

Increasing the Dental Department Capacity in the Family Health Center of Worcester

A Major Qualifying Project Report
Submitted to the Faculty of the
WORCESTER POLYTECHNIC INSTITUTE



In partial fulfillment of the requirements for the
Degree of Bachelor of Science
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Sponsored by the Family Health Center of Worcester

2009-2010

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Abstract

The current operations of the Family Health Center of Worcester's Dental Department were examined to increase clinic capacity and reduce the number of no-show appointments. Data representing employee operations and patient no-shows was collected and analyzed. Based on this data, a series of solutions were designed and implemented utilizing the DMAIC design process. The team presented the results to the Dental Department and offered future suggestions to continue to maximize and manage capacity within the clinic.

Acknowledgements

The MQP team would like to thank the following people from the Family Health Center of Worcester for their contributions and endless support to the project: The project liaisons, Martha Sullivan and Tracy Resendes, Kathie Janko, Georgianna Sgariglia, Noreen Johnson Smith, and Brian Towns. The team also appreciated the support from all of the providers and receptionists at the FHCW Dental Department.

The team would also like to thank the following people from Worcester Polytechnic Institute: The project advisors, Professor Sharon Johnson and Professor Bengisu Tulu, and the Institutional Review Board.

Authorship

The project team believed that by working together as much as possible, a high-quality deliverable would be produced. The team was able to divide some of the labor between the three members and then consolidate it all together. The initial background research was divided between the three project members and then was shared. Abigail was responsible for the research on the Family Health Center of Worcester, Batuhan was in charge of researching the definition of no-shows and how they can create problems, and Jillian was mainly responsible for the background research on federal funding and the DMAIC process.

The team brainstormed and developed their ideas together in three weekly meetings throughout the period of the project. From the shared research, the project methodology could be divided into three main sections: understanding employee operations, managing the no-show rate, and maximizing capacity. The team saw these three areas as an opportunity to divide the responsibility again amongst the three of the members. Jillian provided the write-up of the section on understanding employee operations, Batuhan was responsible for the section on managing the no-shows, and Abigail covered the section on maximizing capacity. Additionally, the team members were responsible for writing portions of the control and recommendations.

When it came to working in the clinic, the team had a shared responsibility to always be present so that everyone would be on the same page. The methods were acted on as a group. Additionally, the leadership of hosting meetings on-site and with the advisors was rotated weekly. One team member would be the chair of the meetings for the week and a second team member would be the scribe. The team felt that this provided equal leadership opportunities for each person.

While the project team divided the writing of the paper for efficiency, it was the team's responsibility as a whole to produce a high-quality document free from error. Editing sessions were held as a group to assure that no error was missed. Overall, the responsibility for the deliverables was shared equally among all three members of the project team.

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Nomenclature

5S : Workplace practices conducive to visual control (Markovitz, Dan, 2009)

- Seiri: Separate needed from unneeded items—tools, parts, materials, paperwork—and discard the unneeded.
- Seiton: Neatly arrange what is left—a place for everything and everything in its place.
- Seiso: Clean and wash.
- Seiketsu: Cleanliness resulting from regular performance of the first three Ss.
- Shitsuke: Discipline, to perform the first four Ss.

Available Work Board: A visual method of scheduling that displays all of the day’s appointments on one white board.

Cleaning: The removal of plaque and calculus (tarter) from the teeth, generally above the gum line. (WebMD, 2010)

Confirmation Call: A call placed to a patient to remind him or her of an upcoming appointment.

Dental: Pertaining to the teeth.

Dental Specialist: A dentist who has received postgraduate training in one of the recognized dental specialties. (American Dental Association, 2009)

- DDS – Doctor of Dental Surgery
- DMD – Doctor of Medical Dentistry

Denture: An artificial substitute for natural teeth and adjacent tissues. (American Dental Association, 2009)

DMAIC: Improvement teams use the DMAIC methodology to root out and eliminate the causes of defects (Benbow, Donald W. and Kubiak, T. M., 2005)

- **D** - Define a problem or improvement opportunity.
- **M** - Measure process performance.
- **A** - Analyze the process to determine the root causes of poor performance; determine whether the process can be improved or should be redesigned.
- **I** - Improve the process by attacking root causes.
- **C** - Control the improved process to hold the gains.

Effective capacity: The volume of appointments that the Dental Department can produce in a year under normal operating conditions.

Extraction: The process or act of removing a tooth or tooth parts. (American Dental Association, 2009)

Federally Funded Center: any federal program, service, activity, or project provided by the federal government that directly aids or benefits the American public in the areas of health, education, public safety, public works, and public welfare. (U.S. Department of Health and Human Services, 2009)

FHCW: Family Health Center of Worcester

Frequency: number

Full-Mouth X-Rays (FMX): A combination of 14 or more periapical and 4 bitewing films of the back teeth. This series of x-rays reveals all the teeth (their crowns and roots) and the alveolar bone around them. (American Dental Association, 2009)

Hygienist: a licensed, auxiliary dental professional who is both an oral health educator and clinician who uses preventive, therapeutic, and educational methods to control oral disease. (WebMD, 2010)

MQP: Major Qualifying Project

No-Show: A patient who fails to show up to their appointment

Open-Ended Question: A form of a question to which the responder is not presented with pre-determined responses to select from. The responder is allowed to answer the question using any interpretation and they chose.

Oral: Pertaining to the mouth. (American Dental Association, 2009)

Oral Surgeon: A dental specialist whose practice is limited to the diagnosis, surgical and adjunctive treatment of diseases, injuries, deformities, defects and esthetic aspects of the oral and maxillofacial regions. (American Dental Association, 2009)

Patient: An individual who has established a professional relationship with a dentist for the delivery of dental health care. For matters relating to communication of information and consent, this term includes the patient's parent, caretaker, guardian, or other individual as appropriate under state law and the circumstances of the case. (American Dental Association, 2009)

Percentage: Mathematically a fraction of the sample the project team is interested in over the total sample

Sample: A randomly selected group of people taken from the population

Sampling Size: The number of people, trials, or other distinct units in the sample taken from the population

Survey: A means of collecting opinionated data in the form of open ended questions distributed to a sample population.

Theoretical capacity: The largest volume of output possible if a facility maintained continuous operation at optimum efficiency, allowing for no losses of any kind, even those deemed normal or unavoidable. (All Business, 2010)

WPI: Worcester Polytechnic Institute

X-Ray: Radiograph. (American Dental Association, 2009)

Executive Summary

Receiving quality dental care is valuable to a person's overall health. Unfortunately, it is not an affordable service for many people. The Family Health Center of Worcester's (FHCW's) Dental Department provides dental care for all patients regardless of income or health.

Project Introduction

The FHCW is a federally funded health center located in Worcester, MA. It is unique in the fact that it is both a care facility to over 30,000 patients and a teaching affiliate for the University of Massachusetts Medical School. The center's priority patients are traditionally underprivileged and underserved, including patients living at or below 200% of the federal poverty level, low income pregnant women, patients with mental illness, patients with chronic diseases such as HIV, and other targeted populations identified as having difficulty accessing health care. The health center sees patients regardless of their insurance status, or lack thereof, and offers the Federal Sliding Scale to qualifying patients. The Major Qualifying Project (MQP) centered on the FHCW Dental Department.

Many of the patients at the Dental Department are below the poverty level and this limits the clinic's ability to send them reminder letters or call them, because many of the patients are either homeless or cannot afford telephones. This contributes to the clinic's no-show rate, which generates capacity issues for the clinic. A no-show is a patient who fails to keep an appointment without proper cancellation. The goal of the MQP was to manage and increase the capacity of the clinic; decreasing the no-show rate was one of the most important issues.

There are three different parties that are affected by the high rate of no-shows within the clinic. These parties are: the clinic, the patients who did not show up and thus did not receive treatment, and the patients who would have been able to receive treatment if the no-shows would have properly cancelled their appointment. During the time slots where the patients did not show-up, the providers had idle time, which was originally blocked off for the scheduled appointments.

The MQP team worked within the Dental Department to increase capacity and reduce the no-show rate through the research and implementation of potential solutions. In order to realize the project goals, the team first researched the background of the Family Health Center of Worcester, and then developed a methodology based on the Define Measure Analyze Improve Control (DMAIC) design process. Implementing this methodology generated several improvements for increasing capacity, reducing the no-show rate, and enhancing employee satisfaction.

The team flowchart in Figure 1 outlines the clinic's daily processes, which allowed them to understand operational issues, and then derive possible solutions. The flowchart highlights the process of patients making appointments, either keeping or failing appointments, and the Dental Department reaching or failing to reach capacity. The key issues that result in the Dental Department are highlighted in the yellow bursts, along with the potential solutions the team formulated. To address each issue, the team utilized the DMAIC procedure.

