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Maximizing the Benefit of the Mobile Eye Hospital

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Abstract

The Armenian EyeCare Project began the Mobile Eye Hospital (MEH) 18 years ago in order to combat the large numbers of eye issues facing the Armenian population. This project focused on improving the efficiency of the MEH in order for it to reach more patients by generating recommendations for route and operational efficiency. By gathering data from the AECP and about lean management techniques, we recommended techniques and their applications and ideas for increased accessibility to the MEH.

Authorship

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Abstract	Camden	Theresa
Executive Summary	Anna and Knarik	Theresa
Introduction	All in part	All in part
Background	All in part	All in part
Methodology	All in part	Knarik and Theresa
Results Objective 1	Camden	All in part
Results Objective 2	Anna and Knarik	All in part
Results Objective 3	Theresa	All in part
Recommendations	All in part	Camden and Theresa
Conclusion	Camden	Theresa

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Executive Summary

With the opportunity to travel around Armenia, the MEH treats thousands of Armenians with eye problems who cannot go to the capital city, Yerevan. The main goal of the MEH is to lower the rate of blindness in Armenia and to detect and prevent eye diseases that lead to blindness.

The goal of this project is to generate recommendations in route organization and operational efficiency to improve the management and efficiency of the MEH so that it can reach more patients. After gathering data from the AECP and on lean management techniques, three main objectives were highlighted to recommend techniques and their applications to the MEH.

The first objective is minimizing patient turnover and waiting time using various lean techniques that were identified through detailed research and interviews with lean specialists. These techniques were investigated to recommend a new way of scheduling appointments to minimize the number of patients waiting in the line and to increase operational efficiency and organization. The primary lean systems that were connected to the project were the Kanban system and the Kaizen system. We researched and analyzed several techniques within these two systems, in order to understand the best way to apply them to the MEH. The examples of such are FOCUS PDCA, 5S, Value Stream Mapping, and Theory of Constraints. These observations can be useful to determine whether there is excess inventory or unnecessary processes that are occurring such as waiting for a process to finish while another process could be taking place etc.

Secondly, to understand the main difficulties that the MEH's staff is facing while delivering eye care to patients, we conducted a series of interviews with the staff. We asked questions regarding how they operate, what schedule they have, and what problems they face while working in the MEH. During those interviews, the medical staff pointed out a few aspects that they felt needed improvement, such as difficulties with patients traversing the stairs and the need for electronic medical records.

Since the majority of the MEH's patients are older people, one of the issues that the MEH deals with is the difficulty of getting the patients in the hospital. Some of the patients are disabled, blind, or have spine problems; hence, some of them find it difficult to climb the stairs and move in the hospital. Thus, the MEH staff sometimes has to carry patients to get them into the hospital. To eliminate the struggle the medical staff is facing and the discomfort of the patients, a few suggestions were provided. We recommend the list of potential handicap accessibility equipment including stair-climbing chairs and ramp options. Acquiring them would solve the time-consuming discomfort the MEH's staff and patients are experiencing, which can result in a possible increase in the number of patients that are treated by the MEH.

The other struggle that the medical staff pointed out was the lack of writing space in the MEH. The nurses do not have a proper table in the hospital to write and fill out the medical forms; Instead, they use the top of the storage container meant for medicine and instruments. This is uncomfortable and challenging for them and decreases their efficiency. To solve this issue, we recommend using some form of Electronic Medical Records (EMR). EMR is an

electronic system to store information about patients and make filling the medical forms more efficient. Since this method is reliable, faster, and does not require storage space, setting it up would increase the MEH's organization as it would solve the issues that the MEH deals with while filling out the medical forms for each patient.

After those interviews to visualize the patient flow and the step-by-step operation of the MEH, we made diagrams to display the process that a patient goes through to have an examination in the MEH from the local screening to the post-operative appointment. The appointments are divided into two diagrams based on the outcome of the initial screening - just an examination or a laser/surgery. Moreover, while interviewing two professionals from Lehigh University, a recommendation was made regarding the scheduling of appointments to make the management of the MEH more efficient. They recommended we look into the order in which appointments are scheduled, as well as the processes within each appointment. This information could be analyzed to find if the equipment is overbooked or could be better scheduled. They also suggested overbooking appointments to make sure that if a patient does not show up, the schedule is robust enough to continue to take the next patient with little to no disruption.

The last objective was to organize the route by mapping the population of Armenia in order to get a more informed route for the MEH to follow. The optimal route is the one that provides the maximum reach in the areas where the demand for eye care is high while taking into consideration the minimization of travel time. For that purpose, an analysis was made using mapping software called ArcGIS to visualize the possible routes. Along with creating the map, research was carried out to understand the Traveling Salesman Problem, an algorithm for calculating the optimal path between predefined locations. As a result, a map was developed and compiled using the Geographical Information System (GIS) software and the data collected from the American University of Armenia and the AECP. The map demonstrates the reach of the MEH and regional centers to potential patients and can be used to determine if the route can be changed in a way to reach more patients.

We made a list of recommendations to meet the objectives that we highlighted in this report to give the AECP a new perspective on their organization and management. These include a two-bin Kanban system with bins laid out with Kaizen foam to streamline gathering materials for procedures and restocking the MEH, and the use of Value Stream Mapping to identify other areas requiring improvement in order to make the MEH more efficient, as well as a list of several other lean management techniques that can easily be implemented by the MEH staff. We also made recommendations involving electronic medical records and patient assistance with the sets of stairs.

The impact of the AECP is incredible as it provides eye care to thousands of people around Armenia without any financial obligations. Some of the patients have serious diseases that led to blindness and other terrible consequences that affected their life. We hope that this report would make at least a small change for AECP to make their work more efficient and help them provide eye care to more patients across Armenia.

Introduction

In Armenia, when people want to be careful about something important, they say, “keep it like the light of your eye”. Nevertheless, the valuable “light of the eye” is very easy to lose. Blindness and eye disease are large problems in Armenia. Eye diseases are prevalent in older generations, defined as 50 years and older. 27% of the older generation suffers from cataracts, 6.7% from macular degeneration, and 3.4% from glaucoma (“Eye diseases are more prevalent,” 2019). Armenia is a difficult place for people with eye problems. There is only one school for blind or nearly blind children, where they learn to read with the Armenian Braille alphabet (“Armenia’s only school,” 2013). The website panorama.am mentions that people with visual impairment are trapped at home and have difficulty finding a proper job (“People with visual impairment,” 2019).

The Armenian EyeCare Project (AECP) provides free eye care services through its regional centers, which are permanent locations, and through its Mobile Eye Hospital (MEH), that travels to deliver care to Armenians. There are several challenges the MEH faces that restrict its effectiveness; It travels around Armenia inside a tractor-trailer, which makes traveling on mountainous or poorly constructed roads difficult and dangerous. The stops on its route are in areas that are restricted by reliance on nearby hospitals for resources and emergency medical services. This reduced coverage limits the number of patients the hospital can see because most patients cannot travel on their own due to vision problems or lack of access to a car. Instead, patients use public transportation, the community’s help, or the help of NGOs and nursing organizations that work with AECP to get to the hospital.

The hospital is also restricted by its own defining characteristics – the space inside the tractor-trailer is only so large, so only so much equipment can be transported. Therefore, the AECP developed the route for the MEH with stops in the parking lots of local hospitals. While the MEH sees patients, the local hospitals provide it with necessary resources along with support in terms of emergency situations, anesthetics, electricity, water, and security issues. Moreover, to make the MEH’s management more efficient, the staff tries to manage their time efficiently to spend the most time on patient appointments. When the MEH goes from one place to another it takes them two days to assemble and disassemble equipment to prepare the hospital for patients. Therefore, locations are visited for three to four weeks so as to minimize set up and take downtime.

Two previous WPI teams have worked with the AECP on separate projects. One of the teams worked to develop an electronic medical record system for the AECP’s regional centers to communicate and share data. The other team developed an online application for children to learn about eye health and preventative practices to protect against eye diseases. The electronic medical records improved the efficiency of the regional centers by organizing data and reducing time spent gathering information; when data is easily shared, it is also easily found. There are other areas where we can save time without compromising the care patients receive. These opportunities for improvement lie in the way the MEH is organized, manages inventory, spends

time setting up and resetting equipment for appointments, and setting up and taking down the hospital when moving to a new location. It is possible that improving these areas will help the admirable work of the AECP reach more patients and improve more lives.

This project focuses on potential ways to improve the efficiency of the MEH by exploring the topics of transportation and management. The goal of our project is to increase the number of patients the MEH can see during its active season, specifically patients with an increased risk of becoming blind. The MEH aims to minimize blindness in Armenia by focusing on the detection of diseases that lead to blindness such as cataracts, glaucoma, diabetic retinopathy, and macular degeneration (AECP, 2020). The time saved will be spent performing more screenings and alternative preventative measures. By minimizing patient turnover time through the implementation of lean management techniques and analyzing the GIS map created by overlaying their current route with the densest populations of Armenians to optimize its route, the MEH will be able to save enough time to fit more appointments into its schedule.

Background

Armenia is not the only country to struggle with blindness in its rural communities. The widespread presence of poor housing and isolation in distant neighborhoods is a barrier to making healthcare affordable. The main reasons for this issue are connected to housing conditions, hygiene, and economic issues. These factors are influenced by disease and a lack of nutrition, as well as an inability to receive preventative care.

