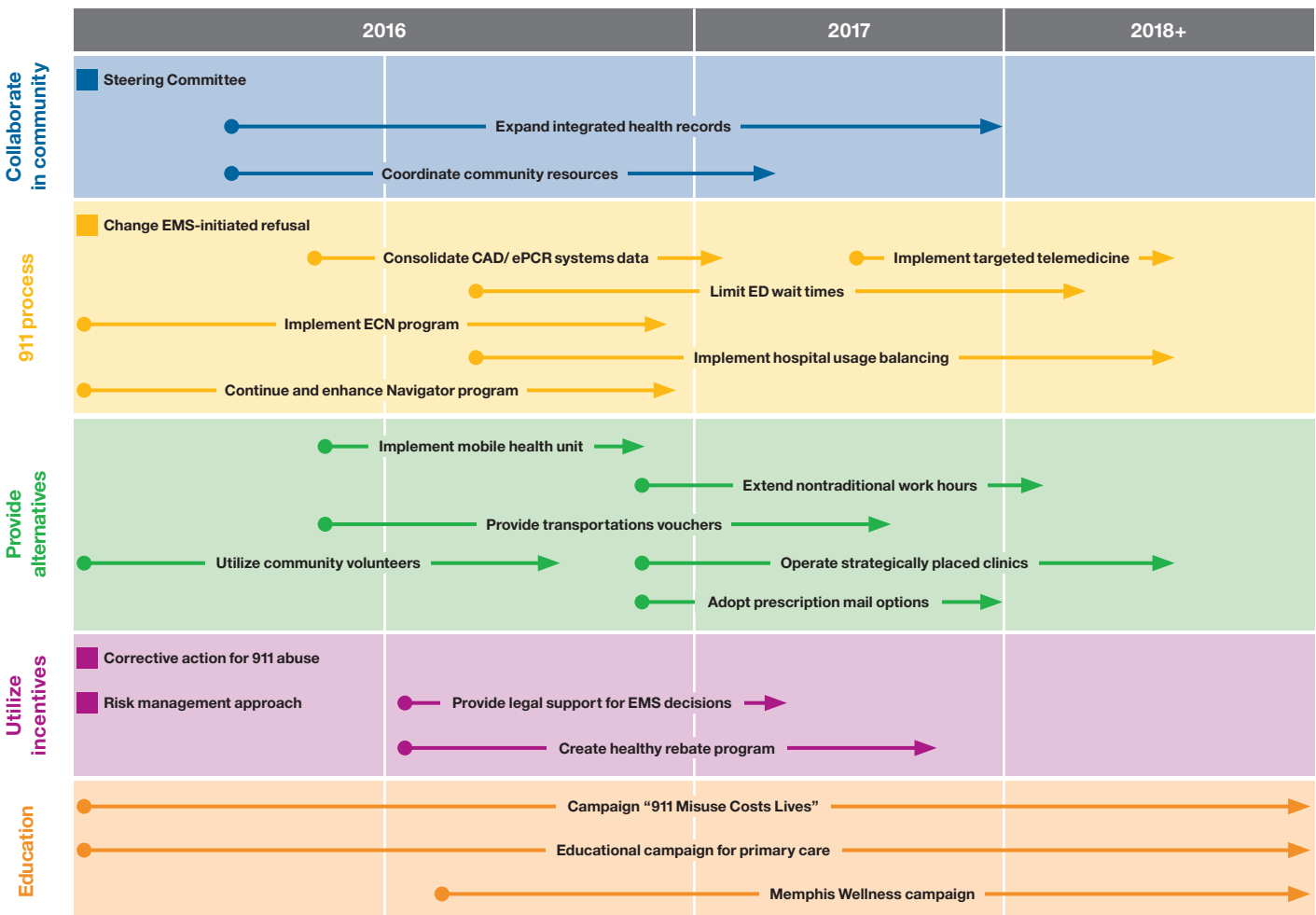


Figure 3: Roadmap of recommendations

4. Recommendations

The following table identifies when the recommendations that follow could potentially be completed, given sufficient sponsorship, accountability and funding. Many of these recommendations can be started in the near term, and some are suited to immediately starting a pilot, evaluating effectiveness after gathering performance metrics and then scaling more broadly to satisfy the community's needs.

| Recommendations | | Timeline | Short term (0 – 6 months) | Medium term (6 – 12 months) | Long term (12+ months) |
|--|---|-------------|------------------------------|--------------------------------|---------------------------|
| Drive collaboration among healthcare stakeholders | | | | | |
| 1 | Implement a healthcare Steering Committee | Short term | | | |
| 2 | Expand integrated health records | Long term | | | |
| 3 | Coordinate community resources | Short term | | | |
| Innovate the 911 EMS response process | | | | | |
| 4 | Create a consolidated view of CAD and ePCR data | Medium term | | | |
| 5 | Limit wait time at Emergency Departments for units | Short term | | | |
| 6 | Institute EMS-initiated refusal of transport | Short term | | | |
| 7 | Implement the Emergency Communication Nurse program | Short term | | | |
| 8 | Implement destination hospital balancing | Short term | | | |
| 9 | Enhance the Navigator program | Short term | | | |
| 10 | Implement a targeted telemedicine pilot | Long term | | | |
| Provide convenient service alternatives | | | | | |
| 11 | Implement mobile health units | Medium term | | | |
| 12 | Operate fire station clinics | Long term | | | |
| 13 | Provide transportation vouchers | Short term | | | |
| 14 | Adopt prescription mail options | Medium term | | | |
| 15 | Extend nontraditional work hours | Medium term | | | |
| Utilize impactful incentives and corrective actions | | | | | |
| 16 | Provide legal support for EMS decisions | Short term | | | |
| 17 | Create healthy rebate program | Long term | | | |
| 18 | Implement corrective action for proven cases of 911 abuse | Short term | | | |
| Create and launch a citywide education campaign | | | | | |
| 20 | Execute “911 Misuse Costs Lives” campaign | Short term | | | |
| 21 | Drive educational campaign for primary care | Short term | | | |
| 22 | Launch Memphis Wellness campaign | Medium term | | | |

Figure 4: Recommendation timelines

Recommendation 1: Drive collaboration among healthcare stakeholders

Looking at the collective recommendations of this report, collaboration on several fronts is key to the success of this initiative. A lack of holistic information around patients, decentralized information about services available for citizens' needs and fragmented, but strong, leadership across critical constituencies all need to be addressed to dramatically move the program forward.

Recommendation 1A: Implement a healthcare Steering Committee.

The recommendations in this report were influenced by more than 70 meetings the IBM team held with stakeholders who were directly affected by the 911 problem, as well as healthcare providers and thought leaders in the community. Every individual and group the IBM team interviewed is passionate and committed to improving the health of the community. All come from differing areas of expertise and collectively will be a powerful force for change.

The City's ability to implement these recommendations and move the needle on the health of Memphians will be the direct result of the governance and oversight that only a strong steering committee can bring. The actions outlined in this report will require true collaboration, drive and occasional course correction over time — not for just a month, or even a year, but well into the future.

Recommendation 1B: Expand integrated health records. At the federal, state and local levels, delivery of healthcare is being transformed into a patient-centered and value-based system, seeking to improve care while reducing unnecessary cost. The Centers for Medicare & Medicaid Services (CMS) have identified that critical to this transformation is a timely interoperable Health Information Exchange (HIE) among a variety of healthcare stakeholders (clinicians, laboratories, hospitals, pharmacies, health plans, payers and patients). CMS encourages HIEs through existing Medicare and Medicaid programs, as well as new programs authorized under the Patient Protection and Affordable Care Act (PPACA), and offers matching state funding at the 90% level for investment in this area.

An HIE is needed for Memphis. To build the HIE, EHRs are real-time, patient-specific records that make information available instantly whenever and wherever it is needed. Making this available to Memphis health service providers will enable a comprehensive view of the patient to achieve holistic care from all providers. A number of stakeholders interviewed, including EMS personnel, hospitals and other healthcare providers, cited the problem of patients receiving care at multiple facilities within days of each other, which suggests not only multiple 911 calls but also duplicate examinations, testing and treatment.

Recommendation 1C: Coordinate community resources. Memphis has a large, highly dedicated community of healthcare providers, including nonprofit services for the poor or underserved. However, this community is fragmented, and it is difficult for underserved citizens to find available services and for healthcare providers to refer patients to services that meet their individual needs. As a result, many people default to using 911 to get convenient, stop-gap care. Unfortunately, that solution does not address the overall health of the individual, which often means they repeatedly use 911. As EMS personnel or social workers intervene to help an individual, they need a convenient, up-to-date listing of services to aid in that effort.

Recommendation 1A: Implement a healthcare Steering Committee

The City should form a collaborative healthcare Steering Committee of various Memphis healthcare stakeholders to guide implementation and ongoing success of the recommendations in this report.

Scope and expected outcomes

Scope

The mayor should immediately form a Steering Committee of community stakeholders representing the breadth of interests. The size of the Steering Committee should be manageable, with no more than 20 representatives.

The Steering Committee will develop a charter and form subcommittees for further studies and fund-raising and to lead implementation of various recommendations.

The Steering Committee will meet at least quarterly to review performance and the status of projects and to agree on course corrections as needed to speed up successful efforts or shut down activities where benefits do not materialize.

The Steering Committee membership can change over time, under the oversight of the Mayor's Office.

Expected outcomes

A cohesive leadership team will guide and monitor action, as well as measure and promote success across the community. Additional outcomes include the following:

- **For EMS:** Reduction in low-acuity 911 calls
- **For Memphians:** Visible leadership they can trust to improve the community, voice in the change and confidence that health services are available
- **For healthcare providers:** A voice in the change, assurance that no stakeholder benefits at the expense of others and improved efficiency and services

Cost of inaction

None or few of the recommendations or improvements will be implemented, 911 service costs will continue to rise and no improvement will be seen by citizens.

| Proposed owners and stakeholders | Suggested resources needed |
|--|---|
| Owners: <ul style="list-style-type: none"> • Mayor Jim Strickland • MFD Director Gina Sweat Stakeholders: <ul style="list-style-type: none"> • Innovate Memphis • City communications and legal/risk offices • City Council representatives • Chamber of Commerce/ Chairman's Circle • MFD Medical Director • Local hospital representative(s) • Nonprofit provider leadership • Faith-community leadership representative(s) • Foundations/alliances • Local corporations • Insurers/payers • Shelby County Health Department • Universities | Resources: <ul style="list-style-type: none"> • Volunteers serve at the request of the mayor • Time commitment to meet initially, then quarterly over time • Minimal operating supplies furnished by Innovate Memphis office • Public space for meetings, such as main library meeting area Cost estimate: Low to no cost |
| Dependencies | Key milestones, activities and time frame |
| This recommendation is mandatory for the success of the whole suite of recommendations. | Short term: <ul style="list-style-type: none"> • Implement Steering Committee • Develop Steering Committee charter • Assign subcommittees • Meet to track and monitor progress |
| Priority | |
| High | |

Recommendation 1B: Expand integrated health records

The City should sponsor implementation of an HIE to house EHRs for Memphis citizens. The City should give healthcare providers access to this comprehensive patient information to integrate and improve overall care.

Scope and expected outcomes

Scope

The City should sponsor the development, implementation and ongoing maintenance of an HIE for the citizens of Memphis. This will include expanding participation of local healthcare providers to feed real-time patient records to a secure system and ongoing subscription for the following:

- MFD Emergency Health Services (for 911 calls and follow-up)
- Hospitals and primary care physicians
- Other healthcare providers

MidSouth eHealth Alliance (MSeHA) is one of the oldest HIEs, but it has been fairly stagnant since its inception in 2008. Out of more than a thousand health organizations in Memphis, only 24 contribute data and 17 retrieve records from the service. MSeHA currently has records for approximately 1.5 million patients and approximately 15 million total records. MSeHA envisions expanding its utility with solutions that span healthcare providers. This vision should include the following features:

- Build out an infrastructure and an innovation platform for additional features and scalability
- Add new features and functionality to ICA software to improve ease of use and enable add-on features, including third-party applications
- Enable medication history and mental health records
- Implement reporting and analytics tools for data mining of individual records and to capture trending and performance statistics

Continue efforts to attract and retain healthcare provider participants, using available funding sources to keep subscription costs low for small and nonprofit providers. The value of an HIE is directly dependent on improving the subscription rate.

Provide MSeHA access to EMS personnel to support emergency care and to aid in directing patients to the appropriate healthcare provider. Wifi-enabled devices should also be available for field use.

Patient consent and provider privacy policies should be sufficient, but adding mental health data or expanding to a universal Personal Health Portal would potentially require further privacy, security and legal review.

The MSeHA Board and Executive Director sponsor team should do the following:

- Focus on continued improvement of user-desired features, such as sending an alert to providers when their patients seek care elsewhere
- Identify “next generation” features, such as a patient risk-assessment tool
- Investigate other HIE tools or additional improvements to MSeHA that the user community desires
- Conduct periodic user surveys and gather statistics on MSeHA participation and performance

The Steering Committee should require periodic reports from MSeHA to evaluate its use and benefit to providers and citizens.

