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Lean Process Improvement at the Boylston Fire Department

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Abstract

Improvement in healthcare quality is often defined by the ability of a service and/or provider to offer exceptional patient care while keeping costs minimal. Although many hospitals have teams of individuals dedicated to overall process improvement, organizations providing prehospital emergency medical services often do not have the same resources. As such, it is difficult for small services, especially fire departments, to continuously improve their performance.

The overall objective of this research was to determine how the Boylston Fire Department – a small department staffed by a combination of full-time, per diem, and paid-per-call members – could improve the quality of patient care provided on emergency ambulance calls. Areas of specific interest included reducing the costs associated with medical supply inventory, enabling fiscal savings to be diverted elsewhere, improving the emergency medical training received by the department's Emergency Medical Technicians (EMTs), and the creation of an online database, to allow the leadership of the department to better monitor the types of training each EMT completes.

A review of the state of the art revealed that while some large ambulance services utilize digital inventory tracking systems, no fire departments the size of Boylston's have modernized inventory management systems for medical supplies. Additionally, while the BFD performs monthly medical training for employees, many fire departments and ambulance services offer training more frequently, and have specialized training programs designed for their personnel and services. Furthermore, digital training records for personnel are common, and often allow both training staff and EMTs to access records.

Methods used to conduct this research included safety stock calculations for critical ambulance supplies, analysis of the Massachusetts Office of Emergency Medical Services (OEMS) ambulance regulations, the

application of six sigma techniques to the department's inventory storage area, and financial analysis of the in-house inventory kept at the BFD, as well as on each of the department's ambulances.

The results showed that the BFD's current inventory management system is outdated, and that there is a significant need for a modernized process. The methods used to provide medical training to department employees, as well as the tracking system utilized to monitor employee progress, have both been shown to be outdated and in need of improvement.

It was concluded that the department's best chance at process improvement relies on the ability of the department to implement a new inventory management system, as well as a more rigorous training program.

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Chapter 1 – Introduction

1.1 Objective

This chapter discusses the rationale for process improvement at the Boylston Fire Department, defines the problem, and proposes an approach.

The process improvement initiative of the Boylston Fire Department had two primary objectives, as outlined below:

1. Modernize the inventory management system utilized for medical supplies, to enable supplies to be more easily located by department members, and to reduce the fiscal demand supplies place on the department.
2. Improve the quality of patient care by providing rigorous, enhanced training to Boylston's Emergency Medical Technicians (EMTs), and implementing a formal quality assurance/quality improvement program.

1.2 Rationale

The Boylston Fire Department is a small department located in the greater Worcester area, bordering the towns of Northborough, Berlin, Shrewsbury, Clinton, and West Boylston, MA. The department is staffed by a combination of full-time, per diem, and paid-per-call FF/EMTs, whose mission is the protect the 4,399 residents of Boylston from crises such as fires, motor vehicle accidents, hazardous materials incidents, and medical emergencies. The department operates out of a variety of apparatus, and responds to all medical emergencies in one of two ambulances. While many of the department's members are cross-trained in both firefighting and emergency medical care, there are some members trained solely in one area.

The Boylston Fire Department's medical supplies are currently maintained by the Lieutenant responsible for EMS operations. Although no formal system is in place, if the stock of any particular item is running low, the Lt. places an online order, which is typically received within 1-2 business days. The vast majority of the department's medical supplies are obtained through Moore Medical, a distributor from Connecticut. Because of the cost savings associated with bulk orders, many supplies are ordered only a couple of times a year, in a large quantity. Additionally, most medications administered are restocked at hospital pharmacies, through contract agreements between the fire department and the hospital (Bradford, 2016).

Because of the critical nature of emergency medicine, the number of supplies in the department's inventory at any given time is quite high. This is because the department would rather have too many supplies, than risk running out in the middle of an emergency. The Massachusetts Office of Emergency Medical Services (MA OEMS) mandates that each ambulance carry enough supplies to respond to at least two critical emergencies back-to-back. Additionally, as shown in Appendix I, MA OEMS has a published guide outlining the minimum number of each type of medical supply an ambulance must carry.

1.3 State of the Art

Large fire departments and ambulance services often have advanced techniques for tracking inventory and conducting emergency medical training. Many services require EMTs to complete online checklists which track equipment used, and update the supply team in real-time, so the individuals responsible for restocking know the type and quantity of critical equipment that must be restocked. Additionally, services often have online databases tracking the training completed by their employees, and providing notifications if an employee has a certification that is soon expiring.

While it may not be fiscally possible for small services to utilize these systems directly, adaptations of these systems are available to departments of any size. Small departments in many cases track inventory using a dated “pen and index card” method, and manually monitor each EMTs training records. As a result, it is feasible for departments to automate at least some of this system, to create more efficiency in the long-term.

1.4 Methods

To meet the research objectives outlined above, an analysis was conducted on the process improvement techniques utilized in other healthcare areas, for example, hospital emergency medicine. Of the various techniques utilized, those that could be best adapted to the Boylston Fire Department were selected.

1.4.1 Inventory Management System

Vendor managed inventory, barcode managed inventory, and inventory systems triggered by visual cues are among the many types of inventory management systems utilized by various businesses and industries to accurately and efficiently track inventory (Bai, et al, 2008). To determine which system would be most effective for the Boylston Fire Department, an analysis was completed of each type. The focus of each analysis was the ease with which the system could be implemented in the fire department setting, the cost associated with using the system, and the systems overall accuracy.

Vendor managed inventory was considered because of its potential to reduce the workload of the department members, with regard to manually ordering supplies, while still consistently maintaining an accurate medical supply inventory for the department (Vigtil, 2007).

Barcode management systems were analyzed because of their potential to enable the EMTs restocking the ambulances to individually track inventory used, while still allowing the inventory numbers to update in live time. With this type of management system, a vendor could be responsible for restocking

supplies when inventory number reached preset, critical levels, or a designated department member can be notified via an alert, so that they know when it is necessary to order additional supplies.

Visual cue systems were also assessed, because of their similarity to the system currently in place, and the ease with which they could be adapted by the department. Clearing denoting the space for each type of supply in the inventory storage area, making the amount of each supply type that should be present clearly visible, and/or having cameras face the supply space are also methods which were considered.

In additional to the analysis of various inventory management systems, numerical calculations were completed regarding the ideal amount of safety stock for various types of medical supplies, and the monetary savings that the department would incur if they choose to adopt a new inventory management system.

1.4.2 Patient Care Quality Improvement

To improve the quality of patient care provided by department EMTs, two areas were identified as critical to success. The first, and most obvious area, is enhancing the training received by department EMTs. By improving training, medical providers have a larger knowledge base to utilize during calls, and have increased exposure to various types of scenarios. The second, and less obvious area, is creating and implementing a stronger quality assurance/improvement program for the department, to allow EMTs to learn from each medical call they complete, and therefore improve their skills with each patient contact.

A variety of training methods were analyzed, specifically those tailored to departments with low call volumes. Additionally, the quality assurance/improvement programs utilized by other departments in the area, as well as private EMS services, and hospitals, were assessed, to determine what type of program would be most successful at the Boylston Fire Department.

1.5 Results

The research conducted shows that process optimization at the Boylston Fire Department is most closely linked with improving the quality of patient care and decreasing inventory costs. By implementing a new and rigorous training program, utilizing a strict quality assurance/improvement program, and managing inventory more efficiently, the BFD can improve EMS operations.

1.6 Conclusion

As with any entity that provides patient care, one of the primary focuses of the organization is ensuring that all patients are receiving the best treatment possible. Because of the low call volume nature of the Boylston Fire Department, it is critical that high-caliber training be implemented many times throughout the year; this is because many of the BFD's EMTs see a significantly lower number of patients than individuals who work full-time in emergency medicine. As shown in Appendix II, in the 2015 year the department responded to 348 medical calls via ambulance. Each medical call was staffed by a minimum of two EMTs; however, in many cases an additional third EMT, completing training, responded with the primary crew. A total of 27 EMTs participated in patient care thus far during the 2016 year, with a similar number participating in 2015.

One of the best ways to improve patient care quality is to provide increased training to EMTs throughout the year; however, there are many factors to be considered with regard to this. First and foremost, as the majority of the BFD's workforce consists of per diem EMTs, who have an additional, unrelated, full-time job, it is difficult to require employees to participate in a large amount of training during the evenings/weekends. Nonetheless, these employees still must be able to provide the same quality of patient care that any full-time EMT could provide. Additionally, although the BFD's Lieutenant responsible for EMS operations audits many of the patient care reports completed by department members, there is no formal process in place to allow EMTs to consistently receive feedback on their

reports, and subsequently the patient care they provided on scene. By implementing a more formal quality assurance/improvement system, department EMTs will better be able to learn from each call they respond to.