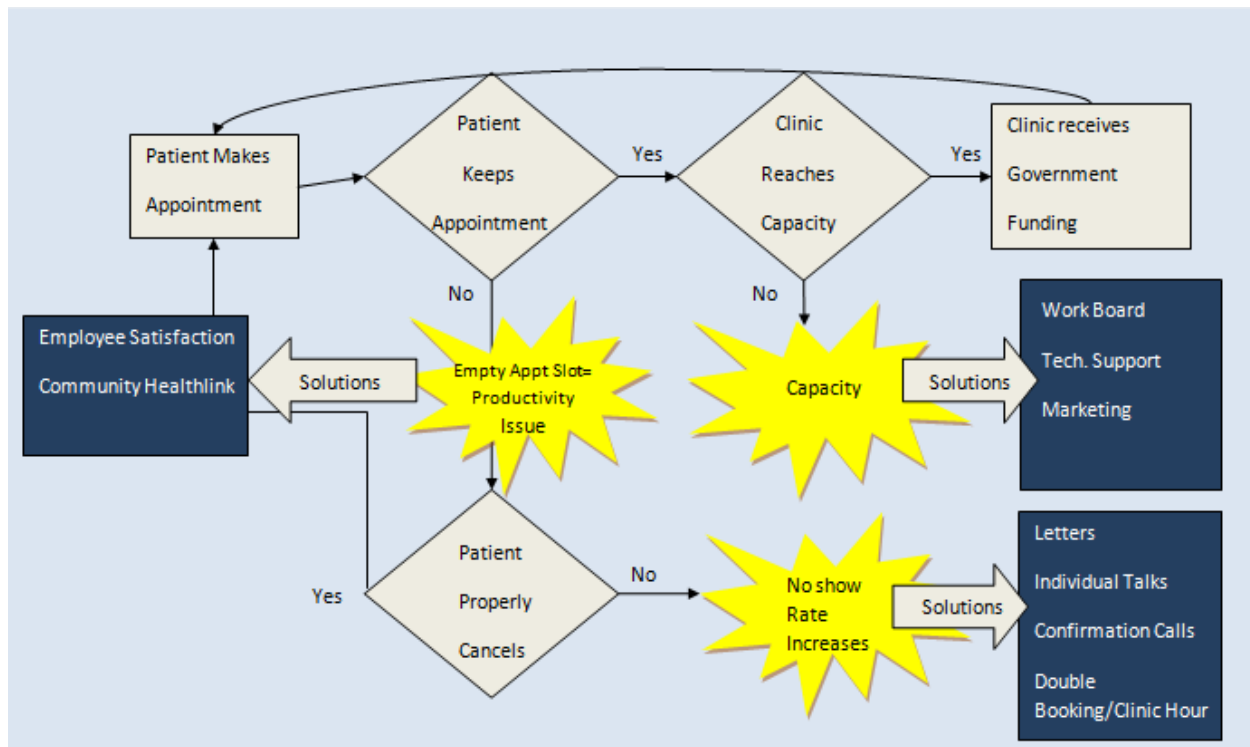


Figure 1: Dental Department Operational Flowchart

Employee Operations

In order to increase and manage the capacity of FHCW’s Dental Department, understanding employee operations was crucial. The team distributed a survey for providers to answer questions regarding the no-show rate, capacity issues, and overall clinic processes. The questions that were asked included providers’ opinions about the reasons for patient no-shows, suggestions for lowering the no-show rate, whether providers feel control over no-show rate, whether they can help lower no-show rate, suggestions to increase capacity of the clinic, and providers’ willingness to share their currently assigned operatories. The team analyzed each of the answered questions, looking for similar responses, opinions or suggestions to increase and manage the capacity of the Dental Department.

The survey results gave the team a better understanding of the division of practice management duties and clinical responsibilities within the clinic. The response to a specific question showed that 58% of the providers felt that their position had no control over the no-show rate, and 33% of the providers indicated that they did not think that they could help lower the no-show rate. The team believed that the clinical staff was less involved in the management of their own daily schedules than the team expected. They believed that by improving communication between the clinical staff, reception staff, and the practice management team that operational improvements could be achieved. Based on

research the team suggested utilizing an office communication board and an incentive program to address some of these issues.

No-Show Reduction

A major goal of the project team was to analyze the number of no-shows within the Dental Department and develop means to reduce them. Appointment data was collected from a randomly chosen week in each month; within each week, each no-show was documented by date, day of week, type of provider, and type of appointment. Analyses were performed on this data to evaluate and measure which factors displayed the greatest influence on the total number of no-shows.

The data showed that no-shows were most frequently seen in non-emergency appointments by hygienists and appointments on Tuesdays. With the analyses, the team was able to develop a variety of solutions to help lower the overall no-show rate. One was to utilize letters to send out to habitual no-shows to remind them of the cancellation policies of the clinic. Next, the team introduced a new process of confirming patient appointments. The no-show data illustrated that hygiene was the main problem-area, specifically the cleaning appointments. In order to maximize the capacity, the team also suggested that the clinic consider reserving a two-hour period each week for the habitual no-shows to be scheduled for hygiene appointments.

Maximizing Capacity

In order to maximize effective capacity in the Dental Department, the team developed an available work board. The expected process was to have the receptionists utilize the board as a tool to help fill appointment slots that resulted when patients failed to keep appointments. After observing use of the board for a week, the team realized it was an inefficient way to accomplish what the clinic's software system could do. Improving the technical capabilities of the receptionists would ultimately be a more efficient way to maximize capacity than the available work board.

The project team had wanted to find a feasible way to display a recently cancelled appointment in the system for all receptionists to see so that they could make filling that appointment a priority. Although cancelled appointments could not be displayed in the scheduling system, the team discovered that it was possible to keep track of the cancelled appointments in the "Notes" section of the system. If a change is made by one receptionist to the "Notes" screen, than all receptionists are able to view the change. Therefore, if the receptionists kept a list of recently cancelled appointments on this screen then filling those appointments first could be a priority for everyone.

Future Recommendations & Conclusion

The team developed and implemented several solutions to manage and improve capacity in the Dental Department, yet due to time constraints the team was not able to implement all of the solutions to increase capacity. The team highlighted several additional opportunities to reduce the no-show rate and manage capacity.

First, the team focused on addressing the issue of the Dental Department expanding in the future to increase theoretical capacity by taking on more patients. The clinic has enough providers to effectively serve its present patient base. The capacity would be increased by an average of 1,664 visits per year with the hiring of a part time dentist. The main issue with hiring more providers is that the clinic has a limited amount of operatories and providers would have to share operatories. In order to prevent this shared operatory usage from leading to poor provider performance, the team developed the idea of 5S dental carts. The dental carts would all be stocked with exactly what the provider would need to complete a visit and would be brought from room to room.

Secondly, the Family Health Center of Worcester's neighboring program, another social service agency, could also be a potential way to manage capacity. This agency is a program that helps rehabilitate the homeless, the mentally unstable, and substance abusers. When patients enter this agency's rehabilitative programs, they could be asked if they need dental care and if so, could be placed on a waiting list for the Dental Department. When a regular patient fails to make an appointment there is a free time slot within the clinic, and this time slot could potentially be filled by one of these inpatients from the rehabilitative program because these facilities are so close together. The downside of admitting these patients is that they can only be treatment planned for short-term care, not long-term care, since the history of these patients returning to the health center for dental care upon discharge from the rehabilitative program thus far has been poor. This makes the solution only a "quick fix" to boost capacity.

Finally, a feasible way to better utilize capacity in the clinic would be to market more effectively throughout the health center itself. The major advantages to marketing within the clinic are that new patients can be easily reached and the new patient will already understand the Health Center's system. The team designed flyers and informational handouts to be distributed through the Health Center, these can be found in Appendix G: Dental Department Flyer and Appendix H: Dental Department Door Tag.

1 Introduction

The Family Health Center of Worcester (FHCW), in Worcester MA, strives to fill capacity in their Dental Department, but has a patient base that is susceptible to high no-show rates. The Family Health Center of Worcester is often unable to contact a patient to notify them of a scheduled appointment because they do not have a permanent address or telephone number. With a patient base consisting of a large percentage of homeless, HIV-positive, and mentally ill patients, the community health center goes out of its way to provide service to people normally turned away by other health facilities. This major qualifying project (MQP) focused on assisting the health center, specifically the Dental Department located in the health center, with increasing current effective capacity by reducing the number of no-show patients. Effective capacity in relation to the Dental Department is the volume of appointments that the clinic can hold on a yearly basis under normal operating conditions.

Currently, the Dental Department serves both a routine care patient base, patients who call ahead and make appointments, and a walk-in population that come to the clinic with dental emergencies and are seen daily starting at 7 a.m. Routine patients who fail to keep scheduled appointments pose a problem for both providers and other patients seeking treatment because there is a vacancy in the clinic resulting in time that could have been spent treating other patients. The current system results in an inefficient clinic that is not being utilized to full capacity.

The Dental Department measures effective capacity based on the number of visits per year. The federal government budgets each federally funded health clinic based on the number of visits they complete. If the clinic falls short of the predicted number of visits per year, then there is potential for funding to be removed from the clinics' budget. However, if the clinic is able to generate more visits than the predicted amount, there is the possibility to receive more funding from the government. Currently, the Dental Department would like to boost their capacity and their overall utilization of resources in order to reach their funding and possibly serve more patients by added funding in their budget.

To support the clinic in serving more patients, the project team looked into a variety of methods to decrease the no-show rate and increase the capacity and utilization of the Dental Department. These improvements were generated through the DMAIC design, or problem-solving, process. DMAIC stands for define, measure, analyze, improve, and control. (Benbow and Kubiak,2005). It is used in industry to streamline the steps to improvement.

In the define and measure stages, the team surveyed the providers at the Dental Department to gain insight on areas of opportunity for boosting utilization. The project team was interested in gathering the personal experiences of the providers, and additionally the team hoped to inspire the providers to be more proactive in identifying solutions related to no-show patients. The team also collected data on no-shows and analyzed it based on several factors within the clinic, such as provider type and day of the week.

In the analyze and improve steps of the project, the team explored opportunities in three areas. First, improving the capacity and flow of a company works best when every employee is on board with the

ideas being implemented. A portion of the team's research dealt with training and development matters. The project team researched methods to effectively address teamwork in the Dental Department and suggested ideas for the implementation of these methods.

Second, because the high no-show rate was a prominent problem in the clinic, the team focused efforts into finding solutions to ultimately lower this rate. Several improvements were explored addressing how patients are contacted, identifying and developing policies for habitual no-shows.

Finally, the team developed ideas to improve the utilization of resources, both the providers and operatories, in the Dental Department, to increase the effective capacity. The team explored opportunities for filling empty appointments slots quickly. These included methods for making receptionists aware of empty slots, as well as identifying patients who might easily get to the clinic to fill no-show spots.