Expected outcomes

An up-to-date repository of patient healthcare records that providers can easily query to influence better holistic care, supported by reporting tools and analytics. Additional outcomes include the following:

- **For EMS:** Access to patient records to conduct better assessments, redirect patients to alternative care and reduce 911 calls
- **For people in need:** Improved care while avoiding duplicate or redundant tests, improved health through providers’ ability to identify and resolve conflicting care or medications
- **For service providers:** Ability to review total care history of a patient for better holistic care, ability to proactively encourage screenings and preventive care, as well as better performance against evolving CMS measures

Recommendation 1B: Expand integrated health records (continued)

Scope and expected outcomes (continued)

Cost of inaction

Health records will continue to be fragmented or absent; higher costs for EMS services, hospitals and insurance; and limited ability to influence better care for citizens. Additional costs include the following:

- **Cost to EMS:** Inability to direct 911 callers to the most appropriate care
- **Cost to citizens:** Increase in healthcare costs, less than ideal care and “band-aid” treatment rather than holistic care
- **Cost to service providers:** Less than ideal care to patients, performance penalties for recidivism (hospital readmissions) and misdirected resource use

| Proposed owner and stakeholders | Suggested resources needed |
|--|--|
| <p>Owner: Healthcare Steering Committee</p> <p>Stakeholders:</p> <ul style="list-style-type: none"> • MSeHA Executive Director • MSeHA Board • Hospital providers • Primary care physicians and healthcare providers • MFD and EMS services • Memphis Communications Department <p>The State of Tennessee is currently the largest sponsor, followed by local hospitals.</p> | <p>Resources:</p> <ul style="list-style-type: none"> • MSeHA Executive Director • IT resources — ICA and others • User group — cross section of provider population <p>Cost estimate: High</p> <ul style="list-style-type: none"> • Significant financial investment could be funded over time; however, as noted above, new federal and state funding can be obtained to split 90/10 the costs of improvements. • Subscription fees should cover operating costs. |
| Dependencies | Key milestones, activities and time frame |
| <p>This recommendation is not dependent on other recommendations, but success is dependent on the participation of the Memphis healthcare community for complete records. The value of any HIE is directly dependent on participation.</p> <p>Having comprehensive healthcare records will assist care providers’ decision-making in a number of other processes, including 911 improvements.</p> | <p>Short term:</p> <ul style="list-style-type: none"> • City advocate healthcare community participation, based on upcoming improvements • Campaign to improve subscription rate and sign up members • Improve MSeHA functionality and roll out changes <p>Medium term:</p> <ul style="list-style-type: none"> • Implement data analysis and reporting tools • Investigate alternative long-term tools <p>Long term:</p> <ul style="list-style-type: none"> • Potentially implement next-generation tools or combine with larger statewide or region-wide HIE |
| Priority | |
| High | |

Recommendation 1C: Coordinate community resources

The City should develop a comprehensive listing of healthcare and social services for EMS and other agencies to improve benefits to the underserved citizens of Memphis.

Scope and expected outcomes

Scope

The Steering Committee should commission one organization and a small team to manually collect existing website resources and physical listings, until an automated replacement (web portal) is available. The public web portal should link current web resources and capture non-digital information.

The Steering Committee should determine how to provide training and access for all 911 nurses, EMS and paramedic staff, social workers and other healthcare referrers and distribute wifi-enabled devices for EMS and paramedic staff to utilize in the field.

Expected outcomes

A comprehensive and up-to-date listing of available healthcare and social services to be used to match citizens' needs to available services.

Additional outcomes include the following:

- **For EMS:** The ability to act as an enabler or social worker to help underserved citizens get the appropriate help they need to survive and thrive
- **For people in need:** Assistance wading through resources that are hard to find or understand to get to the right care at the right time
- **For service providers:** The ability to more easily find resources to address the health or social issues that they can't serve, improving value for the patient

Cost of inaction

Inaction will result in a continued shortage of appropriate services for citizens in need and the risk that citizens will continue to rely on 911 or not be served at all.

| Proposed owner and stakeholders | Suggested resources needed |
|--|--|
| <p>Owner: City of Memphis</p> <p>Stakeholders:</p> <ul style="list-style-type: none"> • MFD and EMS services • Social services providers • Contributing organizations | <p>Team to gather information and compile initial listing</p> <p>Technology solution to implement a portal to access existing listings, such as those maintained by the following organizations:</p> <ul style="list-style-type: none"> • AAAD Aging Commission of the Mid-South • Common Table Health Alliance • Safety Net Collaboration • LINC 2-1-1, the Library Information Center at the Memphis Public Library • Others TBD <p>Cost estimate: Low — could be funded through grants or local business investment</p> |
| Dependencies | Key milestones, activities and time frame |
| <p>Other recommendations are dependent on this one; improved processes will be more effective if this information is available to emergency services providers.</p> | <p>Short term:</p> <ul style="list-style-type: none"> • Staff team • Update listings and disseminate • Plan IT services to implement portal • Develop and implement portal |
| Priority | |
| High | |

Recommendation 2: Innovate the 911 EMS response process

The theme of the IBM team's recommendations is to make changes that result in improved medical care for *everyone* within the limits of a well-funded EMS system. The objectives are the following: 1) better understand the medical needs of the 911 caller, 2) dispatch the appropriate level of EMS resources or provide direction to more-appropriate alternatives, 3) provide the appropriate level of care at the time of contact, which may include transportation to a hospital, 4) advise, and in some cases specify, the most appropriate destination facility when a patient requires transport and 5) proactively and reactively provide non-emergent care and patient follow-up outside of the 911 response system.

Memphis EMS is already in the process of making a number of improvements to its 911 response system. The recommendations largely support, extend and augment these nascent projects.

Memphis EMS operates under a well-defined set of state rules, local protocols and written and implied City policies. Most of the IBM team's recommendations have implications for, and dependencies on, one or more of these rules, protocols and policies. Separate recommendations appear later in this document and address the necessary enabling changes.

The seven recommendations that follow are inherently interdependent. It's possible to implement one alone, but the effects of each recommendation build on the others. The City should consider bundling recommendations together as a single initiative to achieve maximum efficiency.

Recommendation 2A: Create a consolidated view of CAD and ePCR data. The Memphis Fire Department (MFD) needs a complete and cohesive picture of all 911 EMS activity. This picture is necessary to direct and manage the new innovative initiatives addressed in this report as well as to measure their efficacy. Today, the computer aided dispatch (CAD) system shares only a subset of its data with the electronic patient care reporting (ePCR) system. The MFD needs to have access to a single, comprehensive, real-time data source for reporting.

Recommendation 2B: Limit wait time at Emergency Departments for units. The MFD now routinely runs out of ambulances, requiring that private services be contacted and asked to respond to 911 calls. During the critical periods of shortage, saving one call or getting one ambulance back in service more quickly can literally be a matter of life or death for the next 911 caller. There already exists a procedure called "Delayed Offload of Patients to the ED," which empowers the MFD to leave a non-critical patient in a hospital's ED waiting room after sufficient wait time has passed. It is unclear whether this procedure is being used, is effective or is able to be implemented in a more aggressive manner. The MFD needs to encourage use of this procedure, especially during times of high system use, to evaluate its impact on the availability of ambulances.

Recommendation 2C: Institute EMS-initiated refusal of transport. Abuse of the 911 EMS system can occur through ignorance or arrogance. In the former case an ambulance crew can consult with a patient and, with the patient's consent, direct them to more-appropriate care. In the latter case, the patient will not likely consent to alternative care. For a select number of these encounters — for subjects that literally call and are transported by ambulance dozens of times per year — EMS needs to be empowered to just say "no" if circumstances support such a decision. While not widely adopted,³ it is recognized as a tool of last resort and balances the risk of not transporting a habitual abuser of the 911 system against the risk of not having an ambulance available to service a critical patient^{4,5}.

Recommendation 2D: Implement the Emergency Communication Nurse (ECN) program. The majority of 911 EMS calls are for non-acute conditions that could be addressed through non-emergent care. The barriers to this include the inability of the patient to self-diagnose emergent/non-emergent signs and symptoms and the patient's lack of awareness of healthcare alternatives. An ECN program puts a nurse on the line with a low-acuity caller to conduct a secondary triage and attempt to guide the patient to an appropriate level and mode of care.^{6,7,8} The MFD already has progressed down the road of piloting an ECN program, and this recommendation supports that direction with the addition of implementing a tiered response model.⁹

Recommendation 2E: Implement destination hospital balancing.

Patients are always encouraged to allow themselves to be transported to the most appropriate hospital for their condition. Regardless, there is a sense that policy or rules allow patients to ultimately dictate their hospital choice at all times, potentially overriding the “most appropriate” recommendation and allowing for wholly inappropriate choices for emergent care. Patient choice comes into direct conflict with the “good of the many” during peak usage periods for ambulances. A patient’s choice of a hospital across town or one that is known to be overloaded can take an ambulance out of service double the amount of time that is necessary to provide for the patient’s appropriate care. This recommendation seeks to achieve a balance of patient’s wishes and the reality that an EMS system that has no ambulances available potentially puts the next 911 EMS caller at grave risk.

Recommendation 2F: Enhance the Navigator program. Community paramedicine or mobile integrated healthcare (MIH) programs utilize EMS resources in a proactive capacity.¹⁰⁻²⁰ EMS practitioners in the community visit with what would otherwise be 911 callers to ensure they are getting to doctor’s appointments, are being compliant with physician’s orders and are getting the social services and other support they require. MIH benefits a variety of stakeholders. The MFD has a “Navigator” MIH pilot program in place. This recommendation supports that initiative and seeks better integration with other aspects of the EMS and healthcare system in general.

In Figure 5, data shows that the number of frequent flyers increased from 2011 to 2013 and then almost stabilized at an average of 2,000. The Navigator program should proactively address those callers and has a potential to reduce this number. The coordination of community resources (under Recommendation 1) will provide a series of alternatives to 911 that can be referred by the Navigators for this population, enhancing its results.

Recommendation 2G: Implement a targeted telemedicine pilot.

Many recommendations made in this section would benefit from a simple implementation of telemedicine, to wit, video conferencing. Having a nurse practitioner, physician’s assistant or physician on-line with an EMS practitioner on scene with a patient would support and improve the results of the ECN, Navigator, destination hospital balancing and EMS-initiated refusal of transport recommendations.

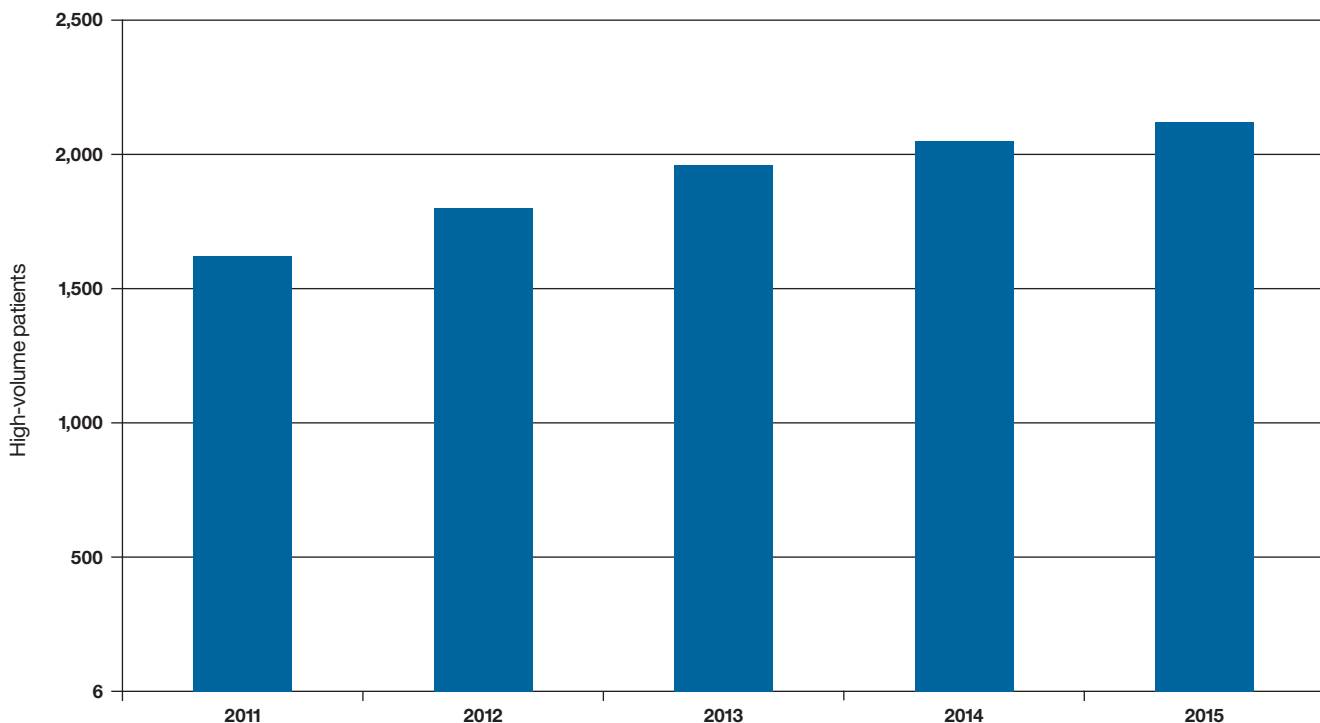


Figure 5: High-volume patients (≥5 calls in a year)

Recommendation 2A: Create a consolidated view of CAD and ePCR data

Memphis EMS should develop and deploy a database that provides a view across both CAD and ePCR systems data.

Scope and expected outcomes**Scope**

The Memphis EMS system generates 911 call and response data in both its computer aided dispatch (CAD) and electronic patient care reporting (ePCR) systems. A consolidated view of this data is essential to support decision-making and measurement of the EMS system's performance. The IBM team recommends using the existing ImageTrend platform for provisioning this data mart for a number of reasons: There is already a base of experience with the environment, much of the CAD data is already transferred to their platform, Memphis EMS is familiar with the report generation tools and it provides HIPAA-compliant security.

Expected outcomes

For the Memphis EMS to make well-informed decisions, it would require an up-to-date, complete view of the call-and-response data. Having a consolidated repository would allow for analysis that is not possible today except through heroic, one-time efforts. For example, it is not currently possible to ask how far responding units traveled to incident locations where the provider's primary impressions were SOP #202 Drug Ingestion. In addition, data that is bridged from both systems will help create performance metrics for various EMS initiatives. For example, a measure of success for the nurse triage program may consider calls that were handled, resolved without EMS resources being dispatched but resulted in follow-up EMS runs.

Cost of inaction

The lack of straightforward access to timely, consolidated data across these systems will hamper future decision-making within EMS and hinder its ability to measure system performance. The difficulty in accessing and consolidating data even on a project-by-project basis will deter its use and will result in decisions being made without it.

| Proposed owner and stakeholder | Suggested resources needed |
|---|--|
| <p>Owner: Memphis EMS</p> <p>Stakeholder: Memphis EMS</p> | <ul style="list-style-type: none"> Development of data mart on ImageTrend platform Technical support from CAD team and vendor <p>Cost estimate: Medium — estimated \$40,000 for initial provisioning, \$6,400 annually for maintenance on ImageTrend. There may be some support costs from CAD software vendor.</p> |
| Dependencies | Key milestones, activities and time frame |
| None | <p>Medium term:</p> <ul style="list-style-type: none"> Document understanding of requirements on CAD system and size of repository required Secure funding Enter into agreements Deploy and test |
| Priority | |
| High | |

Recommendation 2B: Limit wait time at Emergency Departments for units

Memphis EMS should encourage the use of the “Delayed Offload of Patients to the ED”²¹ procedure and potentially expand its scope.

