LEO 2016-03

September 25, 2018

Officer dies in motor vehicle crash at an intersection while responding to a shots fired call – South Carolina

EXECUTIVE SUMMARY

On November 7, 2015, a 37 year old municipal police officer was fatally injured when her patrol car was struck by another law enforcement vehicle on a city roadway while responding to a shots fired call.

The officer was en-route to her primary patrol region after escorting a suspect to the city jail when she responded to a shots fired call from municipal dispatch. Multiple university and municipal police officers were working in the same vicinity and simultaneously responded to the shots fired call. As the municipal police officer was traveling westbound, running lights and sirens, she entered an intersection against the traffic control device. At the same time, a university police officer traveling northbound, also running lights and siren, entered the same intersection. The northbound university patrol vehicle crashed into the westbound municipal patrol car. Both officers were taken to a local medical center by ambulance. The municipal police officer died from injuries sustained in the crash. The university police officer received serious injuries.

Photo 1. Municipal patrol unit at crash scene *(Photo courtesy of South Carolina Highway Patrol)*

CONTRIBUTING FACTORS

Key contributing factors identified in this investigation include:

- **Two vehicles entered intersection at the same time**
- **Speed of vehicles**
- **Multiple agency and patrol car response**
- **Potential adrenaline overload**
- **Poor line of sight at the intersection**

KEY RECOMMENDATIONS

NIOSH investigators concluded that, to help prevent similar occurrences:

- State, county, and municipal law enforcement agencies should consider establishing, training, and enforcing standard operating procedures (SOPs) that require drivers to come to a complete stop at red traffic lights and stop signs during responses and proceed through intersections only after ensuring it is safe to continue.

- State, county, and municipal law enforcement agencies should consider establishing, training, and enforcing SOPs that limit the speed of a patrol unit during responses.
- State, county, and municipal law enforcement agencies and training academies should consider training and emphasizing Tactical Arousal Control Techniques to enhance officer's ability to combat negative effects of 'adrenaline dump' that can occur when responding to hot calls.
- State, county, and municipal law enforcement agencies should establish and enforce a standard operating policy that requires all officers to wear a seatbelt while operating or riding in a patrol unit.
- State, county, and municipal agencies should consider developing and implementing interagency jurisdictional policies that outline roles and responsibilities in situations or physical locations where a multiple agency response is possible.

NIOSH Law Enforcement Officer Investigations

The National Institute for Occupational Safety and Health (NIOSH), an institute within the Centers for Disease Control and Prevention (CDC), is the federal agency responsible for conducting research and making recommendations for the prevention of work-related injury and illness. Through an interagency agreement, the National Institute of Justice funded a NIOSH pilot program to investigate line-of-duty deaths of law enforcement officers resulting from vehicle crashes and being struck by vehicles while responding to roadside emergencies and making traffic stops. These NIOSH investigations are intended to reduce or prevent occupational deaths and are completely separate from the rulemaking, enforcement and inspection activities of any other federal or state agency. NIOSH does not enforce compliance with State or Federal occupational safety and health standards and does not determine fault or assign blame. Participation of law enforcement agencies and individuals in NIOSH investigations is voluntary. Under its program, NIOSH investigators interview persons with knowledge of the incident who agree to be interviewed and review available records to develop a description of the conditions and circumstances leading to the death(s). Interviewees are not asked to sign sworn statements and interviews are not recorded. The agency's reports do not name the deceased officer, the law enforcement agency or those interviewed. The NIOSH report's summary of the conditions and circumstances surrounding the fatality is intended to provide context to the agency's recommendations and is not intended to be definitive for purposes of determining any claim or benefit. The NIOSH report is not intended as a legal statement of facts. This summary, as well as the conclusions and recommendations made by NIOSH, should not be used for the purpose of litigation or the adjudication of any claim.

INTRODUCTION

On November 7, 2015, at approximately 22:16, a municipal police officer was fatally injured when the patrol car she was driving was struck by another law enforcement vehicle. On September 15, 2016, an investigation of this incident was conducted by a team from the National Institute for Occupational Safety and Health (NIOSH) and National Institute of Justice (NIJ). The investigation team reviewed the officer's personnel and training files, coroner's report, dispatch recordings and logs, highway patrol photographs, police dashcam videos, traffic cameras, the highway patrol accident investigations team crash report, witness statements, and the agency's standard operating procedures. Interviews were conducted with members of the municipal law enforcement agency, as well as members of the fire department and emergency medical services that were present at the crash scene. Interviews were also conducted with dispatchers and the highway patrol accident investigation team. The incident site was examined and photographed by the NIOSH/NIJ investigators.

LAW ENFORCEMENT AGENCY

The municipal police department employs 409 sworn officers who protect and serve a population of 133,803 within 132 square miles [USCB 2015]. The department is a full-service agency with three shifts staffed for 24/7 coverage. The agency has three major bureaus: administrative, operations, and special services. The agency is also divided into five patrol regions: North, South, East, West, and Metro. Each patrol officer is assigned to work in a specific region; however, if an officer is in an area other than their own when a broadcast call is made by dispatch, they are to respond to the call to provide assistance. In 2015, officers answered over 163,500 calls for service and made 5,921 arrests.

TRAINING AND EXPERIENCE

The officer worked in law enforcement for approximately 20 years. Prior to joining the municipal police department in 2011, she served as a military police officer where she earned multiple medals and commendations. The officer had a Bachelor of Science degree in Criminal Justice.