2 Background

To best understand the objectives of the Dental Department at FHCW, the MQP team explored its operations and researched a number of subjects. Each of the following topics played a role in the understanding and development of both the project problem and subsequently the problem solution. The goal of the project team was to maximize the effective capacity of the Dental Department in the Family Health Center of Worcester by taking into account the causes of the no-show rate.

2.1 Federally Funded Health Centers

The Family Health Center of Worcester is a federally funded health center located in Worcester, Massachusetts. In order to best understand the practices and operations of FHCW, it is important to understand the patient base that is normally attributed to federally funded health centers.

2.1.1 Definition of Federal Funding

In the United States, federal funding is defined as any federal program, service, activity, or project provided by the federal government that directly aids or benefits the American public in the areas of health, education, public safety, public works, and public welfare. Approximately \$400 billion dollars is annually distributed to these funding areas and is provided by federal government agencies such as the U.S. Department of Housing and Urban Development and the U.S. Department of Health and Human Services (U.S. Department of Health & Human Services, 2009).

2.1.2 Definition of Poverty Line

There are two versions of the federal poverty measure (U.S. Department of Health & Human Services, 2009):

- The poverty thresholds
- The poverty guidelines.

Poverty thresholds are updated annually by the Census Bureau and are used for statistical purposes. They are useful in terms of preparing estimates of the number of Americans in poverty each year.

Poverty guidelines are issued annually in the Federal Register by the Department of Health and Human Services. They are useful for administrative purposes such as determining the financial eligibility for certain federal programs. These guidelines are often referred to as the federal poverty level.

Table 1: 2009 Poverty Guidelines

The 2009 Poverty Guidelines for the 48 Contiguous States and the District of Columbia	
Persons in family	Poverty guideline
1	\$10,830
2	14,570
3	18,310
4	22,050
5	25,790
6	29,530
7	33,270
8	37,010
For families with more than 8 persons, add \$3,740 for each additional person.	

Table 1 illustrates the 2009 poverty guidelines. Poverty guidelines are designated by the year in which they are issued. For example, the guidelines issued in January 2009 represent the 2009 poverty guidelines. However, they reflect the price changes through the 2008 calendar year. Understanding the poverty guidelines is important for the project because many of the patients at the Dental Department are below the poverty level. This influences the federal funding the clinic receives as well as limits operational procedures. For example, the clinics' inability to send patients letters or call them, simply because the majority of patients are either homeless or cannot afford telephones.

2.2 Family Health Center of Worcester

The project team researched the history of the Family Health Center of Worcester, as well as the Dental Department and the current operating practices the Dental Department uses. The patient base, clinic capacity, and typical appointment type are outlined.

2.2.1 History

Located in Worcester, Massachusetts, the Family Health and Social Service Center was founded in 1970 and was first dedicated to the care of families and then later expanded to become a teaching affiliate for

the University of Massachusetts Medical School. The center provides services for both individuals and families, adults and children and is one of the few teaching facilities that is based in a community center. Throughout the years, the facility's Family Practice Residency Program has trained more than 130 physicians to enter into family medicine practice.

When nearby Worcester City Hospital faced closure in 1990, the Family Health center worked with providers to both plan for the closure and to continue community health services in Worcester. Upon the closing of WCH, Family Health opened the Family Health Center of Worcester on Queen Street, which underwent full renovation in 1995. Subsequently, in 1999 Family Health received its first JCAHO accreditation and opened an on-site pharmacy in 2001. Through the years, FHCW has provided thousands of services to its more than 30,000 patients, offering such services as laboratory, interpretation of languages for insurance companies, x-ray and pharmaceutical needs (Family Health Center of Worcester, 2009).

The areas of care in the health center include: medical care, dental care, social services, as well as a plethora of other areas such as radiology and a nutrition program. Encompassed under medical care are HIV/AIDS treatment, immigration physicals, teen health, Women's Health Network, Urgent Care, and disease management. The Dental Department offers a full range of dental services for both adults and children, including preventative exams, fluoride treatment, X-rays, cleanings, fillings, root canals, extractions, dentures and emergency services. Social services includes prenatal care, reach out and read, advocacy, case management of homeless families and South East Asian Health, which aims to provide education and support for Southeastern Asian families residing in Worcester (Family Health Center of Worcester, 2009).

The Family Health Center of Worcester's mission has been "to improve the health and well-being of underserved and culturally diverse Worcester area residents through the provision of high-quality, comprehensive, and continuous primary health care, dental, behavioral health and social services." That being said the patient base of the center includes minority and refugee populations, college students, low-income families, and established residents. Priority patients are HIV positive, low-income pregnant women, and patients with mental illnesses (Family Health Center of Worcester, 2009).

2.2.2 FHCW Dental Department

The goal of the Dental Department at the Worcester Family Health center is to increase patient access to clinic services while increasing revenue and provider productivity and decreasing no-shows. Also, the clinic aims to achieve efficiency through school-based programs, an oral surgery program, and recruitment and retaining dentist program. In (2008), the clinic's revenue was slightly lower than their direct/indirect expenses resulting in approximately a \$50,000 loss on operations. They operate Monday, Tuesday and Wednesday: 7 a.m. to 6:30 p.m., Thursday: 7 a.m. to 7 p.m., and Friday: 7 a.m. to 6 p.m., with a total of 53 clinical hours per week and around 68 visits per day. However, although there are an average of 466 visits scheduled per week, usually there are patients who fail to make their appointment, thus resulting in a no-show rate of 25.1% yearly.

The pay base is a mix of self-paying patients and Medicaid/Commonwealth Care dependent patients (around 60% of the patients rely on Medicaid or Commonwealth Care). [REDACTED]

2.2.3 Current Operations at Family Health Center's Dental Department

Although the clinic has adequate staffing available, due to no-shows, the staff capabilities of the Dental Department were not always utilized to their full capacity. The clinic has five general dentists and their combined working hours are equivalent to the hours of three full time dentists. Dentists and oral surgeons are referred to as 'providers' in the clinic. There are three dental hygienists, one oral surgeon (although the oral surgeon is a part-time employee), and eight dental assistants. Additionally, there are three incoming residents who together equal almost a full time employee; the Family Health Center is not responsible for paying the residents' salary.

Currently at the clinic there are nine operatory rooms available. The Family Health Center would like these nine rooms to be used to full capacity; however when an appointment is a no-show the room usually remains vacant for the duration of that non-kept appointment, which can be anywhere from 30 to 60 minutes. As for the daily scheduled procedures that are taking place in each of these nine rooms, most of them (43%) are preventative services, such as dental cleanings, the next largest category (26%) is restorative services, such as fillings. Other appointments include oral surgery, emergent services, specialty services, endodontics, periodontics, and prosthetics. The appointment times vary with the scheduled procedure, usually 30 minutes is scheduled for routine dental cleanings and the average appointment time for a provider is 60 minutes. Recently, the Family Health Center began to further focus on becoming more of a teaching center, thus the length of the appointments has become longer to account for the extra time necessary to teach residents.

2.3 No-Shows

One of the main problems at Family Health Center of Worcester's Dental Department is the high rate of no-shows and their patient's lack of commitment to appointments.

2.3.1 Definition

The definition of a "no-show" is a patient who fails to maintain his or her appointments with a health care provider, or a patient who does not call to cancel an appointment ahead of time. The no-show rate is often referred to as a percentage, calculated by dividing the total number of patients that were due to come to the clinic for care by the number of patients who failed to show up for their appointments during a specific period of time.

2.3.2 Problems Caused by No-Shows

No-shows cause problems for three parties involved in the process: clinics or hospitals, the patient who does not show and thus does not receive treatment, and patients who could have received treatment in place of the no-show appointment. No-shows cause the largest problem to providers. A patient who does not show up for their appointment leaves the clinic with an open time slot resulting in clinic-inefficiency, The result is an open operatory and a provider with idle time. No-shows cause problems for

the patients as well because they cannot get to the clinic to receive treatment, which might lead to the worsening of their condition. This time cannot be filled with walk-in appointments because walk-ins are on a set schedule: Mondays through Fridays between 7:00 A.M. and 9:30 A.M.

In the past, no-shows have caused problems at many institutions and have been researched in order to find realistic and viable solutions. In Clinica Campesina (Colorado, USA), problems similar to those occurring at Family Health Center of Worcester's Dental Department arose, since their patient population is similar to that of FHCW. It has been stated that "reducing the barriers to care for these patients can increase their sense of connection with their health care providers and improve compliance and outcomes." (Glanz, 2000) Clinica Campesina reduced their no-show rate from 35% to 15% by keeping the majority of the appointments open for same-day visits, instead of scheduling appointments three-four weeks ahead. Patients who schedule appointments farther in advance are often unsure if they can make that exact date and time. This was done by a model of an advanced access scheduling system. Instead of trying to change their patients, they changed their own system in order to accommodate their patients. Although this is an example of what could be done, the team's goal in this study was to explore approaches similar to this one and achieve a similar goal of decreasing the no-show rate at Family Health Center of Worcester's Dental Department. Currently, the Dental Department's scheduling policy is to schedule appointments one month after the appointment is requested.

A similar study done by Galluci (2005) stated that the failure to keep initial appointments at community health centers resulted in a burden on the staff and the center's financial resources. In this study, the authors studied referrals to an outpatient program and found that delay in scheduling appointments had a significant impact on the rate of kept appointments. The sample consisted of 5,091 patients that were outpatients at the John Hopkins community mental health center. The system at this health center is that the patient receives a phone call one day before the appointment. The outcome of whether or not the patient made the appointment depended upon the number of days between initial contact (making the 1st appointment) and the appointment.