As part of the BFD's process improvement initiative, a variety of methods to improve both EMT training, and quality assurance/improvement were analyzed, with a focus on programs tailored to meet the needs of a small combination department.

Chapter 2 – Inventory Management System Modernization

2.1 Objective

The inventory management system modernization research focuses on how to best reduce the costs associated with medical supply inventory, while creating a more organized space, to allow EMTs to locate and restock supplies with more ease. Specific topics of focus include the follow:

1. Minimizing costs associated with medical supply inventory, while ensuring there are no shortages of critical medical supplies.

2. Creating an organized, easily accessible supply storage area, so that EMTs can easily restock each ambulance.

2.2 Rationale

The research objectives outlined above are critical components of successfully implementing a modernized inventory management system. Through the application of six sigma techniques, and financial analysis, it is possible to decrease the fire department's medical supply costs, while creating a more effective inventory storage area.

2.2.1 Minimizing Inventory Costs

The following techniques and systems were analyzed as possible tools to be utilized in the effort to improve Boylston's inventory management system.

2.2.1.1 Vendor Managed Inventory System

Vendor Managed Inventory is an inventory management system that shifts responsibility for inventory management from the customer to the supplier and/or vendor. Rather than the customers ordering the inventory themselves, the customers allow the vendor to have access to their inventory, either in person

or electronically, and the vendor automatically restocks when the supply numbers fall below a certain amount (Maccarthy, 2016). Because of the constant demand on healthcare organizations to reduce costs, there is a subsequent need for continuously improved inventory management systems.

Though Vendor Managed Inventory has several potential benefits, the complications include the initial cost associated with establishing the system, “inaccurate information sharing, transmission delays, and inefficient coordination” between the vendor and the customer (Maccarthy, 2016).

In the Central Massachusetts area, there are currently no fire departments that stock their EMS supplies through a vendor managed inventory system (Flanagan, 2017). Nearly all fire departments track their inventory manually, and place orders to vendors online when supplies are running low. Additionally, some ambulance services have the ability to restock their supply of critical medications at hospital pharmacies, after dropping a patient off.

2.2.1.2 Barcode Inventory Management System

Barcode inventory systems require either individual supplies, or sets of similar supplies, to be labeled with barcodes which can be scanned, to allow information to update an inventory database in real-time. Although such systems can be extremely useful, they are often costly and difficult to implement successfully in environments where supplies are quickly used and disposed of. Additionally, there is a learning curve associated with training employees to scan each item they are going to use.

Although this system is used successfully in some hospital environments, such as operating rooms, it is not easily adaptable to field ambulances, especially at the basic life support level.

2.2.1.3 Visual Cue Inventory Management System

Inventory systems triggered by visual cues are designed to allow the individual managing restocking to know what amounts of inventory are required, and to be able to quickly identify when each type of

supply falls below its set level. This identification then enables the designated person to order more inventory, to bring the stock numbers back to their desired levels.

The kanban system is a simple visual cue system often used in manufacturing, with an overall purpose to "facilitate flow, bring about pull, and limit inventory" (Apreutesei, et al, 2010).

2.2.1.4 Safety Stock Calculations

Safety stock is utilized to prevent shortages of critical items from occurring. Lead time – the amount of time it takes for an item to arrive once it is ordered – the inability of patients to wait for the arrival of a critical item, and error in forecasting how much of a particular item will be required, all contribute to the calculation of and need for safety stock (Demand, 2012). The Boylston Fire Department prefers a conservative approach to medical supply inventory, because the importance of never running out of a critical supply outweighs any fiscal loss that may be sustained.

Below is a sample safety stock calculation for saline bottle, which are utilized by EMTs to clean lacerations and abrasions sustained by patients:

$$Safety\ Stock = Z \times \sqrt{\frac{PC}{T_1}} \times \sigma_d$$

Z = Z-score

PC = Performance Cycle

T_1 = Time Increment

σ_d = Standard Deviation of Demand

Maximum # Saline Bottles Used in 1 Week = 15

Average # Saline Bottles Used in 1 Week = 3

$$Safety\ Stock = Z \times \sqrt{\frac{PC}{T_1}} \times \sigma_d$$

$$Safety\ Stock = 2.05 \times \sqrt{\frac{4\ days}{7\ days}} \times 6$$

$$Safety\ Stock = 9.29$$

$$Safety\ Stock = 9$$

2.2.1.5 Unnecessary Stock

The purchase of medical supplies accounts for between $13,000 and $15,000 of the BFD's budget annually. Analysis of the medical supply inventory of the BFD showed that by reducing the overall inventory stock, financial savings could be achieved.

Appendix VII shows the airway adjunct stock found at the BFD after an inventory analysis. Airway adjuncts are an area of particular interest for stock calculations, because of their importance during critical call. Medical care providers have a tendency to overstock on items they consider critical, to ensure that a stock-out never occurs.

Oral airway adjuncts are typically used in unresponsive patients who are unable to protect their own airway, to maintain patency of the airway, and prevent the tongue from occluding the air's path of travel to the lungs. Oropharyngeal Airways (OPAs) are curved pieces of plastic that slide into the mouth, overtop of the tongue, to keep the tongue in place, and allow air to flow without obstruction. MA state

protocol requires each ambulance to carry a minimum of six adult, six child, and six infant OPAs onboard at all times.

Each ambulance carries 2 “first-in” bags, which contain all of the medical supplies responders need in the first few minutes of an incident. These bags are typically used while operating in a person’s residence, or vehicle, before moving the patient to the ambulance. Per MA protocol, each first-in bag must contain 2 OPAs of each size, for a total of 6 OPAs per bag. The remaining 6 OPAs must be kept in a cabinet within the ambulance, for use during transport.

Very few call types require the use of an OPA. Cardiac arrests, and overdoses, and examples of two of the scenario types that might require the use of this adjunct.

As shown Table 1 below, BFD’s inventory consists of nearly 50 OPAs. With a cardiac arrest call percentage of 1.15%, or about four calls annually, along with the approximately six to seven overdoses the BFD responds to annually, the department’s inventory for OPAs if currently five times greater than its annual use of the supply.

Table 1: Airway Adjunct Inventory & Costs

AIRWAY MANAGEMENT	Location	MA OEMS Required Quantity (per ambulance)	Ambulance 1 Quantity	Ambulance 2 Quantity	In-House Inventory Quantity	Cost/Unit	Total Cost
Airway Adjuncts							
Adult Oropharyngeal Airways	First-In Bag #1	2	2	2	28	$0.43	$18.92
	First-In Bag #2	2	2	2			
	Portable Oyxgen Unit	0	2	2			
	On-Board Ambulance	2	2	2			
Child Oropharyngeal Airways	First-In Bag #1	2	2	2	15	$0.43	$13.33
	First-In Bag #2	2	2	2			
	Portable Oyxgen Unit	0	2	2			
	On-Board Ambulance	2	2	2			
Infant Oropharyngeal Airways	First-In Bag #1	2	2	2	7	$0.43	$9.89
	First-In Bag #2	2	2	2			
	Portable Oyxgen Unit	0	2	2			
	On-Board Ambulance	2	2	2			

The one limiting factor of this number is the fact that OPAs are typically sold in packs of 6; containing 2 adult OPA sizes, 2 child OPA sizes, and 2 infant OPA sizes. Adult OPAs are used most commonly, as

children are significantly less likely to overdose or go into cardiac arrest. However, given this fact we would expect the BFD to have more child and infant OPAs, then adult OPAs, and we in fact see the opposite.

2.2.2 Application of Six Sigma to Inventory Area

As shown in Appendix V, the inventory storage area currently utilized by the BFD is cluttered and poorly organized, making it difficult to maintain an accurate count of medical supplies, and making it challenging for EMTs to restock the ambulance after their calls. Through the application of simple techniques such as color coding certain types of supplies, and placing large labels in all supply areas, EMTs will be able to more easily locate supplies when restocking.

One of the most rudimentary changes that could be completed by department personnel, is to sort supplies into the color coated bins mentioned above, and label each bin with a color coated name and picture, as well as a number, identifying the quantity of a particular supply that should be in the bin. Furthermore, by placing the most frequently used supplies in the most accessible locations, and the less frequently used supplies in the less accessible locations, a more efficient space could be created.

2.3 State of the Art

Large ambulance services utilized database systems which track the amount of each type of supply used by medical providers, enabling specialized teams to monitor trends in equipment usage and to restock critical items quickly. However, because of the associated costs, smaller services often do not have the capital or manpower to implement such systems.

