Cross Contamination within the Lyndhurst Fire Station

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CERTIFICATION STATEMENT

I hereby certify that the following statements are true:

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ABSTRACT

A few years ago, a firefighter at the Lyndhurst Fire Department (LFD) was diagnosed with cancer. Recently, another Lyndhurst firefighter was diagnosed with a staph infection in his knee. Although firefighting is inherently dangerous, firefighters are susceptible to cross contamination causing serious illness. The problem this study investigated was how the current cleaning practices at the Lyndhurst fire station may be unknowingly cross contaminating the living quarters, members bedding and their clothing thus increasing the incidents of health issues and sick time usage. The purpose of this descriptive study was to identify the extent of which cross contamination is an issue in the U.S emergency medical services (EMS), identify the more significant fire/EMS standards related to cleaning and decontamination and evaluate the current cleaning practices by the members of the LFD. This study used the descriptive research method to answer the following research questions:

1. To what extent is contamination of apparatus, equipment, and facilities an issue in the U.S. emergency medical services?
2. What are some of the more significant Fire/EMS industry standards related to cleaning and decontamination?
3. What are the current cleaning and decontamination practices at LFD?

The research determined that contamination of apparatus, equipment and facilities is prevalent in multiple agencies throughout the United States. The National Fire Protection Agency (NFPA), the United States Fire Administration (USFA) and the Firefighters Cancer Support Network (FCSN) have established standards to prevent cross contamination within the fire and EMS services. A survey was distributed to the 25 active members of the LFD to assess the current cleaning and decontamination practices at LFD. When comparing the survey results

to current standards, the members of the LFD are not compliant to the standards thus increasing their risk to cross contamination. It is recommended that LFD update their 25 year old infectious control standard operating policy (SOP) and create a new cancer prevention SOP to align with the standards identified in this research.

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In their daily performance of their duties, firefighters and EMS personnel are exposed to hazardous toxins, carcinogens and viruses. The members of the LFD are no exception. Recently, a Lyndhurst firemedic was diagnosed with a staph infection in his left knee. He was off work for five shifts and administered an aggressive regime of anti-biotics. A few years prior, a Lyndhurst firemedic was diagnosed with cancer. Although it is not known whether his cancer was caused by exposure to contaminates while on the job, research by the Firefighters Cancer Support Network (FCSN) indicates that firefighters are at greater risks of developing cancer due to exposures of hazardous contaminates (FCSN, 2013).

Between the years 2007 and 2016, members of the LFD have used 12,723 hours of sick time (LFD Sick Time Summary, 2016). That averages out to about 50 hours a year per member. Although the LFD does not track exactly why members use sick time, the possibility is from illness due to exposure with patients during ambulance transports and inadequate decontamination practices.

With the ever-changing types of hazardous exposures and the increase of call volume, LFD personnel are finding themselves more vulnerable than ever to contamination; however decontamination practices at the Lyndhurst Fire Station have not changed in decades. *The problem this study addressed is how the current cleaning practices may be unknowingly cross contaminating firefighter living quarters, bedding and clothing thus increasing incidences of health issues and sick time usage.*

Purpose of the Study

The purpose of this descriptive study was to identify the extent of which cross contamination is an issue in the U.S emergency medical services, identify the more significant fire/EMS standards related to cleaning and decontamination and evaluate the current cleaning practices by the members of the LFD. The goal of this study was to provide research-based information to create and update LFD policies and practices to reduce illness and sick time.

Research Questions

The research questions this descriptive study investigated are:

1. To what extent is contamination of apparatus, equipment, and facilities an issue in the U.S. emergency medical services?
2. What are some of the more significant Fire/EMS industry standards related to cleaning and decontamination?
3. What are the current cleaning and decontamination practices at LFD?

BACKGROUND AND SIGNIFICANCE

The City of Lyndhurst is located on the eastern edge of Cuyahoga County. The LFD serves around 14,000 residents. The city is mostly a bedroom community with a small amount of retail and commercial. The LFD is comprised of 26 full time members. Every member is a State of Ohio certified firefighter and paramedic. There are three shifts of six firefighter/medics, one lieutenant and one captain. Each member works a 24 hour on and 48 hour off schedule. The LFD responds to all emergency calls within the city and transports patients to various local hospitals. In 2016, the LFD responded to a total of 2,573 calls for service (LFD Incident Report Summary, 2016).

LFD operates out of one fire station. The current fire station is 9,000 square feet and was built in 1972. LFD has a kitchen that doubles as a training room and day room. There is a female and male locker room each having one shower. There are two male dorm rooms and one female dorm shared between the 26 members. Between the three dorms, there are a total of 12 beds. Members often sleep on the same bed as members from the previous shifts. LFD has one office with two desks shared by the six shift officers. LFD also has a small watch office with two desks shared by the other 18 members of the department. The chief and fire prevention officer each have his or her own office.

LFD has four drive-thru bays. The bays are equipped with an old exhaust removal system that is frequently out of service. Member's fire personal protective equipment (PPE) is stored on wire racks directly behind the ladder truck in the open bays exposed to vehicle exhaust, sunlight and poor air circulation. There is a small multi-purpose room off the bays where cleaning supplies, medical supplies, self-contained breathing apparatus and miscellaneous supplies are

stored. This room, which also houses a gear extractor, a washer machine and commercial dryer has no door and is open to the bays.

In previous years, it was the mentality of the fire service that injury and/or death would only occur in the act of fighting fires. However, The Firefighter Cancer Support Network indicates that firefighter's are more likely to develop certain types of cancer compared to the general American population because of exposure to carcinogens not just at the fire scene, but also back at the fire station via contaminated gear and equipment (FCSN, 2013). This statement became a reality a few years ago when a firefighter from LFD developed cancer.

In 2016, the LFD responded to 2078 EMS calls for service which accounts for nearly 80% of the total call volume (LFD Incident Report Summary, 2016). When transporting a sick patient in the ambulance, equipment and personnel are exposed to multiple forms of bacteria and viruses. Several researchers (Sexton & Reynolds, 2010; Alves & Bissell, 2008; Roline, Crumpecker & Dunn, 2006) found infectious diseases on EMS equipment, in ambulances and multiple areas of fire stations. The risk of contamination is extremely high in these environments. If an employee becomes contaminated, they pose the risk of being off work for an extensive amount of time. Not only is this a burden to the employee, but also a burden to the city.

LFD does have an occupational safety and health SOP. Although this SOP creates infectious control standards for LFD, such as mandatory ambulance disinfecting procedures and dedicated clean and dirty utility sinks, it has not been updated since 1994. The LFD does not have an SOP pertaining to the care and treatment of exposed fire equipment and/or the prevention of cross contamination after hazardous exposures to harmful carcinogens.

The Lyndhurst fire station was built in 1972 when contamination was not relevant in designing the facility. The lack of decontamination rooms/areas, shared washer machines and

mops, one shower, exposed fire PPE in the bays and same cleaning routines for decades provides opportunities for accidental cross contamination.

This study has the potential to impact the ways that members of LFD clean and decontaminate themselves, equipment, apparatus as well as the Lyndhurst fire station thus reducing the risks of developing illness and use of sick time.

LITERATURE REVIEW

The United States Fire Administration (USFA) states that viruses and bacteria are the organisms commonly responsible for the spread of disease (USFA, 2002). The USFA guide continues to define an infectious disease as one that results from the invasion of a host by a disease producing bacteria and/or virus. Communicable diseases are diseases that can be transmitted from one person to another. These diseases can be spread directly or indirectly. Direct contact is when someone directly comes in contact with the blood or other body substance from the infected individual. Indirect contact is when an infected individual passes the disease-producing organism to an inanimate object. The disease transfers when another person comes in contact with that object (USFA, 2002).

Roline, Crumpecker and Dunn (2006) conducted a study at a private ambulance company operating in the western United States. The organization provides both advanced life support and basic life support emergency services. Five specific areas in 21 ambulances were swapped and tested for infectious diseases. After 96 hours, ten samples tested positive for *Methicillin-Resistant Staphylococcus Aureus* (MRSA), a drug resistant bacterium. The areas that tested positive were the steering wheel, the handrail on the stretcher, the cushion on the stretcher, the work area next to the stretcher and the tip of a suction catheter. MRSA hospitalized 126,000 patients between 1999-2000.

Brown, Minnon, Schneider and Vaughn (2009) had similar findings in a separate study. In their study, they took sample swaps from the cardiac monitors, pulse oximeters, stretcher rails and straps, the steering wheel, overhead grab rails and the work area on 51 different ambulances in the state of Maine. Of the 51 ambulances tested, 25 were positive for MRSA noting the highest areas of recovery were those directly exposed to the patient.

Alves and Bissell (2008) also conducted a study taking sample swabs from the interior of four different first due ambulances. Two of the ambulances were from an inner city jurisdiction and two ambulances from a suburban jurisdiction. All four ambulances were swabbed while they were in service after all intended cleaning and decontamination was completed. A swab sample was taken from the oxygen flow meter knob, the bench seat, the communication radio microphone, the driver's door interior grip and the cabinet base of each ambulance. Sixteen of the 20 samples tested positive for either *staphylococcus, bacillus, streptococcus* and/or *klebsielle*, all of which are infectious contaminates.

Sexton and Reynolds (2010) state that EMS and firefighters are at a higher risk of exposure because of the communal lifestyle within fire stations and their frequent contacts of high risk patients. They conducted a study swabbing areas within two fire stations and a central training facility. They targeted five areas within these sites: the general office areas, couches, television/radio remote controls, tables and general kitchen surfaces. All sites were sampled every five days for a total of ten times over a period of two months. Seventeen out of the 160 samples tested positive for *Staphylococcus aureus*, a drug resistant bacterium. Eleven out of the 160 samples tested positive for MRSA. The couches, the classroom desks and the surfaces in the office areas had the highest prevalence of MRSA and *Staphylococcus aureus.*

Between the years 2003 and 2006, the Los Angeles Fire Department (LAFD) had 136 claims for possible MRSA infections with 50 of those cases confirmed. Five of those cases required members to be hospitalized with aggressive antibiotic treatments. The LAFD conducted their own investigation and discovered clusters of MRSA at certain fire stations. The members contracted MSRA from unclean surface areas in the office, workout rooms, bathrooms and kitchens within those stations. During the years 2004 through 2006, 29 members from the

Phoenix Fire Department (PFD) contracted MRSA with eleven of those members requiring hospitalization for treatment. PFD implemented an education program informing the members of proper hygiene and decontamination (Williams, 2006).

The studies done by Roline et al. (2006), Brown et al. (2009), and Alves and Bissell (2008) indicate that there is a presence of harmful organisms in ambulances. More interesting is that the ambulances that were thought to be clean and disinfected tested positive for harmful organisms. The living quarters of the fire station are not immune to these harmful organisms per the study completed by Sexton and Reynolds (2010). In their study, the communal lifestyle of the fire service poses an increased risk of the spread of harmful organisms amongst peers. Their findings of harmful organisms in the fire station living quarters coincide with Williams (2006) where the author describes the negative effects cross contamination can have in the fire service.

Because first responders have a high exposure rate to infectious diseases, many standards have been enacted to protect them and to prevent accidental contaminations. The most significant fire service organizations that play a critical role in establishing requirements and recommendations are the NFPA, the Centers for Disease Control (CDC) and the Occupational Safety and Health Administration (OSHA). All three agencies identify the need for a formal infection control program. There are two basic goals of an infectious control program: to provide all members with the best possible protection from communicable disease and to protect patients from potential infection (USFA, 2002).