To address these issues, other countries have implemented mobile hospitals to reach rural communities. These countries are often concerned about the reach and effectiveness of mobile eye hospitals. An example of how this concern was dealt with comes from Florida. The University of Florida Mobile Outreach Clinic's Care Coordination Program (CCC) started to train undergraduate students to become volunteers and to interview patients in order to provide a quality service (Nguyen *et al*., 2019). Care Coordinators also conducted surveys to ensure that the patients received the care they needed and were satisfied. The approach of integrating undergraduate students in health care became well known among students because the clinic was useful training for pre-health career students in giving them experience with actual patients. The clinic's efforts were concentrated more on vulnerable and poorly developed neighborhoods. The Care Coordinators concluded that patients sometimes complained about long clinic waiting times, location, finances, operational hours, and transportation. The Care Coordinators tried to satisfy the patients' needs as much as possible, along with providing them with motivational interviews to empower them to change their unhealthy behaviors. The CCC's report indicates that the program was helpful for the clinic as it gained motivated volunteers as well as for the patients, who based on the patient satisfaction surveys, stated that the CCC was very helpful (Nguyen *et al*., 2019).

An example from Philadelphia is the Wills on Wheels (WOW) Mobile Eye Unit, established with the collaboration of the National Football League Philadelphia Eagles Eye Mobile (EEM) optometrists and the Philadelphia school system. They provide ophthalmologic healthcare services to those who have been identified by EEM as people needing an ophthalmologist's consultation. They conducted a study of school children who could not get ophthalmic care service from their school nurse on their day of the appointment. These children had an opportunity to be examined by the WOW Mobile Eye Unit (Diao *et al*., 2016). The study results reported that out of 132 students, 82 were examined by the Mobile Eye Unit. Most of the school nurses liked the WOW's service and considered it efficient, comfortable, and convenient for child transport. However, the WOW program's main challenge was getting consent from parents for examinations (Diao *et al*., 2016).

One of the ways Armenia battles eye disease is through the Armenian EyeCare Project (AECP), whose mission is to make eye care more accessible to the people of Armenia. The AECP operates out of a mobile clinic called the Mobile Eye Hospital (MEH) and four permanent regional centers in Lori, Shirak, Syunik, and Tavush, with a fifth center to be opened soon in Vayots Dzor. The AECP was founded in 1992 and the MEH has been en route in Armenia since

2003. The MEH aims to minimize blindness in Armenia by focusing on the detection of diseases that lead to blindness (AECP, 2020). The MEH treats approximately 55 patients a day. Of these 55, 30 are seen for screenings, 15 undergo surgeries such as laser eye surgery, and the remaining 10 are seen for postoperative appointments. The most common surgery performed by the MEH staff is cataract surgery, and the main beneficiaries of the MEH's services are elderly Armenians.

Despite the impact that the MEH has had on the lives of Armenians, there are still limitations to what it can provide. The MEH is a large trailer that travels around Armenia, filled with the necessary equipment for surgeries and screenings. The doctors and staff operate out of the MEH at stops along its route and store their equipment and the trailer in a garage during the winter season when the already difficult navigation of the roads is even more dangerous, as mountainous dirt roads do not allow for transportation of the tractor-trailer in the snow, ice, and rain. It circulates on a two-year cycle, spending about three to four weeks in each location. It travels from stop to stop on weekends, as night travel is dangerous due to poor street lighting. During its time at a stop, the MEH begins to see patients in the morning and begins surgeries after 1 PM. The MEH currently travels only to relatively large cities in Armenia that have established hospitals that are able to supplement the mobile center with electricity and water, as well as provide emergency medical staff and guards for security. The MEH does not circulate to Armenian villages because it is easiest to reach more patients through transportation options such as busses offered by larger cities. People are screened locally for eye problems in order to set up surgeries or eye care appointments, and those people use public transportation, the community's help, or use the help of NGOs and nursing organizations that have partnerships with the AECP to get to the clinic (N. Yeghiazaryan, personal communication, February 6, 2020).

Other problems that have been an issue for mobile hospitals are waiting times and lack of follow-up care. For example, survey results reported by Peters *et al.* (2014) in a study of the mobile clinics provided by the Ministry of Health for remote communities in Katsina State, Nigeria, indicate that patients lack follow-up care in cases where illness doesn't go away. The MEH is addressing this concern by ensuring that the patients are in touch with local doctors if they need anything after the mobile hospital leaves (N. Yeghiazaryan, personal communication, February 6, 2020).

In order to reduce patient waiting times and schedule more follow-up appointments, mobile hospitals can implement lean management principles. Lean management is a technique based on the fundamentals of minimization: Doing more with less. It is implemented in many settings, from manufacturing plants to hospitals, by managers to cut costs, increase throughput, and save time. In the case of the MEH it will be useful to improve efficiency in order to operate more quickly, and in turn, see more patients. Lean management techniques have multiple subsystems, which are set up like equations: There are proportionalities and balances to maintain.

One subsystem is the relation between dependent events and statistical fluctuations (Goldratt, 2016). Dependent events are defined by the order in which they have to be performed; An example of this would be that putting on your shoes depends on you having already put on

your socks. Statistical fluctuations consist of all the deviation around the average time it takes to complete a process. Performing tasks slower than the average time delays all future processes, and it is difficult to make up for lost time, even when other procedures are completed in less than average time. Therefore, a buildup of inefficiencies results, which slows the throughput rate of the process. For example, if you took ten minutes to find your socks, then the completion of the process of putting on your shoes was delayed by those ten minutes. Events are sequentially analyzed to see what can be run in parallel and ways to best order operations. The order of these events is important for when statistical fluctuations stack up. In the case of the MEH, when a doctor starts appointment A late, appointment B is bound to also begin late, and these short lags eventually add up and cause increased patient waiting time. In terms of dependent events, post-operative appointments cannot take place until the surgery has been completed, and surgery cannot be completed until the patient has been screened and diagnosed (Goldratt, 2016).

Another subsystem involves the simultaneous achievement of decreasing inventory, decreasing operational expenses, and maximizing throughput (Goldratt, 2016). Due to the physical limitations of the MEH, minimizing inventory is especially important. Smaller inventory aids in organization and ensures that the staff has enough space to work since carrying only what is needed makes it easier to locate items, know what items are missing, and reduce overall clutter. Operational expenses are costs that the MEH has to pay to successfully treat patients, including the price of the trailer and the salaries of the staff. Throughput in a medical setting is defined as the number of patients that exit the hospital after receiving care. Less time spent looking through inventory represents more time that can be spent seeing patients (Goldratt, 2016).

The New York University Langone Health System implemented a lean approach to their management and considered the program successful. The way NYU Langone Health System approached lean management was by creating a Performance Improvement Team (P.I.T. crew) of surgeons, nurses, hospital administrators, pharmacists, elevator and transport operators, and technicians to analyze their current practices (Certfolio *et al*., 2019). They broke all practices into value-adding and non-value-adding activities. Valuable processes resulted in a positive return on investment and non-valuable ones had zero or negative return and could be eliminated without detriment to the overall operation. This includes repetitive processes, which are processes in which the outcome overlaps with the result of another process, usually performed by a different entity. Post evaluation, all non-valuable processes were eliminated, and valuable processes underwent a secondary analysis: Could these processes be run in parallel, and who on the team is most capable of completing them? In the end, 10% of their processes were eliminated as non-valuable, 25% of their processes previously deemed dependent events were run in parallel, and operating room turnover time decreased from an average of 37 minutes to 14 (Certfolio *et al.*, 2019). Although these techniques can be difficult to implement, this example of lean management proves that it can yield high success in a hospital setting.

Project Statement

We focused on the improvement of the Mobile Eye Hospital by reducing inefficient behavior and processes and increasing the number of patients the hospital can see at each location it stops at using lean management techniques. Some of the areas we seek to improve had to do with setup time upon arrival, take downtime at the end of the three-week period, individual exam preparation time, and the mapping of Armenia's population served by the AECP's services.

Methodology

The goal of our project was to increase the number of patients the MEH can examine and treat during its operational season, specifically increasing the number of diagnoses of eye diseases that lead to blindness, such as cataracts and glaucoma, that are made, as well as increasing the number of blindness-preventing surgeries performed by the MEH. We aim to achieve our goal by finding areas in which the MEH's operations can be optimized. Our overall process is summarized in Figure 1 with our first two objectives described on the left side since they have a similar process and our third objective on the right.

The main objectives of this project were:

1. Minimize patient turnover time and waiting time through relevant lean techniques
2. Generate recommendations based on interview responses to save time and increase organization on the MEH.
3. Map the populations served by the AECP to determine its reach and aid in making more informed decisions on planning the MEH's route and selecting the parking locations.