2.4 Methods

To complete the inventory research objectives, various calculations were completed regarding safety stock of critical ambulance items, and the possible fiscal savings for the department, should they choose

to implement the recommendations. Additionally, six sigma techniques were applied to the inventory storage area, to create a more efficient and organized space.

2.5 Results

Overall, the inventory analysis showed that implementing six sigma techniques would be a simple way for the department to organize inventory space, and make supplies more easily accessible to BFD's EMTs. The simple process of organizing supplies into color coated bins, with large, clear labels, identifying what type and quantity of each supply a bin contains, could be easily implemented and maintained by department personnel.

2.6 Conclusion

Overall, the application of six sigma techniques to the inventory storage area of the department, and the use of safety stock calculations to predict the quantity of specific supply types needed in the inventory, are the changes that would most benefit the BFD.

Chapter 3 – Patient Care Quality Improvement

3.1 Objective

The patient care quality improvement research focuses on how to best improve the training received by department Emergency Medical Technicians, in an effort to yield consistently exceptional patient care. Specific topics of focus include the following:

1. The creation of a training commitment to monitor the overall training provided by the department, and ensure all department members are meeting, if not exceeding, the requirements established by MA OEMS.

2. The implementation of HALO – high acuity, low occurrence – training, to prepare department EMTs for calls where performance is critical in nature, but that rarely occur.

3. Developing a quality assurance/improvement model for the department to utilize to analyze completed calls, so that EMTs can learn from patient care previously provided.

4. The creation of a digital training tracking system, to enable both providers and department leadership to monitor the training completed by each EMT online.

3.2 Rationale

This section explains the importance of each of the objectives outlined above, with the goal of ultimately increasing the quality of patient care.

3.2.1 Training Committee

The Boylston Fire Department's current training model allows for one night of training dedicated to emergency medicine each month, and two nights of training dedicated to firefighting. Nearly all EMS training is led by the department Chief, while most of the firefighting training is split amongst the Chief

and other department officers. Because the BFD is a combination department, very few of its EMTs work in healthcare full-time. As shown in Appendix III and IV, every EMT is assigned to one of seven groups, with each group being responsible for providing the town's medical coverage one night per week. As a result, most EMTs respond to calls only on their one night per week, and lack the constant exposure to patient care that is necessary to continually improve their patient care skills.

One possible solution to the training challenge faced by the BFD is the creation of a training committee, responsible for planning and executing individual trainings throughout the year, and monitoring individual growth in the department's members. In the training committee model shown in Table 2, there are four distinct positions. Each position is responsible for a certain aspect of training, but can still consult with other members of the committee as needed. Because the Boylston Fire Department has a unique agreement with WPI EMS members, which allows WPI EMTs to gain ambulance experience by working at the BFD, while also benefiting the fire department by providing staffing for numerous overnight shifts, one dedicated position has been set aside as a BFD-WPI liaison. By providing a training committee, the workload once previously carried by one individual, can be split amongst four people, in theory resulting in improved training quality and opportunities.

Table 2: Sample Training Committee Model

Title	Position Description
EMS Training Coordinator	▪ Plans and executes all EMS training conducted throughout the year (1 training/month) ▪ Ensures all EMTs meet OEMS training requirements annually ▪ Coordinates additional classes and training opportunities for EMTs (ACLS, PHTLS, conferences, etc.)
Fire Training Coordinator	▪ Plans and executes all fire training conducted throughout the year (2 trainings/month) ▪ Ensures all firefighters are adequately prepared to respond to a variety of incidents, including brush fires, structure fires, motor vehicle collisions, and hazmat incidents

	▪ Coordinates additional classes and training opportunities for firefighters (MA Fire Academy, etc.)
Technical Training Coordinator	▪ Ensure all FFs and EMTs are adequately trained on the technical aspects of the job ▪ Assists both the EMS and Fire Training Coordinators with monthly trainings, as applicable ▪ Provides individual training to department members in areas such as driver training, pump operations, and stretcher/stair-chair use as needed
BFD-WPI Training Liaison	▪ Facilitates training opportunities between WPI and the BFD throughout the year ▪ Ensures WPI EMS members are aware of trainings available to them at BFD, and informs BFD members of training available to them at WPI ▪ Assists other training coordinators in creating trainings suitable for new department EMTs ▪ Responsible for ensuring that all new EMTs receive a thorough new-hire orientation

3.2.2 High Acuity Low Occurrence (HALO) Training

One of the challenges of providing prehospital medical care is critical acuity emergencies, which occur infrequently. Though most EMTs have significant exposure to calls involving falls, motor vehicle accidents, or flu-like symptoms, most have significantly less exposure to cardiac arrests or severe respiratory emergencies, for instance. As a result, quality training must be consistently provided in these areas, to ensure skills stay sharp and are not lost with time. One such way of offering this training, is through the use of simulation (Kobayashi, et al, 2007).

One of the first agencies in New England to utilize a HALO program is Pro EMS, the ambulance service that provides 911 coverage to the city of Cambridge (Skills, 2017). High Acuity Low Occurrence (HALO) training, gives providers the opportunity to practice critical skills that are infrequently used. At the Advanced Life Support (ALS) level, Pro EMS utilizes HALO training to review skills such as “critical airway interventions, IO access, needle thoracostomy, tourniquet deployment, electrical therapy, and

medication administration" (Skills, 2017). At the Basic Life Support (BLS) Level, which Boylston's ambulances are certified to, HALO training can be used to review skills such as high-quality compressions, cardiac defibrillation, medication administration, neonatal resuscitation, and management of acute trauma patients. The American Heart Association, for instance, states that CPR quality can deteriorate as quickly as six months after training (Resuscitation, 2015). As a result, HALO training could be a valuable addition to Boylston's training regiment, especially considering the department's low call volume nature.

The table below is a small clip of appendix VI, showing a sample EMS training schedule for the Boylston Fire Department to utilize in the upcoming year. As shown in Table 3, the schedule includes a diverse array of topics, identifies who should conduct the training, and states why each training is being held. Possible reasons for specific training topics includes OEMS mandates, recertification requirements for active EMTS, and HALO cases.

Table 3: Portion of 2018 Sample EMS Training Schedule

Month	When	What	Who	Why
January	Hour 1	Glucometer Training	EMS Training Coordinator	OEMS Annual Requirement
	Hour 2	Sepsis Training	EMS Training Coordinator	High Acuity Low Occurrence
	Extra Training	**NCCR**	Outside Instructor	Recertification Requirement
February	Hour 1	M&M Rounds	Chief Flanagan	Quality Improvement
	Hour 2	Blood/Airborne Pathogens	EMS Training Coordinator	OEMS Annual Requirement
	Extra Training	**PHTLS (Prehospital Trauma Life Support)**	Outside Instructor	Knowledge Enhancement
March	Hours 1 & 2	Paramedic-Basic Interface	WEMS Paramedic	Required for new EMTs
	Extra Training	**AMLS (Advanced Medical Life Support)**	Outside Instructor	Knowledge Enhancement
April	Hour 1	Management of Asthmatics	EMS Training Coordinator	High Acuity Low Occurrence
	Hour 2	Opioid Overdoses	EMS Training Coordinator	High Acuity Low Occurrence
	Extra Training	**OFF MONTH**	**OFF MONTH**	**OFF MONTH**

3.2.3 Quality Assurance & Improvement Program

Most large ambulance services and fire departments have a formal QA/QI system in place, to allow department members to learn from past calls, and to ensure performance accountability from all members. Additionally, nearly all hospitals conduct Morbidity & Mortality (M&M) Rounds regularly, to analyze mistakes made in patient care, or to showcase unique cases, to enhance the knowledge of healthcare providers. Although one individual reviews the majority of the calls completed by Boylston's EMTs, there is no formal system in place to allow for the full analysis of each call.

Table 4 contains a simple checklist that could be implemented to allow for basic QA/QI analysis of most ambulance calls:

Table 4: QA/QI Checklist

	Medical		Trauma	
On-Scene Time	Less than 20 minutes?		Less than 7 minutes?	
	YES	NO	YES	NO
Vitals Signs	≥ 3 sets?		≥ 2 sets?	
	YES	NO	YES	NO
Pupils Assessed	YES	NO	YES	NO
Mental Status	Assessed?		Assessed?	
	YES	NO	YES	NO
Transport	To appropriate facility for pt?		To appropriate facility for pt?	
	YES	NO	YES	NO

In addition to the above basics, detailed checklists can be created for various types of calls.