The South Carolina Code of Laws, Title 23, Chapter 23 sets the minimum requirements to become a sworn officer in South Carolina including: age of at least 21 years, U.S citizen, and hold a high school diploma [South Carolina Legislative Council 2014]. Additionally, the municipal department requires a valid class 'D' driver's license with an acceptable driving record, no criminal record, and no DUIs in the past ten years. Candidates meeting these qualifications can apply for employment at the municipal department and, if hired, will then be required to successfully meet the requirements for the department's Basic Candidate School (twelve weeks), the South Carolina Criminal Justice Academy's (SCCJA) Basic Law Enforcement School (twelve weeks), and the department's field training program (forty-six working days).

The department's eight-week Basic Candidate School (BCS) helps to prepare new officer's to successfully complete the SCCJA. This is completed by receiving an 80% on all tests excluding Taser which requires a 90%. The BCS curriculum is a mix of classroom-based and hands-on training that includes a wide range of topics including: region familiarization, basic marksmanship, emergency vehicle operations course (EVOC), courtroom procedures, defensive tactics, dispatch radio, report writing, and arrest procedures. The EVOC includes a precision course at low speed and an emergency response course. After graduation the candidate moves on to the SCCJA Basic Law Enforcement School.

The SCCJA Basic Law Enforcement School provides officers with twelve weeks of training on the necessary knowledge, skills, and abilities to perform the duties of a certified law enforcement officer. The SCCJA is a dormitory style academy located in the city of Columbia, SC. The curriculum includes typical law enforcement topics such as criminal law, civil liability, use of force, and defensive tactics. The curriculum also includes over 20 hours of driver training including braking, road vehicle dynamics, and off road vehicle dynamics [Tatum 2017]. The driver training is administered by a SCCJA certified driving instructor and candidates are required to successfully complete a law enforcement emergency vehicle training course. The candidate must pass all areas before receiving certification from the Law Enforcement School. After graduation from the SCCJA, the municipal police department requires the candidate to complete a 46 day Field Training Program.

Any candidates who received law enforcement training as U.S. military police may submit satisfactory proof of successful completion and a verified copy of the courses taken. Training will be reviewed on a case by case basis and each candidate will be given credit for any training deemed equivalent to training offered by the SCCJA [South Carolina Legislative Council 2015]. All candidates must successfully complete a training program approved by the Council.

South Carolina law enforcement officers are required to complete forty Continuing Law Enforcement Education (CLEE) hours in a three-year period. The forty CLEE hours must include one legal update course and one domestic violence course. The remaining required CLEE hours in the three-year period may come from any source approved by the Academy [South Carolina Legislative Council 2015]. There is no requirement for continuing education hours for driver training. At the time of the incident, the officer was up to date on all of her annual training requirements.

ROAD AND WEATHER CONDITIONS

The crash occurred in the center of an intersection of two city roadways. A traffic light was present for traffic control and the intersection was lit by several streetlamps. The surface of the city roadways was asphalt and the posted speed limit was 30 mph. The roadway approaching the scene of the crash from the south had an upward grade and two lanes of traffic travelling in each direction. A yellow double solid center line divides the opposing traffic lanes and a single dashed white line divides the traffic lanes. The roadway approaching the scene from the east had a downward grade and one lane of traffic travelling in each direction with a yellow double solid center line dividing the opposing traffic.

From archived weather reports, at the time of the crash, the temperature was approximately 70 degrees F and the dew point was approximately 66 degrees F. The skies were overcast with no measurable wind gusts and visibility was reported to be ten miles [Weather Underground 2015]. Weather was not considered a factor in this incident.

INVESTIGATION

The following description of officers' activities during this incident are based on the NIOSH/NIJ team's evaluation of security and dash camera videos as well as a review of the state police accident team investigation file.

In the evening of November 7, 2015, a municipal police officer traveled outside of her normal patrol area to escort a suspect to the city jail. After leaving the city jail, she briefly stopped at a local fast food restaurant to order food. At approximately 22:15, municipal dispatch announced a shots fired call across all municipal radio bands and requested that all units respond. The original address announced by dispatch for the location of the shots fired was incorrect. After receiving additional calls from witnesses, the municipal dispatcher broadcasted the correct location, which was a heavily populated entertainment area of the city that encompassed many public restaurants and bars. The correct location was approximately one mile south of the first address given.

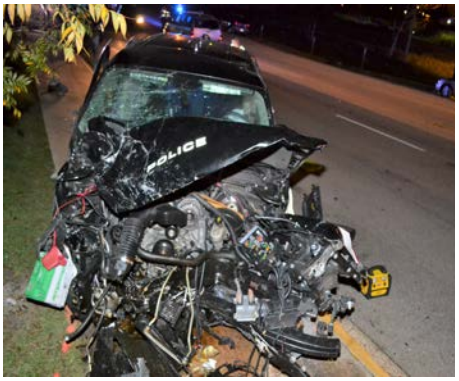

Photo 2. Photo of the university patrol 4x4 utility vehicle at crash scene *(Photo courtesy of South Carolina Highway Patrol)*

At the time of the call, there were several municipal and university police officers in the vicinity (see diagram 1). At the time of the dispatch call, the deceased officer (labeled 1 on Diagram 1) had just left a fast food restaurant and was traveling northbound on Street A, presumably returning to her primary patrol area. At the same time, 3 university police officers (labeled 3, 4, and 5 on the diagram) were located several city blocks away, to the South East. The deceased officer and the university police officers all responded to the call, following the routes noted on the diagram.