The NFPA (2015) establishes the framework for a comprehensive safety and health program. The NFPA creates the standards for a health and infection control program helping to identify and limit member exposure to contagious diseases.

The NFPA (2015) requires all fire departments to have a written infection control policy. It is the goal of this policy to indentify and limit the exposure of members to infectious diseases while on duty within the fire station and their working environment. The fire department must provide the means to clean and disinfect or the disposal of protective ensembles, firefighting tools, work uniforms, emergency medical equipment, and all apparatus. The fire department must assign a designated infection control officer. It is the duty of the infection control officer to ensure compliance of the infectious control procedures and measure their effectiveness.

The NFPA also sets the standards on facility design to help reduce and eliminate infectious diseases. Among the many recommendations set forth by NFPA, the following are most pertinent to this study: Contaminated PPE is not allowed in the living quarters of the fire station. The living quarters of the fire station are areas used for food preparation, living, sleeping, recreation or personal hygiene. Contaminated PPE should be cleaned in a designated area physically separate from the living quarters. This area should be used only to clean personal protective clothing, portable equipment and other clothing. If a fire department provides emergency medical services, it must provide access to disinfecting facilities for cleaning equipment. A disinfecting facility in a fire station must be well lit, vented to the outside, be equipped with floor tiles connected to a sewer and be designed to prevent contamination of other fire station areas (NFPA, 2015).

The NFPA provides recommendations pertaining to the cleaning procedures of personal protective equipment, uniforms, bedding and personal clothes. For fire departments that provide a designated disinfecting area, they must provide at least one dedicated washing machine and clothes dryer dedicated for the sole purpose of cleaning protective clothes, contaminated PPE and other contaminated clothing. Non-contaminated clothing and laundry are not to be washed in

machines dedicated to cleaning contaminated PPE and uniforms. Non-contaminated laundry, including bedding and towels must be cleaned in a separate washer/dryer located in an area different from the designated disinfecting area (NFPA, 2015).

Bars and Eversole (2006) also stress the importance of the fire department providing dedicated washing machines for the purpose of cleaning personal clothing and station/work uniforms. These washers must be used for washing work clothing only. This will help to prevent cross-contamination of items such as bedding, towels and personal clothing. Failure to use dedicated washer machines could lead to the exposure of other fire department members and/or their families. Contaminated fire PPE should only be cleaned in washers dedicated to the task of cleaning those items. This practice will help to prevent cross contamination of cleaning equipment and to minimize exposure to others. When washing contaminated personal protective ensemble, it is recommended that hot water is used and the temperature exceeds 130 degrees Fahrenheit (USFA, 2002).

It is also important to point out that contaminated PPE, station/work uniforms, or other clothing should never be cleaned at home (NFPA, 2015). In order to prevent cross-contamination of family clothing, all contaminated PPE and uniforms should remain and cleaned at the fire station in the designated cleaning area (USFA, 2002).

The NFPA (2015) recommends that all work surfaces be decontaminated with a disinfectant after the completion of every emergency medical run, areas of obvious contamination, after any blood spill and/or at the end of the work shift if there was a possibility of contamination.

The USFA (2002) recommends that all disinfectants used to decontaminate are approved and registered with the Environmental Protection Agency (EPA) as tuberculocidal. A chlorine

bleach solution can also be used to disinfect areas of possible contamination. If areas are grossly contaminated, they should first be washed with hot soapy water and rinsed with clean water to remove all visible material. After the visible material is removed, the area can be properly disinfected.

Rutala and Weber (2008) also state the importance of cleaning before disinfecting. It is important to use soap and water to remove foreign material from the area. They make the argument that thorough cleaning is required before disinfection because materials that remain on the surfaces interfere with the effectiveness.

The NFPA (2014) sets the standards for PPE storage. PPE must be stored separate from contaminants in a clear, dry and well-ventilated area out of sunlight. PPE shall not be stored in areas where temperatures fall below -25 degrees Fahrenheit or exceed 82 degrees Fahrenheit (NFPA, 2014). No policy exists at LFD addressing PPE storage.

Exhaust from the fire apparatus contains over 100 individual hazardous chemical components. When these components combine, they can result in as many as 10,000 different chemical compounds. Fire departments must prevent exposure of exhaust emissions to firefighters and the living quarters of the station. Fire gear that is contaminated should not be allowed in the living and sleeping quarters. If a station is remodeled or a new one is built, the apparatus floor and living quarters must be separate (NFPA, 2013).

The Firefighters Cancer Support Network (FCSN, 2013) released a white paper report outlining immediate actions for firefighters to prevent contamination of PPE. After a fire, a firefighter should perform a gross field decontamination of his or her PPE to remove as much soot and particles as possible. It recommends using a hoseline from the truck with clean water to rinse off the exterior of the PPE. The PPE should be placed in zippered bags or storage bins to be

transported back to the station. The firefighter should use baby wipes at the scene on their head, neck, face, jawline, hands and underarms to remove as much soot possible. Firefighters should change and wash their clothes and shower immediately once back at the station. The white paper report also recommends that firefighters clean their fire hoods, fire helmet and fire PPE immediately once back at the station. Lastly, firefighters should decontaminate the interior of the fire apparatus after each fire. Fire gear should never be taken into the living quarters of the station (FCSN, 2013).

The NFPA (2015) stresses the importance of fire departments having a health and infection control program and a written infection control policy. The NFPA (2015) and Barrs and Eversole (2006) share in the importance of having separate washers and dryers for PPE and uniforms. Both the NFPA (2015) and the USFA (2002) recommend that PPE and uniforms should never be taken home. Per the USFA (2002), all disinfectants should be a tuberculocidal and/or a chlorine bleach solution. The NFPA (2014) continues by recommending that PPE should be stored in clean areas that are well ventilated and free of sunlight exposure. PPE should never be allowed to enter the living quarters of the station and there should be a clear separation between the apparatus floor and living quarters (NFPA, 2013). To help minimize firefighters exposure to harmful cancer causing carcinogens, the FCSN (2013) recommends that firefighters perform on scene gross decontamination after fires and washing PPE, uniforms and showering immediately once back at the fire station.

The findings in the literature review indicate a presence of harmful contaminates in ambulances and fire stations. The literature reviewed the implications of these contaminates to fire service personnel. The fire industry standards were reviewed and give reason to implement

and enforce an infection control program. The standards were reviewed in detail as to how to prevent accidental contamination and serious illness within the fire service.

PROCEDURES

The descriptive research method was used to answer the questions posed in this research project. Internet searches using the keywords cross contamination in the fire service, firefighter cancer, fire station contamination and ambulance contamination were conducted to collect initial information. The online search yielded information from many fire service related websites and organizations. Research was also conducted at the Geauga West Public Library where articles and journals were searched using the library systems online national archive. Books, journals and articles located at the Lyndhurst and Russell Fire Station's departmental libraries as well as the Ohio Fire Chief's archived OFE research projects were also reviewed. Utilizing the Russell Fire Chief's subscription to the Prehospital Emergency Care website, online access was obtained to peer reviewed medical journals and studies pertaining to this study. Statistics from the LFD were obtained from the Lyndhurst Fire Chief and reports from the departments reporting software, Firehouse.

A survey was also sent out to the 25 members of the LFD. Since this survey was created to ascertain whether the current cleaning and disinfecting practices at LFD are in line with industry standards identified in the literature review, only members of the LFD were surveyed. The survey consisted of 28 open-ended questions (See Appendix 1). The survey results were designed to assess how often members disinfected the ambulances and the living quarters of the fire station, how much time was spent disinfecting the ambulances and living quarters of the fire station and the areas of the ambulances and fire station living quarters that were disinfected the most/least. It also assessed the duration of time that members allowed the disinfectant to stay on the surface before wiping, how members cleaned the ambulance and fire station living quarter floors, what towels were used to disinfect those areas and which washer machine was used to

wash the towels. Additionally, survey results were designed to ascertain if members separated towels used to disinfect the ambulances and fire station living quarters from those used in the kitchen of the fire station when washing. Survey results were also designed to assess where members washed their duty uniforms, bedding, fire gear and how often they washed their fire gear. Furthermore, the survey results were designed to assess the satisfaction level of the current cleaning and disinfecting practices. Lastly, the survey results were designed to ascertain what actions members took after fires to prevent cross contamination and what level of concern cancer is to them. The results from the survey were used to evaluate how compliant members of the LFD are with the industry standards identified in the literature review.

Two members of the LFD reviewed the survey before it was sent out. Both members agreed that the survey questions were pertinent to LFD. The final survey was created utilizing the Survey Monkey website. The survey link was emailed to the fire chief, the fire prevention Captain, five shift officers and 18 firefighters for a total of 25 uniformed members. Instructions and a brief explanation as to how the data will be used were included in the email. Members were informed that their participation was voluntary and that their responses were anonymous.

Members had 30 days to complete the survey. Because of a low initial response, the survey time was extended an additional 15 days for a total of 45 days. Another email was sent out to all the members thanking those that had participated and informing those who had not responded that the survey was extended. Members were also reminded face to face and/or in passing to respond to the survey if they had not. The survey link was also sent to a member via text message who was out on extended medical leave and did not have access to his email. Eighteen members or 72% completed the survey during that time.

Definition of Terms

Bacillus. "Any of various rod-shaped, spore-forming, aerobic bacteria of the genus *Bacillus* that often occur in chains and include *B. anthracis*, the causative agent of anthrax" ("Bacillus," 2017).

Disinfection. "To cleanse so as to destroy or prevent the growth of disease-carrying microorganisms" ("Disinfection," 2017).

Infectious Disease. "Any clinically evident communicable disease, or one that can be transmitted from one human being to another or from animal to human by direct or indirect contact" ("Infectious Disease," 2009).

Klebsiella. "A nonmotile, gram-negative, rod-shaped bacterium of the genus *Klebsiella*, such as *K. pneumoniae*, that causes pneumonia and other infections usually in patients with diminished immunity" ("Klebsiella," 2017).

Methicillin-resistant *Staphylococcus aureus* (MRSA). "Any of various strains of the bacterium *Staphylococcus aureus* that are resistant to methicillin and other beta-lactam antibiotics and can cause life-threatening infections" ("Methicillin-resistant Staphylococcus aureus," 2017).

Staphylococcus. "Any of various spherical gram-positive parasitic bacteria of the genus *Staphylococcus* that usually occur in grapelike clusters and commonly cause skin infections such as cellulitis and impetigo and other infectious conditions and diseases" ("Staphylococcus," 2017)

Streptococcus. "Any of various round gram-positive bacteria of the genus *Streptococcus* that occur in pairs or chains and can cause various infections in humans, including strep throat, erysipelas, and scarlet fever" ("Streptococcus," 2017).

Tuberculocidal Disinfectant. "Any disinfectant certified by the U.S. Food and Drug Administration as having the ability to kill *Mycobacterium tuberculosis* as well as less resistant microorganisms e.g. other bacteria, viruses, and fungi" ("Tuberculocidal Disinfectant," 2009).

Limitations of the Study

Because this study was done to ascertain the level of compliancy of the current cleaning practices at the LFD, this study was limited to the Lyndhurst Fire Department and its members.

After the survey was emailed out, it was noticed by one member that two of the answers on questions one and seven could mean the same (See Appendix 1). Question one on the survey asks how often a member disinfects the ambulances. Question seven asks how often a member disinfects the living quarters of the fire station. Members are required, per departmental SOP to disinfect the ambulances every Tuesday and disinfect the fire station living quarters every Saturday. This was listed as an optional answer on the survey. Another optional answer was "weekly". Because members already disinfect the station living quarters and the ambulances once a week, "weekly" could mean the same. Members were able to select only one answer to each of the respective question so this author merged the answers in the results.