3.2.4 Digital Training Tracking System

The BFD currently uses predominantly paper records to monitor which EMTs attend certain trainings. Although there are some computerized records, very few of training records are available online. To best modernize this system, the BFD must implement a training database. An ideal database should

allow both employees and officers to access training records, and should provide alerts if any employee has credential or annual certifications that are close to expiration.

3.3 State of the Art

The use of rigorous and customized training techniques, along with a specialized quality assurance/improvement program, and an online training database, will allow the Boylston Fire Department to match the standards set by some of the best patient care providers in the country.

3.4 Methods

Analysis of the current practices of fire departments and ambulance services of various sizes was conducted, and the systems that could most easily and successfully be modified for the Boylston Fire Department were considered with greatest gravity.

3.5 Results

The results of the patient care quality analysis shows that the greatest improvement will be achieved if the department creates and maintains a training committee of talented, motivated individuals, willing to implement a variety of training – including sessions dedicated specifically to high acuity low occurrence scenarios.

3.6 Conclusion

Overall it is clear that the implementation of several basic changes, will enable the department to consistently provide a higher quality of patient care. This patient care quality improvement will lead to better long-term outcomes, with regard to patient health.

Chapter 4 – Conclusion

4.1 Recommendations

Based on the research conducted, the following recommendations are made to the Boylston Fire Department:

1. Apply six sigma techniques to the inventory storage area, to enable department EMTs to more easily locate supplies, and restock the ambulance after each call. Techniques including color coding bins for different supply types, and marking each supply type with a large, clear label, and an image, to allow for efficient visual location of various supply types. Additionally, strategically placing the supplies throughout the inventory area, so that the most frequently used supplies are most easily accessible, while less frequently used supplies are in less convenient locations.

2. Use the completed safety stock calculations, based on annual equipment usage data, to determine the quantity of each type of supply to be kept in inventory. This will minimize the amount of wasted supplies, therefore reducing the overall fiscal cost of medical equipment annually.

3. Create a training committee, consisting of an EMS training coordinator, fire training coordinator, technical training coordinator, and BFD-WPI Liaison, to together lead the development and implementation of rigorous, enhanced training, to benefit all department members.

4. Implement high acuity low occurrence training, to prepare EMTs to successfully manage critical patients who are infrequently encountered in the prehospital setting. As part of the new training curriculum, include periodic skills checks throughout the year, to ensure all medical personnel maintain a high level of proficiency in critical skills.

5. Use a modernized QA/QI approach, to ensure each patient care report is audited, enabling EMTs to learn from past mistakes, and improve patient care quality in future encounters. A checklist system is a

basic, and simple, approach to quality improvement, which will allow 1-2 department members to consistently monitor every call for important, identified characteristics.

6. Create a simple, online database, to allow EMTs and department officers to easily track the training completed by each provider, and that will provide basic notifications if a member of the department is lacking a critical certification, or has a certification that will soon expire.

4.2 Interdisciplinary Content

Although this research focused predominantly on process improvement from an industrial engineering perspective, all projects are multi-faceted, and accordingly, cannot be successful without utilizing ideas and techniques from a variety of fields. For this research in particular, interdisciplinary components included organizational behavior, the legal risk associated with proving emergent medical care, and the economic benefit of the potential financial savings that could result from a modernized inventory management system. To ensure the success of the implementation of any new system, a variety of perspectives and backgrounds must be considered and incorporated.

4.3 Summary

Through the implementation of the above recommendations, the Boylston Fire Department can transition to a more efficient state of operation, providing numerous long-term benefits, including an increased quality of patient care, a more efficient inventory space, and decreased costs. Although some improvements will be seen immediately after implementing the program, the amount of monetary savings, and the improvement in patient care quality, will become greater with time.

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Appendix

Appendix I – MA Office of Emergency Medical Services Supply Requirements per Ambulance

AR-5-401

MASSACHUSETTS
OFFICE OF EMERGENCY MEDICAL SERVICES
DEPARTMENT OF PUBLIC HEALTH

ADMINISTRATIVE REQUIREMENT MANUAL
EFFECTIVE DATE: December 15, 2016 **AUTHORIZATION:** A. Sousa, Interim Director
TITLE: Basic Life Support (BLS) Equipment List
SUPERSEDES: November 2, 2015

General Principles

A. **REGULATORY AUTHORITY:** 105 CMR 170.455, 170.460, 170.470
B. **AUTHORIZED EQUIPMENT:** Ambulance services must carry equipment and medications as required by Statewide Treatment Protocols. Ambulance services should not equip ambulances with equipment that is outside of scope of practice of its EMT employees, or outside of the service's level of licensure.
C. **PERFORMANCE STANDARDS:** All equipment must be designed and constructed to meet medical performance objectives and must not endanger patients.
D. **MAINTENANCE:** All equipment and supplies must be maintained for proper use according to manufacturers' specifications with regard to maintenance, storage, expiration date, replacement, etc. Services must maintain records of preventive maintenance and repairs for all equipment, including service-level and third-party inspection and maintenance records.
E. **SPECIFICATIONS:** All equipment must be latex free if available. Disposable is preferred.

ITEM	#	DESCRIPTION	MIN. SIZE PER ITEM	TOTAL QUANTITY	CLASS				
					I	II	IV	V	CC
First-In Kit/Bag	1.1	First-In kit may be incorporated into other units (i.e., portable oxygen unit). Each First-In kit must include the following:		2 (I, II, CC) 1 (IV, V)	I	II	IV	V	CC
	1.2	Oropharyngeal airways (sterile/wrapped)	ADULT CHILD INFANT	2 ea.	I	II	IV	V	CC
	1.3	Small dressings gauze (sterile)	4" x 4"	12	I	II	IV	V	CC
	1.4	Medium dressings gauze (sterile)	5" x 9"	4	I	II	IV	V	CC
	1.5	Large dressings gauze (sterile)	10" x 30"	2	I	II	IV	V	CC
	1.6	Soft roller, self-adhering bandage	4" x 5yrds	6	I	II	IV	V	CC
	1.7	Cravats / triangular bandages	40" wide	4	I	II	IV	V	CC
	1.8	Tourniquets approved by the Committee on Tactical Combat Casualty Care for control of arterial bleeding		2	I	II	IV	V	CC
	1.9	Adhesive tape (2") hypoallergenic	5yrds	2	I	II	IV	V	CC
	1.10	Bandage scissors (7") or equivalent		1	I	II	IV	V	CC
	1.11	Sphygmomanometer	ADULT	1	I	II	IV	V	CC
	1.12	Stethoscope		1	I	II	IV	V	CC
	1.13	Penlight-type flashlight		1	I	II	IV	V	CC
	1.14	Sterile water or saline solution (in an unbreakable container)	500 ml	1	I	II	IV	V	CC
	1.15	Bulb syringe (sterile/wrapped) 3oz for irrigation purposes		1	I	II	IV	V	CC
	1.16	Cold packs (instant)		2	I	II	IV	V	CC

ITEM	#	DESCRIPTION	MIN. SIZE PER ITEM	TOTAL QUANTITY	CLASS				
					I	II	IV	V	CC
	1.18	Tongue depressors (wrapped) for glucose administration		2	I	II	IV	V	CC
	1.19	Adhesive bandages (i.e. Band-Aids)	3/4"	6	I	II	IV	V	CC
	1.20	Mouth-to-mask resuscitator mask with one way valve and an oxygen port.		1	I	II	IV	V	CC
	1.21	Facemask and protective eye wear (combination face mask/eye shield equivalent)		2 ea.	I	II	IV	V	CC
	1.22	Exam type gloves (single use, latex-free)		2 pairs	I	II	IV	V	CC
Medications	2.1	Epinephrine Auto-Injector	ADULT PEDI	2 ea.	I	II	IV	V	CC
	2.2	Aspirin (chewable)	81mg or 324mg	At least 648mg	I	II	IV	V	CC
	2.3	Naloxone (prefilled syringe with nasal atomizer)	2mg	8mg	I	II	IV	V	CC
	2.4	Oral glucose or equivalent (with sterile tongue depressors)	25g	2	I	II	IV	V	CC
(Quantity listed is total per unit. Each First-in kit should be stocked with at least 1 dose of each medication)									
Portable Oxygen Unit	3.1	Oxygen cylinder	D or E	1	I	II	IV	V	CC
	3.2	Oxygen cylinder pressure gauge and regulator capable of delivering a range of 0-25 LPM		1	I	II	IV	V	CC
	3.3	Bag-valve mask with oxygen supply reservoir (hand-operated, single use)	ADULT CHILD INFANT	1 ea.	I	II	IV	V	CC
	3.4	CPR Mask	ADULT PEDI	1 ea.	I	II	IV	V	CC
	3.5	Non-Rebreather: High concentration oxygen masks (transparent, disposable) with delivery tubes	ADULT PEDI	2 ea.	I	II	IV	V	CC
	3.6	Nasal cannula with delivery tube	ADULT	2	I	II	IV	V	CC
	3.7	Oxygen connecting tubing		1	I	II	IV	V	CC
	3.8	Cylinder wrench or wheel secured to unit		1	I	II	IV	V	CC
	3.9	Spare oxygen cylinder. All spare cylinders to be maintained in vehicle, but not part of the kit. All spare cylinders must be stored in crash stable devices per adopted standards for ambulance construction & design, and any amendments thereto.	D or E at min. 300L	1	I	II	IV	V	CC
Portable Suction Unit	4.1	Portable suction apparatus (battery powered) capable of delivering a minimum vacuum of 600 millimeters of mercury.		1	I	II	IV	V	CC
	4.2	Wide bore suction tubing (transparent/translucent, non-kinking)		1	I	II	IV	V	CC
	4.3	Semi-rigid pharyngeal suction tip with thumb suction control port		1	I	II	IV	V	CC