Using the deceased officers' patrol car GPS coordinates, her location relative to the dispatch calls was determined. During her travel time down the three city blocks of Street A, the dispatcher confirmed the exact location of the shots fired. After hearing the exact location of the shots fired call, the deceased officer passed another municipal patrol car with lights and siren activated (labeled 2 on the diagram), headed in the opposite direction. The deceased officer made a U-turn to follow municipal patrol car 2; activated lights and sirens; and responded to dispatch she was in proximity of the call and would assist until back-up arrived. She increased her speed from approximately 26 mph to 44 mph and turned west from Street A onto Street B, which has a downhill grade.

The crash was recorded by two traffic cameras mounted on Street B. From these recordings, the Municipal Police Officer labeled 2 can be seen approaching the intersection, traveling westbound on Street B, and coming to a brief stop at the intersection before proceeding straight through the intersection. The traffic light is red at this time. A few seconds later, Municipal Police Officer 1, the deceased officer, can be seen approaching the intersection. The traffic light facing her direction of travel is still red. Municipal Police Officer 1 does not reduce her speed and proceeds through the intersection against the traffic control device in an apparent straight forward direction. She is traveling 64 mph and the posted speed limit was 30 mph. Upon entering the intersection, she is hit on the driver's side door by the University Police Officer 3 who entered the intersection with a green light travelling 76 mph northbound on Street E. The posted speed limit in the area was 30 mph. After impact, her patrol vehicle continued off the roadway and struck a curb, mailbox, concrete wall, and palm trees before coming to rest.

According to discussions with dispatch personnel, university police officers have their own separate dispatch service. However, the university dispatch and the university police officer in charge monitors municipal dispatch for life safety calls and can dispatch university police officers to assist municipal police officers. Officers from both law enforcement agencies are able to communicate with one another by walkie talkies. It is believed the university police officer in charge heard the shots fired call from municipal dispatch and broadcasted the call to university police officers.

Based on their location at the time of the shots fired call, there were several potential routes to take to the location of the call. University Police Officer 5 traveled north then east before turning north onto Street A; at this time the University Police Officer 5 was travelling toward Municipal Police Officer 1. Municipal Police Officer 1 turned west on Street B and the University Police Officer 5 followed immediately behind. University Police Officers 3 and 4 travelled westbound on Street D and turned right onto Street E, heading northbound. This street had an upward grade. The University Police Officer 3 was traveling at approximately 76 mph when he approached the green traffic light at the intersection of Street B and Street E. The posted speed limit was 30 mph. Immediately upon entering the intersection, University Police Officer 3 struck the Municipal Police Officer 1 on the driver's side door. After impact, the University patrol vehicle 3 also continued off the roadway and struck a curb, concrete wall, and a fence (see Diagram 2).