The author of this study suggested that changes aimed at reducing wait time for initial appointments may favorably affect rate of kept appointments and ultimately preserve staff and financial resources. One way of going about reducing wait time between appointments could be to leave an "open schedule" and accept people as they call, for example a patient would call on a Monday and have an appointment on a Wednesday. This result is similar to the Clinica Campesina articles' result, indicating minimal time between appointments is ideal.

Another article that was relevant to the issue of no-shows was a study done by Tidwell (2004) at an urban health center study. The study focused on the African-American population and the ability to keep appointments at an urban mental health center. The factors included familiarity and accessibility. In order to obtain results, a survey was conducted. The 90 respondents were all African Americans who had failed to appear for a recent scheduled appointment. The ages ranged from 15 to 30 years, 38% were unemployed, and 78% has dependent children. Most of the respondents used the state's medical services.

The study showed that there are a number of factors that can stimulate and inhibit keeping both medical and mental health appointments, including the nature of the appointment, age, race, socioeconomic status, ethnic background, family support, education, cultural exposure, religious affiliation, and preconceived beliefs and fears. Another important conclusion of this study was the relationship between the patient and the provider, this relationship correlated directly with the patient keeping appointments. Relating to the Dental Department, this could mean that if clinic appointments were scheduled to take a few extra minutes where the provider could get to know the patients on a more personal level, the patients might be more likely to keep their appointments.

2.4 DMAIC

The DMAIC process is a data-driven quality strategy that is used to improve processes. It is also an important part of a company or organization's Six Sigma Quality Initiative. DMAIC is an acronym for five interconnected phases: Define, Measure, Analyze, Improve, and Control (Benbow et al., 2005).

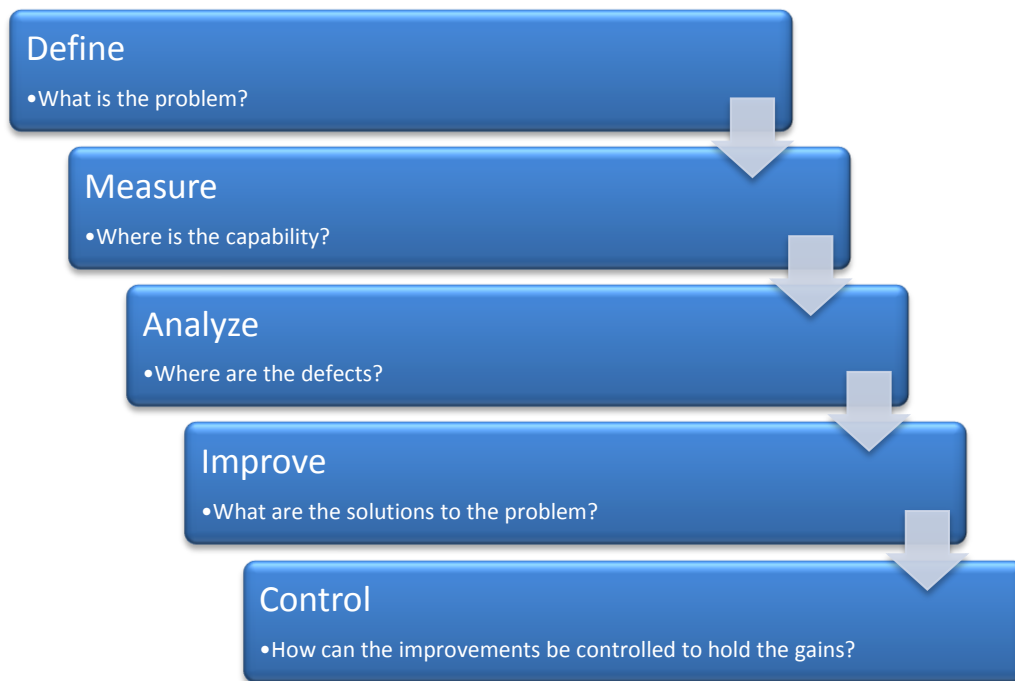


Figure 2: The DMAIC Process

In the “define” phase of the DMAIC process, the company or organization discovers the problem that needs to be solved and develops a problem statement. In the “measure” phase of the process, a means of data collection is developed in order to properly quantify the process performance. Analyzing the process allows the company or organization to determine the root causes of poor performance and determine whether the process can be improved or should be redesigned. In the “improve” phase of the DMAIC process, solutions are introduced to attack the problem. Once the improvements have been made, they are controlled in order to hold the gains. The project team believed that this method of problem solving would benefit the Family Health Center of Worcester. It provided a structured means of clearly defining the problem areas within the Dental Department and adequately developing solutions to meet the clinic's needs.

3 Methodology

The MQP team utilized the DMAIC process within the Family Health Center of Worcester's Dental Department. The goal was to increase the clinic's capacity and reduce the overall no-show rate. The steps of the DMAIC process are to define, analyze, improve, and control. DMAIC is used in industry to streamline the process of executing new ideas and improving existing operations.

3.1 Define

The high no-show rate was a prominent issue within the Dental Department because it negatively affected the clinics' capacity. The Dental Department receives federal funding based on whether or not it meets its' capacity requirement. Therefore in order to keep current funding or possibly receive more funding, the clinic needed to increase its' effective capacity by reducing the no-show rate.

3.2 Measure

To find solutions on how to decrease the no-shows, the project team had to find out why these no-shows were taking place. The team utilized a provider survey and collected no-show data to understand the root causes behind no-show appointments. The team also put an available work board into the scheduling to determine if it had a positive effect on the managing the no-show rate.

3.2.1 Provider Survey

The MQP team collected data in the form of a survey distributed to the providers of the Dental Department. Before the team could actually distribute the surveys an Institutional Review Board (IRB) process had to be completed. The team presented the proposed methodology and the actual questions they planned to ask the providers in the survey to the IRB. IRB processes are important because when human subjects are involved in data collection certain steps need to be taken to ensure the subjects' confidentiality. After the IRB approval, the team continued with the survey distribution and subsequent interview process. The providers who filled out this survey were composed of dentists, dental hygienists, dental assistants, and oral surgeons. In the FCHW Dental Department, there are five dentists, three dental hygienists, five dental assistants, and two oral surgeons. There were 15 surveys returned to the team.

The MQP team carried out a two-part data collection methodology. The first part was distributing a survey, and the second part was conducting an interview with those who volunteer.

The survey that was distributed can be found in

Appendix A: Provider Survey. Maintaining confidentiality was important because the opinions given in the survey may reflect poorly on management, or may have put the individual responder's career at risk. Although, this risk is minimal, it was still possible and the MQP team aimed to do everything possible to prevent it. The following steps ensured the confidentiality of the provider surveys:

1. The survey was handed out with a cover sheet explaining the purpose and explaining how to turn it in to management.
2. The cover sheet made it clear that if the provider does not feel comfortable answering any of the questions, he or she does not have to.
3. The survey was then completed by the provider at his or her own discretion.
4. The survey was then sealed into an envelope, per instruction.
5. The sealed envelopes were collected by the office manager who did not view them.
6. If the individual decided he/she would like to be contacted for a personal interview, then there was a separate detachable sheet where they could provide whatever contact information they were comfortable sharing.
7. After the team collected all of the surveys, the answers were transcribed into one document in order to protect the handwriting of the individual responder. Only summary comments, with no additional information, were made available to the Dental Department director and included in the MQP report.

At first, the team included the possibility of conducting personal interviews but dropped this possibility when only one provider agreed to be interviewed.

3.2.2 No-Show Data

The project team desired to analyze the no-show rate and designed methods to evaluate the number of no-shows in a variety of categories. The team felt that the best way to sample the data was to randomly select weeks from each month. One week was selected from August, September, October, November, December, January, and February. These were the months that the project team worked at FHCW. It was important to include all of these months because it allowed the team to monitor the progress and effectiveness of the changes that were made. Within each week, each no-show was documented by date, day of week, type of provider, and type of appointment. The data was analyzed based on these categories. Analyses were performed with the data to evaluate and measure which factors displayed the greatest influence on the total amount of no-shows. With the analyses, the team was able to develop a variety of solutions to help lower the overall no-show rate.

3.3 Analyze and Improve

After the provider surveys were returned, the MQP team analyzed each question. The team looked for similar responses from multiple providers, personal opinions, and suggestions for improvements. The analysis can be found in section 4.1.1 Analysis. The team also processed the collected no-show data from the Dental Department. This data was examined by different variables, such as time of day, provider type, type of appointment, and day of the week. The individual analyses and graphs the team generated can be found in section 4.2.1 Analysis August-December 2009.

The analyses suggested that improvements be developed in three areas. First, through the analyses of the provider survey, the team realized that better communication among employees and supervisors was needed. This would result in employees who were more willing to undertake ideas to increase patient satisfaction. The team researched ideas on how to develop better employee satisfaction. These improvements are described in section 4.1.2 Improve Employee Satisfaction to Boost Productivity

A second area of improvement related to reducing the no-show rate, based on the analysis of the no-show data. The first was to utilize letters to send out to habitual no-shows to remind them of the cancellation policies of the clinic. Next, the team introduced a new process of confirming patient appointments. The team also suggested that the clinic consider double booking if the no-show rate remains high in the future. These improvements are detailed in section 4.2.3 Improve.

The third area of improvement was to develop ways to better schedule appointment slots created through cancellations. The team developed an available work board. The analysis of the work board showed the team that the board itself was actually an ineffective means of accomplishing tasks the scheduling software was already able to do. The team then looked into ways to improve the staff's technical capabilities. These improvements are discussed in section 4.3.3 Improve.