ITEM	#	DESCRIPTION	MIN. SIZE PER ITEM	TOTAL QUANTITY	CLASS				
					I	II	IV	V	CC
	4.4	Collection bottle or bag (non-breakable, disposable transparent)	550 ml	1	I	II	IV	V	CC
	4.5	Exam type gloves (single use, latex-free)		1 pair	I	II	IV	V	CC
	4.6	Facemask and protective eye wear (combination face mask/eye shield equivalent)		1 ea.	I	II	IV	V	CC
Automatic External Defibrillator	5.1	AED appropriate to ambulance staffing configuration, with appropriate accessories to conform to AHA standards		1	I	II	-	V	-
	5.2	AED Pads	ADULT PEDI	2 ea.	I	II	-	V	-
	5.3	Razor (single-use) or scissors		1	I	II	-	V	-
Diagnostic Equipment	6.1	ADULT Sphygmomanometer	LG-ADULT ADULT	1 ea.	I	II	IV	-	CC
	6.2	PEDI Sphygmomanometer	CHILD INFANT	1 ea.	I	II	IV	V	CC
	6.3	Stethoscope		1	I	II	IV	-	CC
	6.4	Penlight-type flashlight		2	I	II	IV	-	CC
Installed Oxygen System	7.1	An installed oxygen system conforming to adopted standards for ambulance construction & design, and any amendments thereto, and equipped with the following:		1	I	II	IV	-	CC
	7.2	Flow meters capable of delivering a range of 0-15 LPM (min.)		2	I	II	IV	-	CC
	7.3	Oxygen humidifier (unbreakable & single-use).		1	I	II	IV	-	CC
Installed Suction	8.1	Electrically powered suction aspirator system shall be furnished with an illuminated switch, and panel mounted (required per adopted standards for ambulance construction & design)		1	I	II	IV	-	CC
	8.2	Collection bottle or bag (non-breakable, disposable transparent)	1000 ml capacity	1	I	II	IV	-	CC
	8.3	Suction rinsing water bottle		1	I	II	IV	-	CC
	8.4	Semi-rigid pharyngeal suction tip with thumb suction control port		2	I	II	IV	-	CC
	8.5	Wide bore suction tubing (transparent/translucent, non-kinking)	1/4" diameter	2	I	II	IV	-	CC
	8.6	French suction catheters	5, 8, 14 Fr.	2 ea.	I	II	IV	-	CC
	8.7	Spare collection bags when bag type system is furnished		10	I	II	IV	-	CC
Airway Management	9.1	Bag-valve mask with oxygen supply reservoir (hand-operated, single use)	ADULT CHILD INFANT	1 ea.	I	II	IV	-	CC
	9.2	Oxygen connector tubing	84" long	2	I	II	IV	-	CC

ITEM	#	DESCRIPTION	MIN. SIZE PER ITEM	TOTAL QUANTITY	CLASS				
					I	II	IV	V	CC
	9.3	Non-Rebreather: High concentration oxygen masks (transparent, disposable) with delivery tubes	ADULT PEDI INFANT	4 ea.	I	II	IV	-	CC
	9.4	Nasal cannula with delivery tube	ADULT PEDI	4 ea.	I	II	IV	-	CC
	9.5	Oropharyngeal airways (sterile/wrapped)	ADULT CHILD INFANT	2 ea.	I	II	IV	-	CC
	9.6	Neonate oxygen delivery masks	NEONATE	2	I	II	IV		CC
	9.7	Nasopharyngeal airways (sterile/wrapped)	20F 22F 24F 26F 28F 30F 34F	1 ea.	I	II	IV	-	CC
	9.8	PEDI Nasopharyngeal airways (sterile/wrapped)	12F 14F 16F 18F	1 ea.	I	II	IV	-	CC
	9.9	Water soluble lubricant (single use package)		12	I	II	IV	-	CC
Wound Care	10.1	Small dressings gauze (sterile)	4" x 4"	24	I	II	IV	-	CC
	10.2	Medium dressings gauze (sterile)	5" x 9"	12	I	II	IV	-	CC
	10.3	Large dressings gauze (sterile)	10" x 30"	6	I	II	IV	-	CC
	10.4	Soft roller, self-adhering bandage	4" x 5yrds	12	I	II	IV	-	CC
	10.5	Cravats / triangular bandages	40" wide	8	I	II	IV	-	CC
	10.6	Adhesive tape (1") hypoallergenic	5yrds	4	I	II	IV	-	CC
	10.7	Adhesive tape (2") hypoallergenic	5yrds	4	I	II	IV	-	CC
	10.8	Bandage scissors (7") or equivalent		2	I	II	IV	-	CC
	10.9	Sterile water or saline solution (in an unbreakable container)	3000cc total	3 containers min.	I	II	IV	-	CC
	10.10	Commercial occlusive dressings		2	I	II	IV	-	CC
	10.11	Cold packs (instant)		4	I	II	IV	-	CC
Burn Kit	11.1	Burn sheets (sterile) linen or disposable		2	I	II	IV	V	CC
Obstetrical Kit	12.1	Obstetrical kit (sterile) containing the following		1	I	II	IV	V	CC
	12.2	Large towel		1	I	II	IV	V	CC
	12.3	Receiving blanket, or equivalent		1	I	II	IV	V	CC
	12.4	Sterile disposable plastic or rubber gloves;		1 pair	I	II	IV	V	CC
	12.5	Sterile gauze pads	3" x 3"	6	I	II	IV	V	CC
	12.6	Kelly clamps or sterile ties		2	I	II	IV	V	CC
	12.7	Sanitary napkins		6	I	II	IV	V	CC
	12.8	Infant bulb syringe		1	I	II	IV	V	CC
	12.9	Bandage or surgical blade scissors		1	I	II	IV	V	CC

ITEM	#	DESCRIPTION	MIN. SIZE PER ITEM	TOTAL QUANTITY	CLASS				
					I	II	IV	V	CC
	12.10	Container with lid for carrying placenta		1	I	II	IV	V	CC
	12.11	Newborn swaddler system, i.e. space blanket, foil saddler, or equivalent to retain body temperature		1	I	II	IV	V	CC
(Commercial equivalent kit acceptable)									
Splints	13.1	Traction splint (femur) device or equivalent; with ankle hitch and leg ties or equivalent. All accessory items to be stored with splints.	ADULT PEDI	1 ea.	I	II	IV	-	CC
	13.2	4.5' x 3" covered padded board splint (single-use) or equivalent (impervious to saturation)		2	I	II	-	V	CC
	13.3	3' x 3" covered padded board splint (single-use) or equivalent (impervious to saturation)		2	I	II	-	V	CC
	13.4	15" x 3" covered padded board splint (single-use) or equivalent (impervious to saturation)		2	I	II	-	V	CC
Spinal Immobilization	14.1	Half spine board with torso straps and head strap (2" tape or equivalent), or equivalent (i.e., KED)		1 board 3 straps	I	II	-	V	CC
	14.2	Full spine board, with easily cleanable 9' straps or functional equivalent and sufficient padding to maintain in-line head & cervical support/stabilization with head strap (2" tape or equivalent)		1 board 4 straps	I	II	IV	V	CC
	14.3	ADULT Cervical Collar (rigid) **Adjustable collar is equivalent to all 4 sizes**	NO-NECK SMALL MEDIUM LARGE	2 ea.	I	II	IV	V	CC
	14.4	PEDI Cervical Collar (rigid) **Adjustable collar is equivalent to all 3 sizes**	CHILD TODDLER INFANT	2 ea.	I	II	IV	V	CC
(Accessories must be stored together near boards; all must be antibacterial/impervious to contaminates, or disposable)									
Stretcher	15.1	4-wheeled, multi-level ambulance cot		1	I	II	-	-	CC
	15.2	Standard cot mattress with waterproof cover		1	I	II	-	-	CC
	15.3	Patient restraining devices at chest (commercial shoulder harness or equal) hip, and knee to prevent lateral or longitudinal displacement of the patient during transport		1 set ea.	I	II	-	-	CC
	15.4	Dual I.V. holder, capable of being cot mounted		1	I	II	-	-	CC
	15.5	Padded wrist and ankle restraints		1 set	I	II	-	-	CC
	15.6	For power type units, one extra battery, and charger (as recommended by manufacturer)		1	I	II	-	-	CC
Stair Chair	16.1	Stair chair with patient restraint straps		1	I	II	-	-	-
	16.2	For power type units, one extra battery, and charger (as recommended by manufacturer)		1	I	II	-	-	-