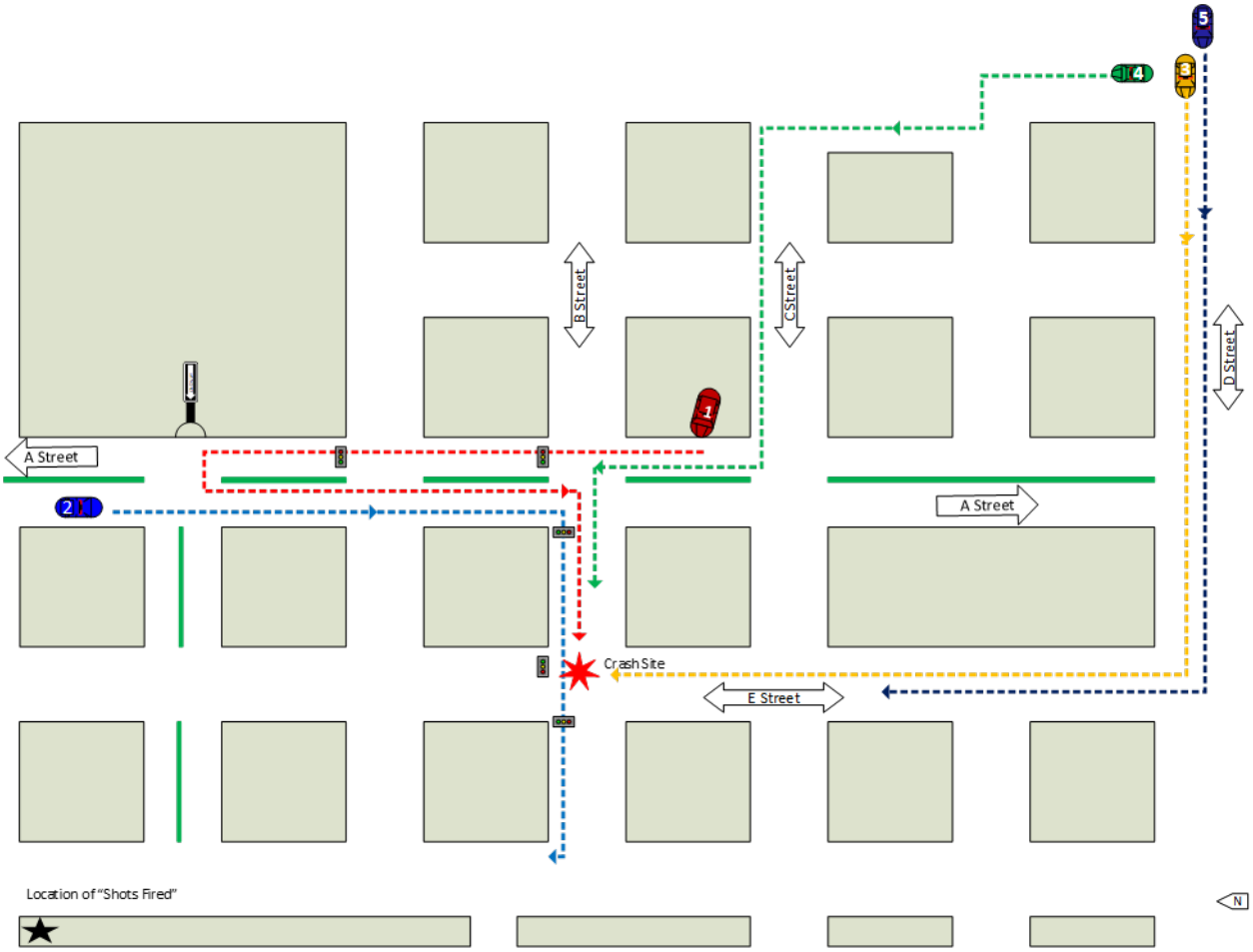

Diagram 1. Location and Route of Multiple Agencies and Officers at the Time of the Shots Fired Call

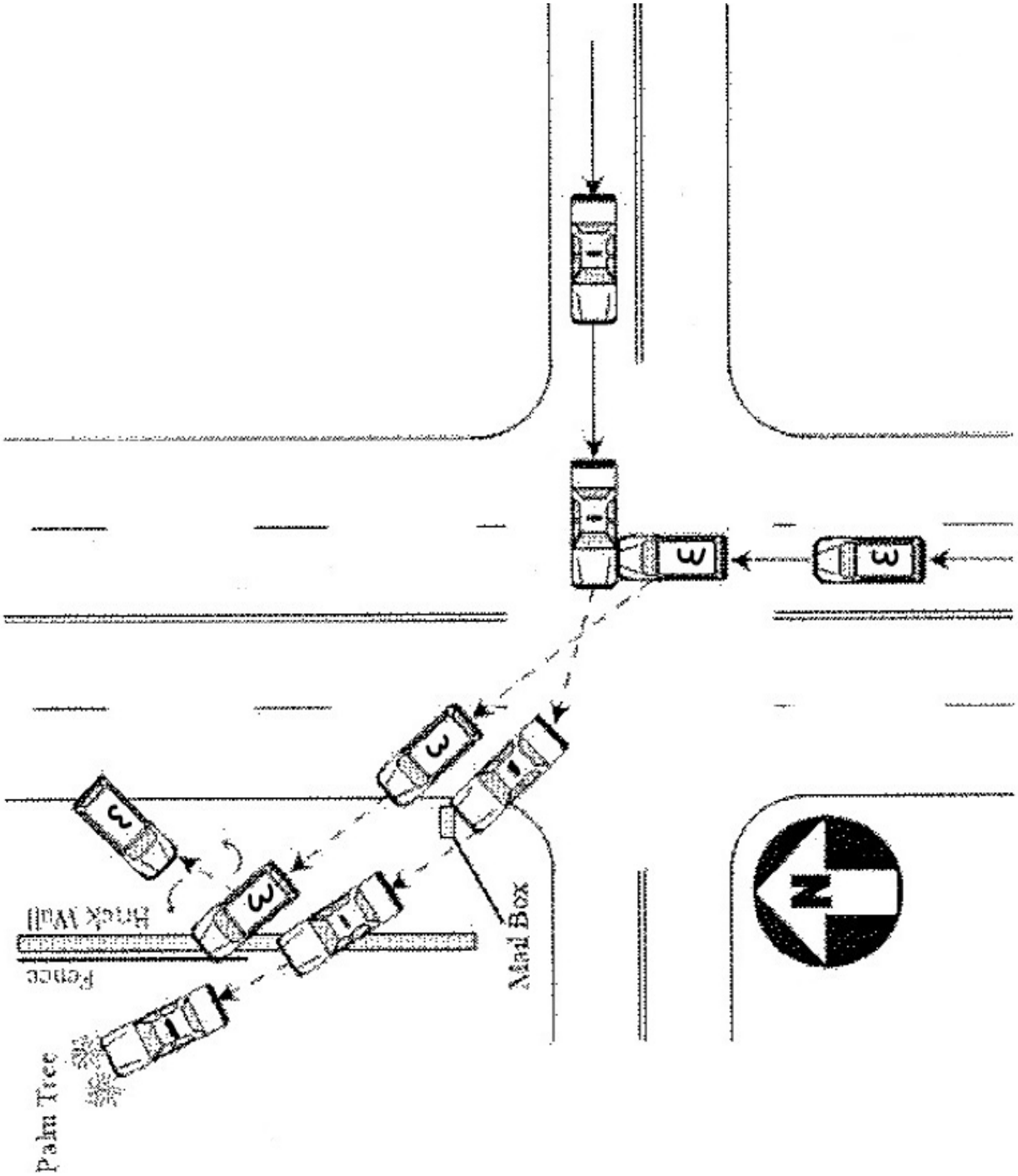

Diagram 2. Impact of municipal and university patrol units
(Courtesy of South Carolina Highway Patrol)

Shortly after the crash, multiple emergency response units responded to the scene, including several law enforcement agencies, EMS, and fire. The Municipal Police Officer 1, who was not wearing a seatbelt, was trapped inside the patrol unit and was extricated by EMS and law enforcement officers. She was given first aid on the scene and immediately transferred to the local trauma hospital by ambulance where she was pronounced dead. University Police Officer 3, who was not wearing a seat belt and suffered serious incapacitating injuries, was also transported to the trauma care hospital where he later recovered from his injuries. At approximately 02:00, the South Carolina Highway Patrol Multi-Disciplinary Accident Investigation Team arrived on-site to investigate the incident.