3.4 Control

The last phase of the DMAIC process is the control section. This section is consisted of monitoring the process after the team implemented the improvements in Dental Department. There are various factors that can affect and alter the new implementations, thus affecting the outcome of the system. As described in Chapter 5 Control, the team collected data from January and February in order to assess the effectiveness of the implemented solutions. The team wanted to see if these solutions produced the desired outcomes.

3.5 Design Reflection

In this section the team reflects on the design component of the project, which is required for industrial engineering majors, and the processes we developed to attempt to solve the operational issues within the clinic. Engineering design is a process of developing a system, component or process to meet a desired need.

3.5.1 Understanding Employee Operations

The team designed a survey to be distributed to providers in the Dental Department in order to better understand operations in clinic and get insight and suggestions from the employees regarding no-show rate and capacity issues. The provider survey's purpose was to get employee's point of view without taking too much time out of their work schedule. The team chose six open-ended questions and collected fifteen responses from the providers but before doing so, team had gone through Institutional Review Board (IRB) process in order to maintain confidentiality of the providers. If team had more time, another survey could have been distributed after the team had implemented solutions. This follow-up survey would have helped the team to better understand the effectiveness of the implementations. The team also was not able to interview the providers due to their busy schedule in the clinic. If the

interviews were made, the team would be able to have an enhanced insight about the employee operations at the Dental Department.

The team decided that improving the connections between staff who had primarily clinical responsibilities and receptionists would be beneficial in addressing the no-show issue one patient at a time. In the survey, 58% of the providers stated that they have no control over no-show rate and 33% stated that there is nothing they can do to lower the no-show rate. The team decided that improving teamwork and communication between these groups by having both the providers and the receptionists work on the shared goal of reducing the no-show rate would result in process improvement and better team dynamics. As a result of researching several articles about these management concepts, the team decided to have a white board in the staff room to be filled by the supervisors indicating the weekly goals, personal or business achievements and congratulating providers. The white board was implemented in the clinic but due to limited time constraints, the team was not able to analyze the effect. Another solution that is provided to the Dental Department as a future recommendation was to give incentives to employees who have done an outstanding job but the team believes that incentives should be designed very carefully and in a timely manner in order to prevent other employees feel degraded. Due to time constraints, the team wasn't able to see the outcomes of these ideas; hence the team wasn't able to assess the effectiveness of the designed solutions properly.

3.5.2 Reducing the No-Show Rate

The team designed a data collection process. The data collection process chose a random week from each of the seven months they were present in the clinic. The data illustrated a picture of the no-shows at the clinic, however if the team had had more resources (i.e. time, more members) the team could have gone into a more in-depth look into the data. Ideally, the data would be taken over a one year, or even a two year period. By being able to take the data over a full year, the team could have made correlations between time of year and the no-show rate. For example, the question "are there less no-shows in the summer months because the weather is favorable making transportation better?" could have been answered. Through the data collection process the team created analyses and from these analyses designed several solutions.

One solution was to improve the no-show letters, letters that were to be sent out to the no-show patients. Although the wording of the letters was shortened and important points were highlighted, the team did not get to analyze the affect of the new letters due to the time constraint of the project. At the time of the project's conclusion, the Dental Department had just started sending the no-show letters to patients. With a longer time frame, the team could have analyzed if the process of sending out a letter to a patient who had missed an appointment was effective. The way to assess the effectiveness would be to keep a log of the patients who received letters and called the Dental Department to explain their absence (the letters instruct patients to do this). If the team had been able to properly assess the effectiveness of the letters then recommendations on whether or not to keep the letter process or to get rid of it entirely due to its ineffectiveness could be made.

3.5.3 Maximizing Capacity

The team designed an available work board to increase the total effective capacity of the clinic. The board designed was a white-board, see Figure 15. An X would be placed where an appointment was filled and would be erased if the appointment became a no-show. The receptionist's goal was then to fill the appointments without Xs. Reflecting on the design of this work board results in the realization that the board was confusing to read and prone to mistakes. The mistakes included erasing the wrong X and filling an appointment that was in fact already filled. Also, the team realized that the board would be more of a burden to the staff rather than an aid. The time spent creating the board each morning (writing in all appointments for the day) would take valuable time out of the receptionists day. The team had developed the idea based on the work boards that are present in emergency rooms, yet the design of the board failed to take into consideration the fact that the clinic does not operate in a fast pace environment like the emergency room. In the Dental Department the receptionists can afford to look through the scheduling software to find the next available appointment instead of having to rely on a white-board that changes in real-time.

One of the main drawbacks to the MQP team trying to implement the board into the clinic was the lack of the team's authority to do so. If the board had been put into place by management, rather than a group of students, the response to the board may have been different.

3.5.4 Overall Project Constraints

The largest constraint for the project was time. The team had about seven months in the clinic. In seven months it is difficult to understand the operations of an organization and then attempt to change those operations for the better. With more time the team could have constructed a better view of the clinic operations through collected data (data encompassing a full year) and through multiple provider surveys (each one asking questions raised by its' predecessor). Also, the team suggested several recommendations for the clinic, but was un-able to test these recommendations out in the clinic and therefore could not assess the effectiveness of each one.

Another constraint for the overall project was that the team did not have a monetary budget; therefore the designs for project solutions could not be expensive. A budget could have been useful when the team tried to implement the idea of an incentive program to make employees more productive. The team could have also created a sample 5S dental cart for the clinic if they had had the funds to do so.

4 Analyses and Improvements

To assess the effectiveness of the project team's implementations in the Dental Department of FHCW, a variety of analyses were performed. The analyses led the team to develop new improvements for the clinic, which are described in this chapter.

4.1 Understanding Employee Operations

In order to better understand employee operations within the Dental Department, a survey was distributed to the providers and was then analyzed by the project team. The results of the survey led to the perception that a higher level of communication and teamwork would be beneficial in the clinic.

4.1.1 Analysis

The MQP team distributed a survey to the providers in the Dental Department, and upon receiving the responses, they analyzed each question. The team looked for similar responses from multiple providers, personal opinions, and suggestions for improvements.

4.1.1.1 Reasons for Patient No Shows

In Question 1 of the survey, providers were asked to give the most likely reasons as to why patients do not show up to appointments. As shown in Figure 3, the most common response was transportation; in fact nine out of fifteen providers stated transportation as the number one reason for missed appointments. The Dental Departments' patient base includes patients who are homeless and patients with little income who may not be able to afford bus or cab fares. If in fact transportation is the reason that patients cannot make it to their appointments, the Dental Department could look into setting up a van or bus system in order to make transportation to appointments more accommodating for the patients.

The second highest reason given was stated as patients having a "lack of appreciation for the free service that the clinic provides." If the patient does not understand that the service the Dental Department provides is free to them under the condition that they make their appointments, then the patient will be more likely to become a no-show. It is also important that the patients realize how valuable these appointments are to their overall health. It is the clinic's policy that if a patient misses three or more appointments that he or she will no longer be considered a routine care patient. Therefore, if the providers have a general feeling that patients are missing appointments due to lack of appreciation, the clinic should make sure that patients have an understanding of the importance that oral health has to overall health.

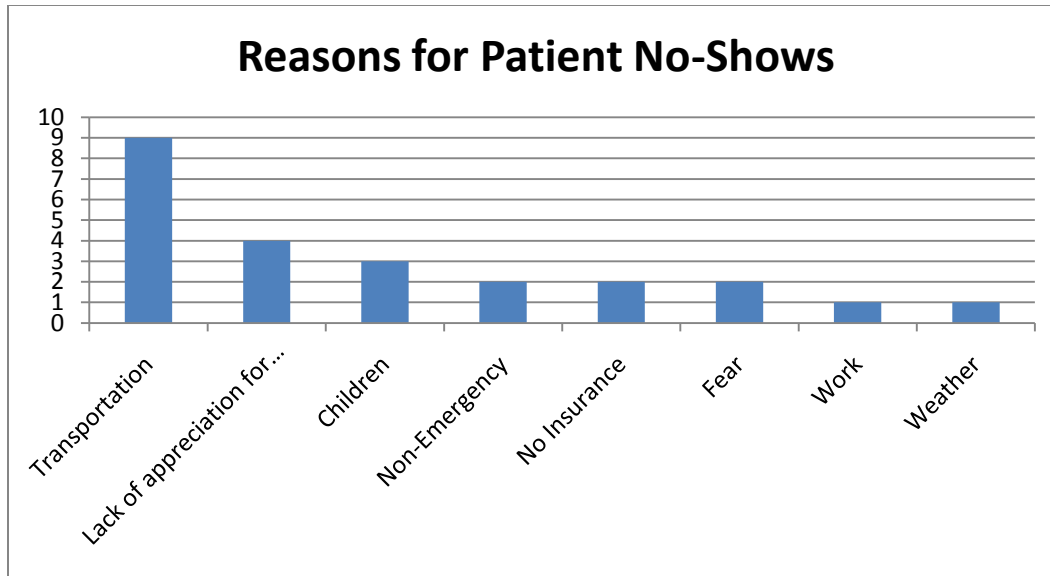


Figure 3: Reasons for Patient No-Shows

4.1.1.2 Suggestions for Lowering the No Show Rate

When the providers were asked to provide suggestions to lower the no-show rate, the following were given:

1. Provide an orientation about dental hygiene. If the patients are better informed about the need and importance of good dental hygiene, they may be more likely to show up for their dental appointments, specifically cleanings.
2. Stop providing care to patients who miss a considerable amount of appointments
3. Guide patients on their options for insurance and make them feel independent even if they don't have insurance.
4. Treat patients with respect and sympathy. If the patient feels welcomed in the clinic, he or she will be more likely to return for further care.
5. Accept new patients/ Bring in a new clientele.
6. Remind patients to check with the person who is transporting them before making the appointment.
7. Schedule a patient's appointments closer together. For example, if the patient needs to be scheduled for three appointments, make them all within the same week so they will be less likely to forget about them.
8. Stricter no-show policies
9. Charge a fee if the patient does not show up to the appointment
10. Reverse-confirmation: if patient does not call back to confirm their appointment, it will automatically be cancelled and filled in

Many suggestions that were made to lower the no-show rate were more information based, such as providing an orientation about the importance and need for dental hygiene to patients or guiding them on their options for insurance or other payment methods would be beneficial. When a patient comes to

the clinic for dental care, even though they have no insurance, trying to make them feel welcomed, independent and respected would make them more likely to come back to the clinic for dental care in the future. Another suggestion was that when scheduling patients that need to be seen multiple times, keeping the multiple appointments closer would make patients less likely to forget their appointments. The team felt that these suggestions were feasible and could be easily implemented in the clinic.