Scope and expected outcomes**Scope**

During peak periods (weekdays, 10:00 am to 6:00 pm) 10% of the transports result in arrival-to-patient-release time, or “wall time,” at area EDs exceeding 40 minutes, with many hospitals exceeding one hour. There is a documented procedure that enables providers to limit their wall time to 45 minutes. An estimated 25,000 patients met the clinical and demographic criteria for this procedure in 2015, and more could potentially meet the criteria if unwarranted interventions (routine IV access and 12-lead electrocardiograms (ECGs), for example) were reduced. It is not possible at this time to track the use of these procedures. This might be a significant tool to release units during peak periods. Once data has been collected, the current procedure can be evaluated with the intent of loosening some of its constraints. This may result in more patients being eligible or a shorter amount of time before action is triggered.

Expected outcomes

During peak EMS system usage, reducing the cycle time for calls is paramount. If this procedure results in even a few units being put into service sooner, periods in which no units are available could be avoided. There would also be fewer instances of ambulance outages.

Cost of inaction

This offloading procedure is already in place. To stop aggressively using it would likely contribute to ED congestion and ambulance outages.

| Proposed owner and stakeholders | Suggested resources needed |
|---|---|
| Owner: Memphis EMS Stakeholders: <ul style="list-style-type: none"> Memphis EMS Medical Director Area ED managers | <ul style="list-style-type: none"> Educational and awareness training materials Manager/trainer Squad training Add offloading procedure to ePCR procedure list Add computed field for offloading eligibility to ePCR <p>Cost estimate: Low</p> |
| Dependencies | Key milestones, activities and time frame |
| Requires changes to protocols if criteria are changed | <p>Short term:</p> <ul style="list-style-type: none"> Initiate changes to ePCR system Develop education and awareness materials Conduct education/awareness campaign Quality assurance/quality inspection (QA/QI) of sample cases Develop audit report and provider coaching program After three months, consider fine-tuning criteria |
| Priority | |
| High | |

Recommendation 2C: Institute EMS-initiated refusal of transport

Memphis EMS should implement a trial program that refers 911 patients to alternative resources for care when they obviously will not medically benefit from being transported to the ED by ambulance.

Scope and expected outcomes

Scope

There is global recognition that EMS systems frequently encounter callers for whom transport to a hospital ED by ambulance is medically unnecessary. This is a sensitive topic given that a false negative determination — a patient in need of emergent care who is steered away from it — can result in grave consequences. There are no prospective, clinically significant studies on this subject. Regardless, EMS systems in the US (14 as of a 2009 study) have implemented some form of EMS-initiated refusal of transport.³ Weighing the risks, Memphis EMS should consider a refusal program that would be based on a conservative protocol, the use of online medical control and the use of alternative transportation facilitated by the ECN during normal business hours.

Expected outcomes

When there is potential for running out of available units, reducing the number of calls by one can literally mean the difference between life and death for a caller with a true medical emergency. A conservative, low-risk implementation of an EMS-initiated refusal of transport trial should result in a small reduction in the number of transports at times of critical capacity.

Cost of inaction

Not pursuing this trial maintains the status quo, an environment in which the 911 caller retains full control over whether they will be transported to the ED by ambulance, with no regard to medical necessity. The impact of inaction is a continued burden on the Memphis EMS system and the risk that a critical 911 call will be missed in favor of an unnecessary transport.

| Proposed owner and stakeholders | Suggested resources needed |
|---|--|
| <p>Owner: Memphis EMS</p> <p>Stakeholders:</p> <ul style="list-style-type: none"> • Memphis EMS • Medical Director • City of Memphis | <ul style="list-style-type: none"> • Changes to EMS protocols • Educational and awareness training materials • Squad training • Add EMS-initiated refusal of transport procedure to ePCR procedure list <p>Cost estimate: Low</p> |
| Dependencies | Key milestones, activities and time frame |
| <ul style="list-style-type: none"> • Requires addition of EMS-initiated refusal of transport procedure to protocols • Requires a change or clarification of City policy regarding 911 EMS responses | <p>Long term:</p> <ul style="list-style-type: none"> • Initiate changes to ePCR system • Develop EMS-initiated refusal of transport procedure (protocol) • Develop education and awareness materials • Conduct education/awareness campaign • QA/QI sample cases |

Priority

High

Recommendation 2D: Implement the Emergency Communication Nurse program

Memphis EMS is in the process of implementing an Emergency Communication Nurse (ECN) program pilot. This recommendation supports that pilot and its potential expansion if successful.

Scope and expected outcomes

Scope

An estimated 50% to 60% of 911 calls for EMS do not rise to a level of acuity that requires ambulance transport to an ED. EMS systems around the globe are using ECNs to further triage low-acuity calls and, where appropriate, arrange for alternative forms of care or transport. Reported rates of diversion away from ambulance transport range from 10% to almost 90%, likely a function of the initial triage resulting in the calls being referred to the ECNs. In 2015, Memphis EMS responded to almost 24,000 Alpha-level (low-acuity) and 1,000 Omega-level (very-low-acuity) calls. A modest assumption of diverting 25% of the Alpha and 50% of the Omega calls would reduce transport volume by 6,500, an approximately 5% reduction. The benchmark for ECNs is to handle approximately 8 calls per hour, or approximately 15,000 calls per year. Given Memphis's call volume, it may require two to three ECNs to meet the call-reduction volumes, but the financial impact and decreased stress on the EMS system would be compelling.

The IBM team recommends the use of first-responder resources to supplement the ECN program. As the program initially builds out, there will be an overflow of Alpha and Omega calls that the nurse will not be able to handle. Rather than falling back on a standard ambulance response, BLS crews should respond on existing fire apparatus and perform an in-person triage to determine if the patient needs an ambulance or alternate services. Even as the program reaches full staffing, it is likely that there will be subsets of low-acuity calls that can be more-successfully triaged by in-person EMS resources versus the ECN. Assuming this is the case, Memphis EMS can continue to use first-response crews as adjuncts to the ECN program — perhaps investing in smaller, less-expensive rapid-response vehicles to replace typical fire apparatus.

Expected outcomes

Because populations and systems vary greatly, the most valuable outcome from the ECN pilot will be to establish performance metrics. These metrics can be used to gauge the desirability of expanding the implementation. In addition, the pilot will reveal the range of public and private resources necessary to accommodate the needs of the non-emergent, low-acuity caller population. A gap analysis can be performed at the end of the pilot to determine if new services need to be identified or cultivated.

Cost of inaction

The volume of low-acuity, non-emergent calls will not decrease without overt action. Individuals will continue to turn to the 911 system for routine healthcare needs and sap the 911 EMS system of resources, increasing costs and potentially leaving callers facing life-threatening emergencies without an ambulance. In addition, these patients will continue to receive suboptimal episodic treatment instead of the more comprehensive long-term care they require.

| Proposed owner and stakeholders | Suggested resources needed |
|---|---|
| <p>Owner: Memphis EMS</p> <p>Stakeholders:</p> <ul style="list-style-type: none"> Memphis EMS Medical Director City of Memphis | <ul style="list-style-type: none"> ECN workstation and software ECN staffing Educational and awareness training materials Squad training Changes to ePCR to capture ECN intervention <p>Cost estimate: Medium</p> |
| Dependencies | Key milestones, activities and time frame |
| Requires a change or clarification of City policy regarding 911 EMS responses | <p>Short term:</p> <ul style="list-style-type: none"> Install ECN workstations and software Hire and train ECN(s) Awareness training to Memphis EMS providers Make necessary changes to ePCR to capture ECN intervention Track and analyze results of pilot |
| Priority | |
| High | |

Recommendation 2E: Implement destination hospital balancing

Memphis EMS should pilot a program whereby transport destination is solely determined by the EMS system during periods of high call volume.

Scope and expected outcomes

Scope

The destination hospital for a 911 caller who is transported is currently determined jointly by the patient and the EMS system — based on the nearest appropriate facility and patient preference. Patients exercise their right to choose approximately 60% of the time. While this accommodation is largely reasonable, during peak periods (weekdays, 10:00 am to 6:00 pm) patient choice can contribute to poor system response times and congestion at critical facilities. For example, in 2015 several hundred Alpha (low-acuity) level calls were transported to Regional One (Memphis's trauma center) during these peak periods. If a patient chooses a distant hospital location or a hospital that is currently experiencing long offload times, they extend the ambulance unit's turn-around time, potentially leading to the system running out of available ambulances. A system without ambulances cannot adequately respond to true, life-threatening emergencies. (The assumption is that a patient exercising their right to choose their destination is not experiencing a true, life-threatening emergency because they would most likely defer to the EMS crew to pick the closest, most appropriate facility.) This recommendation is to allow the EMS system to unilaterally choose the destination facility in periods of extreme ambulance usage (28 or more ambulances in service concurrently). This would affect an estimated 10,000 transports per year, on the order of 10% of all responses.

Expected outcomes

During peak EMS system usage, reducing the time between an ambulance's dispatch and return to service is paramount. Limiting patient choice during critical, high-volume periods will result in units returning to service sooner and an avoidance of out of ambulance situations. The criteria for invoking this special procedure would be adjusted to minimize the impact on 911 callers while meeting the objectives of the program.

Cost of inaction

Continuing to allow unrestricted patient choice of destination contributes to the congestion of the EMS system during peak hours. This congestion puts lives at risk because ambulances are not able to respond to true, life-threatening emergencies in a reasonable time frame.

| Proposed owner and stakeholders | Suggested resources needed |
|---|--|
| <p>Owner: Memphis EMS</p> <p>Stakeholders:</p> <ul style="list-style-type: none"> • Memphis EMS • Medical Director • Area ED managers • City of Memphis | <ul style="list-style-type: none"> • Develop EMS destination choice procedure • Determine approach to staffing “air traffic control” position during peak periods • Identify information sources and technology to determine destination • Add EMS destination choice to ePCR “reason for destination choice” list • Conduct education/awareness campaign • QA/QI sample cases <p>Cost estimate: Medium</p> |
| Dependencies | Key milestones, activities and time frame |
| <ul style="list-style-type: none"> • Requires changes to protocols to add EMS destination determination procedure • Requires state EMS rule/statute change or waiver | <p>Medium term:</p> <ul style="list-style-type: none"> • Identify “air traffic control” resource • Develop education and awareness materials • Conduct education/awareness campaign • QA/QI sample cases • Develop audit report and provider-coaching program • After three months, consider fine-tuning criteria |
| Priority | |
| High | |

Recommendation 2F: Enhance the Navigator program

Memphis EMS should continue the current Navigator pilot and increase its impact through better integration with existing processes and systems and increased resources.

Scope and expected outcomes

Scope

Using community paramedics to reduce the volume of 911 calls and hospital readmissions has demonstrated success across a large number of EMS systems. The Memphis EMS Navigator program is in its infancy, and it must be developed to realize the full potential of its benefits. The IBM team has heard anecdotally that community paramedics may carry a caseload of 250 patients. This is clearly not possible without the tools and technology to operate efficiently. Thus, the IBM team recommends that the pilot be continued and that Memphis EMS document a charter for the program and establish quantifiable metrics that will determine what defines success. Such a charter should consider new initiatives that may be adopted, such as the emergency communication nurse pilot. The Navigators should be given the tools they need to better manage their caseload, including proactive alerts from EMS dispatch when Navigator clients call 911, access to integrated healthcare records (see Recommendation 1B) and an additional vehicle to allow for individual Navigator visits when a team visit is unnecessary. A proactive referral program should be instituted in collaboration with the EDs and primary care physicians.

Expected outcomes

The outcomes are to be defined through the process of developing the charter. An obvious metric for patients who are entered into the program reactively would be the reduction in use of 911 by Navigator clients. It is important to define outcomes that can be accurately tracked and, ideally, have bearing on clinical outcomes.

Cost of inaction

The program's impact will not be fully realized, which will put its future in jeopardy.

| Proposed owner and stakeholders | Suggested resources needed |
|--|--|
| <p>Owner: Memphis EMS</p> <p>Stakeholders:</p> <ul style="list-style-type: none"> Memphis EMS Medical Director Insurers Hospitals and physicians | <ul style="list-style-type: none"> Integration with EMS dispatch, including emergency communication nurse Access to integrated healthcare data Additional vehicle <p>Cost estimate: Medium</p> <ul style="list-style-type: none"> Funding to outfit additional vehicles could come from local business community Potential \$2.5 million federal grant being pursued by Common Table Health Alliance; intended to screen Medicare/Medicaid beneficiaries and focus on the most frequent users Insurers may invest in the program as a means to reduce long-term patient costs |
| Dependencies | Key milestones, activities and time frame |
| Requires adoption of, and access to, a healthcare information exchange | <p>Short term:</p> <ul style="list-style-type: none"> Develop charter, adopt metrics, implement tracking, agree upon evaluation period <p>Medium term:</p> <ul style="list-style-type: none"> Make changes necessary to fully integrate with EMS dispatching Fund and purchase second vehicle <p>Long term:</p> <ul style="list-style-type: none"> Develop awareness campaign directed at EDs and physicians QA/QI sample cases Consider expansion of program |
| Priority | |
| High | |

Recommendation 2G: Implement a targeted telemedicine pilot

While telemedicine is a broad and potentially complex area, Memphis EMS should implement a trial program that leverages simple technology, such as real-time video conferencing, to augment other initiatives.

Scope and expected outcomes

Scope

The use of telemedicine is growing rapidly, especially in rural areas where access to specialized care is limited. The IBM team believes that the simplest form of telemedicine, in the form of physician-patient videoconferencing, can be piloted as part of other initiatives found in these recommendations. Obvious candidates are the EMS-initiated refusal to transport and the EMS determination of destination pilots. A physician or appropriate surrogate communicating via two-way video communication with a patient and the provider on scene can provide an additional level of assessment and confer credibility to EMS crew recommendations. A simple person-to-person video communication, over FaceTime for example, is HIPAA compliant. The fact that this recommendation would be for devices under the control of Memphis EMS — in the hands of a known remote healthcare provider and responding to a patient in the presence of an EMS crew — would further ensure compliance.