ITEM	#	DESCRIPTION	MIN. SIZE PER ITEM	TOTAL QUANTITY	CLASS				
					I	II	IV	V	CC
Auxiliary Stretcher	17.1	Auxiliary stretcher with patient restraint straps, or equivalent (i.e., orthopedic "scoop" stretcher, "Reeves" type stretcher, long spine board)		1	I	II	-	-	CC
Transfer Sheet	18.1	Transfer sheet with a minimum of six (6) handles, or equivalent		1	I	II	-	-	CC
Accessories	19.1	ADULT bed pan urinal, emesis basin, and large basin or equivalent		1 ea.	I	II	IV	-	CC
	19.2	Motion sickness bags, or equivalent, capable of being sealed		2	I	II	IV	V	CC
	19.3	Sheets (disposable or linen)		8 (I, II, CC) 2 (IV, V)	I	II	IV	V	CC
	19.4	Blankets		4 (I, II, CC) 2 (IV, V)	I	II	IV	V	CC
	19.5	Towels		4	I	II	IV	-	CC
	19.6	Paper tissues (disposable)		2 packages	I	II	IV	-	CC
	19.7	Drinking cups (disposable)		2	I	II	IV	-	CC
	19.8	Trash Bin liners, plastic (with ties)		2	I	II	IV	-	CC
	19.9	Bio-Hazard bags (with ties)		2	I	II	IV	-	CC
	19.10	Ring Cutter (with extra blade)		1	I	II	IV	-	CC
	19.11	CPR board or functionally equivalent (i.e., short board) hard washable surface for patient torso accessible to patient compartment.		1	I	II	IV	-	CC
	19.12	Child appropriate restraint device (i.e. PediMate) to provide safe transport of pediatric patient on stretcher		1	I	II	IV	-	CC
Personal Protection	20.1	Exam type gloves (single use, latex-free)	SMALL MEDIUM LARGE X-LARGE	1 box ea.	I	II	IV	V	CC
	20.2	Facemask and protective eye wear (combination face mask/eye shield equivalent)		4 ea.	I	II	IV	V	CC
	20.3	Antiseptic hand sanitizer dispenser or 25 individually wrapped antiseptic hand wipes		1	I	II	IV	V	CC
	20.4	Infection control kit, containing two (2) each of disposable, fluid resistant gowns, masks, caps, protective eye wear, and two (2) different sizes of gloves.		1 kit	I	II	IV	V	CC
Safety/ Access Equipment	21.1	Safety goggles		2	I	-	-	V	CC
	21.2	ANSI vest or equivalent (Class II/III)		2	I	II	IV	V	CC
	21.3	NIOSH-approved respirator		2	I	II	IV	V	CC

ITEM	#	DESCRIPTION	MIN. SIZE PER ITEM	TOTAL QUANTITY	CLASS				
					I	II	IV	V	CC
Vehicle Equipment	23.1	Warning Lights: Emergency warning beacon, visible 360 degrees, as permitted by M.G.L. c.90, s.7, or as required per adopted standards for ambulance construction & design or any amendments thereto.			I	II	IV	V	CC
	23.2	Audible Warning Device: A siren, adopted standards for ambulance construction & design & AMD Standard 023			I	II	-	V	CC
	23.3	Global positioning system (GPS) navigation system, and street directories and road maps for primary and backup areas served.			I	II	IV	V	CC
	23.4	Fire Extinguishers: CO2 or dry pounder, UL approved. Mounted in patient compartment (I, II, IV, CC).	5 lbs.	2 (I, II, CC) 1 (IV, V)	I	II	IV	V	CC
	23.5	Handlights: (6-volt/4.5-volt if rechargeable) bulb or LED or equivalent			I	II	IV	V	CC
	23.6	Chock Blocks		2	I	II	-	-	CC
	23.7	Road Reflectors (DOT approved triangles or equivalent)		6	I	II	-	V	CC
	23.8	US DOT Emergency Response Guidebook (current edition) or electronic equivalent		1	I	II	IV	V	CC
	23.9	National Institute of Occupational Health & Safety (NIOSH) pocket guide to Chemical Hazards (current edition) or electronic equivalent		1	I	II	IV	V	CC
	23.10	Binoculars	7 x 35mm	1	I	II	IV	V	CC
	23.11	SMART triage tags		25	I	II	IV	V	CC
	23.12	Additional protective equipment to adequately safeguard crew from anticipated exposures as defined by the licensee.			I	II	IV	V	CC
OPTIONAL Access Equipment	22.1	Screwdriver (8"; Phillips and flathead)		1 ea.	-	-	-	-	-
	22.2	Hacksaw (5 wire carbide blades)		1	-	-	-	-	-
	22.3	Pliers (10" vice grip)		1	-	-	-	-	-
	22.4	Short handled sledge hammer	3 lbs.	1	-	-	-	-	-
	22.5	Rope (synthetic)	50' x 0.5" diameter	1	-	-	-	-	-
	22.6	Hard Hat or equivalent		2	I	-	-	V	CC
	22.7	Leather Gloves (or equivalent)		2 pairs	I	-	-	V	CC

Appendix II – 2015 Call Volume & Calls by Dispatch Reason

Runs by Dispatch Reason	# of Times	% of Times
Abdominal Pain	12	3.45
Allergies	2	0.57
Animal Bite	1	0.29
Back Pain (Non-Traumatic)	10	2.87
Breathing Problem	26	7.47
Cardiac Arrest	4	1.15
Chest Pain	19	5.46
Choking	2	0.57
Convulsion/Seizure	10	2.87
Diabetic Problem	2	0.57
Eye Problem	2	0.57
Fall Victim	44	12.64
Headache	3	0.86
Heart Problems	3	0.86
Heat/Cold Exposure	1	0.29
Hemorrhage/Laceration	8	2.30
Ingestion/Poisoning	6	1.72
Not Available	16	4.60
Pregnancy/Childbirth	1	0.29
Psychiatric Problems	26	7.47
Sick Person	54	15.52
Stroke/CVA	7	2.01
Traffic/Transportation Accident	53	15.23
Transfer/Interfacility/Palliative Care	1	0.29
Traumatic Injury	17	4.89
Unconscious/Fainting	14	4.02
Unknown	0	0.00
Unknown Problem/Man Down	4	1.15
Total Number of Calls	348	