4.1.1.3 Does Provider Feel Control over No Show Rate?

Question 3 asked whether or not providers felt that their position in the clinic had control of the no-show rate. The responses can be seen in Figure 4. From the pie graph generated, it is clear that a large percentage (58%) of providers believe that they do not have control over this rate. Only 34% said that there are things they can do in order to help lower this rate and 8% were unsure as to whether their position could control the no-shows.

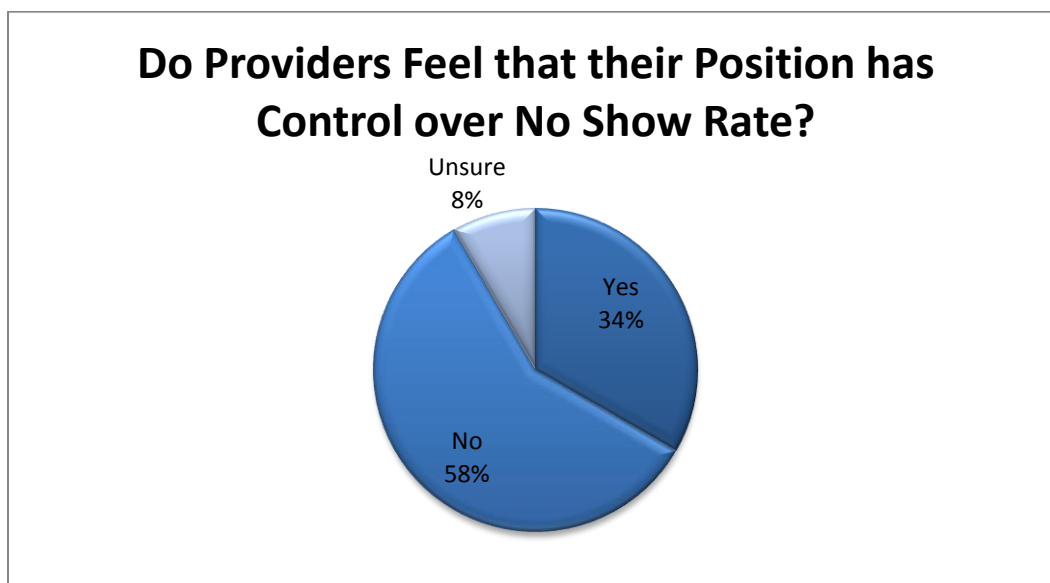


Figure 4: Do Providers feel that their Position has Control over No Show Rate?

4.1.1.4 Provider Control over No Show Rate

Question 4 asked the providers if there is anything that they could do personally to lower the no-show rate. Although many of them felt that there was not anything they could do to control it, others provided the following suggestions:

1. Enforce the no-show policies
2. Try to be punctual, on time, pleasant, and non-confrontational
3. Remind the patient to call and cancel the appointment if they can't make it.
4. Do not insist on a time for a patient to come in. Make sure the appointment is scheduled at a time that is available to the patient.
5. Call to remind the patient of the appointment
6. Move the wait list along to bring more patients in

Even though the team received some answers, many of the providers stated that they have no power on lowering the no-show rate. In section 4.1.2 Improve Employee Satisfaction to Boost Productivity, this question will be discussed in more detail. The team reviewed other suggestions to lower the no-show rate. Confirmation calling as well as informing and educating patients on no-shows and its affects were the feasible suggestions from the providers. Another suggestion was to be more flexible about patient availability when scheduling an appointment.

4.1.1.5 Suggestions to Increase Capacity

Survey Question 5 asked the providers to provide some suggestions on how to fill the open time slots that result from patient no-shows. Suggestions and concerns are as follows:

1. Adding a different patient might cause some concern considering the doctor does not know what the patient's needs are. It can make the providers fall behind if the fill-in patient requires more care than expected.
2. Take in emergencies and walk-ins
3. Extend the time of the appointment for another patient that day. Specifically, if a patient needs a follow-up appointment, schedule it for that time slot instead of having them come back another day.
4. Because a patient with two no-show appointments can no longer be given priority care, allow them to come into the clinic and wait from 8-1 and 2-4:15. If there is a cancellation or a no-show, then they can be seen. If not, they can come back the following day and wait again.
5. Start taking new patients who are eager and willing to show up
6. Overbook the appointments by scheduling two patients in the same time slot. This would be valuable to look into and should only be done with patients who are most likely to be a no-show or with the most commonly cancelled appointment types.

From this question the team wanted to learn if the providers had any thoughts on managing or increasing the capacity of the clinic. Bringing in new patients for care and moving people with multiple no-shows to emergency clinic hours were the ideas that the team considered. Another feasible idea that one of the providers suggested was double-booking patients who had multiple no-shows or patients who frequently cancelled their appointments. The team believed that these ideas should be taken into consideration to increase the capacity of the Dental Department.

4.1.1.6 Provider Willingness to Share Operatories

In Figure 5 the team analyzed providers willingness to share operatories with other providers on the basis that it would improve the efficiency of the clinic. The data is from Question 6 on the provider survey. There were many "blank" responses to this question which were placed in the "Other" category. Five out of fifteen providers said "yes", three out of fifteen providers stated that the providers already share operatories, and zero providers stated that they would be un-willing to share their operatory. In the case of increasing demand for dental care, sharing operatories throughout the clinic may be a viable choice for seeing more patients as the providers themselves are prepared to share.

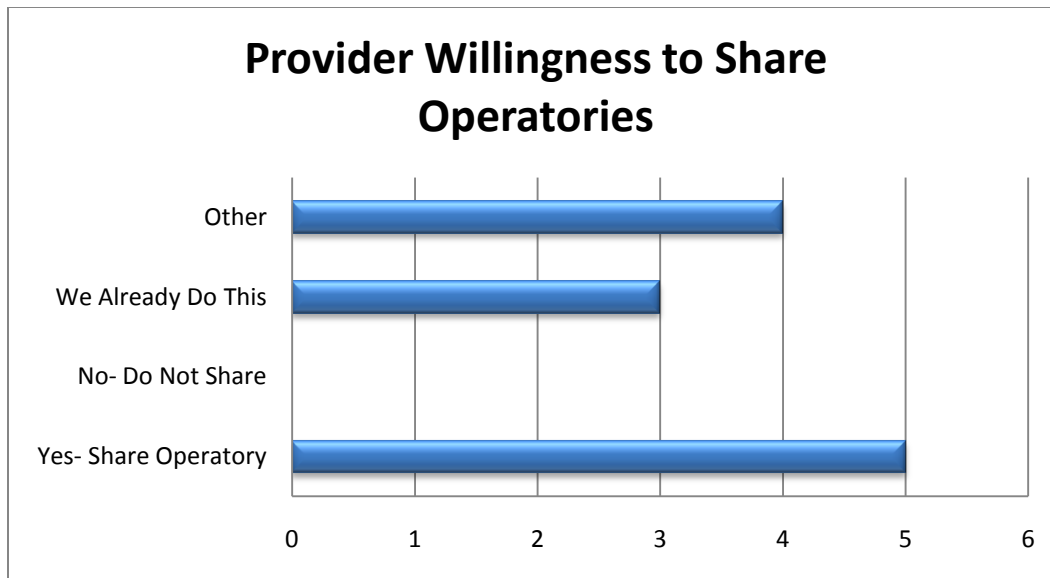


Figure 5: Provider Willingness to Share Operatories

4.1.2 Improve Employee Satisfaction to Boost Productivity

An indication of the communication issue between the employees and management was the response to the surveys the team had distributed. The survey mainly asked questions regarding the no-show rate. The question aimed to the staff that dealt with “what they could do to lower the no-show rate” had “nothing” for a third of the responses. The fact that the staff believed that there is nothing they can do to improve patient satisfaction suggests that individual employees lack the belief that they can contribute to, and take some ownership of, the no-show rate.

In order to make any changes to the Dental Department, the team realized that improving communication between the employees and their superiors would result in employees who were more willing to undertake ideas to improve processes and increase patient satisfaction. The team researched ideas on how to develop better employee satisfaction. Then, the team developed a process plan to implement teamwork and communication into the clinic.

Glanz (2000) indicated that there are three major desires that employees have and are willing to increase their commitment to their work and workplace for:

1. Interesting work
2. Full appreciation for the work they do
3. Feeling of being in on things.

According to the article, Baxter Labs surveyed their employees to learn what would make them happy and more committed to their work. The majority answered “to be respected as whole human beings with a life outside of work”. The article also specifies an acronym CARE as the main elements of an energetic workplace, which means:

C= Creative Communication

A= Atmosphere and Appreciation for All

R= Respect and Reason for Being

E= Empathy and Enthusiasm

One of the ideas presented by Glanz (2000) on how to achieve an energetic workplace was to have a contest with the employees to increase competitiveness. This has to be done very carefully since it might degrade other employees in the workplace. An idea that was given in the article was to have a contest: "If my company/ department were a T-shirt, this is what it would say. . .". This would help managers and supervisors learn how their employees feel about their workplace. Another idea was to send a handwritten note to each employee per week or have a bulletin board in the office. As the studies indicate, employees feel the need to be appreciated and this is one way for managers to show their appreciation to their employees. An incentive can be given to an employee who has done an outstanding job, or a manager can send congratulation cards on special days such as birthdays or for personal or business successes. Managers or supervisors can also show their appreciation and boost morale and communication between employees by bringing ice cream or doughnuts to everyone in the office.