Photo 3. Municipal patrol unit involved in crash *(Courtesy of South Carolina Highway Patrol)*

CONTRIBUTING FACTORS

Occupational fatalities are often the result of one or more contributing factors or events that result in the injury or fatality. NIOSH/NIJ investigators identified the following contributing factors in this incident:

- **Two vehicles entered intersection at the same time**
- **Speed of vehicles**
- **Multiple agency and patrol car response**
- **Potential adrenaline overload**
- **Poor line of sight at the intersection**

CAUSE OF DEATH

The County Coroner's Office listed the cause of death as multiple blunt force injuries to the head and torso due to a motor vehicle accident.

RECOMMENDATIONS/DISCUSSION

The following recommendations focus on methods that could eliminate or mitigate the factors identified as contributing to this incident. They are not aimed at any agency, but are intended for consideration by law enforcement agencies, state and local governments and departments of transportation nationwide, as well as safety researchers, and the general public.

Recommendation #1: State, county, and municipal law enforcement agencies should consider developing and implementing standard operating procedures (SOPs) that require drivers to come to a complete stop at red traffic lights and stop signs during responses and proceed through intersections only after ensuring it is safe to continue.

Discussion: The goal of a law enforcement agency when responding to an emergency is to arrive on the scene as quickly as possible. In order to arrive safely, operators of emergency vehicles should be aware of their specific state and agency regulations related to emergency driving. South Carolina law (Chapter 5, Section 56-5-760.A) dictates that a driver of an authorized emergency vehicle, may exercise certain privileges when responding to an emergency call; however, this does not relieve the operator from the duty and responsibility to drive with regard for the safety of others. These privileges include proceeding past a red stop signal or stop sign, but only after slowing down, as may be necessary for safe operation and clearing the intersection [South Carolina Legislative Council 1990]. At the time of the incident, the policy of the municipal agency was to 'exercise due care for the safety of others when entering the intersection on a red light while on an emergency response'.

Video footage of the incident was obtained from a nearby traffic camera. In addition, dashcam video footage from a university patrol unit travelling behind the deceased officer's car was obtained. These videos show the municipal police officer was running lights as she approached the intersection with a red light in her direction. Per the airbag control module data, the municipal patrol car was traveling at 64 mph when she entered the intersection. The videos show that the municipal patrol car did not slow down or stop at the red light. Immediately after entering the intersection against the red traffic light, the municipal patrol car was struck on the driver's side door by a university patrol car also responding to the shots fired call with lights and siren.

After the incident, the municipal agency's policy was changed to, 'All responding vehicles must come to a complete stop before entering an intersection, counter to the established traffic control device'. A policy and procedures manual is the cornerstone of strong communication between the agency and officers regarding the agency's operations. Strong policies are those that explicitly define expectations and are clear in their language. For example, as dictated in the prior agency policy, 'due care' may mean different things to different officers and result in different behaviors and outcomes. The municipal agency changed the language of their intersection crossing policy to be more precise with a specific objective behavior – '…come to a complete stop'.

Prior to the incident, the university agency policy required officers to: "Proceed past a traffic control device, only after slowing down and clearing the intersection for oncoming pedestrian and vehicle traffic". After the incident the university policy was revised to include specific instructions for clearing an intersection emphasizing the need to clear the intersection even if the officer has the right of way. This revised intersection policy also states that: "An officer will only proceed at a speed allowing safe stopping prior to entering the intersection."

Although a model specific to law enforcement agencies is not available at this time, The International Association of Fire Chiefs (IAFC) has developed a guide for developing policies related to the operation of emergency vehicles during a response that may have applicability for law enforcement agencies [IAFC 2009]. This guide recommends, "The fire department emergency vehicle shall come to a full stop before entering a negative right-of-way intersection (red light, flashing red light, or stop sign), blind intersection, or any intersection where hazards are present and/or the driver cannot account for all oncoming traffic lanes. The emergency vehicle shall not enter the intersection until all approaching traffic has yielded the right-of-way and it is safe to proceed. The emergency vehicle driver shall ensure that all approaching vehicles in all lanes have yielded the right-of-way before advancing." While this policy is more restrictive than many emergency responder state laws, it is written to ensure safe passage for the emergency responder, as well as fellow public safety professionals and civilians. Law enforcement agencies should consider modifying and adopting similar intersection crossing policies.

Recommendation #2: State, county, and municipal law enforcement agencies should consider developing and implementing SOPs that limit the speed of a patrol unit during responses.