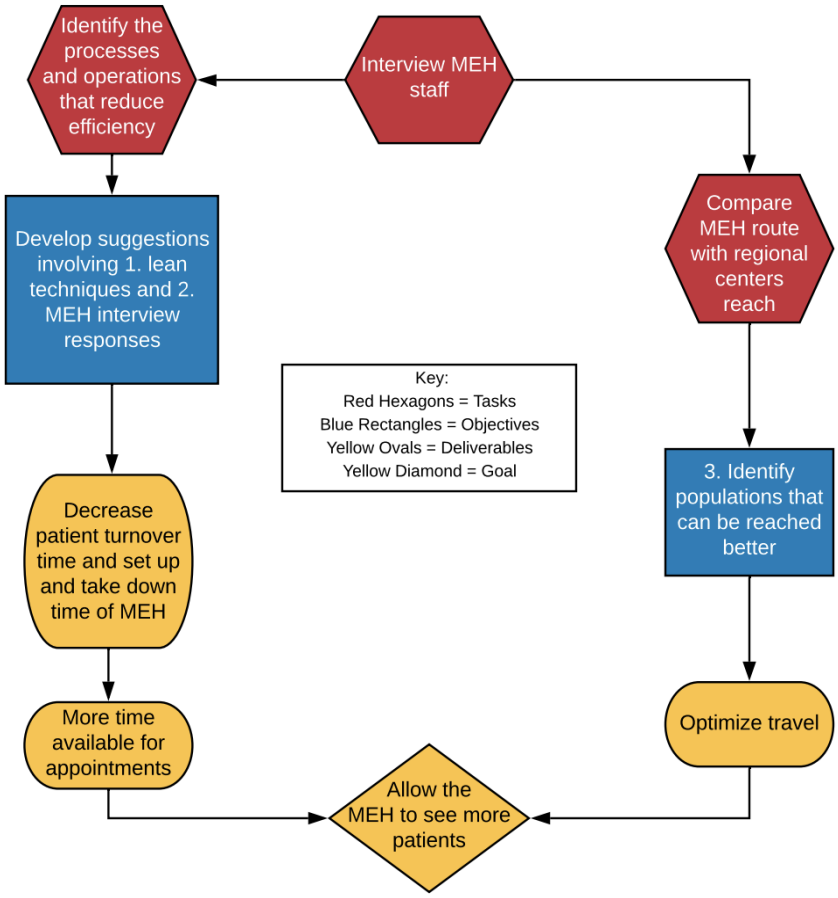

Figure 1: Process diagram of our work plan towards our goal

Time limits the number of patients the MEH is able to see. Therefore, our first objective was to reduce operating room turnover time between patients, which involves the clean-up and set-up of the room. In order to improve the system, we first needed to observe their current process flow. In accordance with lean techniques, we needed to look for dependent events and bottlenecks. The type of dependent events we looked for were the type that can be turned into independent events and completed simultaneously or in a new, more efficient order. If there is a bottleneck process, we could turn it into a non-bottleneck by purchasing a duplicate of that piece of equipment if it will comfortably fit inside the MEH and is not over budget, or by finding new ways to complete the same process with different staff or materials. We looked for these dependent events and bottlenecks by gathering information and data from the AECP and the MEH on current procedures and operations through interviews with MEH staff and meetings with our sponsor.

In order to receive informed consent from the staff that we interviewed, we informed them of our intent, that everything was completely anonymous, and we only recorded and conducted interviews with their consent. To overcome the language barrier, the interviews were conducted in Armenian by the AUA half of our team. Through these interviews, the MEH's staff members answered several questions, including:

- How long does it currently take to turn over an operating room? What part of the turnover process takes the longest? How many staff are involved in turnover?
- What is the layout of the room?
- Can you describe how some of the procedures are done in terms of organization, instrument access, and personnel involvement?
- Do you often spend a lot of time looking for equipment?
- How do you report when you are low on supplies? How long does it take to get new supplies after requesting them?
- Do you find the work area to be cluttered? Are there tools there that are rarely used?
- What happens with extra materials that aren't used up but aren't required at the next location when it is time to move to the next location?
- Are there other processes that take a lot of time and can be performed quicker and more efficiently?
- How do you make the MEH accessible for disabled patients?

This interview process was standardized by asking interviewees some of the same core questions. Once we had the answers to these questions, we investigated which lean management techniques might be most applicable, as determined through books, articles, and interviews with relevant experts. Then we recommended an implementation strategy to best work these techniques into their daily practices.

We gathered information on patient demographics, procedure types, staffing, transportation, and operations of the MEH from our sponsor, the AECP. We analyzed the data by

comparing it to our knowledge of lean management and process optimization. Using this information, we determined which areas needed optimization or improvement. The process analysis was as follows:

- If we find that there is no necessary chronology to how they turn over an operating room, then tasks can be run in parallel.
- If tasks can theoretically be run in parallel, are there any other limitations that would prevent them from being completed simultaneously? If limitations exist, and they involve staff, this circles back to the question of having an appropriate staffing level of the proper expertise working on room turnover, and whether staff roles can and should be shifted.
- If instead, we find that item organization is the greatest detriment to their turnover operations, we can focus on implementing a labeling system, the Kanban system, or an easier way to record and submit what supplies they are running low on so as to keep inventory stocked in appropriate quantities.
    - Labeling drawers and storage containers with a clear description of what supplies are inside makes it easier to find items and stay organized.
    - The Kanban system is a way of organizing supplies in a way that makes it easy to see when something goes missing and when stock is low. In this instance, we would implement the Kanban foam system, where each tool fits into a foam insert to prevent clutter and to prevent items from getting lost.

Inventory can be problematic on both ends of the spectrum: There can be too much or too little. Too much inventory adds clutter and makes the organization more difficult, whereas too little inventory limits the number of patients the MEH is capable of treating. Therefore, a balance must be found. This is most easily achieved through clear documentation of inventory and practices and communication among the staff of the MEH in regard to what pieces of inventory and practices are really necessary. As an example, in “The Goal” by Eliyahu Goldratt, management and machinists were not communicating well and problems on the floor of the machine plant were being ignored. It was not until better documentation practices and communication were implemented that their plant was able to turn a profit.

Our second objective was to produce recommendations that decrease the setup and take downtime of the MEH’s equipment. One way we wanted to reach this objective was by modifying the order of procedures, which include screenings, surgeries, and the processes between them such as sterilization. We considered alternate schedules for procedures compared with the current one. The categories we considered were the convenience of doctors, patients, and resource usage. The schedule with the shortest waiting time for patients, the least overlap of space and equipment usages, and the lowest number of doctors needed were preferred. Long wait times earlier in the day signal a need for a scheduling change. Having shorter procedures performed earlier in the day is beneficial since shorter procedures tend to reduce wait times overall. The appointments that take a long time can be moved to the end of the day so that they

do not cause a backlog. As of now, surgeries, which are generally longer procedures, do not start until one in the afternoon (N. Yeghiazaryan, personal communication, February 6, 2020), so making all quick appointments in the morning before 1 PM should not greatly alter the schedule, while still reducing the number of patients waiting outside at any given time. Success can be measured by noting any difficulties as well as documenting the number of patients they are now able to treat. If they find a lot more time gaps in their daily routine due to this new schedule, they will be able to identify whether or not they can fit more appointments.

Our third objective was to determine the effective reach of the MEH and recommend transportation improvements. There are currently four regional centers, and a fifth is under construction. These regional centers serve the outer regions of Armenia so that the MEH can focus on serving central Armenia. This route is tweaked every year and the search for an ideal route is still underway. The MEH is currently transported in a tractor-trailer to relatively major cities and is parked adjacent to hospitals. The optimal route would be one that provides maximum patient reach in areas with the highest demand for eye care while minimizing travel time. For this minimization, we looked to guidelines such as the Traveling Salesman Problem, an algorithm for calculating the optimal route between predefined locations, along with mapping software called ArcMAP to visualize the possible routes. A map containing population density, roads and transport, and current locations where the MEH stops along with regional center locations can give us and the AECP a better idea of their coverage and where it can be improved. We will first map the population that the MEH is serving. High volume areas have 100,000 to 1.1 million people per city, such as Yerevan and Gyumri, and low volume areas have fewer than 10,000 people per town, such as in Tashir and Aparan. We developed a map using data from the American University of Armenia and the AECP that displays the reach of the MEH and regional centers in order to determine if there are potential patients the AECP could better serve. This map was based on the locations of high volumes of patients that were determined through the population data, the current route the MEH travels, and permanent regional center locations. Data was compiled using the Geographical Information System (GIS) software for analysis. By overlaying population density, regional center locations, and roads, the AECP can determine the effectiveness of the MEH.

Results

Objective 1: Lean techniques

We have identified two lean systems and several lean techniques that we feel the MEH can feasibly implement and will aid in organization and time management, as well as ultimately, enabling them to see more patients. The systems and techniques are:

Table 1: Summary of Lean Systems	
System	**Definition**
Kanban	Supplies are delivered as needed, making sure workers have exactly what they need but not too much. Makes inventory management easier and reduces unneeded stock. Shows the actual needs, eliminating waste, and improving efficiency (Schmidt, 2016).
Kaizen	A system for continuous improvement by setting small incremental goals that have a strong emphasis on teamwork throughout the company is implemented in. It follows a cycle commonly referred to as "Plan, Do Check, Act"(1). Its foundational principle is that everything can and should be improved (2) (“What is Kaizen?”, n.d.).

Table 2: Summary of Lean Techniques	
Technique	**Definition**
FOCUS PDCA	A derivative of Kaizen developed in the healthcare industry. Systematic process improvement method. Created for the medical industry. It does not require in-depth expertise, even when working with highly technical or scientific processes. It can be learned quickly (“FOCUS PDCA”, 2020).
5S	Sort, Set in order, Shine, Standardize, Sustain. A systematic approach to organization and cleanliness in the workplace. It can be easy to start with and can be used with Kaizen and Kanban (McFadden, 2020).
Value Stream Mapping	Follows the production journey of a product. Flow diagram designating processes and steps. Two separate aspects: Current state and future state maps. It helps identify waste and eliminate it (“Value Stream Mapping (VSM)”, 2020).
Theory of Constraints	A technique that focuses on eliminating bottlenecks (a process or piece of machinery where inventory buildup occurs, the limiting factor in operation) and minimizing inventory as a means of increasing throughput (Goldratt & Cox, 2004).
Minimizing inventory	Minimizing inventory minimizes clutter, helps with organization and knowledge of what actual inventory is, as well as eliminating storage costs if applicable (Goldratt & Cox, 2004).
Work sampling	A technique used to determine how exactly time is spent in the workplace. Involves periods of observation at random intervals to determine the proportion of time a worker spends in each task (“Work Sampling”, 2020).
Non-Value Added activity elimination	Difference between activity and productivity. The typical manifestations of waste are overproduction, waiting, conveyance, over-processing, excess inventory, unnecessary movement, and defects (Goldratt & Cox, 2004).
Analytical Hierarchy Process	Identifies and selects lean management techniques through a structured decision-making method in order to choose the best lean management methods and improve healthcare systems
Taguchi Method	The Taguchi method is a statistical method to find the best combination of control factors and parameters to improve the quality of the product and perform the minimum number of experiments to find the ideal combination (Phadke, n.d.)