A member informed the author that when they tried to access the survey link, they were alerted that they already completed the survey. It was discovered that there was an option selected with this survey through Survey Monkey that only allows one survey to be completed per internet protocol (IP) address. The survey link was sent out for 24 hours before the author discovered and turned off this option. Most the members access their email from the fire station

computers when on duty. Since these computers share the same IP address, it is not known whether or not some members tried to access the survey within that time and were denied.

Another member stated that after he completed and submitted the online survey, he never received a confirmation that the survey was accepted. He states that the website timed out after he submitted the survey. Since the survey responses were anonymous, it is not known whether or not this member's survey results were submitted.

RESULTS

The first research question inquired about the extent of which contamination is an issue in apparatus, equipment and facilities in the U.S. emergency medical services. The peer reviewed studies of Roline et al. (2006), Brown et al. (2009) and Alves and Bissell (2008) found infectious contaminates inside emergency medical service apparatus throughout the United States. The literature review also points to a study by Sexton et al. (2010) that identified infectious contaminates found inside two separate fire stations and a training facility located in the United States. Furthermore, the literature review identified two major fire departments, the Los Angeles Fire Department and the Phoenix Fire Department that had members contract an infectious disease (Williams, 2006).

The second research question sought to indentify the more significant fire/EMS industry standards related to cleaning and decontamination. The NFPA is the fire industry leader that creates standards for health and infection control programs for fire departments nationwide. In particular, NFPA 1500, NFPA 1581 and NFPA 1851 are the standards that detail the recommendations to prevent cross contamination within the fire service. The USFA also provides standards relating to the prevention of cross contamination in the fire service. The Firefighters Cancer Support Network is a leading source for prevention of cancer caused by cross contamination in the fire service.

Utilizing the results from research question two that identified the leading fire service industry standards, an internal survey was created and sent to the members of the Lyndhurst Fire Department. The survey results were designed to compare the industry standards to the current cleaning and decontamination practices of the LFD. Eighteen out of the 25 members of the LFD responded to the survey (See Appendix 2).

No member of the LFD answered that they disinfect the ambulance every shift. Of the members that answered, 83% disinfect the ambulances weekly. When doing so, 50% spend less than ten minutes and 50% spend less than twenty minutes actively disinfecting the ambulances. The cot (100%), the seats next to cot (100%), the steering wheel (94%) the backboards (94%) and door handles (88%) were the areas of the ambulances that members state they disinfect the most. The passenger seat (27%), driver seat (27%), clipboard (33%) and phone (44%) were areas that were disinfected the least. When disinfecting the ambulances, 100% of the members use the white truck towels located in the bays. When cleaning the ambulance floors, 94% of the members use the white truck towels while 33% also use the mop hanging in the apparatus bays to complete that task.

When asked how often members disinfect the Lyndhurst fire station living quarters, 83% answered weekly and 5% answered every shift. When disinfecting the living quarters of the station, 44% spend less than ten minutes doing so while 44% spend less than twenty minutes. The phones (83%), gym (77%), kitchen table (66%) and bathroom sinks (66%) were the areas that members answered they disinfect the most. The recliners (5%), couches (5%), kitchen table chairs (11%), water fountain (27%) and office desks (38%) were areas that members answered they disinfect the least. When disinfecting the fire station, 88% of the members answered that they use the white towels from the bays. It should be noted that 5% answered that they use both the white towels from the bays and the colored kitchen towels. When cleaning the fire station living quarter floors, 100% of the members answered that they use the mop hanging in the apparatus bays.

When asked about the level of satisfaction with the disinfecting practices at LFD, 5% were very satisfied, 22% were somewhat satisfied, 38% were neutral, 27% were somewhat unsatisfied and 5% were very unsatisfied.

When washing the white truck towels from the bays and the colored towels from the living quarters of the Lyndhurst fire station, 100% of the members answered that they wash the towels together. Of the members that answered, 83% use the uni-mac gear extractor to wash the colored kitchen towels (16% use both the top load and uni-mac gear extractor). When washing the white towels from the bays, all the members answered that only use the uni-mac gear extractor.

When washing their duty uniform, 94% of the members answered that they wash their uniforms at the fire station using the top load washer machine 72% of the time. It should be noted that 22% use both the top load washer and gear extractor. Nearly all (94%) of the members wash their dorm bedding at the station. Almost half (44%) use the top-load washer, 38% use the uni-mac gear extractor and 16% use both to wash their dorm bedding.

Members use the gear extractor 100% of the time when washing the outer and inner layers of their PPE fire gear. When asked how often they wash their fire gear, 72% of the members answered after each fire, 22% about once a year and 5% about once every six months. When washing their fire hood, 77% wash after each fire, 16% about once a year and 5% about once every six months. When washing their fire gloves, 72% wash them after each fire, 16% once a year and 5% once every six months.

When back at the station after a fire, almost all the members (94%) shower immediately while 72% wash their duty uniform and 55% wash their gloves. Of the members that answered, 16% wash the soot off their gear at the scene and 11% use baby wipes to wipe their exposed

skin. Five percent transport their gear back to the station outside of the apparatus cab and decontaminate the interior of the cab. Only 5% do not do any of these recommended practices after a fire. Majority of the members (83%) do not bring their gear into the living quarters of the fire station however 11% still bring their fire gear into the living quarters.

When asked how concerned members were of developing cancer from harmful exposures as a firefighter, 27% were very concerned, 27% were somewhat concerned, 33% were neutral, 5% were somewhat concerned and 5% were not concerned at all.

DISCUSSION

Firefighters are usually seen on the news fighting fires and saving lives. What is usually not seen on the news are firefighters disinfecting their ambulances or cleaning their gear. Because disinfecting and cleaning do not garnish the same sense of pride as saving a life, they tend to be viewed as mundane tasks that were created to keep firefighters busy between calls. Given the findings in this research project, proper cleaning and disinfecting should be a top priority in the fire service. When comparing the survey results to the standards identified in the literature review, there are many areas that the members of the LFD need to improve in order to prevent cross contamination.

Although the ambulances at the LFD were not sample swabbed and tested, the studies done by Roline et al. (2006), Brown et al. (2009) and Alves and Bissell (2008) indicate that they are vulnerable to infectious disease contamination. These studies found that the highest areas of contamination were found on the driver's door, the bench seat, the steering wheel, the cot and areas directly exposed to the patient. When compared to the LFD survey results, these are areas that members tend to disinfect the most. This finding indicates that members of LFD are appropriately disinfecting the areas in the ambulances that are most vulnerable to contamination of infectious diseases. However, the survey results showed that majority (83%) of the members only disinfect the ambulances once a week. According to NFPA (2015), members should be disinfecting the ambulances after every medical run or at the end of each shift. This finding is rather alarming and needs to be addressed. Because members are not disinfecting after each run, they are increasing their risk to exposure of harmful infectious diseases.

This research project reviewed the cleaning and disinfecting practices of the living quarters of the Lyndhurst fire station. The survey results indicate that the areas the members

disinfect the least are the recliners, the couches, the desks, the kitchen table chairs and water fountain. With exception to the water fountain, these were areas found by Sexton et al. (2010) and Williams (2006) to have the highest levels of infectious disease contamination in fire stations. These findings suggest that the members need to focus more on disinfecting these areas. It should be noted that the bathrooms and gyms were also areas found to have high levels of infectious disease contamination. The survey results indicate that the bathrooms and gym are areas that the members disinfect the most at LFD.

The survey results showed that 33% of the LFD members use the mop from the apparatus bays to clean the floors of the ambulances. When not in use, this mop hangs on the walls in the apparatus bays exposed to exhaust emissions. What is alarming is that every member answered that they also use this mop to clean the floors in the living quarters of the fire station. This practice is a direct violation of NFPA (2013) that states there must be a separation between the apparatus floor and the living quarters and contaminated items must not be brought into the living quarters of the station. Using the same mop to clean the ambulance floors and the living quarter floors increases the risk of cross contamination. When it comes to fire gear, majority (83%) of the members do not bring their contaminated gear into the living quarters. Even though that is a high compliancy number, no member should bring his or her contaminated fire gear into the living quarters.

The Lyndhurst fire station lacks the proper facilities to comply with the recommendations of the NFPA. The fire station only has one laundry room. The laundry room is equipped with one washer machine, one gear extractor and one dryer. Per NFPA (2015) and Bars and Eversole (2006), the Lyndhurst fire station should have a separate laundry room for non-contaminated laundry. They also recommend that there be a washer machine dedicated to the purpose of

washing only contaminated laundry and a washer machine dedicated to washing only non-contaminated laundry. One of the most alarming findings of the survey is that every member washes the living quarter kitchen towels with the towels used to clean and disinfect the ambulances and other parts of the fire station. Not separating the towels increases the chances of cross contamination. The kitchen towels are used to wipe dishes and the counters and should be washed separate from contaminated towels. To make matters worse, 83% of the members wash the towels, 55% wash their dorm bedding and 27% wash their duty uniforms in the gear extractor. Considering that all the members answered that they use the gear extractor to wash their contaminated fire gear, these practices increase the risk of cross contamination and need to be addressed.

Members of LFD do a great job cleaning contaminated laundry at the station and not their homes. NFPA (2015) and USFA (2002) recommend that these items should only be cleaned at the fire station and never taken home. Through the survey results, it was found that 94% of the members wash their duty uniforms and bedding at the station. Even though some members use the gear extractor to wash these items, majority (72%) use the top load washer machine to wash their uniforms.

Although cancer is not a new topic, it is gaining more recognition throughout the fire service. With one member of LFD already being diagnosed with cancer and firefighters being 2.2 times more likely to develop cancer than the regular public, every measure should be taken to prevent it (FCSN, 2013). The LFD does not have any SOP pertaining to cancer prevention. The FCSN (2013) recommends that every department create an SOP in an effort to reduce cancer. Based off the survey results, the LFD needs to improve on their cancer prevention efforts. Majority of the members fall short on nearly every recommendation set forth by the FCSN on

cancer prevention after a fire. The only FCSN recommendations that majority of the LFD members follow are showering once back at the station and immediately washing their uniforms. The members must follow all the FCSN recommendations 100% of the time to minimize cross contamination and reducing the risk of cancer.

The survey results indicate that the LFD members need to improve on how often they wash their fire PPE. Fire PPE should be washed after every fire (FCSN, 2013). Of the LFD members, 72% wash their fire gear and gloves after each fire while 77% wash their fire hood after each fire. This is another area that an SOP can mandate that all PPE must get washed after each fire.

Because the Lyndhurst fire station was built in 1972, it lacks the proper space for fire PPE storage. Currently, all the fire PPE is stored on racks in the bays exposed to apparatus exhaust, sunlight and extreme temperatures. This is against the recommendations of the NFPA (2014) that PPE must be stored separate from contaminants in a clear, dry and well-ventilated area out of sunlight and extreme temperatures. Because fire PPE is stored on racks in the apparatus bays, members are exposed to cross contamination every time they don their PPE.

The current LFD infectious control SOP is more than 25 years old and does not address the majority of the fire industry recommendations. An updated SOP will guide members on proper cleaning and disinfecting techniques thus limiting the potential for cross contamination. The current set up of the Lyndhurst fire station is not conducive to achieving all the recommended standards. Given the space constraints and design, it might be difficult to create the recommended physical separations to comply with the current standards. However, there are areas that the members can immediately improve on to prevent cross contamination. Only 27% of the members are satisfied with the current disinfecting practices at LFD. This number

indicates that the members would be willing to change the current cleaning practices to help make LFD a safer environment.