Expected outcomes

A simple, inexpensive video-conferencing-based consultation between a 911 caller and a physician might help ensure that a recommendation to seek alternative care or to be transported to an alternative hospital is accepted more readily. This pilot would improve the success rate — as measured by fewer complaints and higher patient satisfaction — of the pilots for EMS-initiated refusal to transport and EMS determination of destination. It will also support EMS providers in assuming a new level of responsibility for decisions on patient care.

Cost of inaction

A higher level of resistance to, and dissatisfaction with, the EMS-initiated refusal to transport and the EMS determination of destination pilots.

| Proposed owner and stakeholders | Suggested resources needed |
|---|---|
| <p>Owner: Memphis EMS</p> <p>Stakeholders:</p> <ul style="list-style-type: none"> • Memphis EMS • Medical Director • City of Memphis | <ul style="list-style-type: none"> • Equipment and services to support video conferencing • Changes to EMS protocols • Add telemedicine consultation to ePCR procedure list <p>Cost estimate: Low</p> |
| Dependencies | Key milestones, activities and time frame |
| Requires modification to protocols that support EMS-initiated refusal to transport and the EMS determination of destination. | <p>Long term:</p> <ul style="list-style-type: none"> • Identify and obtain buy-in of hospital/medical control resources • Identify, fund and acquire necessary equipment and services • Initiate changes to ePCR system • Develop protocol changes • Create education and awareness materials • Conduct education/awareness campaign • QA/QI sample cases |
| Priority | |
| Low | |

Recommendation 3: Provide convenient service alternatives

The IBM team recommends addressing the gaps in service that currently exist in the healthcare system in Memphis. Providing convenient service alternatives to calling 911 plays a significant role in the overall strategic solution this report offers. The specific actions that make up this recommendation are to establish strategically based healthcare options for low- and no-income households, provide transportation vouchers to those in need of transport, obtain the services of community volunteers to contribute their skills and resources to support these recommendations, mail prescriptions to citizens who are unable to leave their homes and establish nontraditional hours of operation for healthcare providers. Separately these actions address different subsets of the population, but holistically they address the gaps in service that perpetuate misuse of the 911 and EMS systems.

In establishing strategically based care, the City must use existing metrics and data to determine exactly where care is needed. The IBM team created a heat map, plotting areas with high 911 call volumes relative to areas of low call volume. This data, combined with data comparing 911 call levels by zip code, gives a clear picture of high-volume 911 call areas in the city (Figure 6). Zip code 38109 has the highest number of 911 calls in total, while zip code 38106 has the highest call volume per capita. These regions should be the initial focus for establishing any of the new healthcare facilities or services described in this recommendation. Research and data support two options for providing these strategically placed healthcare facilities: 1) mobile health units and 2) fire stations that double as healthcare clinics.

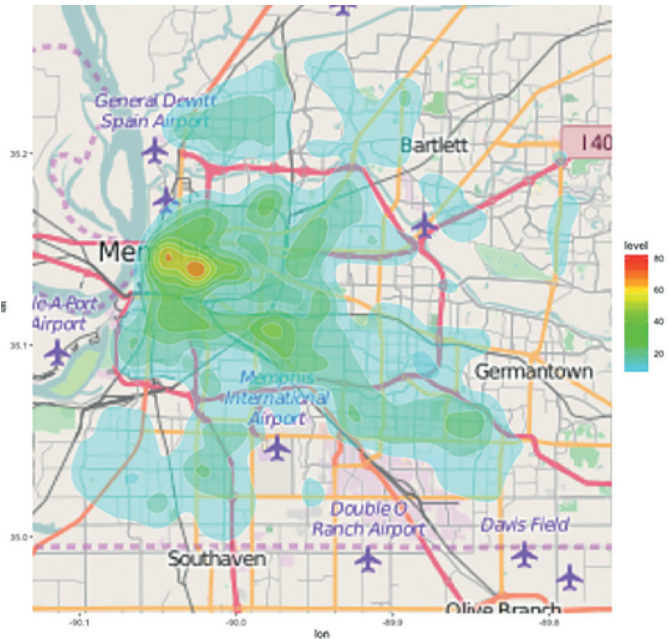


Figure 6: Heat map of EMS calls

| Zip code | EMS calls | Population | Calls/1,000 |
|----------|-----------|------------|-------------|
| 38106 | 9,886 | 24,640 | 401 |
| 38114 | 9,441 | 27,896 | 338 |
| 38108 | 6,254 | 18,685 | 335 |
| 38104 | 7,829 | 23,867 | 328 |
| 38107 | 5,366 | 17,118 | 313 |
| 38118 | 10,716 | 42,779 | 250 |
| 38109 | 11,572 | 46,265 | 250 |
| 38127 | 10,566 | 44,632 | 237 |
| 38122 | 5,350 | 23,586 | 227 |
| 38116 | 9,398 | 41,491 | 227 |
| 38111 | 9,516 | 44,612 | 213 |
| 38115 | 7,849 | 41,823 | 188 |
| 38128 | 7,817 | 43,440 | 180 |

Figure 7: EMS calls by zip code

Recommendation 3A: Implement mobile health units. Due to geographic isolation or lack of transportation, many citizens cannot access a doctor or healthcare provider. To meet this need, care delivery organizations, such as hospitals and health clinics, can operate strategically placed mobile health units. These units are uniquely qualified to provide high-quality care to underserved populations, for low-acuity situations, with considerable cost savings. St. Joseph Health, a \$4.4 billion nonprofit Catholic health system with 14 hospitals serving California, Texas and New Mexico, is a prime example. St. Joseph Health invests \$5 million annually in mobile health clinics, 11% of which is offset by reimbursements. These mobile clinics provide care through more than 32,000 patient encounters annually and offer services, such as primary care, dental care and vision care to people in need.²² Using data from the heat map, specific areas within the City of Memphis can be targeted with mobile health units. The Family Van is another example of successful mobile health units being operated in a metropolitan area. The Family Van is a nonprofit organization that started 18 years ago in Boston, Massachusetts. The Family Van’s charter is to empower community members through improved health literacy and preventive screenings to enable citizens to live healthier lives. The Family Van is one of an estimated 2,000 mobile health clinics across the United States.²³

Recommendation 3B: Operate fire station clinics. Operating small-scale health clinics in existing fire stations is an additional option to provide strategically located care for high-volume 911 areas. Fire stations are City property and would eliminate the need to build new facilities. Just as with mobile health units and minute clinics, fire station clinics would provide another convenient medium for treating low-acuity cases using basic life-support functions. To equip a fire station for providing these services, the appropriate personnel and equipment would need to be present. Doctors, nurses or nurse practitioners would serve as the staff, serving citizens locally rather than requiring them to travel across town to a primary care physician or the ED. This would provide care to low- and no-income community members. Similar practices have been executed successfully in other cities around the US. The City of Hayward, California, colocated a fire station and health clinic in 2015. Their goal, as stated by city officials, was to reduce overcrowding in hospital emergency rooms and provide care in an area of the city that has lacked adult health services. City-conducted research found that citizens are comfortable going to a fire station to receive care, and the cost savings of treating these individuals locally versus transporting them to the ED were significant.

Recommendation 3C: Provide transportation vouchers. Providing transportation vouchers is another action that will enable citizens who do not otherwise have the transportation means to access care. Memphis's public transportation system is out-of-date and inefficient, making it difficult for citizens without cars to access healthcare. Sometimes, this leads such individuals to call 911 for a ride to care. If the City invests in a travel voucher system, it can outline specific criteria to determine which citizens qualify. Similarly, some US cities have provisions for elderly citizens, or citizens who are unable to drive, that allow them to travel for free or significantly reduced prices using public transportation or a third-party vendor. The same principle would be applied in Memphis. Once qualified, citizens would receive vouchers by mail that they could redeem at sanctioned vendors. These vouchers would cover their roundtrip route to fill a prescription, visit their primary care physician or address other health and social service needs they may have.

Recommendation 3D: Adopt prescription mail options. The other side of solving transport issues is providing options in which citizens do not have to travel at all. One solution is to mail prescriptions to patients' homes, a service that is offered by many pharmacies and insurance companies. In Memphis, more than 30% of ED visits that arrive by ambulance have a prescription filled during their hospital visit. The subset of the patients who go to the ED solely to receive a prescription may decrease if physicians, pharmacies and patients all work together to have prescriptions mailed to patients regardless of their insurance status. There are a number of legal and administrative considerations, but finding an appropriate way to mail medicine to the people who need it would help improve preventive health access and likely decrease reliance on 911 and ambulance transport for prescriptions.

Recommendation 3E: Extend nontraditional work hours. Although providing transportation options will majorly support convenient service alternatives to Memphians, it is not the only gap in service. Most healthcare facilities, not just in Memphis but all across the US, close between 4 pm and 5 pm. Data that was obtained from the MFD and the EMS system (Figure 8) showed that the City experiences the highest 911 call volumes between 6 am and 2:30 pm (MFD shift 1) and between 2:30 pm and 11 pm (MFD shift 2). During peak 911 call times then, there are at least six hours during which non-ED healthcare providers are unavailable. Providing services during nontraditional hours of operation would empower citizens to utilize measures other than 911 to receive care. Whether this means operating mobile health units in strategically placed neighborhoods from 5 pm to 10 pm on certain days or having fire station health clinics open to the public until midnight, there are creative ways to provide healthcare during the hours when the citizens of Memphis need it most.