The lean systems we explored are the Kanban system and the Kaizen system. Kanban is a system in which parts are delivered to the examination room as needed. It makes sure the surgeons and nurses have exactly what they need when they need it, but not too much of it. Kanban cards are used to signal when new parts are needed, and no parts are delivered until the card is shown. Kanban makes inventory management easier and reduces unneeded stock. It shows the actual inventory needs, eliminates waste, and improves overall efficiency (Schmidt, 2016).

The Kaizen system is a model for continuous improvement in which employees at all levels and in all departments work to achieve incremental goals for the betterment of the company as a whole. Working towards smaller goals makes it easier to see and understand progress. The central philosophy of the Kaizen system is focusing on improving specific areas within one company through employees actively engaged in the improvement of the company. One of the most recognized methods within this system is Kaizen Foam, depicted below in Figure 2 ("What is Kaizen?", n.d.). Kaizen foam is a useful technique for ensuring that instruments and tools are readily available and eliminates time spent searching for the proper tool.

Figure 2: Kaizen foam (Bennet, 2019)

Within these two systems are techniques created for specific applications and to make applications more tangible. These include FOCUS PDCA, 5S, Value Stream Mapping, and Theory of Constraints. FOCUS PDCA is an acronym that stands for:

- Find a process to improve
- Organize to improve the process

- Clarify current knowledge of the process
- Understand the source of process variation
- Select the process improvement
- Plan-Do-Check-Act.

The FOCUS PDCA method does not require in-depth expertise and can be learned quickly, even when working with highly technical or scientific processes. It is very good at supporting a culture of continuous improvement. The last step, Plan-Do-Check-Act, is a common Kaizen subsystem, which means it is a system that is used to implement the Kaizen philosophy, which is why this system works with Kaizen so well ("FOCUS PDCA", 2020).

The 5S system is a systematic approach to organization and cleanliness in the workplace. The S's stand for: Sort, Set in order, Shine, Standardize, and Sustain. The original S's were in Japanese, so translations into English may vary, but the ideas behind them are clear. 5S seeks to clear unnecessary items from the workspace, organize an efficient storage system, clean the work and storage spaces regularly, incorporate these changes into standard procedures, and assign responsibility to employees and keep track of progress made by adhering to the system. It is relatively simple and easy to implement (McFadden, 2020).

Value Stream Mapping follows the flow of a patient from the local doctor to the MEH. It is essentially a flow diagram that uses distinct icons to designate processes and steps. It includes two separate aspects: Current state and future state maps. Current state maps identify current processes and flow of supplies, patients, and information. They often show differences between how things are actually done, and how they are documented or how procedures are supposed to be carried out. This part of the process helps to identify waste. Future state maps are to eliminate the identified waste. Value Stream Mapping is used to lay out a plan for the near and distant future ("Value Stream Mapping (VSM)", 2020).

The Theory of Constraints is based on finding the constrained or constraining resources, in the form of a bottleneck or limiting factor to a set of operations. Bottlenecks are pieces of equipment or procedures that limit the throughput of the whole system, whereas non-bottlenecks do not have such a strong impact on the bigger picture. Therefore, identifying and reorganizing around bottlenecks increases throughput, and allows for a cease in the buildup of unwanted inventory. In terms of a hospital, a bottleneck may be a surgical laser. If all the examinations happen quickly and the laser is not properly scheduled, there would be a buildup of patients waiting outside of that operating room. Identifying where that waiting time is the longest identifies how to reorganize and reschedule resources (Goldratt & Cox, 2004).

Work sampling is a lean management technique that focuses on eliminating non-value-added activity or activity that does not contribute to the end goal of the process. It involves observation of workers for a period of time at random intervals. This is done in order to determine the proportion of time the worker spends in various categories of activity. This can help give the MEH staff a better idea of how time is spent and allow them to reorganize tasks in a way that allows more appointments to be scheduled ("Work Sampling", 2020).

Another aspect of non-value-added activity elimination is observing the difference between activity and productivity. Through techniques and methods similar to work sampling, other areas of work such as inventory, process time, and production levels, can be observed. Observing all of these areas and comparing them can show where the non-value-added activity is taking place. It can show where overproduction is taking place, where processes are waiting for something to finish while another process could be taking place, why excess inventory exists, and where unnecessary processes are taking place (Goldratt & Cox, 2004).

The Taguchi Method is a statistical method used to find the smallest number of tests that need to be performed in order to determine an outcome. This method is usually used in a manufacturing context. It is generally used to determine the optimal way to create a part but can also be applied to performing tasks (Phadke, n.d.).

Objective 2: Interview Results

For our second objective, we interviewed the five medical staff members of the MEH: the nurse, surgical nurse, examiner, laser surgeon, and surgeon.

One of the aspects of the MEH that the interviewees thought needed improvement was handicap accessibility. Currently, the MEH staff has to lift the disabled patients up the stairs so that they can get up the MEH stairs, which consists of seven steps (N. Yeghiazaryan, personal communication, April 28, 2020). However, as some of the interviewees mentioned, because they do not have any equipment for the disabled people, carrying them takes time, effort, and personnel, usually requiring 3 staff members. Making the trailer more accessible would mean increasing the comfort of the patients, their caregivers, and the staff. Moreover, it will save the time and efforts of the MEH staff and increase their ability to treat the patients, as they will have more energy and time for appointments.

The staff also reported that they have issues with using paper-based medical records. They do not have a table to fill out these forms. Instead, they use the top of the storage container meant for medicine and instruments. The space is not only uncomfortable, but it is also so small that people have to take turns to use that free counter space. A solution that was suggested by interviewees was using Electronic Medical Records (EMR). EMR is an electronic system to store information about patients, which includes their test and screening results, and diagnoses. Compared to paper-based medical records, this method is more reliable, faster to fill out, does not require storage space, and makes searching faster. EMR is used by medical staff and requires short training to learn how to use it. Setting up EMR would increase the MEH's organization as it would fix the lack of table space and inconvenience issues that the staff has while filling out paper records. It would also save space, as the MEH staff has to keep all of the records of patients from their current region in the MEH while they operate in that region. They do this to ensure that they will easily find information about a recent patient in case they need to. To make the medical record available for all medical staff with the latest updates, it will be necessary to have an online system, which will require a stable internet connection and electricity, which is a

potential disadvantage of this system. If a stable internet connection is not accessible, then online forms that are filled out and saved on a tablet or laptop will be a simpler option.

Interviewing a professor and a graduate student from Lehigh University led us to consider scheduling as an area to be improved. Schedules need to be designed for robustness so that they can quickly recover from unpreventable external complications, such as bad weather, patient appointment cancellations, unexpected new flow of patients, or a staff member calling out sick. One way to do this is to overbook appointments, if statistically a lot of patients do not show up for their appointments. This is a common practice for airlines. If the MEH uses overbooking and all patients arrive on time for their appointments, a plan must be in place to see all patients in a reasonable amount of time. Therefore, the MEH should only overbook as many patients as they can still manage to see if all patients do show up for their appointments to manage the risk factor of this technique. We later learned that the MEH does overbook to some capacity, and we recommend they explore this more. It is also important to know what equipment is needed for each appointment and for how much time during that appointment the equipment will be needed for. Back-to-back booking of these resources leaves no room for statistical fluctuation and will cause time delays in a schedule. Properly documenting and helping the AECP to see how they operate through visualization tools will guide them to what can be improved.

One of the methods of visualization we used was a swim lane diagram, showing what procedures have to be done in chronological order in each “lane” or step, for surgeries, laser procedures, and examinations. We created two swim lane diagrams, one depicting the steps a patient requiring surgery must go through (Figure 3) and one depicting the steps a patient getting examined must go through (Figure 4). These diagrams are made to follow a patient through the MEH from local screening to post-operative appointments.