RECOMMENDATIONS

The research presented in this study demonstrates the importance of proper cleaning and disinfecting to prevent cross contamination. The research findings indicate that the current cleaning and disinfecting practices at the LFD are inadequate and are increasing the risk of cross contamination amongst the members. The following recommendations should be considered to reduce the risk of serious illness amongst the members of the LFD:

1. *Update the current LFD infectious control policy*. The current policy will be updated to reflect the newest NFPA standards. This updated policy will indentify and limit the exposure of members to infectious diseases thus reducing the risk of cross contamination. An updated policy will protect all members of LFD from communicable disease and protect patients from potential infection.
2. *Designate an infectious control officer*. The infectious control officer will oversee the compliance of the updated infectious control policy. The infectious control officer will measure the effectiveness of the infectious control policy. The infectious control officer will also make changes to the policy to reduce the risk of exposure to harmful infectious diseases to members and eliminate potential cross contamination.
3. *Increase the frequency of ambulance disinfecting*. Changes in the infectious control policy will reflect the frequency of ambulance disinfecting. The ambulances will be disinfected after every medical transport. Members will continue to use a tuberculocidal disinfectant to disinfect the ambulances. When disinfecting, members should focus on areas directly exposed to the patient, bench seats next to the patient, the interior door handles, the steering wheel and handrails.

4. *Disinfect areas of the living quarters*. Members will continue to disinfect the living quarters of the station every Saturday per the current LFD SOP. Members will use a tuberculocidal disinfectant spray to perform this task. Members will focus their disinfecting efforts on the couches, the surfaces of all desks and tables, the kitchen counters, the gym and bathrooms.
5. *Use separate mops to clean the ambulance floors and the living quarters*. A mop and mop bucket will be used for the sole purpose of washing the ambulance floors. A separate mop and mop bucket will be used for the sole purpose of cleaning floors in the living quarters of the station.
6. *Designate the top load washer for non-contaminated laundry and the gear extractor for contaminated laundry*. The top load washer machine will be used to wash the kitchen towels, work uniforms, bedding and other non-contaminated laundry only. The gear extractor will be used to wash dirty fire PPE, towels used to disinfect and other contaminated laundry. If a new station is constructed or the current one is remodeled, there should be two separate laundry rooms. A laundry room should be located in the living quarters and will be used to wash non-contaminated laundry. Another laundry room should be located in an enclosed room off the apparatus bays and will be used to wash fire PPE and contaminated laundry.
7. *Wash the kitchen towels separate from the towels used to disinfect*. The kitchen towels will be washed in the top load washer machine. Towels used to disinfect and clean the apparatus and fire station will be washed in the gear extractor.

8. *Create an "After the Fire" SOP*. Utilizing the recommendations from the FCSN (2013), an SOP will be created. The SOP will reduce the risk of cross contamination therefore reducing the risk of cancer to the members of LFD.
9. *Move the fire PPE storage to a room separate from the apparatus bays*. In order to meet the NFPA standards identified in the literature review and reduce the risk of cross contamination, the fire PPE will be moved out of the apparatus bays and into a room that is closed to the apparatus bays. This room will be free of contaminates, dry, well vented and not allow sunlight exposure.

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APPENDIX 1 – SURVEY QUESTIONS

1. How often do you disinfect the ambulances with TB-Quat or other anti-bacterial spray?
   A. Every shift
   B. weekly
   C. monthly
   D. Only disinfect the ambulance on the required Tuesday
   E. Other

2. When it needs it, how much time do you spend disinfecting the ambulance with TB QUAT spray or other anti-bacterial spray?
   A. 1 to 10 minutes
   B. 11 to 20 minutes
   C. 21-30 minutes
   D. more than 30 minutes

3. Please select the areas of the ambulance that you disinfect with TB QUAT spray or other anti-bacterial spray?
   ~Cot
   ~Monitor
   ~BP cuff
   ~3-lead cables
   ~Bench seats next to cot
   ~Phone
   ~Clipboard
   ~Steering wheel
   ~Radios
   ~Door handles
   ~Driver Seat
   ~Passenger seat
   ~Backboards
   ~Other areas not listed

4. When disinfecting the ambulances with TB QUAT spray or other anti-bacterial spray, what towels do you use?
   1. Disposable paper towels
   2. White truck towels from the bay
   3. Colored kitchen towels from the kitchen
   4. Both the colored kitchen towels and the white truck towels
   5. Other

5. After applying the TB QUAT spray or other anti-bacterial disinfecting spray, how long do you let it sit before wiping?
   A. Wipe immediately
   B. Less than 30 seconds
   C. Less than 1 minute
   D. More than 1 minute

6. How do you clean the floors of the ambulance (select all that apply)?
   A. With the mop hanging in the bays
   B. With the mop from the gym
   C. With the white truck towels
   D. With colored towels from the kitchen
   E. Other

7. How often do you disinfect the fire station living quarters with TB QUAT spray or other anti-bacterial spray?
   A. Every shift
   B. weekly
   C. monthly
   D. Only disinfect the station on the required Saturday duty
   E. Other

8. How much time do you spend disinfecting the fire station living quarters with TB QUAT spray or other anti-bacterial spray?
   A. 1 to 10 minutes
   B. 11 to 20 minutes
   C. 21-30 minutes
   D. more than 30 minutes

9. Please select the areas of the fire station that you disinfect with TB QUAT spray or other anti-bacterial spray
   ~kitchen table
   ~kitchen table chairs
   ~Kitchen counter tops
   ~The recliners
   ~The couches
   ~The phones
   ~The computer keyboards
   ~The computer mouse
   ~Door handles
   ~Water fountain
   ~Desks

~toilets
~bathroom sinks
~Gym
~Other areas not listed

10. When disinfecting the fire station living quarters with TB QUAT spray or other anti-bacterial spray, what towels do you use?
    A. Disposable paper towels
    B. White truck towels from the bay
    C. Colored kitchen towels from the kitchen
    D. Both the colored kitchen towels and the white truck towels
    E. Other

11. How do you clean the tile floor of the kitchen, bathrooms and locker room inside the fire station living quarters (select all that apply)?
    A. With the mop hanging in the bays
    B. With the mop from the gym
    C. With the white truck towels
    D. With colored towels from the kitchen
    E. Other

12. When washing the towels, do you separate the colored kitchen towels from the white truck towels?
    A. Yes, I wash the kitchen towels separate from the truck towels
    B. No, I don't separate the towels and wash them together
    C. I don't wash the towels
    D. Other

13. Which washer machine do you wash the colored kitchen towels?
    A. Top load washer machine
    B. Uni- Mac Gear extractor
    C. Both
    D. Other

14. Which washer machine do you wash the white truck towels?
    A. Top load washer machine
    B. Uni-Mac Gear extractor
    C. Both
    D. Other

15. Where do you wash your duty uniform?
    A. At the fire station
    B. At home
    C. At both the fire station and home
    D. Other

16. If you wash your duty uniform at the station, which washer machine do you use?
    A. Top Load washer machine
    B. Uni-Mac Gear Extractor
    C. Both
    D. Other

17. Where do you wash your dorm bedding?
    A. At the fire station
    B. At home
    C. At both the fire station and home
    D. Other

18. If you wash your dorm bedding at the station, which washer machine do you use?
    A. Top Load washer machine
    B. Uni-Mac Gear Extractor
    C. Both
    D. Other

19. How important to you is using anti-bacterial spray to disinfect?
    A. Very important
    B. Somewhat important
    C. Neutral
    D. Somewhat not important
    E. Not important

20. What is your level of satisfaction with the disinfecting practices at Lyndhurst FD?
    A. Very satisfied
    B. Somewhat satisfied
    C. Neutral
    D. Somewhat unsatisfied
    E. Very unsatisfied

21. How often do you wash your fire gear?
    A. After each fire
    B. Once a month
    C. Once every 6 months
    D. Once a year
    E. Other

22. How often do you wash your fire hood?
    A. After each fire
    B. Once a month
    C. Once every 6 months
    D. Once a year
    E. Other

23. How often do you wash your fire gloves?
    A. After each fire
    B. Once a month
    C. Once every 6 months
    D. Once a year
    E. Other

24. Which washer machine do you use when washing the outer shell of your fire gear?
    A. Uni-Mac gear extractor
    B. Top load washing machine
    C. Other

25. Which washer machine do you use when washing the inner liner of your fire gear?
    A. Uni-Mach gear extractor
    B. Top load washing machine
    C. Other

26. Please select all that you do after a fire
    A. I remove as much soot off my fire gear with clean water at the fire scene
    B. I use baby wipes to clean my exposed skin (neck, face and hands) at the fire scene
    C. I take my gear off at the scene and transport it back to the station outside of the fire truck cab area
    D. I immediately shower once I get back to the station
    E. I immediately wash my station uniform once I get back to the station
    F. I immediately wash my gloves and hood once I get back to the station
    G. I immediately decontaminate the interior of the truck once back at the station

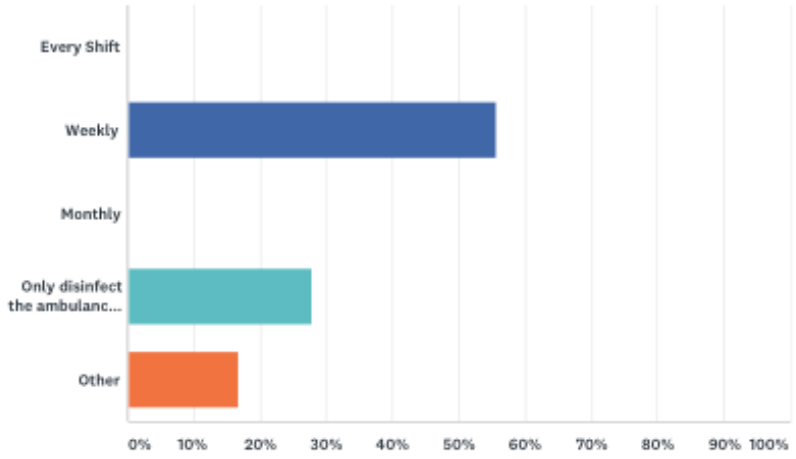
27. Do you ever bring your fire gear into the living quarters of the station?
    A. Yes
    B. No
    C. Other

28. How concerned are you about developing cancer from harmful exposures as a firefighter?
    A. Very concerned
    B. Somewhat concerned
    C. Neutral
    D. Somewhat not concerned
    E. Not concerned

APPENDIX 2 – SURVEY RESULTS

Q1 How often do you disinfect the ambulances with TB-Quat or other anti-bacterial spray?