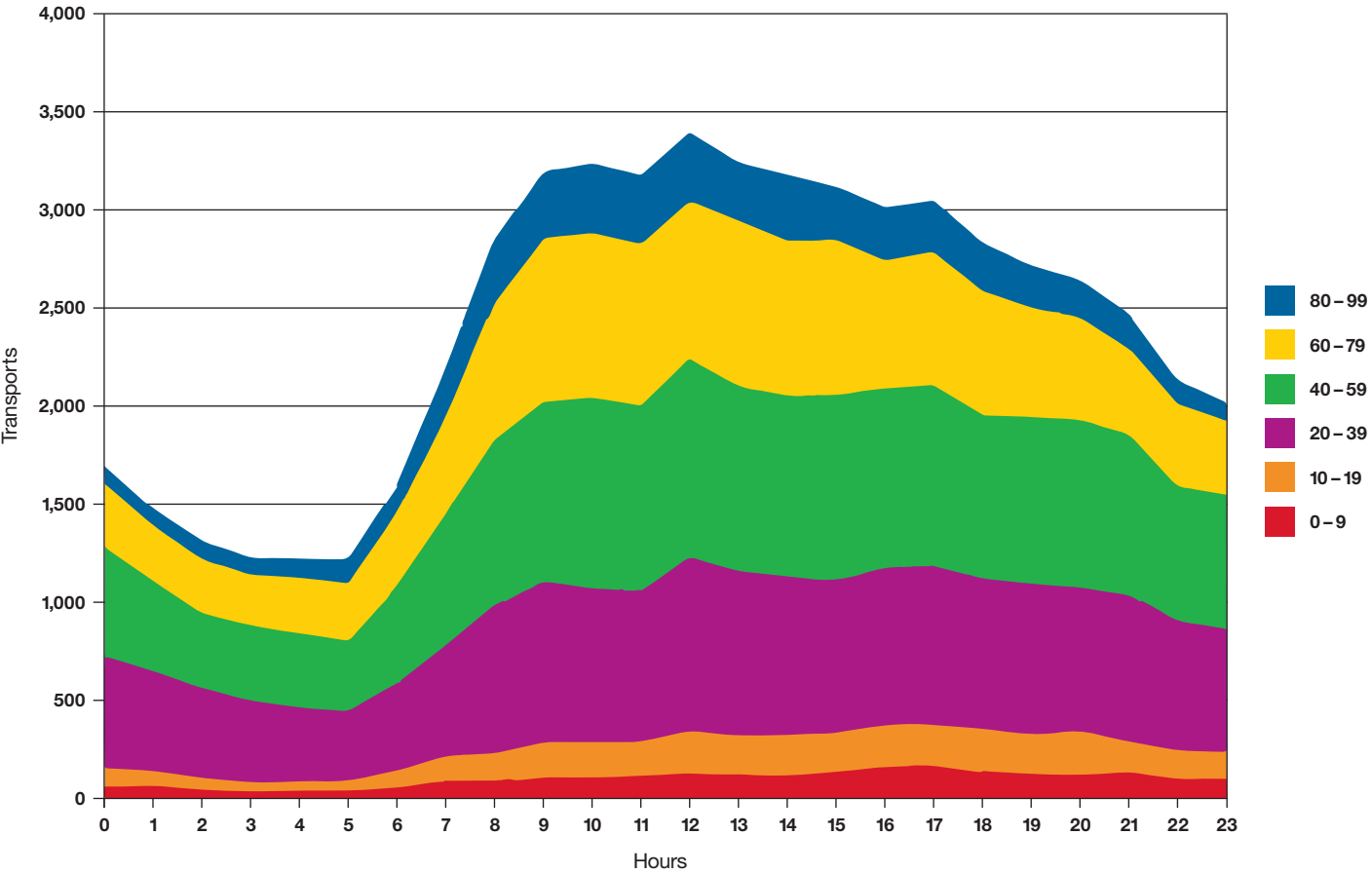


Figure 8: Weekday transports by hour and age group

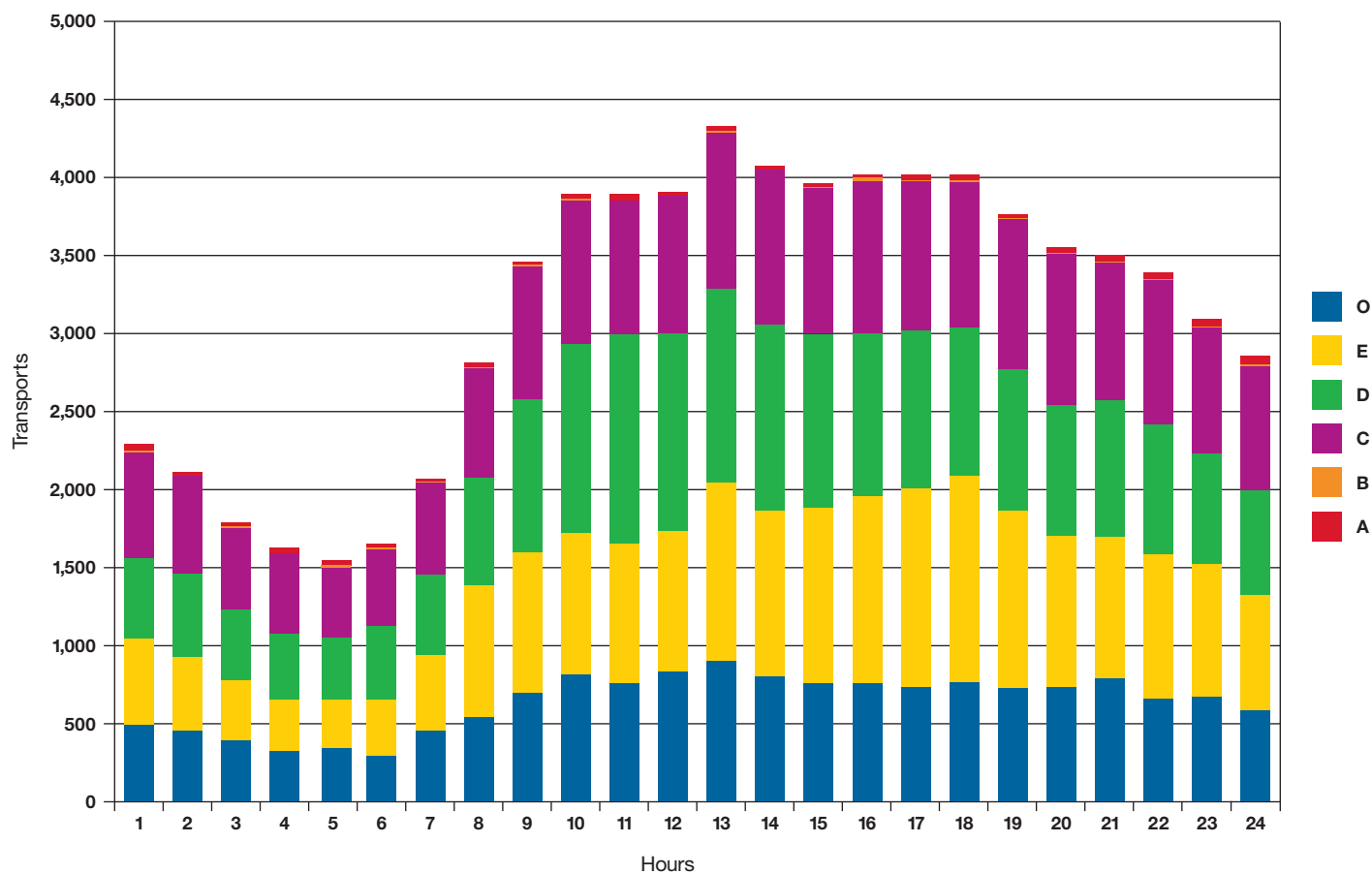


Figure 9: Call volume by hour of day

Recommendation 3A: Implement mobile health units

The City should provide convenient healthcare service alternatives for its citizens, including mobile health units.

Scope and expected outcomes

Scope

Similar to the Family Van, these mobile units across the country offer, on average, a \$21 return for every \$1 invested. A person who is using Family Van instead of an ED is saving Massachusetts taxpayers, on average, more than \$900. While a visit to the ED costs an average of \$923, an encounter on a mobile health unit costs the organization an average of around \$117. The remaining savings can be accounted for by additional quality-adjusted life years (QALY), or years in which major health crises were avoided, resulting in a higher quality of life and reduced healthcare costs.

- The return on investment (ROI) and the ability to place mobile health units in strategic areas within the city to address healthcare needs makes this an important action for Memphis.
- The City should pilot this initiative and gauge effectiveness while building the business case to scale efforts. The implementation timeline for a pilot could be short. In a short period, a mobile unit and staff could be in place and the necessary equipment added to the unit to enable functionality. Cost for a decommissioned school bus is around \$10,000. There would be relatively low costs for low-acuity medical equipment. The largest cost would be paying unit personnel, at approximately \$80 to \$100 per hour per person.
- The cost for constructing and operating mobile health units varies across the country, and the average is \$500,000 annually, but, as previously stated, the ROI is significant. These mobile health units will not only provide convenient access to care for low-acuity situations but also serve low- and no-income households.

Expected outcomes

- Increase in healthcare literacy and preventative care action by citizens
- Decrease in the number of 911 calls
- Increase in the number of available ambulances
- Transportation made available to citizens who are unable to transport themselves
- Individuals able to stay at or close to home while receiving the care they need

Cost of inaction

Continued misuse of the 911 and EMS systems as primary medical care. The number of EMS-dispatched ambulance units in Memphis has increased by more than 4% annually over the last six years, while the City budget has remained flat. As costs continue to rise and the budget remains flat, inaction will eventually result in Memphians with high-acuity situations not receiving care.

| Proposed owner and stakeholders | Suggested resources needed |
|--|--|
| <p>Owner: Healthcare Steering Committee</p> <p>Stakeholders:</p> <ul style="list-style-type: none"> • Local hospitals • Clinics • Insurance companies • Primary care providers • MFD EMS teams • City government | <ul style="list-style-type: none"> • Decommissioned buses or ambulances • Patient information and addresses • Personnel (doctors, nurses, nurse practitioners) • Basic medical supplies <p>Cost estimate: Medium</p> |
| Dependencies | Key milestones, activities and time frame |
| Funding to obtain, retrofit and stock vehicles as well as pay initial staff; connection to MSeHA and ePCRs | <p>Short term:</p> <ul style="list-style-type: none"> • Obtain vehicles for mobile health units • Obtain staff for mobile health units • Determine clinic placement using data provided by heat maps <p>Long term:</p> <ul style="list-style-type: none"> • Scale mobile units, clinics and volunteer programs |
| Priority | |
| Medium | |

Recommendation 3B: Operate fire station clinics

The City should implement health clinics based in fire stations.

Scope and expected outcomes

Scope

Memphis would be on the cutting edge of healthcare practices by implementing health clinics based in fire stations. Given the current environment, the City would also expect to see significant ROI, decreases in low-acuity 911 calls in affected geographic areas and increased healthcare literacy of the citizens in these areas. The IBM team recommends the following:

- The City should pilot this approach for low-acuity situations, as it can give direct insight on effectiveness without overspending, help determine a roadmap for scaling the approach in the future and aid in the speed of implementation.
- Given that the facilities are already established, implementing this action and starting a pilot could be done immediately and in a short period of time. The major actions would be to allocate staff and add necessary equipment.
- Costs would be minimal, similar to those of mobile clinics. The highest cost would be compensation (approximately \$65 to \$85 per hour for a nurse practitioner and \$100 per hour for a doctor), as well as minimal costs for equipment and minor facility changes. Setting up this facility would cost less than \$100,000, and the annual operating cost would depend on the number of personnel and their level of expertise but should not exceed \$350,000 annually (two nurses at \$85 per hour, eight hours per day, five days a week, 50 weeks a year). Establishing health centers at one or two fire stations initially as a pilot is recommended.

Expected outcomes

- Increase in healthcare literacy and preventative care action by citizens
- Decrease in the number of 911 calls
- Increase in the number of available ambulances
- Individuals able to stay at or close to home while receiving the care they need

Cost of inaction

Continued misuse of the 911 and EMS systems as primary medical care. The number of EMS-dispatched ambulance units in Memphis has increased by more than 4% annually over the last six years, while the City budget has remained flat. As costs continue to rise and the budget remains flat, inaction will eventually result in Memphians with high-acuity situations not receiving care.

| Proposed owners and stakeholders | Suggested resources needed |
|--|--|
| Owners: <ul style="list-style-type: none"> • MFD Director Gina Sweat • Healthcare Steering Committee Stakeholders: <ul style="list-style-type: none"> • Local hospitals • Clinics • Insurance companies • Primary care providers • MFD EMS teams • City government | <ul style="list-style-type: none"> • Patient information and addresses • Personnel (doctors, nurses, nurse practitioners) Cost estimate: Medium |
| Dependencies | Key milestones, activities and time frame |
| Approval from the MFD to host clinics on site, obtainment of personnel, connection to MSeHA and ePCRs | Short term: <ul style="list-style-type: none"> • Obtain staff for fire station clinics • Determine clinic placement using data provided by heat maps Long term: <ul style="list-style-type: none"> • Scale mobile units, clinics and volunteer programs |
| Priority | |
| Medium | |

Recommendation 3C: Provide transportation vouchers

The City should provide transportation vouchers to enable citizens to obtain care without calling 911.

Scope and expected outcomes

Scope

A program that offers transportation vouchers also has the potential for immediate and rapid implementation. Once an agreement is signed with a third-party vendor and criteria are set for users, the program can begin.

- The average cost for subsidized transportation in metropolitan areas in 2010 was \$13 per round trip. This amount can be used to craft a budget estimate for a travel voucher program, considering the number of subsidized rides per year.
- The important keys for this action are making sure citizens are educated about eligibility requirements and understand how to become participants as well as the purpose and appropriate use of the vouchers.

Expected outcomes

- Increase in healthcare literacy and preventative care action by citizens
- Decrease in the number of 911 calls
- Increase in the number of available ambulances
- Transportation made available to citizens who are unable to transport themselves
- Individuals able to access the care and services they need

Cost of inaction

Continued misuse of the 911 and EMS systems as primary medical care. The number of EMS-dispatched ambulance units in Memphis has increased by more than 4% annually over the last six years, while the City budget has remained flat. As costs continue to rise and the budget remains flat, inaction will eventually result in Memphians with high-acuity situations not receiving care.

| Proposed owner and stakeholders | Suggested resources needed |
|--|---|
| <p>Owner: Healthcare Steering Committee</p> <p>Stakeholders:</p> <ul style="list-style-type: none"> • Local hospitals • Clinics • Insurance companies • Primary care providers • MFD EMS teams • City government | <ul style="list-style-type: none"> • Decommissioned buses, ambulances or other vehicles, equipped to be accessible for all patients • Patient information and addresses • Personnel: drivers trained to transport patients with a range of conditions, potentially community volunteers <p>Cost estimate: Medium</p> |
| Dependencies | Key milestones, activities and time frame |
| Funding vendor Memorandum of Understanding, and legal clearance | <p>Short term:</p> <ul style="list-style-type: none"> • Reach agreement with third-party vendor for travel vouchers |
| Priority | |
| Medium | |

Recommendation 3D: Adopt prescription mail options

Memphis should adopt a prescription mail option to provide an easier alternative than 911.

Scope and expected outcomes

Scope

Adopting a program to mail prescriptions, particularly maintenance medications, would mean working with a select number of pharmacies and prescribing doctors who would mail medicine to patients, with their consent.

The cost would be moderate. Immediate action can be implemented in months and would address a large number of 911 system users. The largest cost may be subsidizing medications for some of the recipients.

Expected outcomes

- Increase in healthcare literacy, preventative care action and management of chronic diseases by citizens
- Decrease in the number of 911 calls
- Increase in the number of available ambulances
- Individuals able to stay at home while receiving the care they need

Cost of inaction

Continued misuse of the 911 and EMS systems as primary medical care. The number of EMS-dispatched ambulance units in Memphis has increased by more than 4% annually over the last six years, while the City budget has remained flat. As costs continue to rise and the budget remains flat, inaction will eventually result in Memphians with high-acuity situations not receiving care.

| Proposed owner and stakeholders | Suggested resources needed |
|--|--|
| <p>Owner: Healthcare Steering Committee</p> <p>Stakeholders:</p> <ul style="list-style-type: none"> • Local hospitals • Clinics • Insurance companies • Primary care providers • MFD EMS teams • City government | <ul style="list-style-type: none"> • Patient condition and prescription information and addresses • Personnel (doctors, nurses, nurse practitioners) <p>Cost estimate: Medium</p> |
| Dependencies | Key milestones, activities and time frame |
| Access to ePCRs, cooperation of insurance companies, pharmacies and prescriptions | <p>Short term:</p> <ul style="list-style-type: none"> • Settle on an agreement with primary care providers and pharmacies for mailing prescriptions • Determine priority neighborhoods using data provided by heat maps |
| Priority | |
| Medium | |

Recommendation 3E: Extend nontraditional work hours

The City should provide convenient healthcare service alternatives for its citizens, enabling them to obtain care without calling 911.

Scope and expected outcomes

Scope

Expanded hours of operation for either existing healthcare services, or newly established ones, is critical to providing healthcare when the citizens of Memphis need it most.

The cost of this action would be moderate, as personnel would need to receive additional compensation to work nontraditional hours or additional personnel would need to be hired. Initial funding would come from a sponsor or grant, but the ROI far outweighs any upfront costs. Over the longer term, as convenient alternatives to 911, such as clinics with extended hours, are adopted by the population, the frequency of unreimbursed 911 transports will decrease. Some of the EMS budget previously put toward these unrecovered costs can be allocated toward funding extended care hours at clinics and other healthcare entities.

Encouraging citizens to use their neighborhood resources, such as mobile health units, volunteer drivers and mail-order prescriptions, decreases the number of 911 calls. This subsequently allows more ambulances to remain available to the City for high-acuity situations.

The data shows that the two areas in Memphis to initially focus these efforts or pilot programs would be zip codes 38109 and 38106. Piloting efforts in areas that need the most attention will give immediate feedback on the success rate and provide insight for scaling to more areas and more people.