The office manager at FHCW has tried an incentive approach in the clinic with the receptionists. A one hour lunch break was promised to the receptionist who could fill twenty open time slots. The receptionists were excited about the competitive nature of this task and put in a considerable amount of effort. One receptionist was rewarded with the extra long lunch for reaching the goal of 20 appointments. This particular incentive was enough to boost the performance of the staff. The team believes that incentives like this should be implemented in order to increase teamwork, communication, and efficiency of the office. Being appreciated because of the work that an employee has done would increase the feeling of ownership of everyone in a workplace. Although the team believes that incentives are a good way to show appreciation, the team also believes that incentives should be chosen and planned very carefully so other employees do not feel disregarded. The incentives should not affect their performance negatively and should be done in a timely manner.

Due to the suggestions from research that communication is essential to improving operations, the team decided to install a communication board into the clinic specifically for providers and receptionists. The board would be used for positive comments about the staff, for example if providers perform exceptionally well they could be recognized. Also, the board is an effective tool to communicate capacity goals and to note when those goals are met. As long as the comments are positive then they help all of the staff better connect with each other and be better appreciated for doing good work.

4.2 Managing the No Show Rate

In order to better manage the no-show rate within the Dental Department, data was collected and analyzed by the project team. The results of the analysis led to improvements such as modifying no-show letters sent to the patients, improving the process of confirmation calling, and better employee-to-patient communication.

4.2.1 Analysis August-December 2009

The MQP team collected appointment data, including no-shows, from the Dental Department for randomly selected weeks out of each month they were working at the clinic in order to get an overview of reasons of frequency of missed appointments. The team analyzed the following weeks, which included one week with a Monday holidays: August 24-28, 2009, September 7-11, 2009, October 13-16, 2009, and November 30 – December 4, 2009, January 25-29, 2010, and February 1-5, 2010.

The team then processed the data by different variables, such as time of day, provider type, type of appointment, and day of the week. The individual analyses for each of different graphs the team generated are described in this section.

4.2.1.1 Provider Type Effect

Figure 6 indicates the no-show appointments distributed by provider type, in other words, medical care type. In this figure, DDS is a Doctor of Dental Surgery, or an oral surgeon, DMD is a Doctor of Dental Medicine, and DHYG stands for Dental Hygienist. The data presented in this section comes from the no-show data for the combined weeks October 13-16 and November 30 to December 4. Based on the data collected, 63% of all the no-shows are for hygienist visits. Hygienists are responsible for dental “Cleanings” which are recommended to patients every six months. They might have the highest no-show rate because cleanings are not emergency care. If the patient is not in pain, he or she might skip a cleaning appointment because it could be seen as an unnecessary step for proper healthcare. As shown in Figure 6, the majority of appointments are also with hygienists, but the percentage of no-shows is significantly higher.

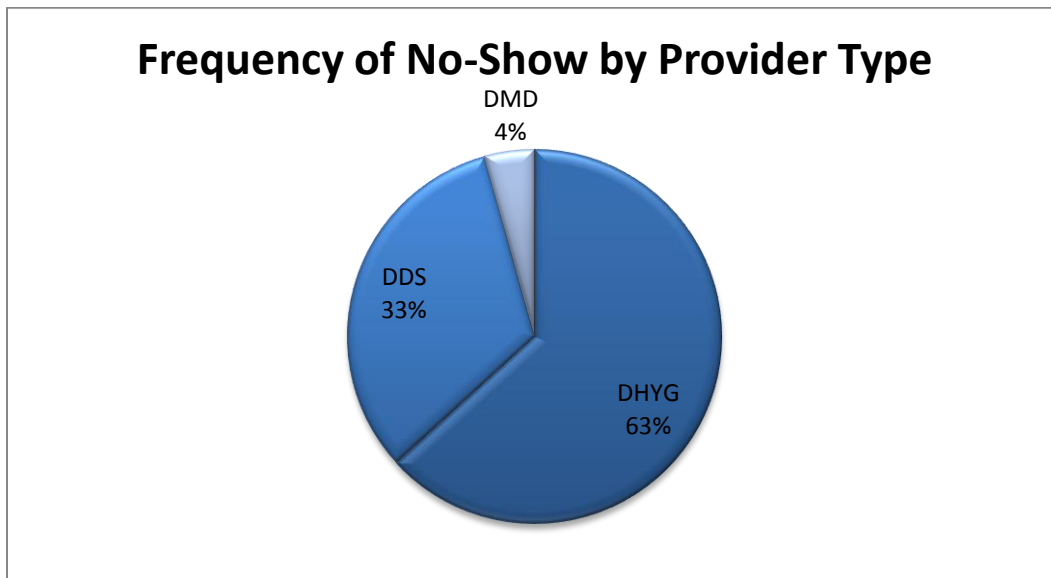


Figure 6: Frequency of No-Show by Provider Type

The team also analyzed the no-show appointments for each provider based on that provider’s total number of appointments in Figure 7. The providers with the highest number of total appointments also had the highest number of no-show appointments. This indicates that even though Providers A, C, D, experience a high volume of no-show patients, they also have the highest number of total appointments per week. This eliminates the possibility that these providers experience a high number of no-show appointments due to personal reasons, for example their attitudes towards the patients. Providers A and C are DHYG and Provider D is DDS. The team then researched the percentage of no-show appointments based on the individual provider’s total number of appointments, as shown in Figure 9. Providers H and K, although having a low number of total appointments, have high percentages of no-show appointments in relation to total appointments. Providers H and K are both DDS. This might be because of the hours of the day or the days of the week that they work. Overall, understanding the variability among providers could be explored more deeply in an additional study.

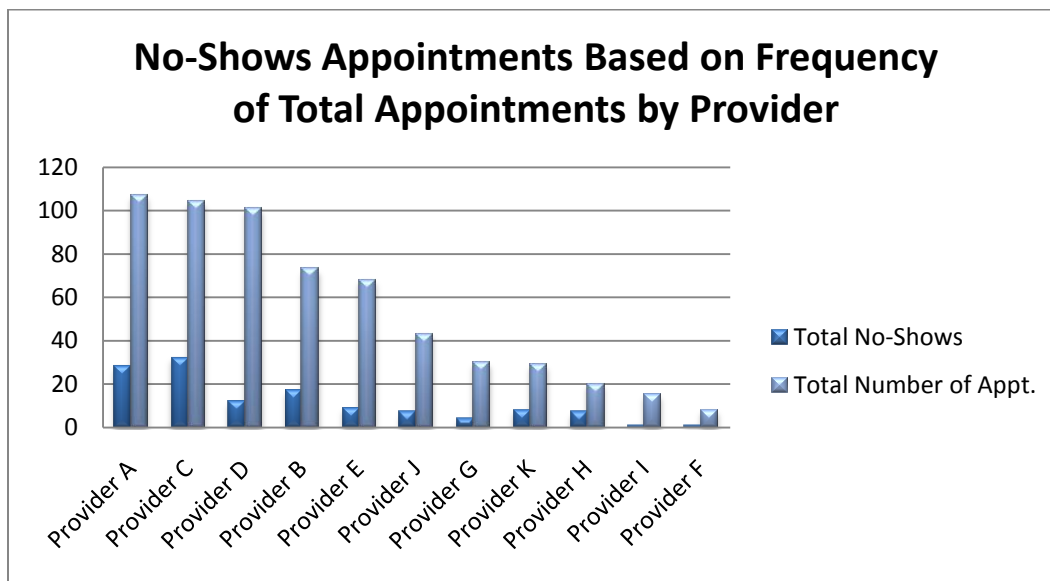


Figure 7: No-Show Appointments Based on Frequency of Total Appointments by Provider