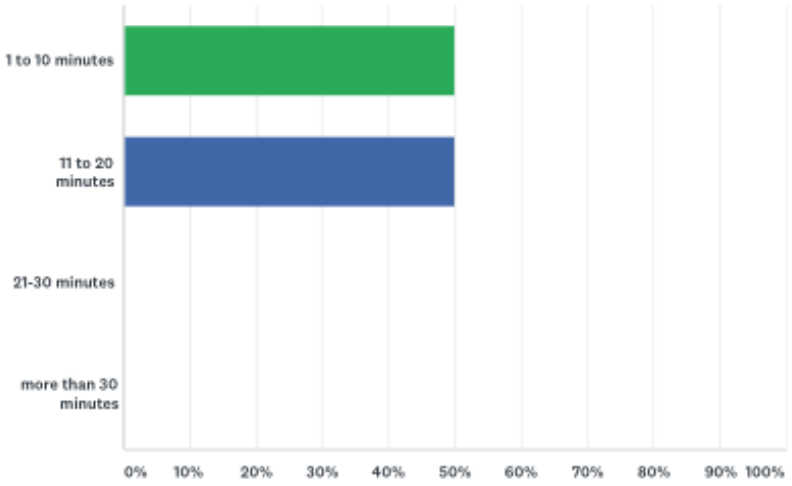
Answered: 18 Skipped: 0



ANSWER CHOICES	RESPONSES	
Every Shift	0.00%	0
Weekly	55.56%	10
Monthly	0.00%	0
Only disinfect the ambulances on the required Tuesday	27.78%	5
Other	16.67%	3
TOTAL		18

Q2 When it needs it, how much time do you spend disinfecting the ambulance with TB QUAT spray or other anti-bacterial spray?

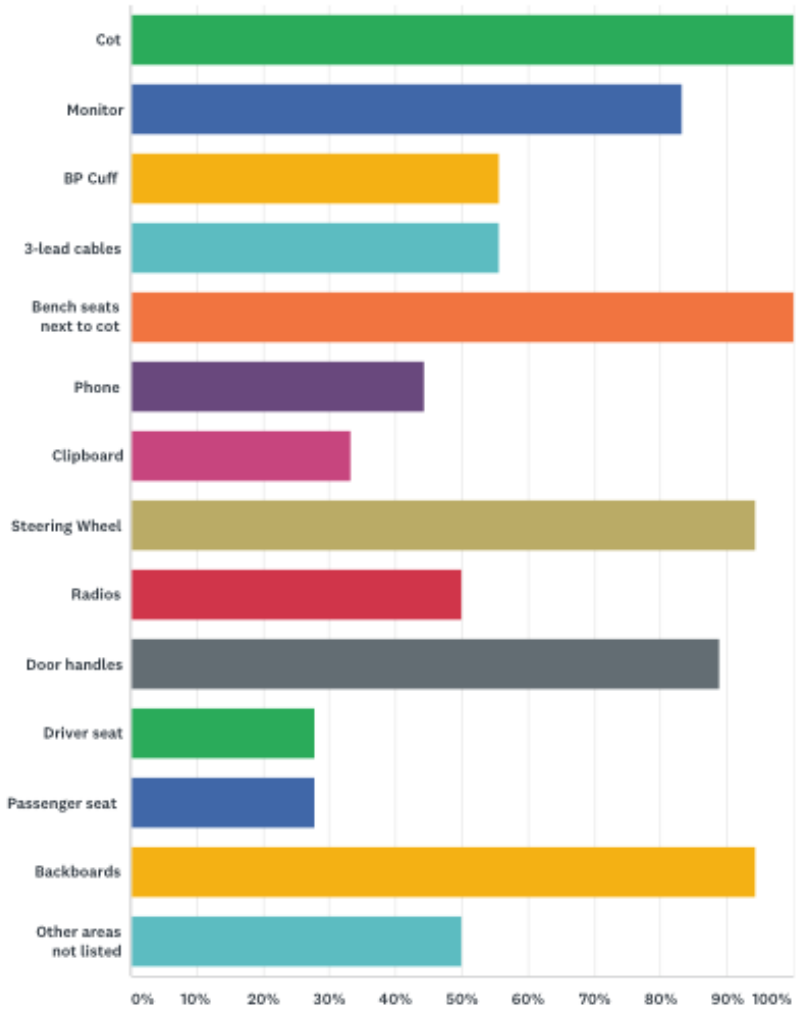
Answered: 18 Skipped: 0



ANSWER CHOICES	RESPONSES	
1 to 10 minutes	50.00%	9
11 to 20 minutes	50.00%	9
21-30 minutes	0.00%	0
more than 30 minutes	0.00%	0
TOTAL		18

Q3 Please select the areas of the ambulance that you disinfect with TB QUAT spray or other anti-bacterial spray?

Answered: 18 Skipped: 0

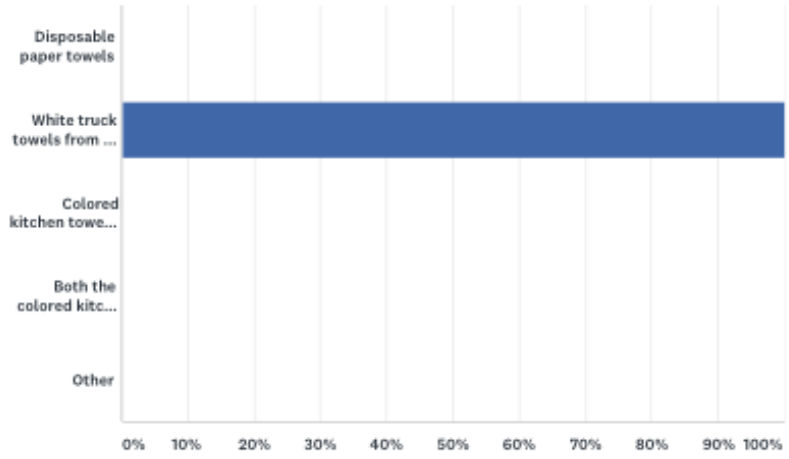


ANSWER CHOICES	RESPONSES	
Cot	100.00%	18
Monitor	83.33%	15
BP Cuff	55.56%	10
3-lead cables	55.56%	10

Bench seats next to cot	100.00%	18
Phone	44.44%	8
Clipboard	33.33%	6
Steering Wheel	94.44%	17
Radios	50.00%	9
Door handles	88.89%	16
Driver seat	27.78%	5
Passenger seat	27.78%	5
Backboards	94.44%	17
Other areas not listed	50.00%	9
Total Respondents: 18		

Q4 When disinfecting the ambulances with TB QUAT spray or other anti-bacterial spray, what towels do you use?

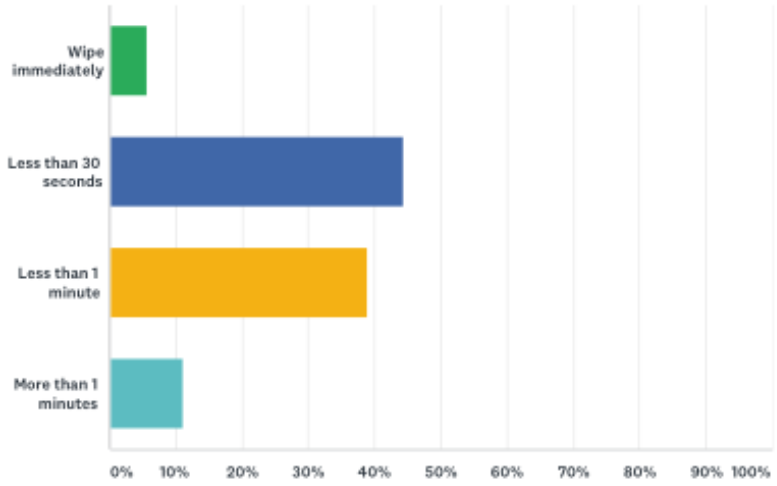
Answered: 18 Skipped: 0



ANSWER CHOICES	RESPONSES	
Disposable paper towels	0.00%	0
White truck towels from the bay	100.00%	18
Colored kitchen towels from the kitchen	0.00%	0
Both the colored kitchen towels and the white truck towels	0.00%	0
Other	0.00%	0
TOTAL		18

Q5 After applying the TB QUAT spray or other anti-bacterial disinfecting spray, how long do you let it sit before wiping?

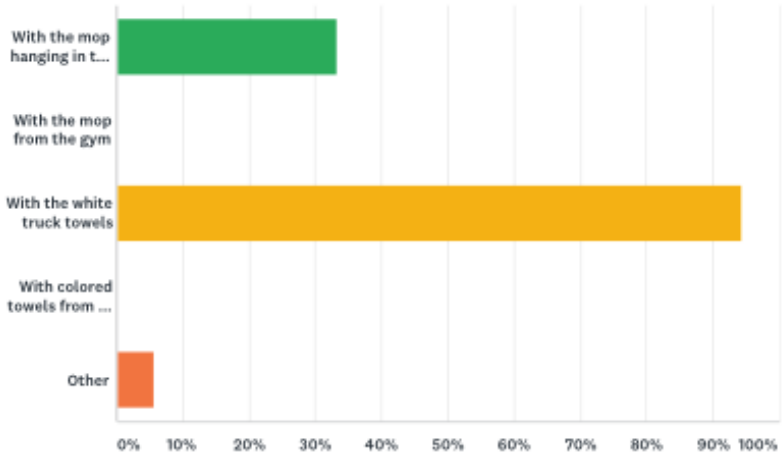
Answered: 18 Skipped: 0



ANSWER CHOICES	RESPONSES	
Wipe immediately	5.56%	1
Less than 30 seconds	44.44%	8
Less than 1 minute	38.89%	7
More than 1 minutes	11.11%	2
TOTAL		18

Q6 How do you clean the floors of the ambulance (select all that apply)?

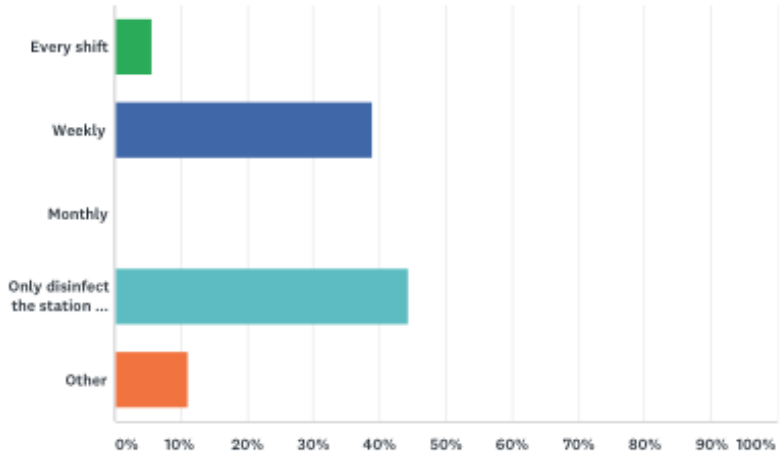
Answered: 18 Skipped: 0



ANSWER CHOICES	RESPONSES	
With the mop hanging in the bays	33.33%	6
With the mop from the gym	0.00%	0
With the white truck towels	94.44%	17
With colored towels from the kitchen	0.00%	0
Other	5.56%	1
Total Respondents: 18		

Q7 How often do you disinfect the fire station living quarters with TB QUAT spray or other anti-bacterial spray?

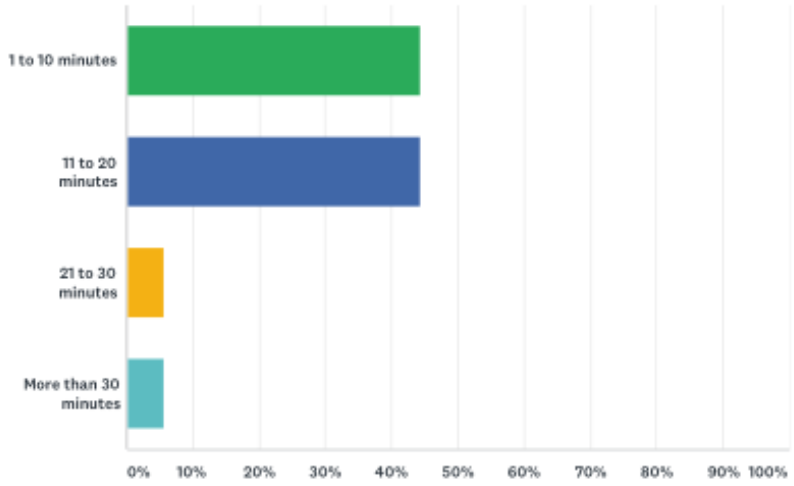
Answered: 18 Skipped: 0



ANSWER CHOICES	RESPONSES	
Every shift	5.56%	1
Weekly	38.89%	7
Monthly	0.00%	0
Only disinfect the station on the required Saturday detail	44.44%	8
Other	11.11%	2
TOTAL		18

Q8 How much time do you spend disinfecting the fire station living quarters with TB QUAT spray or other anti-bacterial spray?