*A*ppendix III – Sample Group Schedule for BFD Members

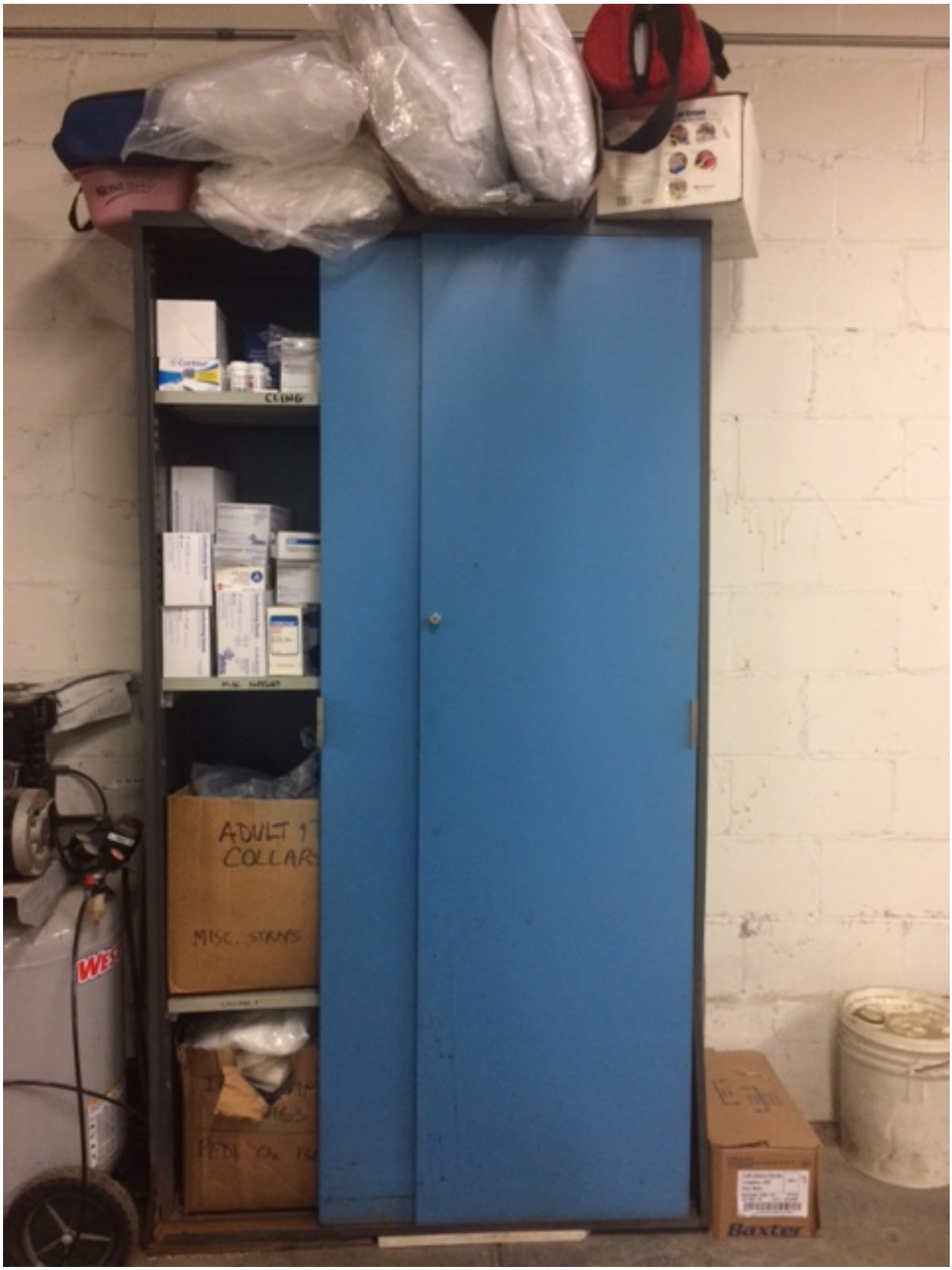
February 2017

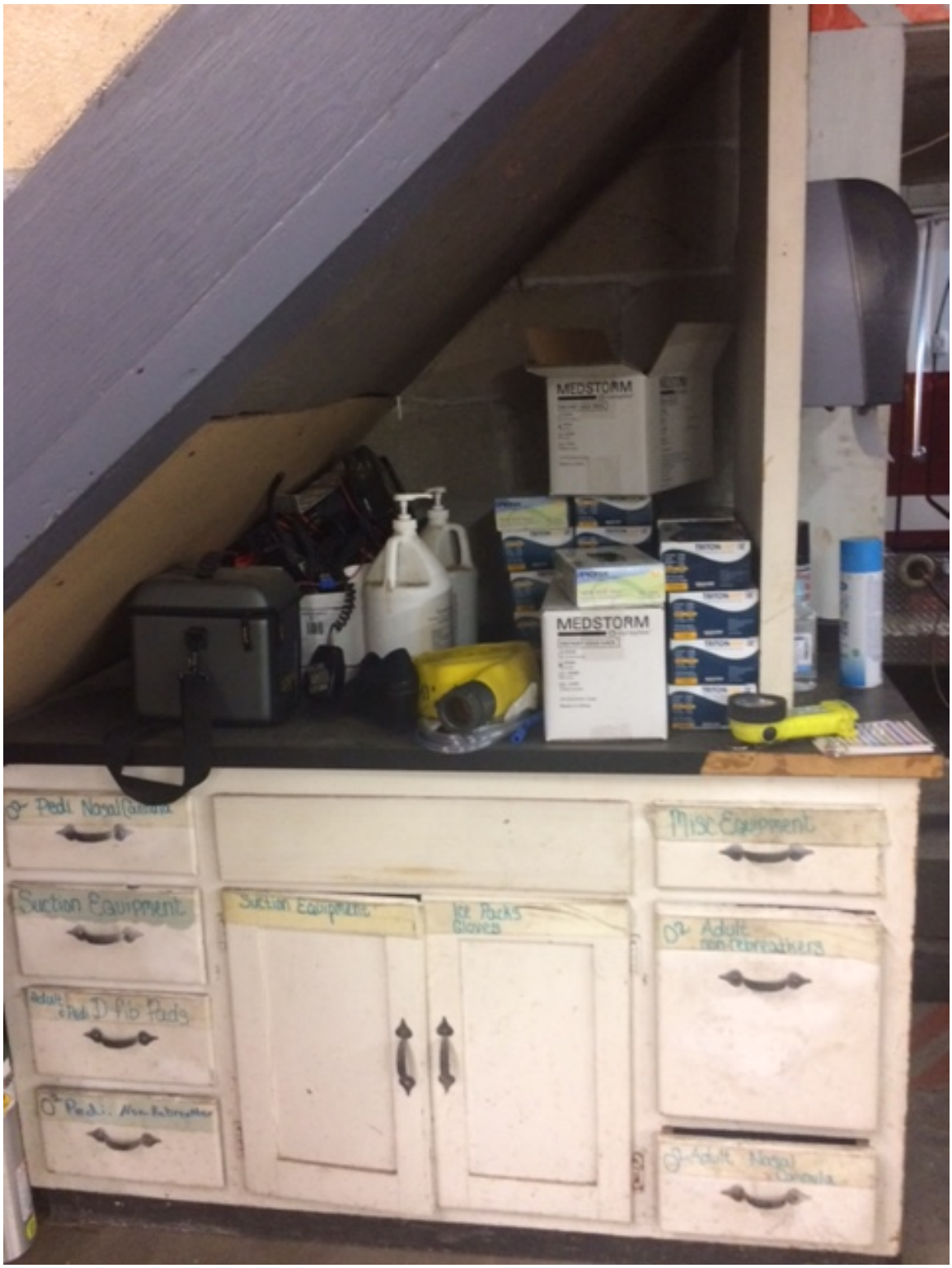
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
			1	2	3	4
			Group 2	Group 3	Group 4	Group 5
5	6	7	8	9	10	11
Group 7	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
12	13	14	15	16	17	18
Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7
19	20	21	22	23	24	25
Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	Group 1
26	27	28				
Group 3	Group 4	Group 5				

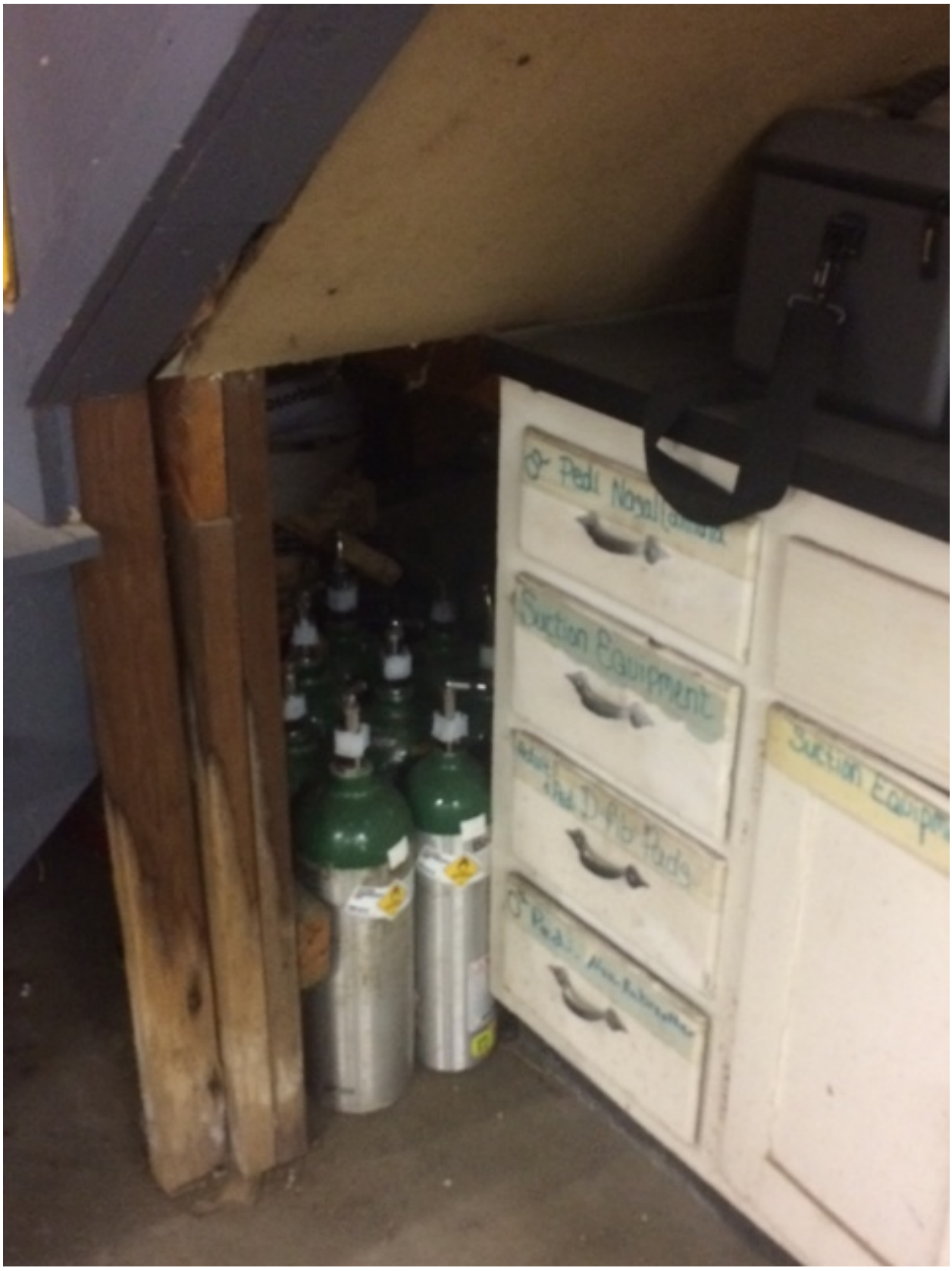
Appendix IV – Group Assignments for Boylston EMTs