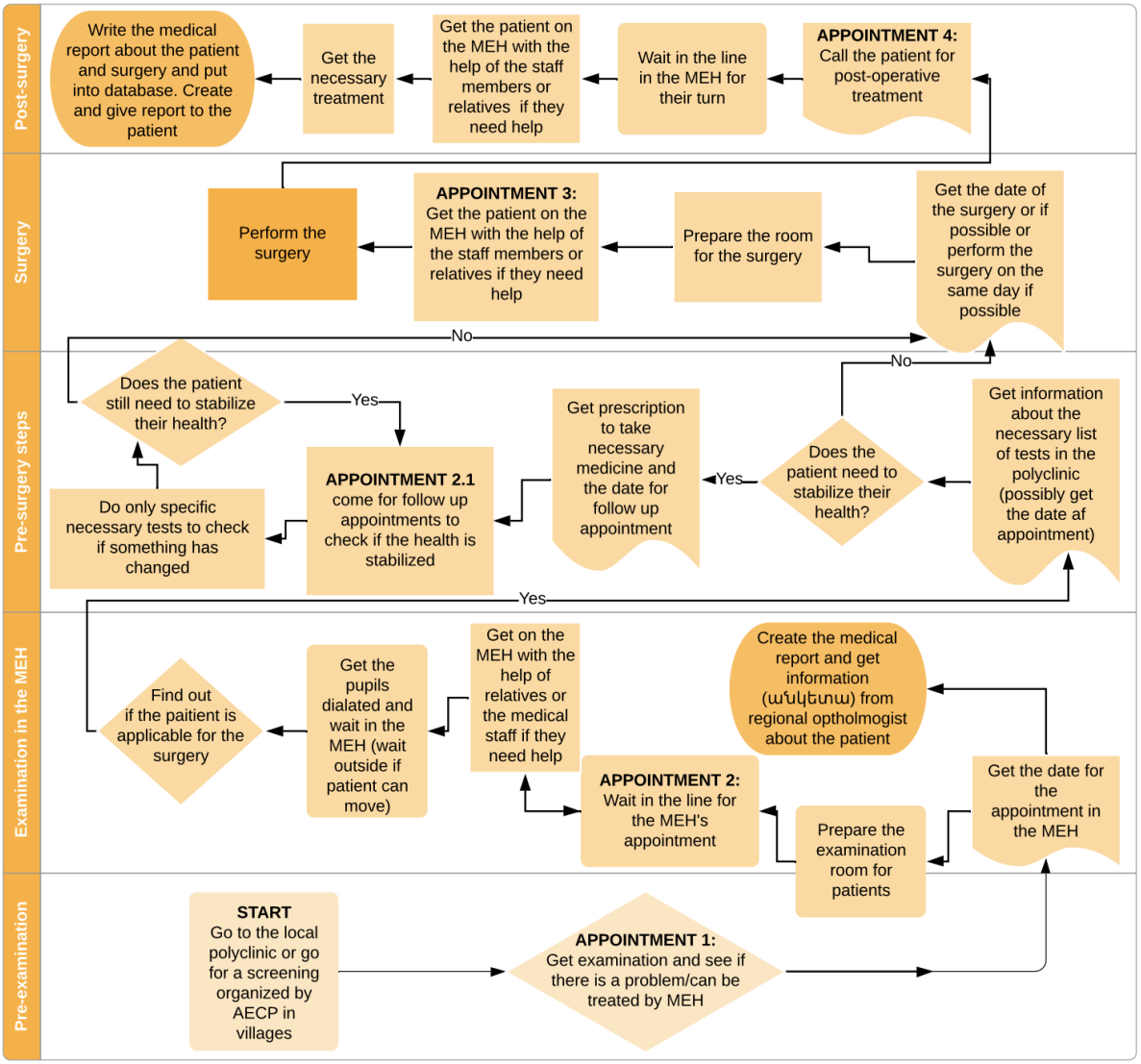

Figure 3: Swim lane diagram of MEH surgery or laser procedure patient

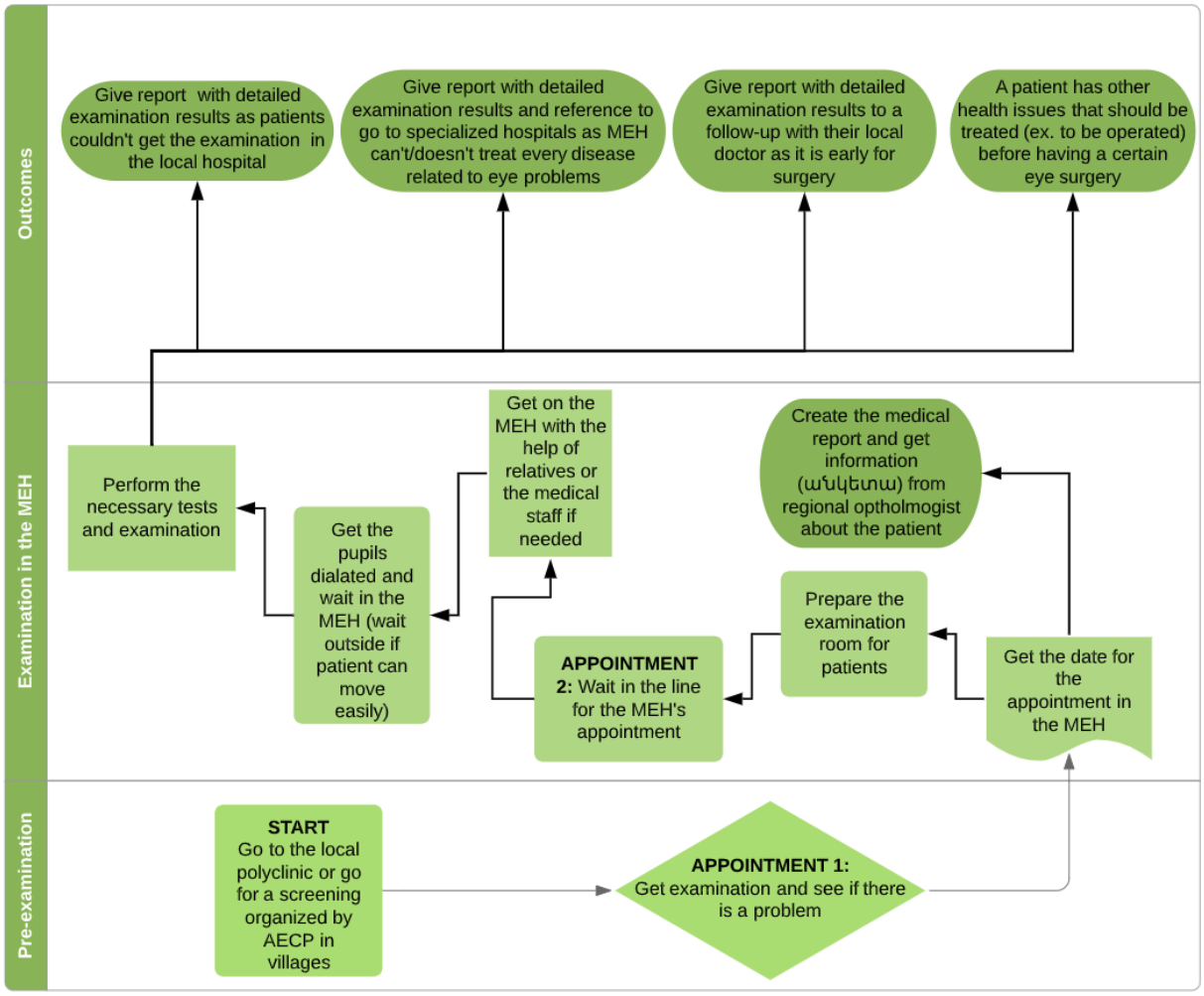

Figure 4: Swim lane diagram of patient examination

Another visualization tool we used was the logical flow diagram, outlining how a patient gets an appointment with the MEH. This type of diagram allows for analysis of each step, what can be eliminated or consolidated, and what can be made easier and less time-consuming. From this diagram, shown in Figure 5, we concluded that communication between the local polyclinics and the MEH is crucial and that there could be waste found in the number of examinations patients are required to go through, since patients are examined locally and in the MEH before treatment options are considered.