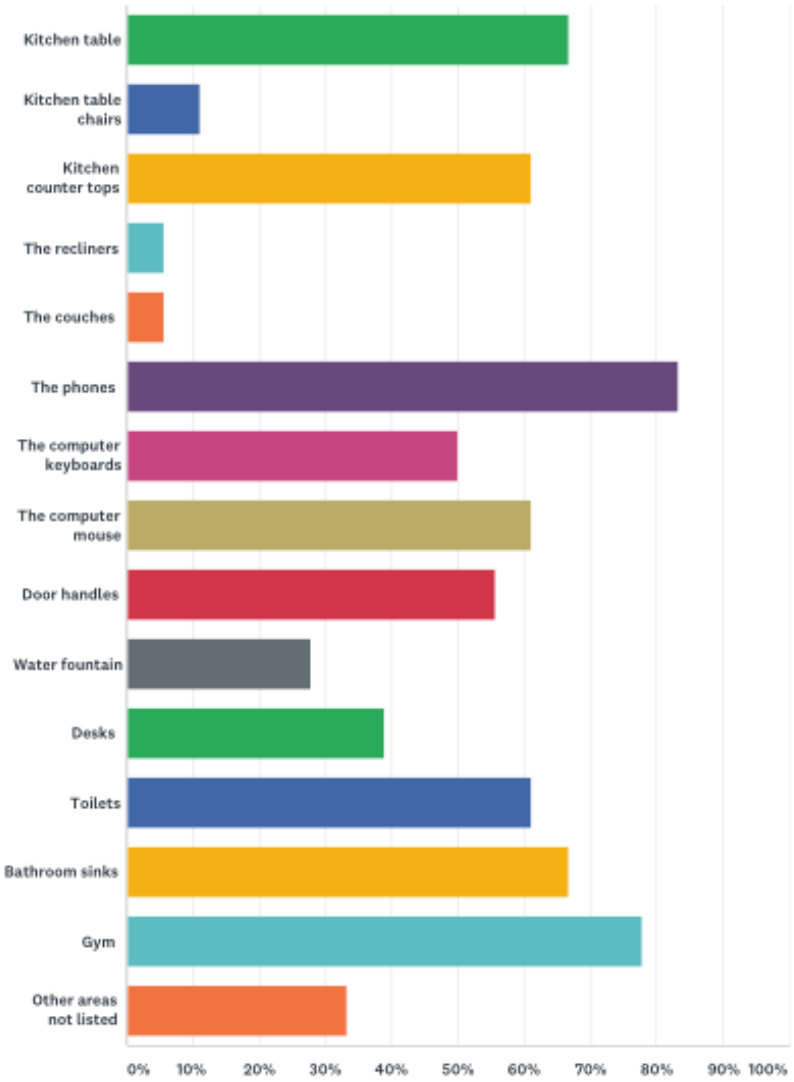
Answered: 18 Skipped: 0



ANSWER CHOICES	RESPONSES	
1 to 10 minutes	44.44%	8
11 to 20 minutes	44.44%	8
21 to 30 minutes	5.56%	1
More than 30 minutes	5.56%	1
TOTAL		18

Q9 Please select the areas of the fire station that you disinfect with TB QUAT spray or other anti-bacterial spray

Answered: 18 Skipped: 0

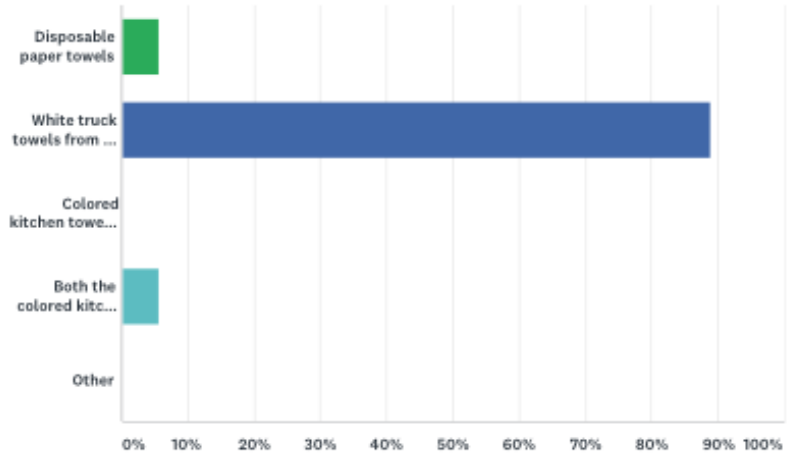


ANSWER CHOICES	RESPONSES	
Kitchen table	66.67%	12
Kitchen table chairs	11.11%	2

Kitchen counter tops	61.11%	11
The recliners	5.56%	1
The couches	5.56%	1
The phones	83.33%	15
The computer keyboards	50.00%	9
The computer mouse	61.11%	11
Door handles	55.56%	10
Water fountain	27.78%	5
Desks	38.89%	7
Toilets	61.11%	11
Bathroom sinks	66.67%	12
Gym	77.78%	14
Other areas not listed	33.33%	6
Total Respondents: 18		

Q10 When disinfecting the fire station living quarters with TB QUAT spray or other anti-bacterial spray, what towels do you use?

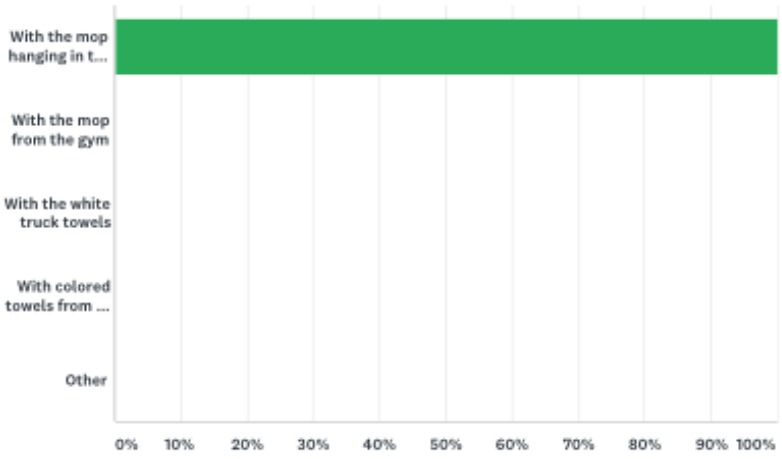
Answered: 18 Skipped: 0



ANSWER CHOICES	RESPONSES	
Disposable paper towels	5.56%	1
White truck towels from the bay	88.89%	16
Colored kitchen towels from the kitchen	0.00%	0
Both the colored kitchen towels and the white truck towels	5.56%	1
Other	0.00%	0
TOTAL		18

Q11 How do you clean the tile floor of the kitchen, bathrooms and locker room inside the fire station living quarters (select all that apply)?

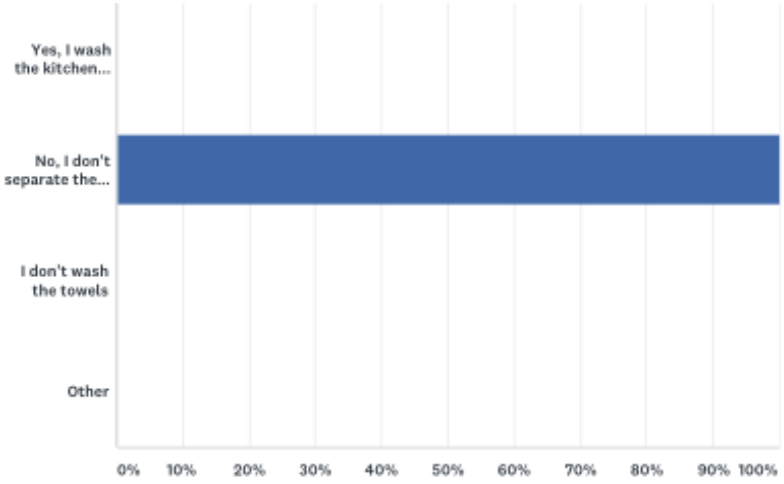
Answered: 18 Skipped: 0



ANSWER CHOICES	RESPONSES	
With the mop hanging in the bays	100.00%	18
With the mop from the gym	0.00%	0
With the white truck towels	0.00%	0
With colored towels from the kitchen	0.00%	0
Other	0.00%	0
Total Respondents: 18		

Q12 When washing the towels, do you separate the colored kitchen towels from the white truck towels?

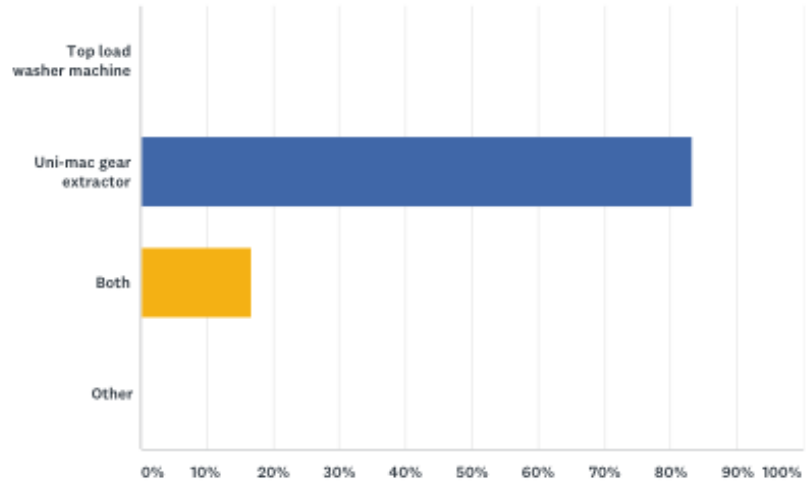
Answered: 18 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes, I wash the kitchen towels separate from the truck towels	0.00%	0
No, I don't separate the towels and wash them together	100.00%	18
I don't wash the towels	0.00%	0
Other	0.00%	0
TOTAL		18

Q13 Which washer machine do you wash the colored kitchen towels?