Discussion: In the state of South Carolina, another privilege authorized to operators of emergency vehicles while responding to a call is the option to 'exceed the maximum speed limit if he does not endanger life or property' (South Carolina law, Chapter 5, Section 56-5-760) [South Carolina Legislative Council 1990]. At the time of the incident, the policy of the municipal agency during a Code 3 (emergency) response was 'officers shall not exceed the posted speed limit by more than 20 mph (excluding motor vehicle pursuits)'. The University law enforcement agency does not have a speed cap policy; however, a program is in place to monitor the speed of patrol units and alert administration when pre-established set speeds are exceeded. Law enforcement officers and agencies must balance the primary goal of quickly arriving to an emergency with that of arriving safely.

At the time of the crash, data from the patrol unit's airbag control module indicated the patrol car was traveling at 64 mph. The posted speed limit was 30 mph. The officer was traveling 34 miles over the posted speed limit which was in excess of the agency's 20 mph policy. Higher speeds are linked with an increased likelihood of a motor vehicle crash [SWOV 2012]. Nearly all research studies conclude that crash rates increase when speed increases [Institute of Transport Economics 2009]. Increased speed reduces the amount of information a driver can visually see and limits the time available to receive and process this information [AASHTO 2001]. Higher speeds are also linked with increased injury severity

from crashes [SWOV 2012]. The likelihood of a driver being involved in a fatal crash increases when their speed is over the posted speed limit [Road Accident Research Unit Adelaide University 2001]. This research also showed that small reductions in speed can lead to significant reductions in motor vehicle crash fatalities.

One of the primary tenants of the law enforcement community is to arrive safely at scenes in a timely manner. It is a commonly held belief in the law enforcement community that faster response times lead to better criminal justice outcomes such as lower crime rates, as well as increased public satisfaction with the police. However, the reality of trying to get to an incident faster and taking more risks, in doing so, can result in a catastrophic incident. Officers must show restraint and maintain calmness during emergency driving. Data show that in regards to crime detection, response time matters only within the first minute after a crime takes place [Bayley 1996]. Data show that police action and response past the one minute mark becomes nearly irrelevant [Sherman et al. 1997]. Research has also shown that response times also have little impact on arrest rates [Kansas City Police Department 1978].

Response time is also not a strong, direct determinant of citizen satisfaction. The public image of the police is complex. Historically, police departments have used crime-related measures such as crime rates, clearance rates, and response times to measure citizen satisfaction [George Mason University 2001]. Studies have found that citizen satisfaction with response times is affected by a range of other variables [Brown and Coulter 1983]. Other studies have shown that response time does influence citizen's overall satisfaction with police, but so does individual officer actions once on the scene [Percy 1980]. Agencies and officers should recognize that while small decreases in response times may not impact criminal justice outcomes or citizen satisfaction, it could save law enforcement lives and enable officers to arrive on scene safely.

No law enforcement organization or stakeholder group has developed and encouraged a model set of policies related to the operation of emergency vehicles during a response; however, one mechanism to potentially improve officer safety during responses is speed caps. Many law enforcement agencies have implemented policies that cap an officer's speed when responding to call. An example of one such policy is: "Code 3 or emergency response driving, will not exceed posted speed limit by more than 20 mph. In regards to pursuit driving, the 20 mph over posted speed limit maximum rule is removed" [Las Vegas Municipal Police Department 2010]. Speed caps are not yet common policies within law enforcement agencies. One study found that only 27% of officers in a single state reported having a driver policy that restricted their speed in emergency responses [NIOSH 2014].

Another way of encouraging officers to limit vehicle speed during response may be through the use of vehicle monitoring devices. The patrol units operated by the university police department involved in this incident are equipped with monitoring systems that send alerts for speed that exceeds pre-established set points which the system records. Reports are downloaded from the monitoring system for each vehicle at regular intervals and reviewed by a director of compliance. The data is then used as a counseling aid or to support disciplinary action, depending upon the circumstances related to each exceedance.

At the time of the crash, the municipal law enforcement agency had a speed cap of no more than 20 mph over the posted speed limit; however the officer was driving in excess of this cap. The University officer was also well above this limit, adding to the severity of the crash. Agencies must balance officer and civilian safety with that of achieving acceptable response times when answering calls. While there is no research on the impact of agency speed caps, given that even small decreases in speed lead to a lower risk

for injury, law enforcement agencies should consider implementing speed caps. In addition to developing this policy, agencies should also fully train their officers and enforce the policy.

Another way to increase officer safety during hot calls is improved EVOC training. By applying certain principles of dynamics when braking and accelerating, officers can arrive at the scene faster, by actually driving at a seemingly slower pace [Peterson, 2015]. Officers may feel a natural need to push hard when responding to a call; however good EVOC training helps officers to understand that looking ahead, thinking ahead, entering turns under control, and maintaining composure maximizes an officer's ability to absorb information and make good decisions [Peterson, 2015]. For example, one agency used GPS computers to show that aggressively driven EVOC runs took more time than those driven in a more controlled, slow manner [Peterson 2015]. They showed that on 180-degree turns, conservative drivers entered the turn slower and started braking earlier than the aggressive driver, yet this technique resulted in a faster overall time [Peterson 2015]. They found that more aggressive drivers lost time because their cars slid and went wide on turns causing the officers to drive a longer distance and wait to start accelerating out of the turn. The 'slower', less aggressive drivers braked earlier, stayed on line, stayed under control, and were able to accelerate out of the turn earlier [Peterson 2015].

Recommendation #3: State, county, and municipal law enforcement agencies and training academies should consider training and emphasizing Tactical Arousal Control Techniques to enhance officer's ability to combat negative effects of 'adrenaline dump' that can occur when responding to hot calls.