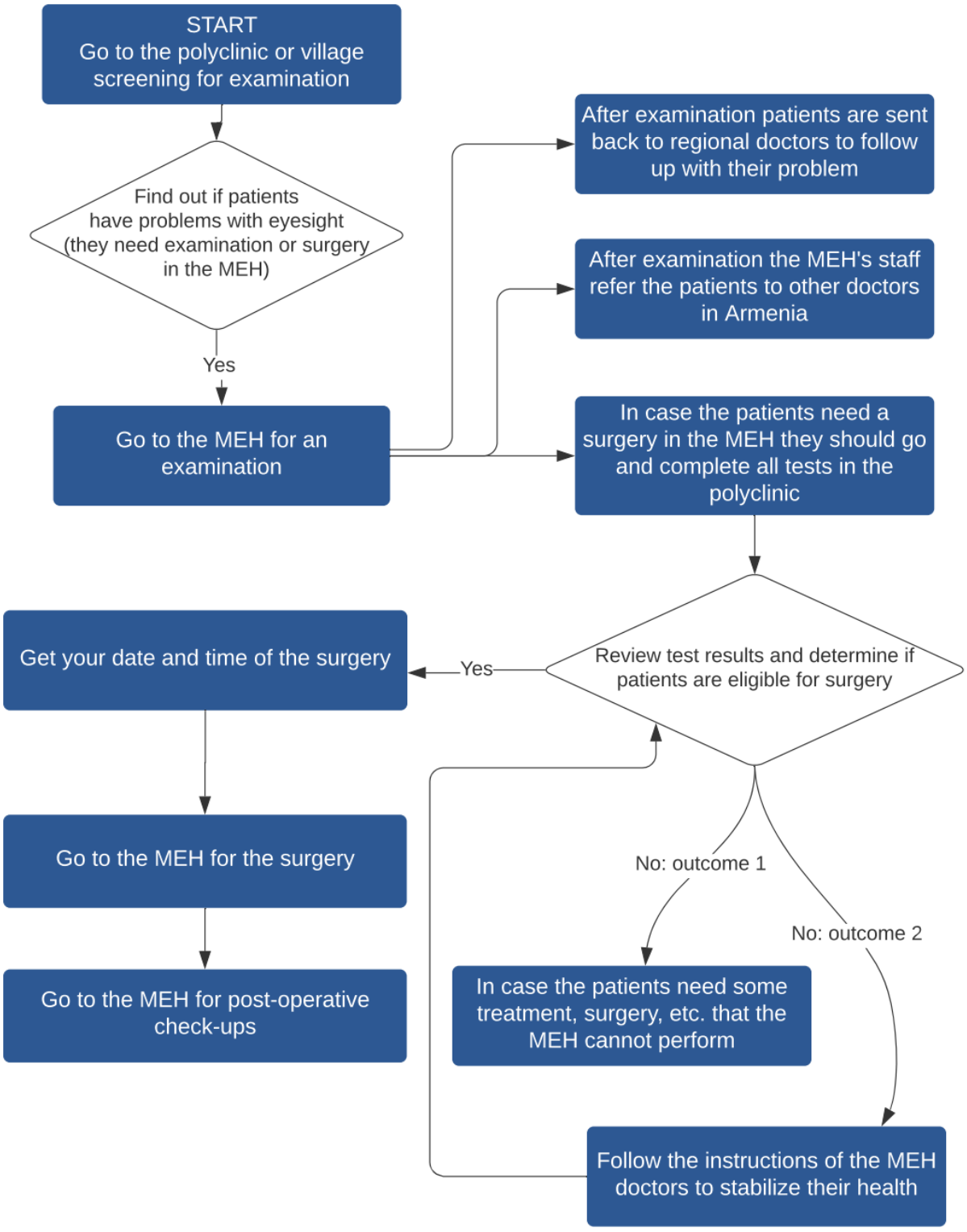

Figure 5: Logical flow diagram of a MEH patient

Lastly, we used the time table shown in Figure 6 to display the schedule from the staff point of view. The information on this schedule came from staff and sponsor interviews in the form of how many of each appointment type is scheduled on an average day, and what time of day that appointment type is conducted. Included are approximations of turnover time, time of each type of procedure scheduled, and that procedure's duration. The turnover times are blank spaces and vary in length. They include sterilization, filling out forms, and other tasks involved with cleaning after the previous patient and setting up for the next one. Turnover time lengths were approximated around the known average length of the appointment types and how many of those appointments they have per day.

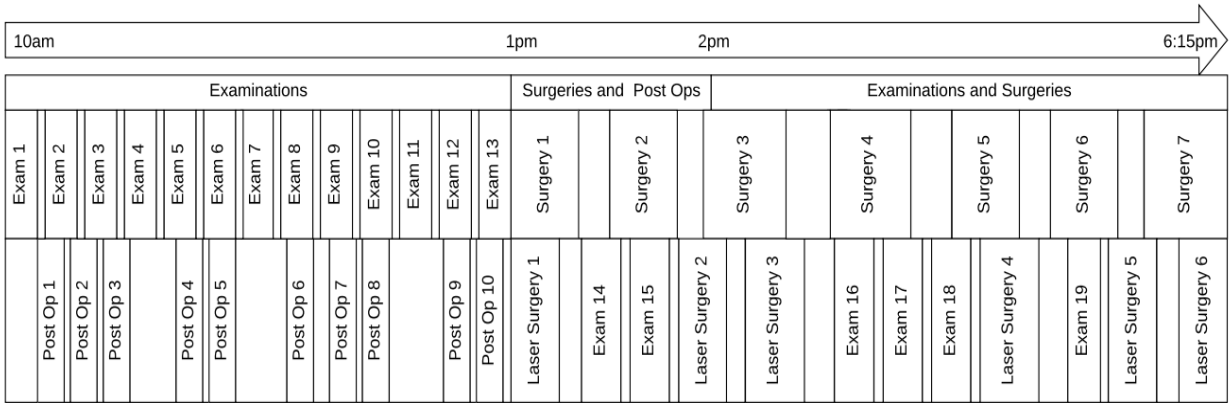

Figure 6: Time table of operations in the MEH

Objective 3: ArcGIS

We created a map using ArcGIS to show the reach of the MEH by superimposing population data with the locations where the AECP services are offered. This map includes the population distribution, roads, AECP Regional Center locations, and the MEH route (Figure 7). As displayed above, all of the Regional Centers and MEH stops are located in densely populated locations. In the areas that the MEH covers, there are enough stops close enough together for patients to be able to choose the location to which they would like to travel, which allows the MEH to reach more patients. In the areas that are covered by the regional centers, more travel is required for Armenians who are in the range of the regional centers, with less flexibility since the regional centers are expected to cover a greater area. However, scheduling flexibility is higher for regional centers than for the MEH because regional centers operate year-round and the MEH does not.

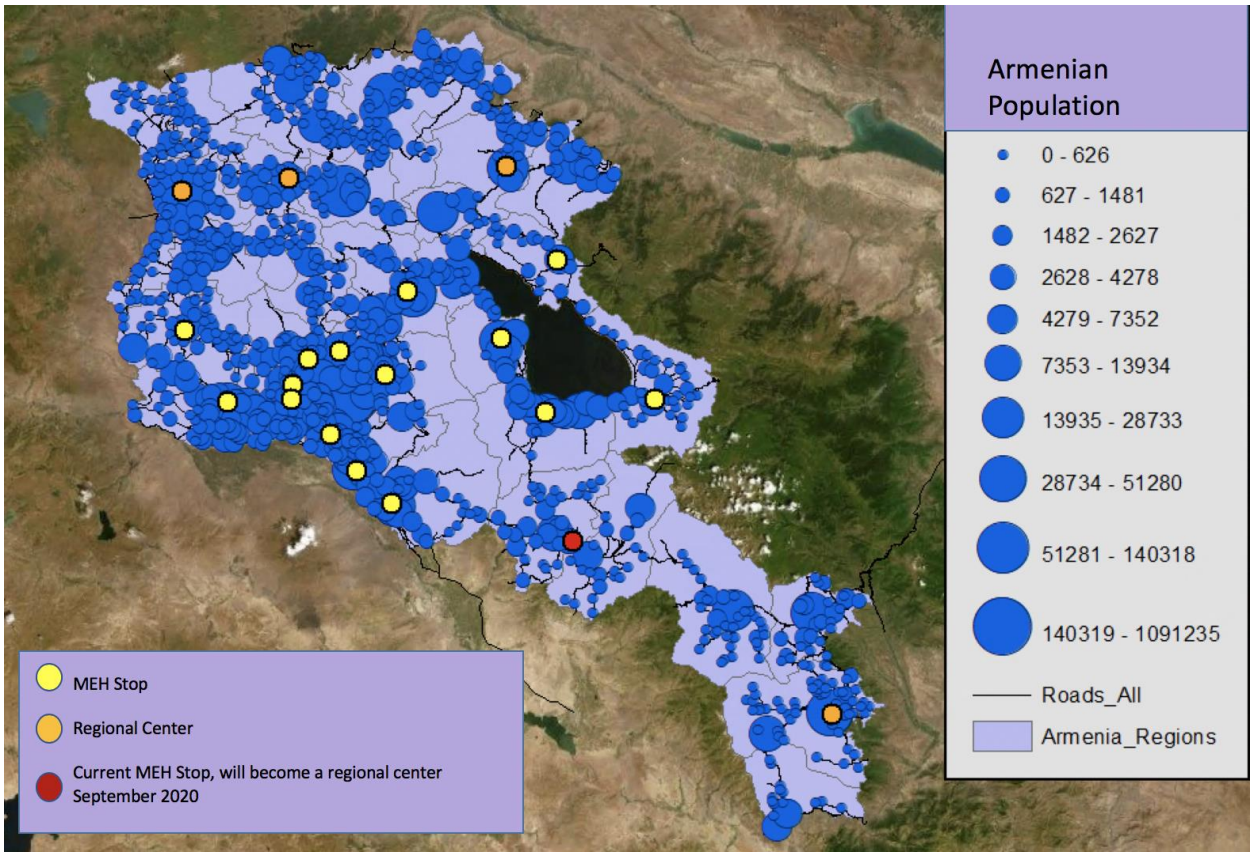

Figure 7: Map of AECP Coverage in Armenia

Since the MEH covers central Armenia well in terms of serving the most densely populated sections, the improvement on which we decided to focus was how the path between stops is chosen, and the order in which the stops are visited. These types of modifications are designed to minimize travel time so that the time spent stationary and seeing patients can be maximized. Currently, the route changes every cycle and is analyzed and tweaked between each cycle, but must start and end near Yerevan, as that is where the equipment is stored between operation seasons. One technique that could be used to make these decisions is the Traveling Salesman Problem (TSP), which is a mathematical algorithm for route optimization, used to find the route that travels to every city on a list and returns to the starting point in the shortest amount of time. The TSP equation is $R = (n-1)!/2$, where R is the number of possible routes and n is the number of locations on the route. Once the number of routes is determined, they are analyzed for efficiency through a number of methods, including dynamic programming, the branch and bound method, or other techniques that involve software and computer coding expertise. By drawing out each path, the top quickest routes can be identified and further analyzed for optimization.

Recommendations

Universal Accessibility

Since the main population treated by the MEH is elderly, as we learned from interviews, many of the patients have trouble ascending and descending the stairs on their own. Handicap patients struggle even more. Most patients require one person to guide them up the stairs and three workers, including the chief surgeon, are needed to carry wheelchair-bound patients in and out. In order to ensure the MEH staff are spending as much time and energy doing medical work for the patients, we recommend that the MEH be made more handicap-accessible.

One way to alleviate this struggle for the staff and discomfort for the patients is by using a portable ramp. There are several foldable models of varying length and weight capacity. Measurements should be made in terms of the size compatible with the set of seven stairs they use, as well as measurements for packing and traveling purposes. If ramps are too large to be comfortably packed and transported, there are less bulky options to consider. There are multiple stair-climbing chair options to use in place of a ramp, ranging from electric to mechanical, two-wheel to four-wheel, that the MEH could use to transfer wheelchair-bound patients into the hospital. The JCMED brand wheelchair is an example of an electric wheelchair, while the VEVOR model climbing chair is a mechanical ambulance-style stair chair (Table 3). Electric stair-climbing chairs can be operated by one person, whereas ambulance-style chairs require two people, one at each end of the chair. The main benefits of using the ambulance chairs are that they are smaller, lighter, and cheaper, whereas the benefits of using the electric wheelchairs are that they need less personnel and are easier to use because no lifting of the chair is needed.