Expected outcomes

- Increase in healthcare literacy and preventative care action by citizens
- Decrease in the number of 911 calls
- Increase in the number of available ambulances
- Individuals able to stay closer to home while receiving the care they need

Cost of inaction

Continued misuse of the 911 and EMS systems as primary medical care. The number of EMS-dispatched ambulance units in Memphis has increased by more than 4% annually over the last six years, while the City budget has remained flat. As costs continue to rise and the budget remains flat, inaction will eventually result in Memphians with high-acuity situations not receiving care.

| Proposed owner and stakeholders | Suggested resources needed |
|--|--|
| <p>Owner: Healthcare Steering Committee</p> <p>Stakeholders:</p> <ul style="list-style-type: none"> • Local hospitals • Clinics • Insurance companies • Primary care providers • MFD EMS teams • City government | <ul style="list-style-type: none"> • Personnel (doctors, nurses, nurse practitioners) • Additional security potentially needed <p>Cost estimate: Medium</p> |
| Dependencies | Key milestones, activities and time frame |
| Funding for personnel and after hours security, cooperation of existing clinics and staff | <p>Short term</p> <ul style="list-style-type: none"> • Determine clinic placement using data provided by heat maps • Secure funding to sponsor additional hours • Coordinate offerings between clinics <p>Long term:</p> <ul style="list-style-type: none"> • Scale mobile units, clinics and volunteer programs • Monitor and expand the program |
| Priority | |
| Medium | |

Recommendation 4: Utilize impactful incentives and corrective actions

The MFD currently provides service for anyone who calls for help, primarily for two reasons: (1) the MFD has a mission and policies to provide service for any 911 call, whether the call is emergent or non-emergent and (2) a concern for overall liability.

The IBM team recommends both incentivizing nonemergency callers to use alternative means for care and disincentivizing proven, repeated, nonemergency 911 callers who cause a significant waste of resources. Once a clear outline of available and appropriate services is established and communicated, rewarding citizens who use these services will help incentivize positive behavior change.

Data shows that a few citizens, colloquially known as “frequent flyers” for their high volume of calls and transports, have been abusing the 911 system for a long time. For example, three citizens have collectively called more than 1,000 times in a three-year period. For those proven, long-term offenders, the IBM team recommends disincentivizing their abuse of the system by instituting punitive measures. Changes to current policies and updated procedures will need to include participation of legal and risk management to protect EMS paramedics and other professionals in order to let them make the most appropriate decision when needed.

An analysis of 2015 EMS 911 call data shows that average system response time stays below nine minutes regardless of the number of ambulances in service, handling calls up to a critical value of 14 units. Above this value, response time grows approximately by one-half minute for every incremental simultaneous call. For example, the 30th ambulance dispatched in the case where 29 are already busy will have a response time of nearly 18 minutes — double that of the 14th ambulance when it was dispatched.

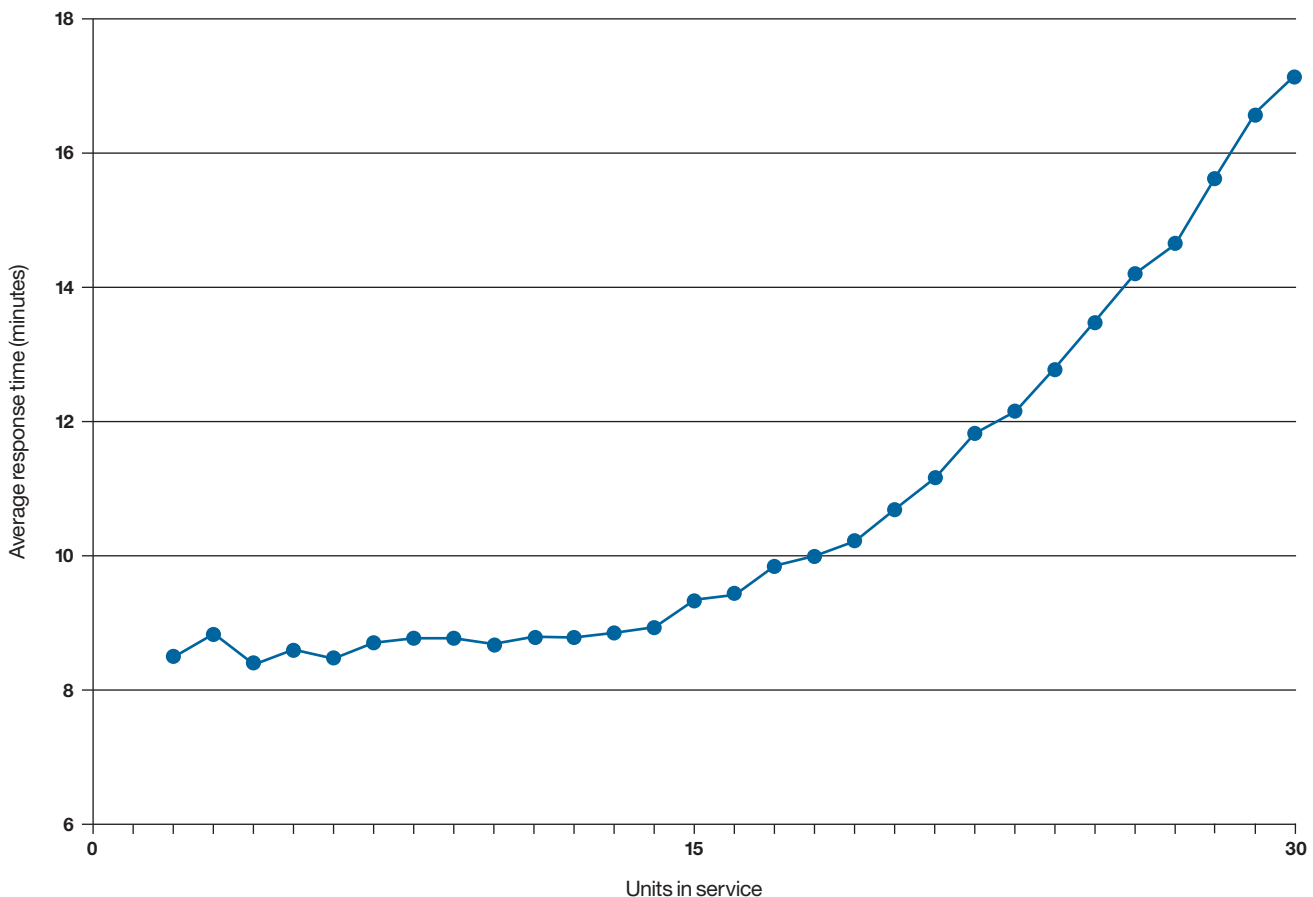


Figure 10: Average response time versus units in service

Recommendation 4A: Provide legal support for EMS decisions

The City should give EMS legal authority and protection to give the appropriate service for those in need.

Scope and expected outcomes**Scope**

The City's legal counsel and the MFD should review, define and support the EMS team to determine appropriate service. EMS paramedics should have more autonomy to determine whether transportation is truly required.

Expected outcomes

EMS responders, paramedics and the MFD will have approved policies and procedures in place to take the appropriate action regarding transport to the ED. This will address acceptable risk and reduce the volume of ambulance transports to reduce costs when the situation indicates that transportation is unnecessary.

Cost of inaction

Continued escalation of costs and instances of no ambulances available for true emergencies.

| Proposed owner and stakeholders | Suggested resources needed |
|---|--|
| Owner: MFD, supported by City Attorney's Office and legal council Stakeholders: <ul style="list-style-type: none"> • MFD • City's legal council • EMS dispatchers | <ul style="list-style-type: none"> • Legal advice • Communication plan to responders for updated policies Cost estimate: Low |
| Dependencies | Key milestones, activities and time frame |
| None | <ul style="list-style-type: none"> • The MFD to identify and revise appropriate policies and procedures for review with the City's legal counsel to define the overall risk the City is willing to take • Publish new procedures and train appropriate 911 and EMS staff |
| Priority | |
| High | |

Recommendation 4B: Create healthy rebate program

Memphis should incentivize citizens to not use 911 when it is unnecessary.

Scope and expected outcomes

Scope

One of the reasons Memphians use 911 for nonemergency calls is the need for primary care. Whether they need to get a prescription or a ride to a dentist, they see 911 as a one-stop shop to meet their needs. To reduce the number of non-emergent cases presented to EMS, it is imperative that Memphis provides primary care alternatives that are equally convenient and affordable.

Healthy rebate programs have been implemented in a number of places throughout the country, with the following being some positive results:

- Utah provides a wide range of rebates for public employees who partake in biometric testing (cholesterol, blood glucose, height, weight, body fat percentage, BMI and blood pressure), diabetes prevention measures or tobacco cessation.²⁴
- Wisconsin provides rebate programs for eating healthy.²⁵
- Memphis initiated a program for mothers to receive grocery discount vouchers for taking their children to a preventive dental care appointment.

A detailed program should be defined and planned by a subcommittee nominated by the Steering Committee and related stakeholders. The Chamber of Commerce may provide the viability of discount vouchers.

The IBM team recommends implementing a pilot and, depending on results, scaling it further.

Expected outcomes

By improving health and reducing repeated calls, the number of 911 calls will decrease.

Cost of inaction

The volume of low-acuity, non-emergent calls will not reduce without overt action. Individuals will continue to turn to the 911 system for routine healthcare needs and sap the 911 system of resources, increasing costs and potentially leaving callers facing life-threatening emergencies without an ambulance. In addition, patients will continue to receive suboptimal episodic treatment instead of the more comprehensive long-term care they require.

| Proposed owner and stakeholders | Suggested resources needed |
|--|---|
| <p>Owner: Steering Committee</p> <p>Stakeholders:</p> <ul style="list-style-type: none"> • Chamber of Commerce • Partner clinics • Primary care providers | <ul style="list-style-type: none"> • Subcommittee nominated by Steering Committee to define parameters and areas targeted by the rebate • Project Manager designated by the subcommittee to initiate the program and to coordinate/consolidate its outcomes and results • Discount vouchers <p>Cost estimate: Low</p> |
| Dependencies | Key milestones, activities and time frame |
| <ul style="list-style-type: none"> • Funds to support discount voucher program • Organization willing to contribute an employee part-time to manage the program | <ul style="list-style-type: none"> • Steering Committee to nominate a subcommittee that would define details and areas of operation for piloting the rebates, create voucher contracts with local commerce and implement the initiative • Gather and consolidate results |
| Priority | |
| Medium | |

Recommendation 4C: Implement corrective action for proven cases of 911 abuse

Memphis should implement corrective actions to discourage future 911 calls from a small number of “frequent flyers” that abuse the 911 system.

Scope and expected outcomes

Scope

A small percentage of 911 callers abuse the system, knowing there are currently no repercussions for such behavior. A policy was previously approved by the Memphis City Council stating that offenders should not be arrested. The IBM team’s research has shown that other jurisdictions have implemented punitive measures, including fines or even jail time. Consider the following examples:

- Police can send information packets to first-time 911 abusers, as they do in Wakefield, MA, but if calls persist, a system of graduated sanctions, such as fines, could be of value. In many communities, making false or harassing 911 calls is a prosecutable offense, punishable with a fine or jail time. For callers who repeatedly dial 911 (without good reason), civil fines are more appropriate than criminal sanctions because most prosecutors will neither prosecute nor seek jail time for the offenses. Generally, prosecutors file on 911 offenses in only the most egregious cases, unless a different arrangement is agreed upon between the police and the prosecutor.²⁶
- If three or more responses to a residence occur within a six-month period and are determined to be a misuse of the 911 system, an administrative fee of \$500 shall be assessed with respect to each emergency response that occurred within that period. (Seattle, WA)²⁸
- “Any person who telephones the 911 emergency line with the intent to annoy or harass another person is guilty of a misdemeanor punishable by a fine of not more than \$1,000, by imprisonment in a county jail for not more than six months, or by both the fine and imprisonment. Nothing in this section shall apply to telephone calls made in good faith.” (California)²⁸
- Escalating punishment for whomever willfully and maliciously communicates with a Public Safety Access Point (PSAP), or causes a communication to be made to a PSAP, which communication transmits information which the person knows or has reason to know is false and which results in the dispatch of emergency services to a nonexistent emergency or to the wrong location of an actual emergency; or whoever willfully and maliciously, makes or causes to be made three or more silent calls to any PSAP and thereby causes emergency services to be dispatched.

This recommendation specifically addresses 911 abusers without impacting callers who have a true emergency. The actions taken need not be advertised; changing behavior of a small few, and subsequent word of mouth, would be enough to achieve desirable results.

The scope involves putting in place a legal committee consisting of members, such as the MFD and the City Law Division (City Attorney’s Office), to define, among several alternatives, the appropriate corrective action for this population.

Corrective actions should be procedurally documented and approved through the appropriate legal channels and can be implemented incrementally.

Expected outcomes

Significant reduction in abusive non-emergent 911 calls, with associated cost savings.

Cost of inaction

This group of callers, although very small, costs the system more than \$1,000 per unnecessary trip to the ED and potentially affects the availability of units to respond to true emergencies.

| Proposed owner and stakeholders | Suggested resources needed |
|--|---|
| Owner: MFD Stakeholders: <ul style="list-style-type: none"> • City Law Division • MFD paramedics • Memphis Police Department | <ul style="list-style-type: none"> • Legal advice • Internal training and communication plan for EMS, Navigators and others to be aware of the new policy Cost estimate: Low |
| Dependencies | Key milestones, activities and time frame |
| Legal approval from the City and buy-in from the MPD | Short term: <ul style="list-style-type: none"> • Form legal committee • Evaluate options for corrective action • Select and approve short-term and long-term options based on ease of implementation • Update procedures as needed and train personnel |
| Priority | |
| Low | |

Recommendation 5: Create and launch a citywide education campaign

Consistently during interviews, the IBM team heard the necessity for a reeducation campaign on 911 misuse and healthy living for the reduction of non-emergent calls to 911 to be successful. This education needs to emphasize equally convenient options as 911. Education should focus on healthy living, as the lack of primary care options for those who are uninsured or in poverty is central to misuse of 911. It will need to provide a consistent message that educates the younger as well as older population to reverse the generational mind-set. Educational material, such as visuals, must be easy to consume in order to reach citizens with low-level reading skills. A focused effort on health education would enhance the City's economic development opportunities as investors consider community health a key metric when evaluating investment opportunities. Finally, because citizens and the media take to social channels to express concerns about emergency issues, the IBM team recommends a proactive engagement in managing targeted social media messages in response to active and high-profile discussions.

Memphis has resources, many at low cost, available for completing an education initiative. These resources include, among others, school-wide education; education to a majority of faith-based community organizations; partnership with University of Memphis for public relations (PR) collateral; face-to-face visits from respected stakeholders (City Council members and the Fire Department Chief, for example) to community venues. It should be noted that while the IBM team recommends several actions with short-term impacts, a full change in mind-set is expected to take a longer period of time (possibly a few years), given its generational basis.