Discussion: At the time of the incident, the officer was responding to a shots fired call outside of her normal patrol area. These types of calls can put officers in a heightened level of alert because they arrive on scene anticipating an encounter with armed people. Officers responding to these calls are also at a disadvantage since they may not know the source, location, or underlying cause of the gunfire [Breul and Keith 2016]. Responding to a shots fired call could cause an increase in an officer's adrenaline. However, the role that adrenaline plays in an officer's decision-making processes while responding to hot calls is dependent on both the officer and the call. Data has shown that both psychological and physiological stress responses during critical incidents can shape the outcome of the incident.

Adrenaline is a hormone released seconds after being exposed to stress, fear, or dangerous situations and triggers the body's fight-or-flight response [Miller-Keane Encyclopedia 2003]. When this happens, adrenaline can flood the body and is referred to as an adrenaline dump. An excess of adrenaline can impact fine and complex motor skills, as well as hinder short-term memory [Humes 2003]. Excessive adrenaline can also cause the officer to lose peripheral vision, otherwise known as 'tunnel vision' [Humes 2003]. The combination of these physiological effects can diminish an officer's complex motor skills ability to function at a higher-level and leave them to rely on simple and emotional instincts [Humes 2003].

The brain's ability to process information and develop responses is a highly complex function that is executed in milliseconds [Glennon 2007]. There are numerous studies on how stress impacts officer's decision-making ability in use of force situations, but the role that stress plays in other types of situations has not been fully examined. While these physiological alterations are involuntary in nature, there are techniques that officers can use to minimize the side effects of adrenaline dump. Tactical Arousal Control Techniques (TACT) are processes used to self-regulate this [Asken 2007]. These techniques are used to break the cycle of increasing physical and physiological tension when the first signs of stress are noticed [Asken 2007].

The most common form of TACT is tactical or combat breathing [Asken 2007]. The technique is to breathe in cycles counting one to four; breathe in through your nose, stop and hold your breath, exhale through your mouth, stop and hold your breath, and repeat. An added suggestion that enhances the effect of these breathes is to take a deep breath and when exhaling, picturing something light floating down to the height of their belly button [Asken 2007]. These approaches may seem trivial to officers, but they can actually control heart rate, muscle tension, and brain waves as well as promote concentration, attention and reduce reaction time [Asken 2007].

Combat breathing works best when it becomes an involuntary and subconscious reaction to stressful triggers [Asken 2007]. In order to achieve this, practice is of vital importance. One suggested method is have officers practice combat breathing while listening to sirens and watching dashcam pursuits [Humes 2003]. This type of daily training, performed at the academy, may result in officers unconsciously performing combat breathing at the sound of a siren.

Finally, officers should recognize when an adrenaline dump is occurring and prepare for the known side effects. For example, while the officer may experience a surge of strength, fine motor skills diminish. Therefore, intricate tactical skills should be avoided [Bertomen 2008]. Adrenaline dump can be mediated by a person's perception of the incident. This is an important training concept to be considered – the sympathetic response can be partially offset by training [Bertomen 2008].

In this incident, the fatal crash occurred while the officer was responding to a potential adrenaline inducing trigger of a shots fired call in an area that was not her assigned patrol area. There is no way to fully assess if the officer was dealing with an adrenaline overload as she approached the intersection; however, given the totality of the incident, adrenaline could have played a role in this fatality. If the officer was experiencing an adrenaline overload, this could have impacted her decision-making skills such as hastening through the red traffic light. These physiological impacts could also cause tunnel vision. The surveillance video showed the deceased officer following another municipal patrol unit through the red light. Her vision may have been focused solely on the patrol unit directly in front of her and experienced a loss of peripheral vision, therefore not properly clearing the intersection that she was approaching or seeing the oncoming university police officer‘s patrol car.

Training academies should consider training officers in a form of combat or tactical breathing and encourage this practice daily while in the academy. Additionally, agencies could consider having field training officers speak to the effectiveness of these techniques to young officers and encourage this behavior while on patrol. To improve officers' openness to these techniques, agencies and academies could educate officers that these techniques are used and encouraged by the highest trained military personnel, including US military special operation teams and the NAVY Seals [Marx 2013].

Recommendation #4: State, county, and municipal law enforcement agencies should establish and enforce a standard operating policy that requires all officers to wear a seatbelt while operating or riding in a patrol unit.

Discussion: Seatbelts are designed to keep a person in place and prevent them from being ejected from the vehicle. The most common seatbelt consists of a lap belt that goes across the pelvis, and a shoulder belt that extends across the rib cage. Use of the seatbelt spreads the stopping force across bones in the hips, shoulders, and chest; the parts of the body that can absorb the impact best [Harris 2002].

When a vehicle crashes into an object, there are actually three collisions. A vehicle travelling at 50 mph and accelerates those riding in the car to the same speed. Although it feels as if the riders and the vehicle are moving as one, in reality the riders inertia is separate from the vehicle; thus when the vehicles crashes

into an object it comes to an abrupt stop while the riders continue moving at 50 mph. If the riders are not wearing a seatbelt, a second collision occurs; the riders continue moving until somethings stops them, such as the windshield or dashboard. The third collision occurs after the body comes to a stop, the person's internal organs slam into bones or other organs, causing serious or fatal injuries. A seatbelt would have applied a stopping force to slow down the body and prevent it from coming to a sudden stop such as by making contact with the windshield or dash board. The use of seatbelts can reduce the risk of fatal injuries by 86 percent and reduce serious injuries by 50 percent. [Montgomery 2017].