Table 3: List of Potential Handicap Accessibility Equipment

Item	Dimensions	Max. Weight	Product Weight	Link
SingleFold Ramp Model Number SFW	61cm (24in), 91cm (36in), 122cm (48in) 152cm (60in) lengths	363kg (800 lb)	4.5kg (10 lb)	**https://tinyurl.com/y928jwl5** (Prairie View Ramps, 2020)
Electric Stair Climbing Wheelchair JCMED Model Number 5L	Open: 157x51x159cm (62x20x63in) Folded: 107x59x29cm (42x23x11in)	159kg (351 lb)	33kg (73 lb)	**https://tinyurl.com/y98mc5au** (JCMED, 2020)
VEVOR 2 Wheels Stair Climbing Chair	Unfolded: 49x74x91cm (19x29x36in) Folded: 70x54x17 cm (28x21x7in)	160kg (353 lb)	8kg (18 lb)	**https://tinyurl.com/y7g3hm9m** (Vevor, 2020)

Table Space and EMR

There is a lack of writing space in the MEH. The nurses do not have a table to fill out medical forms. Instead, they use the top of the storage container meant for medicine and instruments. Not only is it uncomfortable, but it is so small that the staff has to take turns to use that writing surface, which slows down the overall patient appointment. As a short-term solution, we recommend using clipboards, lap desks, a floating desk mounted to the wall that can be stored during travel, or chairs with a collapsible table attached in place of the other chairs they use. However, as a long-term solution, the MEH should use some form of EMR. Having all documents stored electronically would save storage space on the MEH, as they keep all documents related to patients served in that region in the MEH during that stop. It would also make locating documents much faster, as saving a file to an online folder is much quicker and easier for storing and accessing information than filing paperwork is. Also, typing is a clear form of written communication that involves no handwriting interpretation, which will also improve clarity and efficiency. If nurses are spending less time with paperwork and waiting for writing space to clear, patient appointments can run more smoothly. EMR would also aid in communication in the form of file sharing. If possible, copying the main hospital or the regional center's EMR system would be the quickest and easiest implementation route. If not, converting all paper forms to online PDFs that could be filled out on a tablet inside or outside the hospital would be a simple and helpful change the MEH could make. A more complete EMR system could potentially be the work of a future IQP team.

Lean Techniques

The Kanban system is applicable to the MEH's inventory management system. The current system of resupplying the entire hospital seems to be quite efficient and uses some aspects of Kanban, such as letting the person responsible for resupply know when a certain disposable c or item is running low. Kanban could also apply to the organization and storage of the supplies within the MEH. Supplies could be organized by the procedure so that all the nurse or doctor has to do is take one tray from a cabinet and know that that tray contains everything they need for that one procedure as depicted in the figure below:

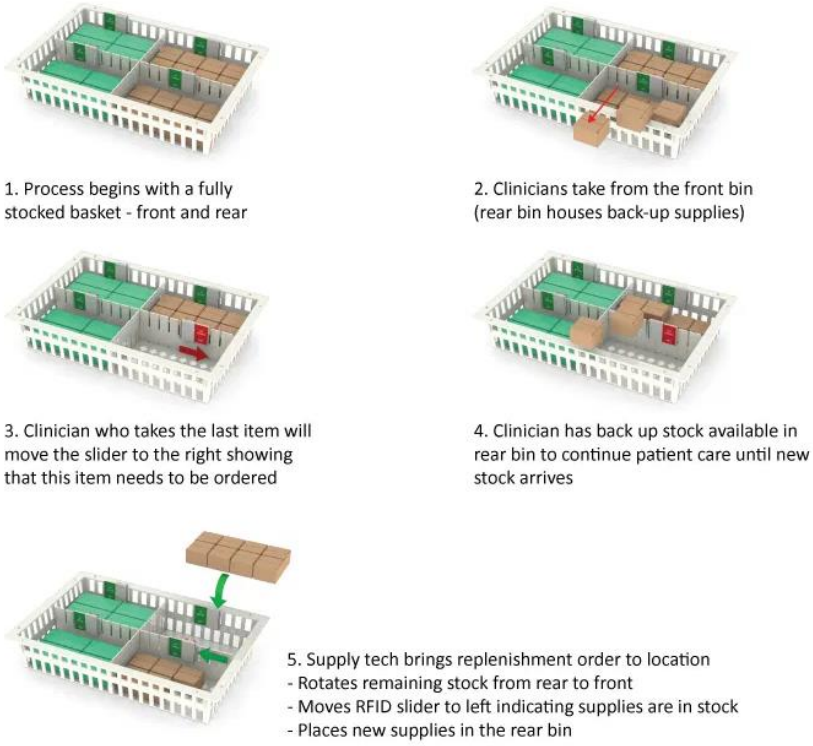

Figure 8: Depiction of Kanban bins in use (Medical Storage Solutions, n.d.)

The Kanban bins or trays that we are recommending could contain every item, or there could be two trays where one contains disposable items and the other contains reusable items needing to be sterilized. This way the items can easily be disposed of or sterilized as soon as the procedure is completed, and another set can be brought out for the next procedure immediately, saving time. For items that are required in the same room for more than one type of procedure or are reusable without sterilization, there could be a specific storage container for them as well.

Kanban relies on a card system for resupply. When the last tray is taken for a procedure, this signals an immediate need for resupply of those items (Figure 8). The time it takes to set up or reset more trays would dictate the placement of the card, whether it appears when the last tray in the cabinet is taken or if there are only a couple trays left. This method ensures that there is never any confusion when it comes to restocking the MEH.

The Kaizen foam method integrates seamlessly into Kanban. The trays can be inlaid with foam that has cutouts for each tool or instrument, designating its place in the tray. This allows for quick and efficient access to each tool available in the tray and eliminates time spent looking for the required tool. Kaizen foam also eliminates mistakes when filling each tray, because it makes clear when an item is missing from the tray. The overall Kaizen philosophy is also applicable to the MEH. It's a system for continuous improvement by setting incremental goals with a focus on making businesses more efficient. The plan-do-check-act (PDCA) cycle this philosophy follows is based on the foundational principle that everything can be improved.

FOCUS PDCA can be applied to any procedure performed in the MEH. The first step is to find a process to improve. It can be applied to preparing for surgeries and examinations, organizing inventory, organizing patient appointments, getting the hospital ready for the day, setting up the MEH in a new location, or taking it down to move to a new location. FOCUS PDCA allows for a more standardized and organized implementation of many of the other lean techniques mentioned.

Similarly, the 5S Strategy can be applied in any area where cleanliness and organization make a difference in efficiency. As the MEH carries medical equipment that is expensive and a lot of which needs to be sterile, cleanliness and organization are vital. The 5S method would need to be adopted by everyone working directly in the MEH because it puts the responsibility of adhering to the system on those who work directly on the MEH. Both FOCUS PDCA and the 5S strategy can be applied to an area such as setting up the hospital at each new location. Both systems seek to gain an understanding of how the process actually functions and what could be improved through reorganization and cleaning.

One of the most important recommendations is the use of Value Stream Mapping. It is similar to what we have done through the creation and analysis of operation flow charts. While we did not carry it out the way it is described, the general philosophy is what we adopted and adhered to. Value Stream Mapping is vital because it shows where the waste of materials or time is in the forms of non-value-adding activity in a process. By mapping out every detail in all of the steps in a process, and then comparing this map to what the steps actually are, one can observe differences and find activities or steps that are non-value-added or even time drains. With this knowledge, one can create a future state map, which will dictate the optimal steps for a process to be fully implemented by a given time. This will help identify waste in areas that would not be noticed otherwise. The swim lane diagrams we created are examples of current state maps. Both were created to depict the process flow in order to give us a better idea of how the MEH operates with respect to certain areas. An actual current state map would include much more detail about each step, including timestamps, room, and staff involvement.

Value Stream Mapping can be used in conjunction with the Theory of Constraints to find more specific types of waste and bottlenecks. When mapping out processes, the MEH should look for steps that seem to slow down the overall process or cause a buildup of some sort. These areas are often bottlenecks that need to be reorganized in order to increase efficiency. An example of a bottleneck operation could be a specific type of surgery that, when performed in the middle of the day, causes appointments after it to be delayed. This type of surgery could be moved to later in the day to affect as few appointments as possible, or an additional surgeon could be hired and extra equipment could be bought.

Both of these process changes yield an overall decrease in the amount of time a given operation takes. The first figure demonstrates rearranging events so that like events happen at the same time and there is less travel waste across the hospital. In the second figure, two surgeries can occur simultaneously, which decreases patient waiting time between the examination and surgery, as well as after the surgery before the post-operative appointment. Which solution the

MEH picks will be dependent on which is more feasible for them. It would be more cost-effective and space-saving to rearrange the current schedule instead of buying new equipment, and we suggest trying this before trying the second solution.