The IBM team recommends implementing a comprehensive citywide education program, specifically including the following:

Recommendation 5A: Execute "911 Misuse Costs Lives" campaign.

Given several generations of learned behavior using 911 for non-emergent issues, the IBM team suggests developing an enticing, long-lasting message driven through public service announcements (PSAs) and faith-based and other community organizations. PSAs are one vehicle that can get the word out to the masses. The IBM team suggests an initial low-cost campaign, including PR and collateral assistance from the University of Memphis School of Journalism through a student project program. Memphis is a deep-rooted faith-based community, so the IBM team suggests using these organizations as a key venue. In addition, education needs to be placed in schools to break the continued generational mind-set of misusing 911. Respected individuals in the city should visit these venues to spread the word. Long-term continued education is essential and can be more comprehensive by including radio and television.

Recommendation 5B: Drive educational campaign for primary care.

Addressing easy and affordable access to primary care will improve the health of Memphis's citizens and reduce repeated 911 calls. Simple messaging should include options available for each community, stressing affordability, flexible hours and close proximity. Primary care options need to be messaged to show they are equally convenient and affordable. Respected individuals should schedule time to carry messaging to the community and build trust in the new system. This education should be executed in a similar fashion to "911 Misuse Costs Lives," focusing on faith-based organizations, schools and general public venues.

Recommendation 5C: Launch Memphis Wellness campaign.

The City of Memphis is dedicated to the overall health of its citizens, as evidenced by the creation of coalitions, such as Healthy Shelby, Safety Net and Common Table Health Alliance. To effectively reduce 911 calls, the City must address underlying problems, including poor preventative care and disease management, lack of access to primary care or social services and poor healthcare literacy. The IBM team proposes a long-term healthy campaign that includes traditional education about the value and benefits of nutritious foods, as well as the importance of regular checkups and screening for high-risk diseases (heart disease, for example). Faith-based organizations provide a valuable venue, as they provide physical locations, trusted leadership and a culture of community outreach. A low-cost wellness campaign can be accomplished through community volunteers, including restaurant owners who can provide nutritional education, low-cost PR collateral and publicity.

Recommendation 5A: Execute “911 Misuse Costs Lives” campaign

The City should develop an action plan to drive community awareness to change behavior around nonemergency calls and to improve healthy living.

Scope and expected outcomes

Scope

The City should consider the following actions when designing and implementing a community-wide education plan:

- Establish a task force within the Steering Committee to be responsible for creating, executing and maintaining an education campaign around appropriate use of 911 and healthy living
- Key components of the 911 misuse and primary care campaigns include the following:
 - Strong messaging, likely with visuals, on risks of 911 misuse
 - Positive messaging to show an enhanced system with clear and equally convenient options for non-emergent care needs
 - Messaging around the importance of primary care
- Drive education through the following media:
 - Faith-based organizations, schools, public places (bus stops and billboards, for example), local sports venues (FedExForum, AutoZone Park, for example), radio, television
- Develop collateral, including print, presentations, pamphlets, posters and billboards
- Incorporate respected individuals (from the Grizzlies and the MFD, for example) in collateral
- Coordinate key City stakeholders and respected organizations (Director Gina Sweat and Mayor Strickland, for example) to meet with citizens
- Set up a proactive engagement process to manage targeted social media messages in response to active and high-profile discussions
- Use low-cost measures for initial collateral
- The following should be researched for additional funding options:
 - Chamber of Commerce, grant awarding institutions, volunteers, faith-based organizations, nonprofit organizations

Expected outcomes

- Heightened awareness of the risk of 911 misuse
- Changed behavior to differentiate services for non-emergent and emergent care
- Reduction of 911 calls for non-emergent care
- Growth of leadership and PR experience for University of Memphis students

Cost of inaction

Continued risk of EMS not being able to attend to true emergencies, lack of known services as alternatives for non-emergent care, continued poor healthy living and further detracting of Memphis as a good place to live.

| Proposed owner and stakeholders | Suggested resources needed |
|--|---|
| <p>Owner: Steering Committee — communications lead</p> <p>Stakeholders:</p> <ul style="list-style-type: none"> • Faith-based leaders • School leaders • University of Memphis School of Journalism • Memphis Public Relations Society (advisors to the students) • City health coalitions (Healthy Shelby, for example) • Hospitals (Methodist, Baptist, Regional One) • Grizzlies, Red Bird teams • MFD representatives • Local restaurant owners • Chamber of Commerce | <ul style="list-style-type: none"> • PR and communications leader • Graphic artist(s), PR resources <ul style="list-style-type: none"> – Discussed University of Memphis Meeman 901 Strategies and New Memphis Institute as low-cost options or partners • Coalition of selected faith-based organization leaders, including Reverend Christopher Girata • Community volunteers • Local restaurant owners • National 911 Education Coalition campaign <p>Cost estimate:</p> <p>Short term to medium term: Low</p> <ul style="list-style-type: none"> • Initial campaign collateral (University of Memphis Meeman 901 Strategies program): \$1,500 • Time from key educators: free • “Coaches” from local restaurants: free <p>Long term: Medium</p> <ul style="list-style-type: none"> • PR firm for comprehensive collateral (radio, television and billboards): \$500,000 • Ad at Grizzlies, Red Birds games (costs need to be confirmed) |

Recommendation 5A: Execute “911 Misuse Costs Lives” campaign (continued)

| Dependencies | Key milestones, activities and time frame |
|---|--|
| <ul style="list-style-type: none"> • Cooperation of different venues to educate (schools, faith-based congregations, restaurants) • Agreement with University of Memphis Meeman 901 Strategies group • Agreement with key respected leaders to dedicate time | <p>Short term:</p> <ul style="list-style-type: none"> • Assign lead(s) from Steering Committee for education plan • Create messaging and educational collateral — IBM team has discussed with University of Memphis Meeman 901 Strategies program to work on PR and collateral (contact is Kate Frail until the end of April) • Launch education plan to inform citizens in faith-based communities and schools (utilize “April is 911 Month”) • Ensure Communications Department is proactive around social channels, working with other social media institutions to ensure positive messaging, as well as responding to negative feedback • Create schedule of respected leaders to visit selected venues to communicate message once PR is complete <p>Long term:</p> <ul style="list-style-type: none"> • Roll out comprehensive PR program for continual education (fall 2016) |

Priority

High: Feedback from stakeholders and community leaders indicated education is critical to the long-term success and sustainability of the revised 911 system.

Recommendation 5B: Drive educational campaign for primary care

The City should develop an action plan to drive community awareness to change behavior around addressing easy and affordable access to primary care.

Scope and expected outcomes

Scope

The City should consider the following actions when designing and implementing a community-wide education plan:

- Establish a task force within the Steering Committee to be responsible for creating, executing and maintaining an education campaign around primary care
- Key components of the primary care campaign include the following:
 - Strong messaging, likely with visuals
 - Messaging around the importance of primary care
- Drive education through the following media:
 - Faith-based organizations, schools, public places (bus stops and billboards, for example), local sports venues (FedExForum, AutoZone Park, for example), radio, television
- Develop collateral, including print, presentations, pamphlets, posters and billboards
- Incorporate respected individuals (from the Grizzlies and the MFD, for example) in collateral
- Coordinate key City stakeholders and respected organizations (Director Gina Sweat and Mayor Strickland, for example) to meet with citizens
- Set up a proactive engagement process to manage targeted social media messages in response to active and high-profile discussions
- Use low-cost measures for initial collateral
- The following should be researched for additional funding options:
 - Chamber of Commerce, grant awarding institutions, volunteers, faith-based organizations, nonprofit organizations

Expected outcomes

- Changed behavior to differentiate services for non-emergent and emergent care
- Reduction of 911 calls for non-emergent care
- Growth of leadership and PR experience for University of Memphis students
- Enhanced image of Memphis as a place to live, work and invest

Cost of inaction

Continued risk of EMS not being able to attend to true emergencies, lack of known services as alternatives for non-emergent care, continued poor healthy living and further detraction of Memphis as a good place to live.

| Proposed owner and stakeholders | Suggested resources needed |
|--|--|
| <p>Owner: Steering Committee — communications lead</p> <p>Stakeholders:</p> <ul style="list-style-type: none"> • Faith-based leaders • School leaders • University of Memphis School of Journalism • Memphis Public Relations Society (advisors to the students) • City health coalitions (Healthy Shelby, for example) • Hospitals (Methodist, Baptist, Regional One) • Grizzlies, Red Bird teams • MFD representatives • Local restaurant owners • Chamber of Commerce | <ul style="list-style-type: none"> • PR and communications leader • Graphic artist(s), PR resources <ul style="list-style-type: none"> – Discussed University of Memphis Meeman 901 Strategies, Student Research Program and New Memphis Institute as low-cost options or partners • Coalition of selected faith-based organization leaders, including Reverend Christopher Girata • Community volunteers • Local restaurant owners • National 911 Education Coalition campaign <p>Cost estimate:</p> <p>Short term to medium term: Low</p> <ul style="list-style-type: none"> • Initial campaign collateral (University of Memphis Meeman 901 Strategies program): \$1,500 • Campaign collateral for wellness in Memphis, University of Memphis student research program: free • Time from key educators: free <p>Long term: Medium</p> <ul style="list-style-type: none"> • PR firm for comprehensive collateral (radio, television and billboards): \$500,000 • Ad at Grizzlies, Red Birds games (costs need to be confirmed) |

Recommendation 5B: Drive educational campaign for primary care (continued)

| Dependencies | Key milestones, activities and time frame |
|---|---|
| <p>Cooperation of different venues to educate (schools, faith-based congregations, restaurants)</p> <p>Agreement with University of Memphis Meeman 901 Strategies group and Student Researching Campaign class to adopt a program to improve health in Memphis</p> <p>Agreement with key respected leaders to dedicate time</p> | <p>Short term:</p> <ul style="list-style-type: none"> • Assign lead(s) from Steering Committee for education plan • Create messaging and educational collateral — IBM has discussed with University of Memphis Meeman 901 Strategies program to work on PR and collateral (contact is Kate Frail until the end of April) • Launch education plan to inform citizens in faith-based communities and schools (utilize “April is 911 Month”) • Ensure Communications Department is proactive around social channels, working with other social media institutions to ensure positive messaging, as well as responding to negative feedback • Create schedule of respected leaders to visit selected venues to communicate message once PR is complete <p>Long term:</p> <ul style="list-style-type: none"> • Roll out comprehensive PR program for continual education (fall 2016) |
| Priority | |
| <p>High: Feedback from stakeholders and community leaders indicated education is critical to the long-term success and sustainability of the revised 911 system.</p> | |

Recommendation 5C: Launch Memphis Wellness campaign

To effectively reduce 911 calls, the City of Memphis must address underlying problems, including poor preventative care and disease management, lack of access to primary care or social services and poor healthcare literacy.

Scope and expected outcomes

Scope

When designing and implementing a community-wide education plan, the City should consider the following actions:

- Establish a task force within the Steering Committee to be responsible for creating, executing and maintaining an education campaign around appropriate use of 911 and healthy living
- Key components of the “Memphis Wellness” campaign include the following:
 - Basic nutrition collateral, including ready-made presentations
 - Calendar of healthy events in the city (Healthy Memphis 2016 and health fairs) and the free services being offered (blood pressure checks, for example)
 - Monthly body mass index (BMI) assessment and improvement metrics
 - Establish and communicate metrics to benchmark results on health in Memphis
- Drive education through the following mediums:
 - Faith-based organizations, schools, public places (bus stops and billboards, for example), local sports venues (FedExForum, AutoZone Park, for example), radio, television
- Develop collateral, including print, presentations, pamphlets, posters and billboards
- Incorporate respected individuals (from the Grizzlies and the MFD, for example) in collateral
- Coordinate key City stakeholders and respected organizations (Director Gina Sweat and Mayor Strickland, for example) to meet with citizens
- Set up a proactive engagement process to manage targeted social media messages in response to active and high-profile discussions
- Use low-cost measures for initial collateral
- The following should be researched for additional funding options:
 - Chamber of Commerce, grant awarding institutions, volunteers, faith-based organizations, nonprofit organizations

Expected outcomes

- Reduction of 911 calls for non-emergent care
- Heightened awareness of healthy living benefits
- Improved health and wellness of the community
- Enhanced image of Memphis as a place to live, work and invest

Cost of inaction

The City of Memphis must address underlying problems, lack of access to primary care or social services and poor healthcare literacy to enable other options than 911 for healthcare.

Recommendation 5C: Launch Memphis Wellness campaign (continued)

| Proposed owner and stakeholders | Suggested resources needed |
|--|--|
| <p>Owner: Steering Committee — communications lead</p> <p>Stakeholders:</p> <ul style="list-style-type: none"> Faith-based leaders School leaders University of Memphis School of Journalism Memphis Public Relations Society (advisors to the students) City health coalitions (Healthy Shelby, for example) Hospitals (Methodist, Baptist, Regional One) Grizzlies, Red Bird teams MFD representatives Local restaurant owners Chamber of Commerce | <ul style="list-style-type: none"> PR and communications leader Graphic artist(s), PR resources <ul style="list-style-type: none"> Discussed University of Memphis Meeman 901 Strategies, Student Research Program and New Memphis Institute as low-cost options or partners Coalition of selected faith-based organization leaders, including Reverend Christopher Girata Community volunteers Local restaurant owners National 911 Education Coalition campaign <p>Cost estimate:</p> <p>Short term to medium term: Low</p> <ul style="list-style-type: none"> Campaign collateral for wellness in Memphis, University of Memphis student research program: free Time from key educators: free Health fairs: mostly free (use volunteers and hospitals) “Coaches” from local restaurants: free <p>Long term: Medium</p> <ul style="list-style-type: none"> PR firm for comprehensive collateral (radio, television and billboards): \$500,000 Ad at Grizzlies, Red Birds games (costs need to be confirmed) |
| Dependencies | Key milestones, activities and time frame |
| <ul style="list-style-type: none"> Cooperation of different venues to educate (schools, faith-based organizations, restaurants) Agreement with University of Memphis Student Researching Campaign class to adopt a program to improve health in Memphis Agreement with key respected leaders to dedicate time | <p>Short term:</p> <ul style="list-style-type: none"> Assign lead(s) from Steering Committee for education plan Create messaging and educational collateral Launch education plan to inform citizens in faith-based communities and schools (utilize “April is 911 Month”) The IBM team has discussed the wellness campaign with the University of Memphis, student research team; action is to follow up with Melissa Janoske in mid-summer to confirm if they will accept the project for their students in the fall/spring Ensure Communications Department is proactive around social channels, working with other social media institutions to ensure positive messaging, as well as responding to negative feedback Create schedule of respected leaders to visit selected venues to communicate message once PR is complete <p>Medium term:</p> <ul style="list-style-type: none"> Assign lead(s) to execute the Memphis Wellness campaign (late summer 2016) Confirm funding for long-term PR campaign (late summer 2016) Execute wellness program (fall 2016) <p>Long term:</p> <ul style="list-style-type: none"> Roll out comprehensive PR program for continual education (fall 2016) |
| Priority | |

High: Feedback from stakeholders and community leaders indicated education is critical to the long-term success and sustainability of the revised 911 system.