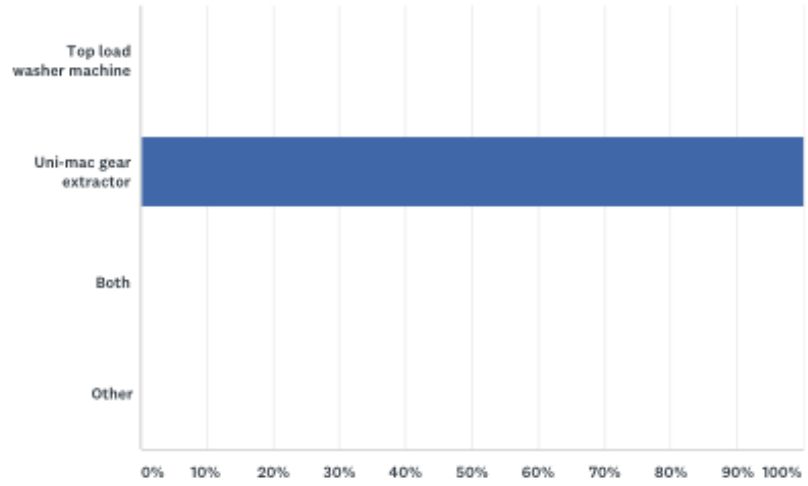
Answered: 18 Skipped: 0



ANSWER CHOICES	RESPONSES	
Top load washer machine	0.00%	0
Uni-mac gear extractor	83.33%	15
Both	16.67%	3
Other	0.00%	0
TOTAL		18

Q14 Which washer machine do you wash the white truck towels?

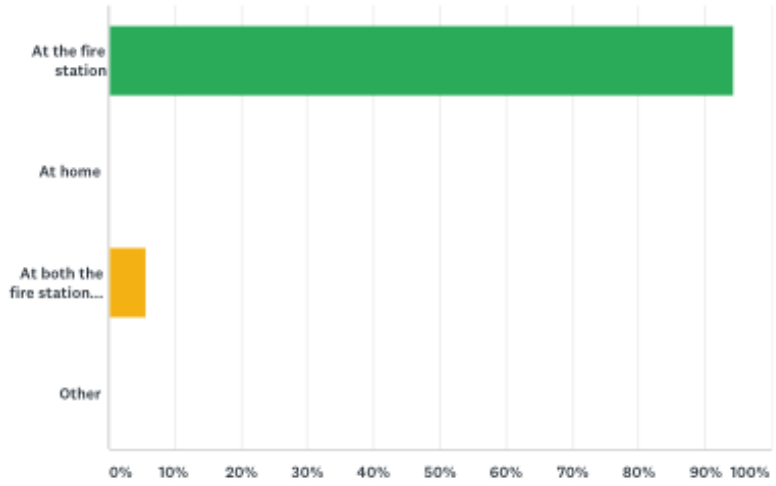
Answered: 18 Skipped: 0



ANSWER CHOICES	RESPONSES	
Top load washer machine	0.00%	0
Uni-mac gear extractor	100.00%	18
Both	0.00%	0
Other	0.00%	0
TOTAL		18

Q15 Where do you wash your duty uniform?

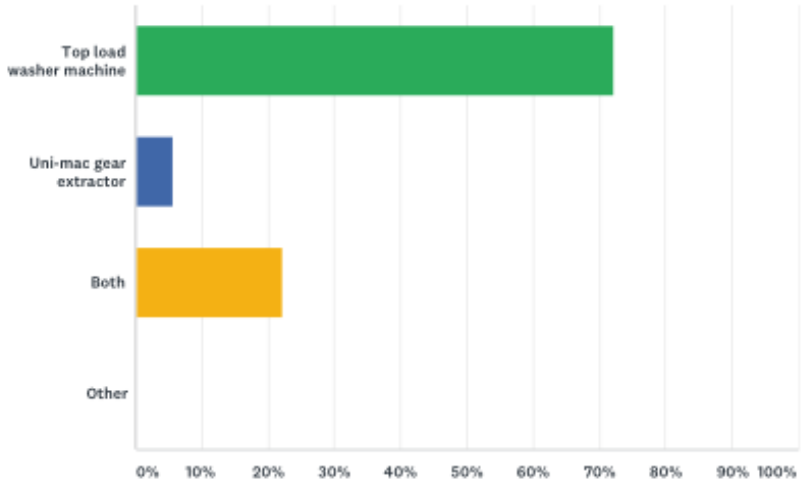
Answered: 18 Skipped: 0



ANSWER CHOICES	RESPONSES	
At the fire station	94.44%	17
At home	0.00%	0
At both the fire station and home	5.56%	1
Other	0.00%	0
TOTAL		18

Q16 If you wash your duty uniform at the station, which washer machine do you use?

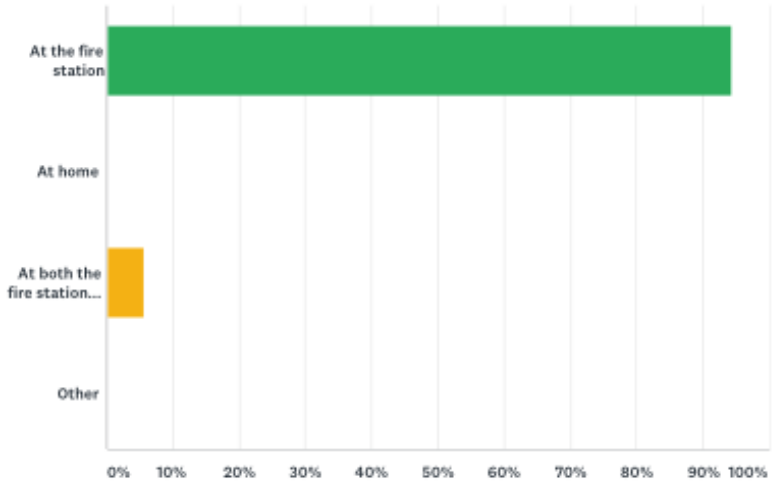
Answered: 18 Skipped: 0



ANSWER CHOICES	RESPONSES	
Top load washer machine	72.22%	13
Uni-mac gear extractor	5.56%	1
Both	22.22%	4
Other	0.00%	0
TOTAL		18

Q17 Where do you wash your dorm bedding?

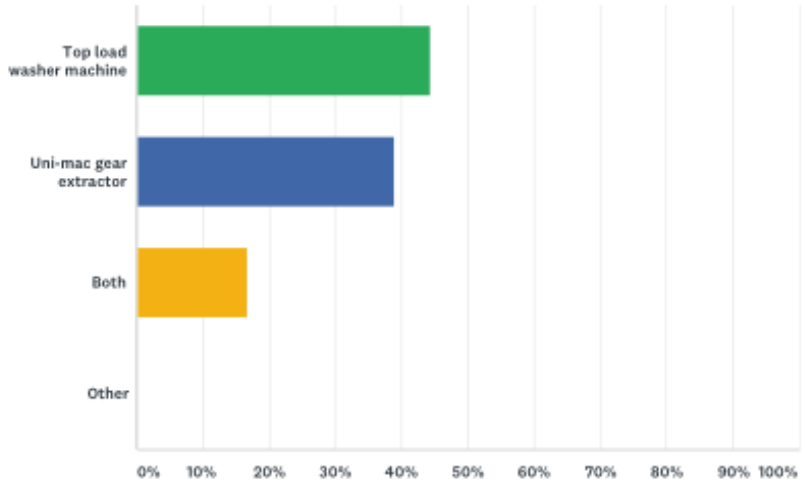
Answered: 18 Skipped: 0



ANSWER CHOICES	RESPONSES	
At the fire station	94.44%	17
At home	0.00%	0
At both the fire station and home	5.56%	1
Other	0.00%	0
TOTAL		18

Q18 If you wash your dorm bedding at the station, which washer machine do you use?

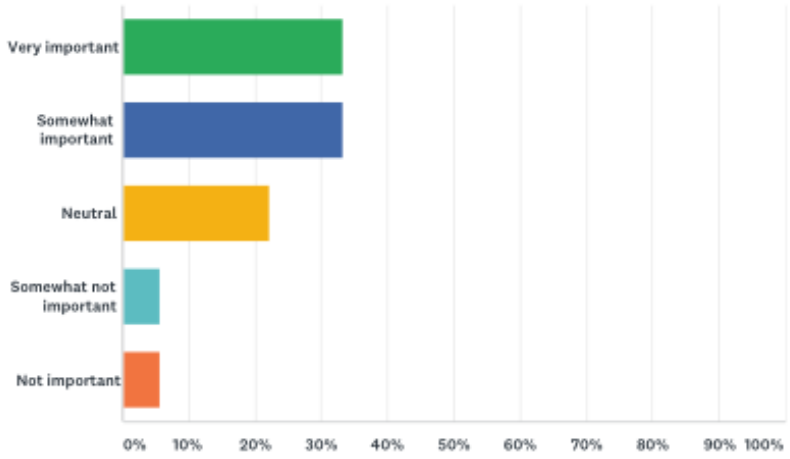
Answered: 18 Skipped: 0



ANSWER CHOICES	RESPONSES	
Top load washer machine	44.44%	8
Uni-mac gear extractor	38.89%	7
Both	16.67%	3
Other	0.00%	0
TOTAL		18

Q19 How important to you is using anti-bacterial spray to disinfect?

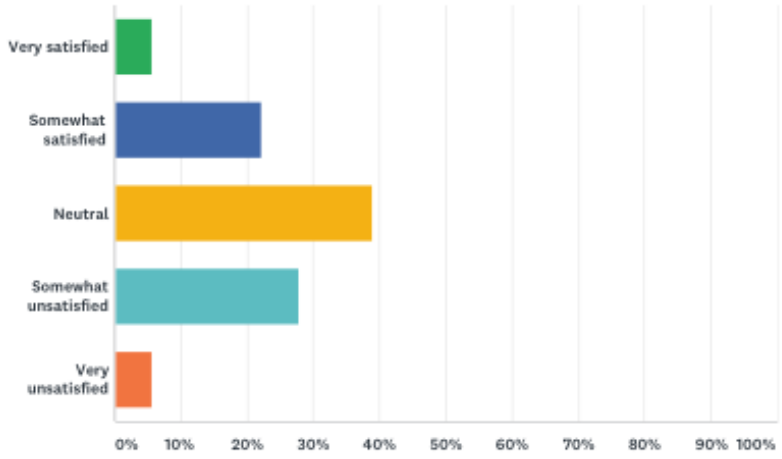
Answered: 18 Skipped: 0



ANSWER CHOICES	RESPONSES	
Very important	33.33%	6
Somewhat important	33.33%	6
Neutral	22.22%	4
Somewhat not important	5.56%	1
Not important	5.56%	1
TOTAL		18

Q20 What is your level of satisfaction with the disinfecting practices at Lyndhurst FD?

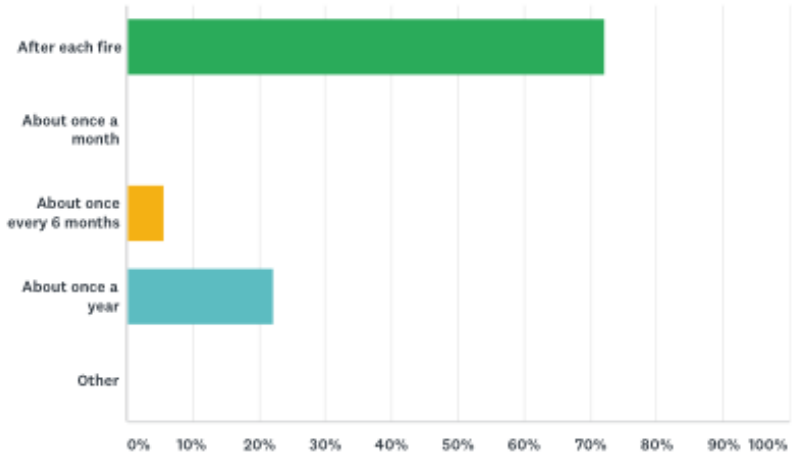
Answered: 18 Skipped: 0



ANSWER CHOICES	RESPONSES	
Very satisfied	5.56%	1
Somewhat satisfied	22.22%	4
Neutral	38.89%	7
Somewhat unsatisfied	27.78%	5
Very unsatisfied	5.56%	1
TOTAL		18

Q21 How often do you wash your fire gear?