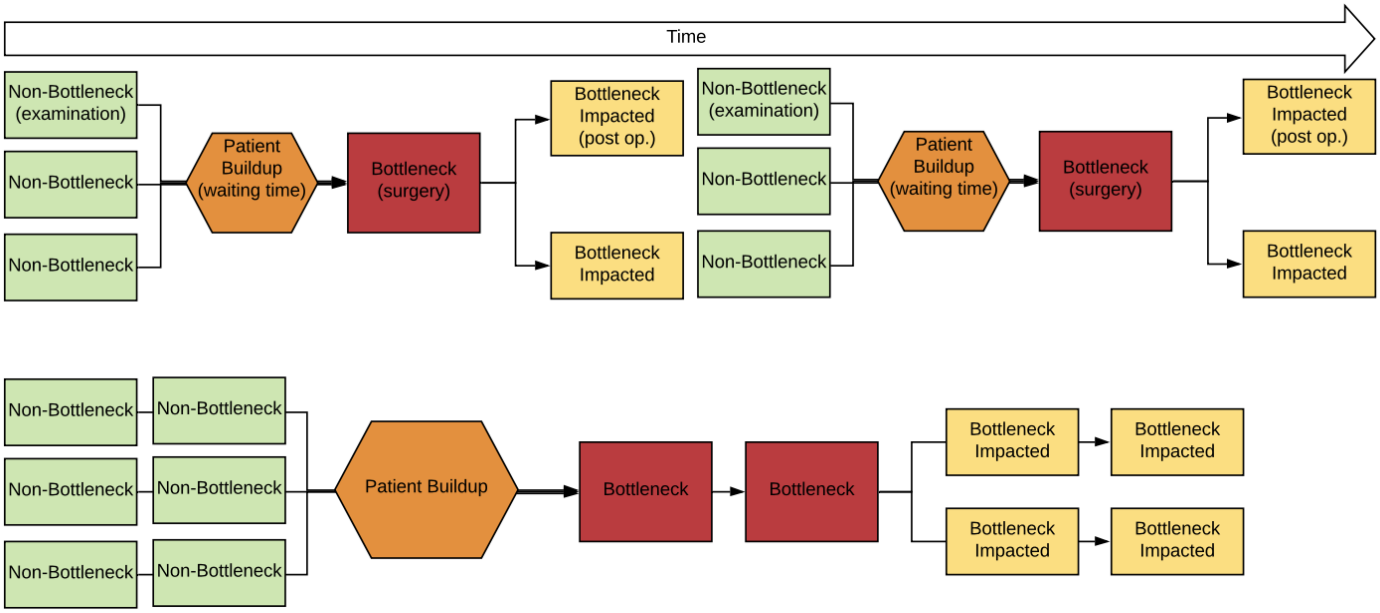

Figure 9: Changing Order of Operations Around the Bottleneck Process

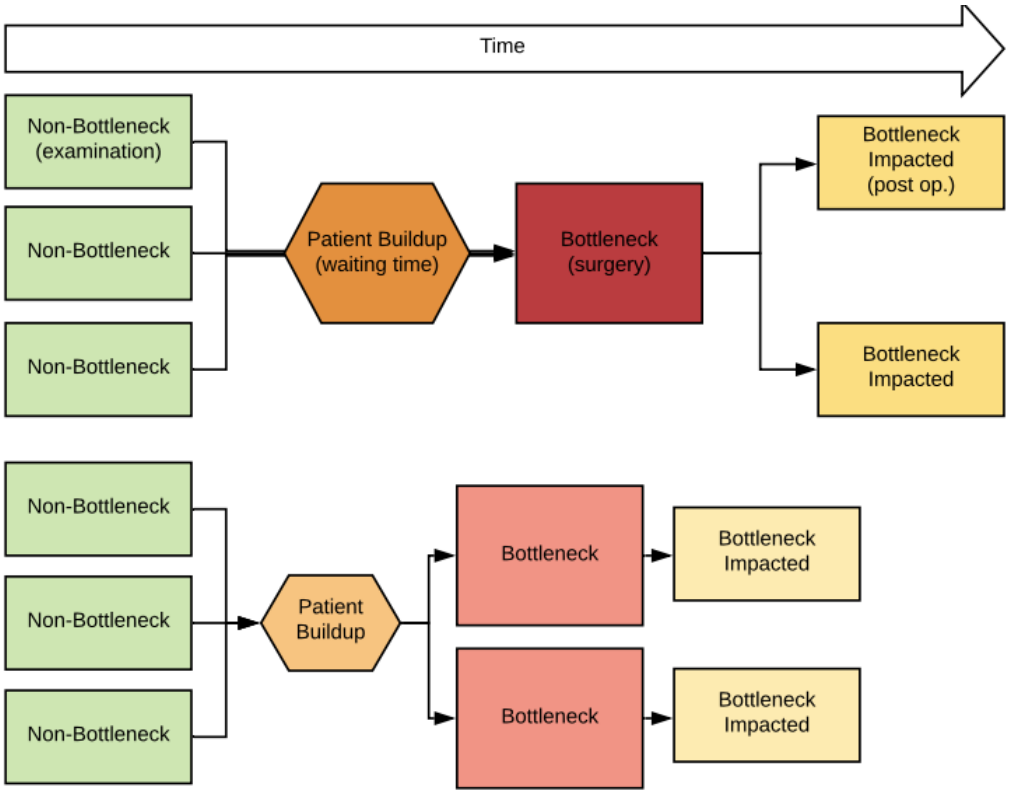

Figure 10: Adding Additional Equipment and Staff to Alleviate the Bottleneck

Observing the operations going on in the MEH in conjunction with Value Stream Mapping will give a better understanding to the AECP of what activities go on outside of actual procedures that are non-value-adding activities. This will give a better understanding of how time is spent and allow processes to be rearranged to optimize this spent time. For example, if a nurse is waiting for the autoclave to finish sterilizing instruments needed for the next procedure, they could in the meantime go and restock the tool trays. All of these methods can be used for differentiating between activity and productivity and eliminating the former if it doesn't add to productivity.

The Taguchi Method can be applied to the MEH for the purpose of finding the best combination of factors to change without changing them all and testing them in every possible combination. For example, say getting a wheelchair ramp saves ten minutes per day, and rearranging the procedure schedule saves another ten minutes per day. Taguchi can let you know how much time making both of these changes at the same time can save mathematically, instead of actually changing one of them for a few days to gather that data, and then changing the other, and then changing both. This can save a lot of time when it comes to implementing our recommendations.

One of the shortcomings of lean management is that the initial implementation is difficult and often requires testing certain techniques and adjusting around what is successful and what is not. Taguchi can streamline this initial implementation process by allowing one to compute the best combinations of changes.

The implementation of lean management techniques may also change the scope of some employees' work. In order to measure the success of the lean implementation, staff members can keep a journal and record the amount of time that each of the processes and operations takes to complete. These measurements could be made before implementing these lean techniques and again after implementing them. However, the staff should be given some time to get adjusted to their new routines. Comparisons should be made not only between the two journals but also with expected time versus actual time taken to complete a task. Lean implementation related improvements should be analyzed and built upon where feasible, and any detrimental or ineffective changes can be altered or removed. In measuring changes, it may help to run a statistical analysis, such as a T-Test, to measure whether the changes seen are significant or not. To ensure the new system is retained and effective, another IQP team could work with the AECP to gather feedback from the MEH staff to see what changes they would like to keep, and what problems they have with the new system as well as determine some strategies that worked well and others that did not work as well. Following up with subsequent project teams will ensure that the staff are satisfied with the management changes and will help them to personalize the lean techniques to the MEH.

Scheduling

The order in which appointments are made and the allocation of equipment needed for those appointment types are factors that should also be considered. There are multiple scheduling strategies we recommend the MEH look into that can save time by helping to account for fluctuation in appointment time.

Back-to-back allocation of a certain supply can cause hold-ups and increase patient waiting time. As an example, if equipment A is needed for the duration of an examination and equipment B is needed for the duration of a post-operative appointment, booking appointments such that the schedule is A-B-A-B instead of A-A-B-B makes it so that if the first appointment runs overtime, the second patient is not waiting for A to become available. It may also be helpful to not schedule handicapped patients back-to-back, which could be done by adding a checkbox on the referral form that is filled out by the local doctors and using that information when the schedule is made. This checkbox would ask whether the patient requires assistance to enter and exit the MEH, as well as contain a brief description of the patient's handicap situation.

Patients should be prepped for surgery before the surgeon's arrival for the afternoon surgeries. This will help to make sure all patients are seen on time and the surgeon can get started right away. Similarly, surgeries that are predicted to be longer and more complicated than others should be scheduled for the end of the day so that those complications do not interfere with another patient's appointment (American Academy of Ophthalmology, Chapter 10).

Coverage of AECP

Using the map that we have created using ArcGIS, the reach of the AECP's care can be determined for both the regional centers and the MEH. From here the AECP can determine if the locations visited are sufficient, or they can find a new route that covers more area. We believe this map in conjunction with the Traveling Salesman Problem can be used in helping the MEH determine its next route. The population data on the map should guide them not only in choosing the location but also potentially the duration of the stay. The further and more frequently the MEH has to travel, the more time is spent driving, packing, and unpacking instead of treating patients. It may make more sense for the MEH to extend its stay in one location instead of traveling a short distance to the next stop.

Conclusion

In conclusion, the Mobile Eye Hospital helps the people of Armenia a great deal. The work the AECP is doing is reducing the number of people who have treatable eye problems. Making the MEH more accessible will help patients to feel more comfortable as well as increase the amount of time the staff can focus on their medical procedures. Lean management techniques have the potential to greatly increase the number of patients the MEH is able to reach by allowing the AECP to analyze the operations of the MEH and to find areas where efficiency could be improved, and then improve these processes. Using the visualization tools created during this project, including the map and diagrams, the AECP can better analyze their own processes, route, and procedures to make them as efficient as possible. The increased efficiency of travel and practice will make the MEH capable of treating more patients and will, in turn, decrease the number of Armenians with eye disease and blindness.

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