Group 1	Schloerb	Wheeler	Young	
Group 2	Donohue	Easterbrook	Borges	Smith
Group 3	Mackenzie	Mercure	Luckette	
Group 4	Ronn	Portis	Deans	Pratt
Group 5	Bradford	Donovan	Green	Washek
Group 6	O'Sullivan	Rumpf	Foley	Studley
Group 7	D. Buddenhagen	Osterberg	Steward	

Appendix V – Boylston's Current Medical Supply Inventory Storage Area




MEDSTORM
MEDSTORM
Suction Equipment
Misc Equipment
Suction Equipment
Ice Packs
Gloves
Adult
Adult
D Pad Pads


Suction Equipment

Appendix VI – 2018 Proposed EMS Training Schedule for Boylston EMTs

Month	When	What	Who	Why
January	Hour 1	Glucometer Training	EMS Training Coordinator	OEMS Annual Requirement
	Hour 2	Sepsis Training	EMS Training Coordinator	High Acuity Low Occurrence
	Extra Training	**NCCR**	Outside Instructor	Recertification Requirement
February	Hour 1	M&M Rounds	Chief Flanagan	Quality Improvement
	Hour 2	Blood/Airborne Pathogens	EMS Training Coordinator	OEMS Annual Requirement
	Extra Training	**PHTLS (Prehospital Trauma Life Support)**	Outside Instructor	Knowledge Enhancement
March	Hours 1 & 2	Paramedic-Basic Interface	WEMS Paramedic	Required for new EMTs
	Extra Training	**AMLS (Advanced Medical Life Support)**	Outside Instructor	Knowledge Enhancement
April	Hour 1	Management of Asthmatics	EMS Training Coordinator	High Acuity Low Occurrence
	Hour 2	Opioid Overdoses	EMS Training Coordinator	High Acuity Low Occurrence
	Extra Training	**OFF MONTH**	**OFF MONTH**	**OFF MONTH**
May	Hour 1	CPR Skills Check	EMS Training Coordinator	High Acuity Low Occurrence
	Hour 2	Firefighter Rehabilitation	EMS Training Coordinator	Knowledge Maintenance
	Extra Training	**GEMS (Geriatric Education for EMS)**	Outside Instructor	Knowledge Enhancement
June	Hour 1	Pharmacology	EMS Training Coordinator	Knowledge Maintenance
	Hour 2	Cardiac Patients	EMS Training Coordinator	Knowledge Maintenance
	Extra Training	**ACLS (Advanced Cardiac Life Support)**	Outside Instructor	Knowledge Enhancement
July	Hour 1	Left Ventricular Assist Devices	EMS Training Coordinator	High Acuity Low Occurrence
	Hour 2	Tracheostomy Patients	EMS Training Coordinator	High Acuity Low Occurrence
	Extra Training	**OFF MONTH**	**OFF MONTH**	**OFF MONTH**
August	Hour 1	Tourniquet Skills Check	EMS Training Coordinator	High Acuity Low Occurrence
	Hour 2	M&M Rounds	Chief Flanagan	Quality Improvement
	Extra Training	**Life Flight Information Session**	Outside Instructor	Knowledge Enhancement
September	Hours 1 & 2	CPR	Chief Flanagan & Lt. Bradford	Required Certification
	Extra Training	**Vehicle Extrication**	Training Committee	High Acuity Low Occurrence
October	Hour 1	Burn Management	EMS Training Coordinator	Knowledge Maintenance
	Hour 2	Carbon Monoxide Poisoning	EMS Training Coordinator	Knowledge Maintenance
	Extra Training	**OFF MONTH**	**OFF MONTH**	**OFF MONTH**
November	Hour 1	Point-of-Entry Protocols	EMS Training Coordinator	Knowledge Maintenance
	Hour 2	Stroke Management	EMS Training Coordinator	Knowledge Maintenance
	Extra Training	**PALS (Pediatric Advanced Life Support)**	Outside Instructor	Knowledge Enhancement
December	Hour 1	Concussions	EMS Training Coordinator	Knowledge Maintenance
	Hour 2	Head Bleeds	EMS Training Coordinator	Knowledge Maintenance
	Extra Training	**OFF MONTH**	**OFF MONTH**	**OFF MONTH**

Appendix VII – Airway Adjunct Inventory

AIRWAY MANAGEMENT	Location	MA OEMS Required Quantity (per ambulance)	Ambulance 1 Quantity	Ambulance 2 Quantity	In-House Inventory Quantity	Cost/Unit	Total Cost
Airway Adjuncts							
Adult Oropharyngeal Airways	First-In Bag #1	2	2	2	28	$0.43	$18.92
	First-In Bag #2	2	2	2			
	Portable Oyxgen Unit	0	2	2			
	On-Board Ambulance	2	2	2			
Child Oropharyngeal Airways	First-In Bag #1	2	2	2	15	$0.43	$13.33
	First-In Bag #2	2	2	2			
	Portable Oyxgen Unit	0	2	2			
	On-Board Ambulance	2	2	2			
Infant Oropharyngeal Airways	First-In Bag #1	2	2	2	7	$0.43	$9.89
	First-In Bag #2	2	2	2			
	Portable Oyxgen Unit	0	2	2			
	On-Board Ambulance	2	2	2			
Nasopharyngeal Airways, Size 36	On-Board Ambulance	0	1	1	1	$1.65	$4.95
Nasopharyngeal Airways, Size 34	On-Board Ambulance	1	1	1	0	$1.65	$3.30
Nasopharyngeal Airways, Size 30	On-Board Ambulance	1	1	1	0	$1.65	$3.30
Nasopharyngeal Airways, Size 28	On-Board Ambulance	1	2	1	2	$1.65	$8.25
Nasopharyngeal Airways, Size 26	On-Board Ambulance	1	1	2	5	$1.65	$13.20
Nasopharyngeal Airways, Size 24	On-Board Ambulance	1	1	1	3	$1.65	$8.25
Nasopharyngeal Airways, Size 22	On-Board Ambulance	1	2	1	0	$1.65	$4.95
Nasopharyngeal Airways, Size 20	On-Board Ambulance	1	1	1	3	$1.65	$8.25
Nasopharyngeal Airways, Size 18	On-Board Ambulance	1	1	2	0	$1.65	$4.95
Nasopharyngeal Airways, Size 16	On-Board Ambulance	1	2	1	2	$1.65	$8.25
Nasopharyngeal Airways, Size 14	On-Board Ambulance	1	1	1	1	$1.65	$4.95
Nasopharyngeal Airways, Size 12	On-Board Ambulance	1	1	1	2	$1.65	$6.60
Water Soluble Lubricant	On-Board Ambulance	12	20	20	100	$0.10	$14.00