5. Conclusion

Overwhelmingly, the IBM Smarter Cities Challenge team found that the community's understanding of this critical issue, the appetite for innovation, the timing and community leaders' level of passion and commitment to improve the health of Memphians to be a "perfect storm." This could not be a better environment for the mayor to immediately initiate action on the recommendations in this program.

There are several organizations, business leaders, current initiatives and health and social service providers in Memphis all working to address the problem presented here. However, progress is hampered by these entities operating alone. Forming a collaborative Steering Committee under the leadership of Mayor Jim Strickland and Fire Director Gina Sweat is critical to getting these entities marching in formation.

The fact that many of these recommendations have a high impact for improvement, and are relatively easy to get started, is a big plus for the City's capacity to act. Most recommendations are based on supporting data or benchmarks of success from other communities and lend themselves to pilots that can be evaluated and scaled over time. Initial funding requirements in many cases are low, with local businesses or grants as potential candidates to start or sustain. Cost savings for every nonessential \$1,000 ambulance run can be repurposed in future budgets to expand or sustain initial actions.

The benefit of implementing these recommendations is clear. Almost immediately, citizens will start to receive better (alternative) care and regain health over time. Fewer trips to EDs will free up ambulances for better availability to answer high-acuity 911 calls, and overall cost and strain on the Memphis EMS and health care community will be reduced.

**FIRE DEPARTMENT
OF
MEMPHIS**

6. Appendix

A. Acknowledgments

| Name | Title | Organization |
|-----------------------|--|--|
| Melissa Wilkes | Director of Crisis Services | Alliance HealthCare Services |
| Owen Lawrence | Chief Executive Officer | Alliance HealthCare Services |
| Patrick Siglin | Systems Network Analyst | Alliance HealthCare Services |
| Dr. Jan Young | Executive Director | Assisi Foundation |
| Laura Riker | LMSW, Special Consultant to EMS and Innovate Memphis | Baptist Hospital |
| Keith Norman | Vice President Government Relations | Baptist Hospital |
| Dana Dye | Chief Executive Administrator | Baptist Memorial Health Care |
| Samuel Lynd | CEO Administration | Baptist Memorial Health Care |
| Janet Williford | System Director | Baptist Trinity Home Care & Hospice |
| Melanie Moody | Manager, Fire Communications | CAD Team |
| Gary Simpson | CAD coordinator | CAD Team |
| Laura Silsby | GIS tech coordinator | CAD Team |
| Kevin Adams | Senior Vice President | CBRE, Memphis |
| Shantelle Leatherwood | Chief Executive Officer | Christ Community Health Services, Inc. |
| Andreana Smith | Director of MEMPHIS Plan and Patient Services | Church Health Center |
| Mayor Jim Strickland | Mayor | City of Memphis |
| Doug McGowen | Chief Operating Officer | City of Memphis |
| Justin Entzminger | Director, Innovate Memphis | City of Memphis |
| Jennifer Sink | Attorney | City of Memphis |
| Ursula Madden | Communications Director | City of Memphis |
| Kerri Campbell | Communications Lead and Team Manager, Innovate Memphis | City of Memphis |
| Worth Morgan | Councilman | City of Memphis |
| Jamita Swearingen | Councilman | City of Memphis |
| Sandra Burgess | Risk Manager | City of Memphis |
| Brent Nair | Chief Information Officer | City of Memphis Information Services |
| Jeremy Sanders | Chief Operating Officer, Programming and Operations | Common Table Health Alliance |
| Dr. Susan Nelson | Retiring Chief Executive Officer | Common Table Health Alliance |
| Dr. Renee Frazier | Chief Medical Officer | Common Table Health Alliance |
| Christopher A. Owens | Director, Marketing and Communication Relations | Common Table Health Alliance |
| Belinda Bryan | Elder Care Coordinator | Coordinated Response to Elder Abuse (CREA) |
| Chastity Taylor | Care Coordinator | Coordinated Response to Elder Abuse (CREA) |

| Name | Title | Organization |
|-----------------------|---|--|
| Jennifer Keith | Clinical Director of Emergency Services | Delta Medical Center |
| Joyce Kerulo | Vice President Billing Services | Digitech |
| Phil Trenary | President and Chief Executive Officer | Greater Memphis Chamber |
| Shea Flinn | Senior Vice President, Chambers Circle | Greater Memphis Chamber |
| Amy Daniels | Senior Vice President, Communications and Programming | Greater Memphis Chamber |
| Kelly Rayne | Senior Vice President, Community Development | Greater Memphis Chamber |
| Morgan Bohannon | President | iHeart Radio |
| David Zaiman | Business Development Manager | ImageTrend |
| Joe Garah | Vice President of Client Services | ImageTrend |
| Meri Armour | Chief Executive Officer | Le Bonheur Children's Hospital |
| Barry Gilmore | Chief of Emergency Services | Le Bonheur Children's Hospital |
| Dr. Joe Holley | Medical Director | Memphis Division of Fire Services |
| Gina Sweat | Director | Memphis Division of Fire Services |
| Pam Kiestler | Chief | Memphis Division of Fire Services |
| Andrew Hart | Division Chief | Memphis Division of Fire Services |
| Michael Jubirt | Deputy Director | Memphis Division of Fire Services |
| Dale (Kirk) Locke | Deputy Chief | Memphis Division of Fire Services |
| Keith Staples | Deputy Chief | Memphis Division of Fire Services |
| Daryl Payton | Deputy Chief | Memphis Division of Fire Services |
| Matthew Hamm | Lieutenant | Memphis Division of Fire Services |
| Kevin Spratlin | Lieutenant | Memphis Division of Fire Services |
| Richard Keith | Lieutenant | Memphis Division of Fire Services |
| Joe Payne | Fire Marshal | Memphis Division of Fire Services |
| Julian (Skill) Wilson | Lieutenant | Memphis Division of Fire Services |
| Hope Lloyd | Deputy Division Chief | Memphis Division of Fire Services |
| Charles Spratlin | Division of Fire Services | Memphis Division of Fire Services |
| Thomas Malone | President, Fire Fighters Association | Memphis Fire Fighters Association, IAFF Local 1784 |
| Joe Norman | Vice President, Fire Fighters Association | Memphis Fire Fighters Association, IAFF Local 1784 |
| Matthew Tomek | Secretary and Treasurer | Memphis Fire Fighters Association, IAFF Local 1784 |
| D. Scott Bjork | President and CEO | Memphis Union Mission, Inc. |

| Name | Title | Organization |
|--------------------|--|--|
| Audrey May | Public Services Supervisor | Memphis Public Library and Information Center |
| Melanie Keller | President/Chief Executive Officer | Meritan |
| Jackie Lloyd | Administrative Director | Methodist Alliance Home Health |
| Dave Evans | Director of Security | |
| Gary Shorb | Chief Executive Officer | Methodist Le Bonheur Healthcare |
| Cato Johnson | Senior Vice President, Public Policy and Regulatory Affairs | Methodist Le Bonheur Healthcare |
| Phyllis Chambers | Director of Emergency Center | Methodist University Hospital |
| Cameron Brackett | Executive Director | MidSouth eHealth Alliance |
| Kelli J. Saucerman | Vice President of Quality | Regional One Health |
| Chantay Smart | Medical Director | Regional One Health |
| Dr. Richard Donlon | Chief Executive Officer | Resurrection Health |
| Allissa Haushalter | Director of Health Department | Shelby County Health Department |
| Dr. Helen Morrow | Chief Medical Officer | Shelby County Health Department |
| Elizabeth Cawein | Chief Executive Officer | Signalflow PR |
| Matthew Morris | Program Manager of the Healthy Outcomes Program and Community Engagement | South Carolina Emergency Medical Services Advisory Council |
| Dave Archer | Chief Executive Officer | Saint Francis Hospital-Memphis |
| Wanda Peperone | Director of Nursing | Saint Francis Hospital-Memphis |
| Dale Cribber | Medical Director | Saint Francis Hospital-Memphis |
| Marian Levy | DrPH, Asst. Dean of Students and Public Health Practice, Assoc. Professor, School of Public Health | University of Memphis School of Public Health |
| Fawaz Mzayek | Assistant Professor | University of Memphis School of Public Health |
| Melissa Janoske | Assistant Professor | University of Memphis School, School of Journalism, Meeman 901 Strategies program |
| Katherine Friedel | Graduate Student | University of Memphis School, School of Journalism, Student Researching Campaign program |

B. Team biographies



Masharn Austin
Workforce Strategy and Talent Leader
IBM Watson
Brooklyn, NY

Masharn Austin is part of the IBM Watson™ Group in New York City, where he leads all employee engagement business initiatives and early professional recruitment. In the Watson Group, he has created and implemented a Delivery Excellence Incentive Program for two critical business functions and created and facilitated a social eminence strategy. Prior to joining Watson, Austin worked in Mexico City, where he created and implemented an early professional inside sales program for cloud and SoftLayer. He has also worked with IBM in China and London as part of a Human Resources Leadership Development Program. Austin has lead numerous community service initiatives at IBM, including serving as a Pathways in Technology Early College High School (P-TECH) mentor and managing Thanksgiving food drives with Settlement House in New York City. He also founded and participates in the annual Turkey Bowl Food Drive in Atlanta, Georgia. Austin hails from Atlanta, Georgia. He received his bachelor's degree from Furman University and graduate degree from Georgetown University.



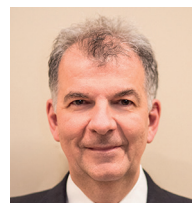
Steffi Diamond
Program Director, Watson Innovation
IBM Watson
Littleton, MA

Steffi Diamond's 29-year career in the technology industry has included nine years at IBM, with her current role as leading the releases of IBM Watson Cognitive Services to market. Throughout her career, Diamond has managed software development functions, including development, quality assurance, globalization, product management and customer support. She is passionate about continually improving products through streamlining processes, with an objective to reduce costs and deliver products quicker to market. She also has served as a Senior Manager for development and quality assurance for several products at IBM, and her team won the IBM 2012 Outstanding Technical Achievement award for creating a streamlined globalization testing process, enabling up to 40% of defects to be found earlier. Diamond holds a Master of Administrative Science degree from Boston College and Bachelor of Science degree in computer science and psychology from Brandeis University. She enjoys running, reading and tennis, and she serves as liaison for special needs for the City of Newton, Massachusetts.



Kathi Hanrahan
Delivery Executive, Navy ERP,
US Federal Public Sector
IBM Global Business Services
Alexandria, VA

Kathleen (Kathi) Hanrahan is an Account Delivery Executive within IBM Global Business Services® – Public Sector Enterprise Applications and oversees US Department of Defense client relationships for multiple contracts to deploy and support software solutions. In her 19 years consulting with IBM, she has led the US Navy's enterprise resource planning solution for more than 72,000 users globally and has extensive experience as a program manager leading strategy, analytics, business process improvement and systems implementation projects for clients across aerospace, telecommunications and electronics industries. Hanrahan started her career in the aerospace and defense industry before moving into consulting. She has a Master of Business Administration degree, is a certified Project Management Professional, has won several corporate awards, including IBM's Golden Circle, and has been actively involved in founding and supporting professional women's networking groups. Her hobbies include traveling, exercise, arts and crafts and volunteering with local charities.



Keith Hermiz
Senior Data Scientist, Business
Analytics Research
Essex Junction, VT

Keith Hermiz is a Senior Data Scientist with the IBM Analytics group. He has spent most of his 20 years with IBM working as an analytic consultant, supporting internal and external clients and applying novel mathematical and computer science techniques to challenging business problems. Hermiz earned a BS degree from Brown University and PhD from the University of Maryland, College Park in the field of applied mathematics. He holds a Master of Business Administration degree from the University of Rhode Island. Hermiz has spent more than a dozen years as a volunteer in emergency services. He is nationally certified as a Firefighter, Fire Instructor and Advanced Emergency Medical Technician (AEMT), with advanced certifications in trauma and medical life support. He is a licensed AEMT and Instructor/Coordinator in the State of Vermont. Hermiz holds the posts of Fire Department Captain and Head of Emergency Medical Services for Grafton, Vermont. In addition, he has been a regular volunteer provider for a number of regional ambulance services.



Hugo Motta
Executive Project Manager,
Consulting by Degrees
IBM Global Business Services
Rio de Janeiro, Brazil

Hugo Motta is an Executive Project Manager with more than 20 years of experience. Motta joined IBM in 2002, following its acquisition of Price Waterhouse, where he had been an auditor and consultant since 1994. His projects at IBM have covered several areas, including financial management, strategy and change, change management, system implementation and shared service centers. In recent years, he has managed projects in the oil and gas industry, focused on HSSE (health, safety, security and environment), with projects like a gas pipeline implementation strategy and an occupational health area process improvement for a 50,000+ employee oil and gas company. Motta is also a certified instructor for consulting career training and an author of a book entitled "Corporate Education: People Management." He has a Master of Business Administration degree from Catholic University of Rio de Janeiro, Brazil, and a Post Graduate degree in sustainability management from Federal University of Rio de Janeiro. Motta is a Counselor of Children's Aid and Onda Solidaria, British and Brazilian NGOs, respectively. He enjoys travel and has visited Japan, China, Arab Emirates, Morocco, India and several European countries and American states.

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