More officers are killed or injured by motor vehicles than other causes; however, many officers still do not wear seatbelts. The University of Buffalo Center for Transportation Injury Research analyzed data collected by the Fatality Analysis Reporting System for motor vehicle crashes involving marked patrol units where seatbelt use was available. "Results showed that 40.4 percent of unbelted occupants died, compared to 15.5 percent of those wearing seatbelts." [Baker 2005]. The National Highway Traffic Safety Administration reviewed motor vehicle crashes involving LEOs from 1980 through 2015. Their finding was that 42% of police officers killed in vehicle crashes during that period were not wearing seatbelts [National Center for Statistics and Analysis, 2018].

The most common reasons why law enforcement officers (LEO) do not wear seat belts are they are too confining, can't get their gun out, cannot exit the patrol unit quickly, and their utility belts get tangled in the seatbelt [Scoville 2011]. The Police Executive Research Forum has stated "a culture has developed in policing that just being an officer means that you don't have to wear a seatbelt" [Johnson 2014]. Thus, having a policy is not enough; this culture must be changed and the policy must be enforced. Examples of failure to comply with seatbelt policies in use by law enforcement agencies include time off without pay and written reprimands. In some states workers' compensation settlements are reduced if the LEO failed to use a safety device, such as a seatbelt [Scoville 2011].

While wearing a seatbelt is a primary way for officers to reduce their likelihood of serious injury or death in a crash, tactical exceptions to seat belt use might be needed. For example, exceptions to this policy would be considered for tactical purposes only if the vehicle is at a speed of 15 mph or less. Neither one of the LEOs involved in the crash was wearing a seatbelt. Although the seatbelt probably would not have prevented the fatal injuries to the municipal police officer, injuries sustained by the university police officer may have been less severe.

Recommendation #5: State, county, and municipal agencies should consider developing and implementing interagency jurisdictional policies that outline roles and responsibilities in situations or physical locations where a multiple agency response is possible.

Discussion: In this incident multiple police officers, from multiple agencies, simultaneously responded to the same shots fired call. These law enforcement agencies utilized unique dispatch services. The shots fired call originated from the municipal dispatcher and was broadcast to municipal police officers; however, it was common practice among university police to scan the municipal dispatch. Although the location of the call was an entertainment area consisting of bars and restaurants outside of the university campus, it was visited by university students and therefore patrolled by both university and municipal officers. The university officers heard the municipal dispatcher announce the shots fired call and also responded using lights and sirens. The municipal agency and university police do not have a formal working agreement. However, the agency personnel have a good working relationship and assist each other in the handling responses. Further, the agencies in this incident have concurrent jurisdiction. The municipal agency had primary jurisdiction for the location of the shots fired with the university agency

having concurrent jurisdiction. The university agency has primary jurisdiction on university property within the city limits with the municipal agency having concurrent jurisdiction.

Mutual aid agreements allow public safety agencies to make the most effective use of their time and staff resources by enabling them to coordinate resources in emergencies or other special circumstances. These types of agreements allow agencies to work together when an event is beyond the capabilities of the affected entity. Also, mutual agreements may be made between local agencies for the enforcement of specific types of criminal offenses. Certain calls are associated with a high degree of uncertainty, such as a shots fired calls. At the onset of such a call, it may be unknown if a single agency's resources are sufficient to handle the situation. The best use of policing resources may be to have more people respond rather than not enough. Mutual aid agreements, at a minimum, should include language on: the legal status of the agencies; procedures for agency personnel to act within the other agency's jurisdiction; procedures for requesting mutual aid; the identity of those persons authorized to request mutual aid; reporting guidelines; expenditures; and procedures for maintaining radio communication with outside personnel [CALEA, N.D.].

In this incident, given the number of responding municipal police units, the potential for an intersection collision between responding units existed. However, a formal memorandum of agreement between police agencies could also allow for the development of protocols in emergency response procedures to minimize the chance of emergency vehicles from different agencies meeting at traffic intersections. If procedures and protocols are jointly developed and supported by both agencies, they will enhance overall safety and efficiency in emergency responses [NIOSH, 2009].

There are several challenges to communication between neighboring agencies. First, one agency's existing radio systems may not work with the radio equipment used by neighboring agencies. While wireless communication devices operate on different bands of the radio spectrum, there is limited affordable technology that allows one radio to communicate across all frequencies. Also, older radio components will only work with equipment made by the same manufacturer. Even though these limitations exist, there are several approaches that could improve interoperability.

SAFECOM is a federal program managed by the US Department of Homeland Security that coordinates interoperability efforts (DHS, N.D.). SAFECOM has developed key documents for baseline communications and interoperability standards for emergency responders, including a technical assistance guide, the interoperability continuum, and grant guidance [DHS, N.D]. Additionally, sharing radio towers is another method to consider (DHS, N.D). Finally, there is software that can be used to create interoperability. For example, rather than using a bridge device to make connections across different agencies, the software uses Ethernet cards as wireless connection components.

In a time of limited resources for public safety professionals, law enforcement agencies should consider developing mutual aid, or at a minimum, formal agreements between neighboring agencies to share resources and potentially avoid confusion when serious incidents arise. Additionally, law enforcement agencies could examine cost-effective ways to improve the interoperability across neighboring agencies. The agencies in this incident have full radio interoperability.

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