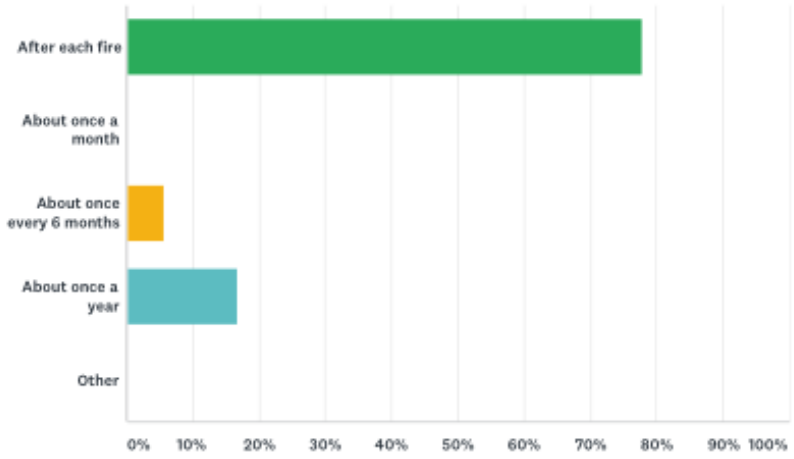
Answered: 18 Skipped: 0



ANSWER CHOICES	RESPONSES	
After each fire	72.22%	13
About once a month	0.00%	0
About once every 6 months	5.56%	1
About once a year	22.22%	4
Other	0.00%	0
TOTAL		18

Q22 How often do you wash your fire hood?

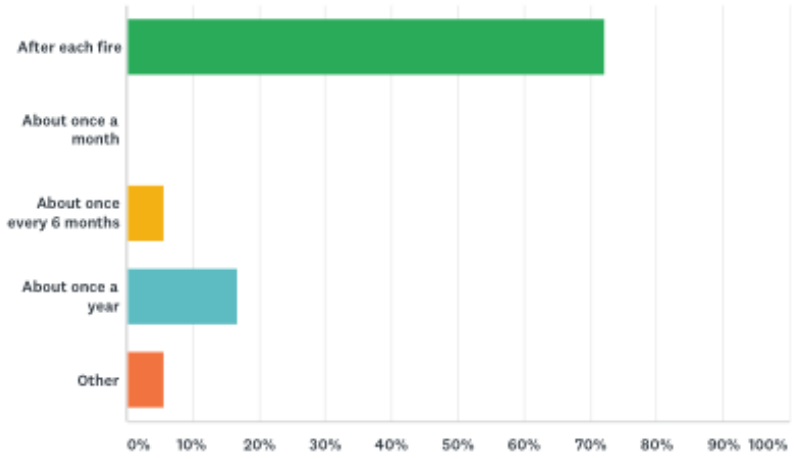
Answered: 18 Skipped: 0



ANSWER CHOICES	RESPONSES	
After each fire	77.78%	14
About once a month	0.00%	0
About once every 6 months	5.56%	1
About once a year	16.67%	3
Other	0.00%	0
TOTAL		18

Q23 How often do you wash your fire gloves?

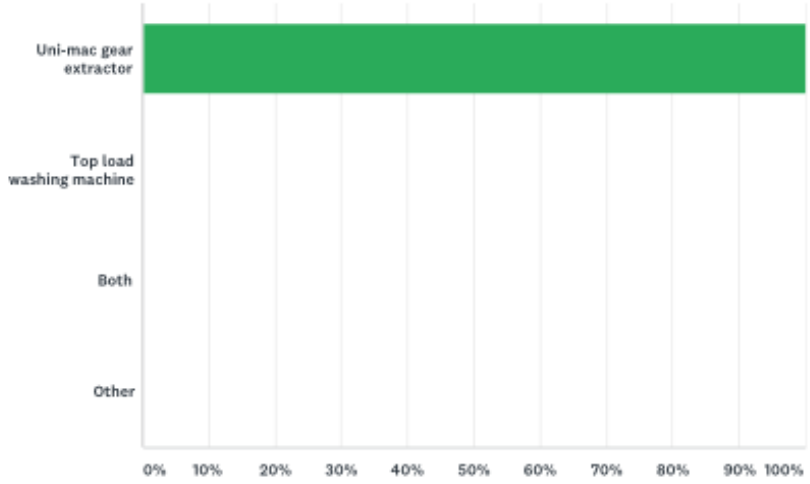
Answered: 18 Skipped: 0



ANSWER CHOICES	RESPONSES	
After each fire	72.22%	13
About once a month	0.00%	0
About once every 6 months	5.56%	1
About once a year	16.67%	3
Other	5.56%	1
TOTAL		18

Q24 Which washer machine do you use when washing the outer shell of your fire gear?

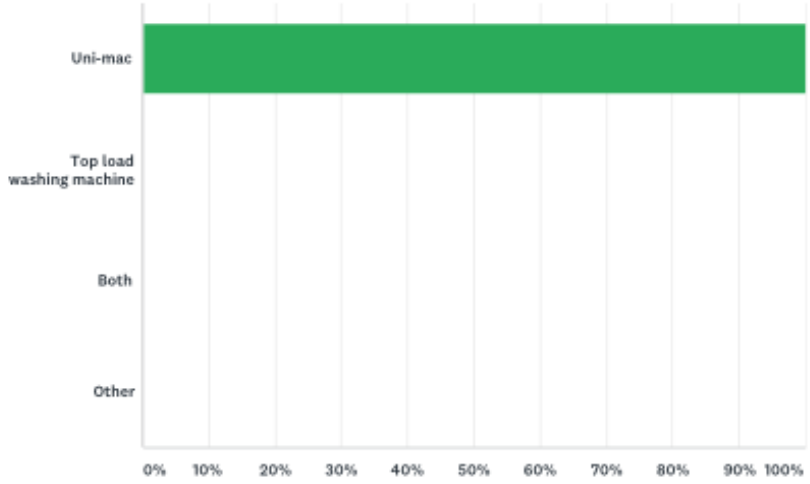
Answered: 18 Skipped: 0



ANSWER CHOICES	RESPONSES	
Uni-mac gear extractor	100.00%	18
Top load washing machine	0.00%	0
Both	0.00%	0
Other	0.00%	0
TOTAL		18

Q25 Which washer machine do you use when washing the inner liner of your fire gear?

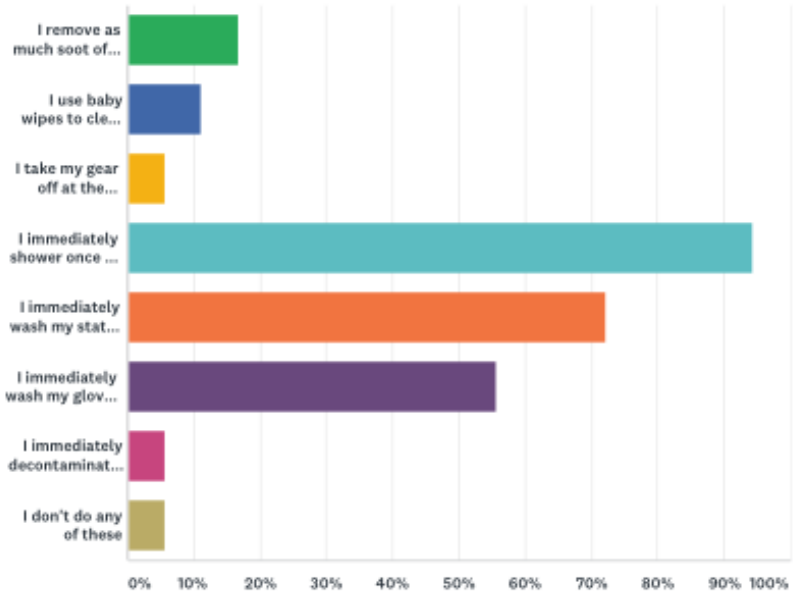
Answered: 18 Skipped: 0



ANSWER CHOICES	RESPONSES	
Uni-mac	100.00%	18
Top load washing machine	0.00%	0
Both	0.00%	0
Other	0.00%	0
TOTAL		18

Q26 Please select all that you do after a fire?

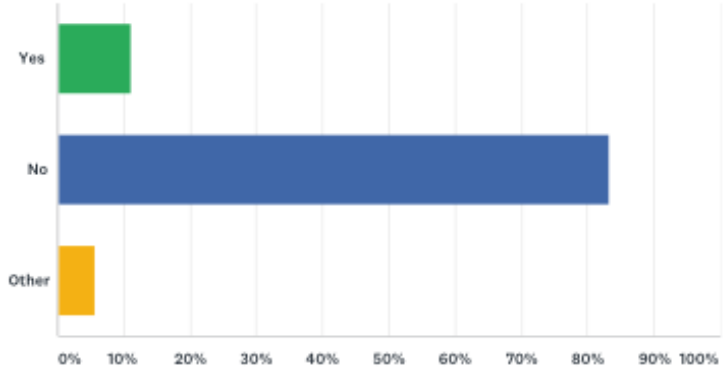
Answered: 18 Skipped: 0



ANSWER CHOICES	RESPONSES	
I remove as much soot off my fire gear with clean water at the fire scene	16.67%	3
I use baby wipes to clean my exposed skin (neck, face and hands) at the fire scene	11.11%	2
I take my gear off at the scene and transport it back to the station outside of the fire truck cab area	5.56%	1
I immediately shower once I get back to the station	94.44%	17
I immediately wash my station uniform once I get back to the station	72.22%	13
I immediately wash my gloves and hood once I get back to the station	55.56%	10
I immediately decontaminate the interior of the truck once back at the station	5.56%	1
I don't do any of these	5.56%	1
Total Respondents: 18		

Q27 Do you ever bring your fire gear into the living quarters of the station?

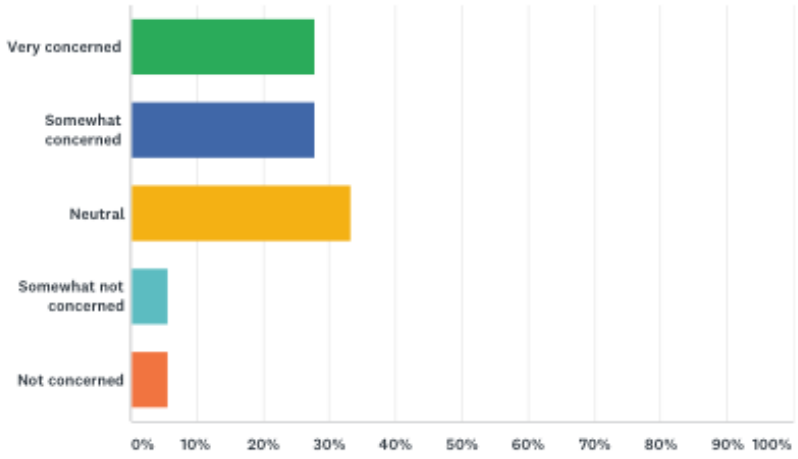
Answered: 18 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	11.11%	2
No	83.33%	15
Other	5.56%	1
TOTAL		18

Q28 How concerned are you about developing cancer from harmful exposures as a firefighter?

Answered: 18 Skipped: 0



ANSWER CHOICES	RESPONSES	
Very concerned	27.78%	5
Somewhat concerned	27.78%	5
Neutral	33.33%	6
Somewhat not concerned	5.56%	1
Not concerned	5.56%	1
TOTAL		18