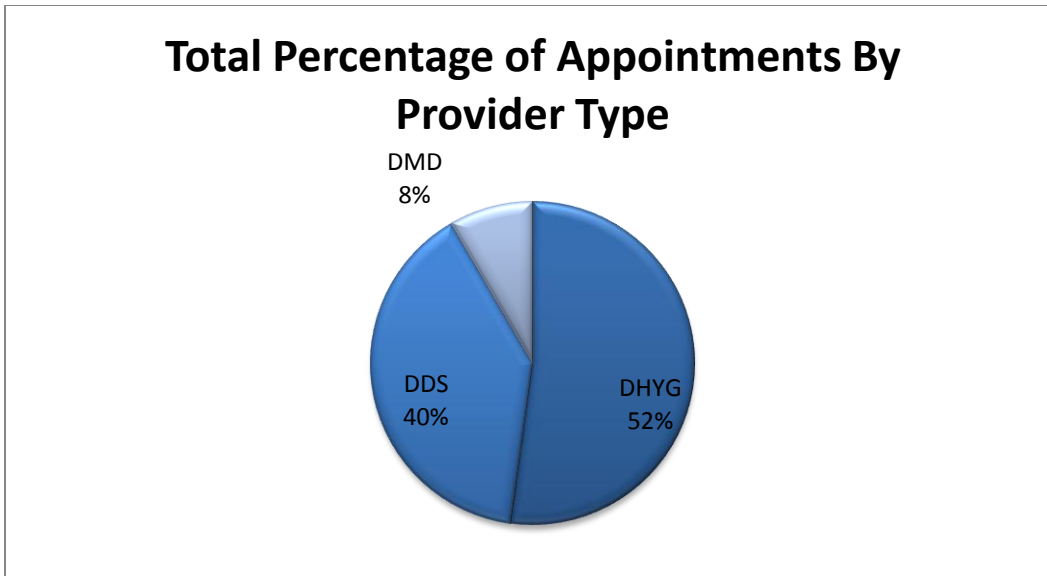


Figure 8: Total Percentage of Appointments By Provider Type

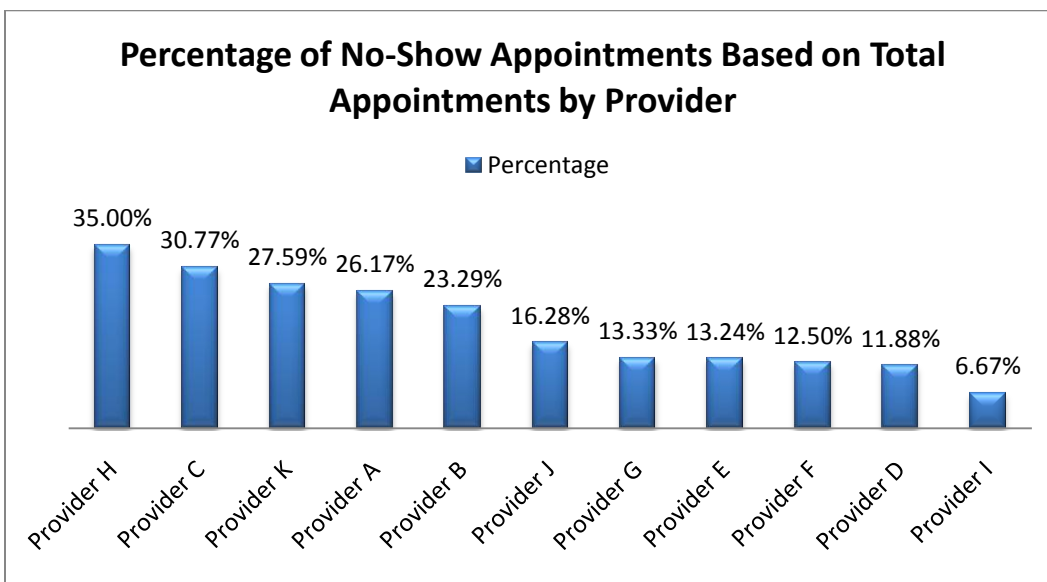


Figure 9: Percentage of No-Show Appointments Based on Total Appointments by Provider

4.2.1.2 Day of Week Effect

Figure 10 indicates the percentage of no-show appointments, out of the total no-shows. The data presented in this section comes from the no-show data for the combined weeks October 13-16 and November 30 to December 4. Tuesday has the highest number of no-shows. As the number of appointments increases, there is a higher chance that there would be more no-show appointments on that particular day. Figure 11 compares the number of no-shows on a particular day against the total number of appointments for that day. Tuesday has the highest number of no-shows, however the total number of appointments on Tuesdays is only slightly more than Wednesday and Thursday. This indicates that there is room for reducing the no-show rate on Tuesdays.

Percentage of No-Shows by Day of Week

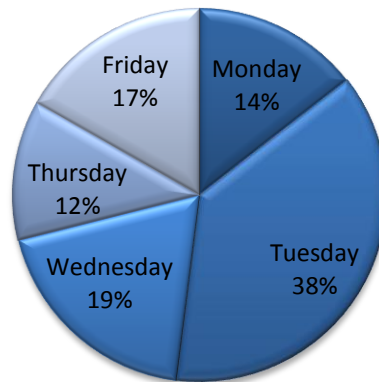


Figure 10: Percentage of No-Shows by Day of Week

Total No-Show Appointments Based on Total Appointments by Day of Week

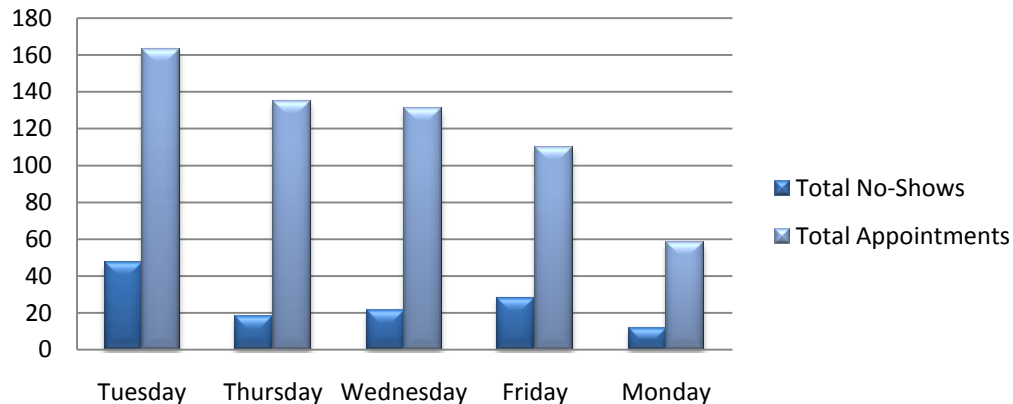


Figure 11: Total No-Show Appointments Based on Total Appointments by Day of Week

The team speculated that another reason for the high number of no-shows on Tuesdays was because of the long period of time between the confirmation call and the appointment itself. Normally, to confirm an appointment, the receptionist calls 48 hours prior. However, for Tuesday appointments, the receptionists call on Fridays to confirm, which is up to 72 hours in advance. This causes patients to become forgetful of their appointments. If the confirmation call was to be placed on Mondays for Tuesday appointments, it would not allow the patients adequate time to be able to cancel. The project team suggested that a confirmation call be placed on both Fridays and Mondays in order to ensure that Tuesday appointments will be kept. The Dental Department put this new confirmation procedure into place at the beginning of February.

4.2.1.3 Time of Day Effect

In Figure 12, the frequency of the no-shows was also analyzed by time of day; the data in this section is based on the combined data from 4 weeks: August 24-28, 2009, September 7-11, 2009, October 13-16, 2009, and November 30 – December 4, 2009. The highest frequency of no-show appointments were scheduled between 7:30 a.m. and 10:00 a.m. This indicates that morning appointments more likely to result in no-shows than any other time during the day. The rest of the times, the no-show appointments are distributed fairly equally throughout the day. The fewest numbers of no-shows occur during 12:00 p.m. to 2:00 p.m. and during 4:00 p.m. to 6:00 p.m. because appointments are not frequently scheduled for these times due to the lunch hour and closing time. Understanding that morning appointments are the most missed by patients could lead the clinic to begin double booking morning appointments in the hopes that if one patient fails to show up, the other scheduled patient will be able to make the appointment and no idle time will be wasted by providers.

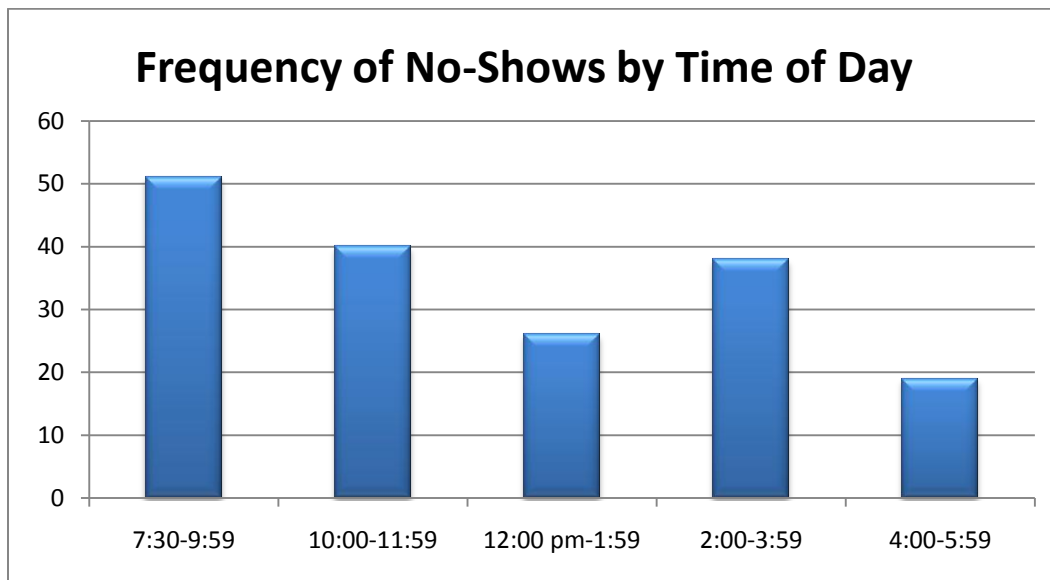


Figure 12: Frequency of No-Shows by Time of Day

4.2.1.4 Appointment Type Effect

The team also analyzed the no-shows by the type of appointment scheduled. Data in this section is based on the combined data from 4 weeks: August 24-28, 2009, September 7-11, 2009, October 13-16, 2009, and November 30 – December 4, 2009. In Figure 13, the frequency of missed appointments by type was compiled into a bar chart. Over 70 of the appointments that resulted in no-shows were dental cleanings. This was more than double the rate for any other appointment type (the second most missed appointment type was Operatives, 33). The team speculated that cleanings are the number one missed appointment type because the patient knows that the appointment is not for emergency reasons and does not have toothaches or other pain that needs to be immediately resolved. For this reason, the clinic should work on educating their patients so that they realize the preventative importance of dental cleanings. The clinic can utilize this information to look into the possibility of double-booking those

patients who have a record of missing their cleaning appointments with other patients who also have a record of missing their cleanings in order to try and maximize the efficiency of the clinic. This would be done with the mindset that if one patient misses their appointment, the other patient who is also booked for the same time would be able to make the appointment.

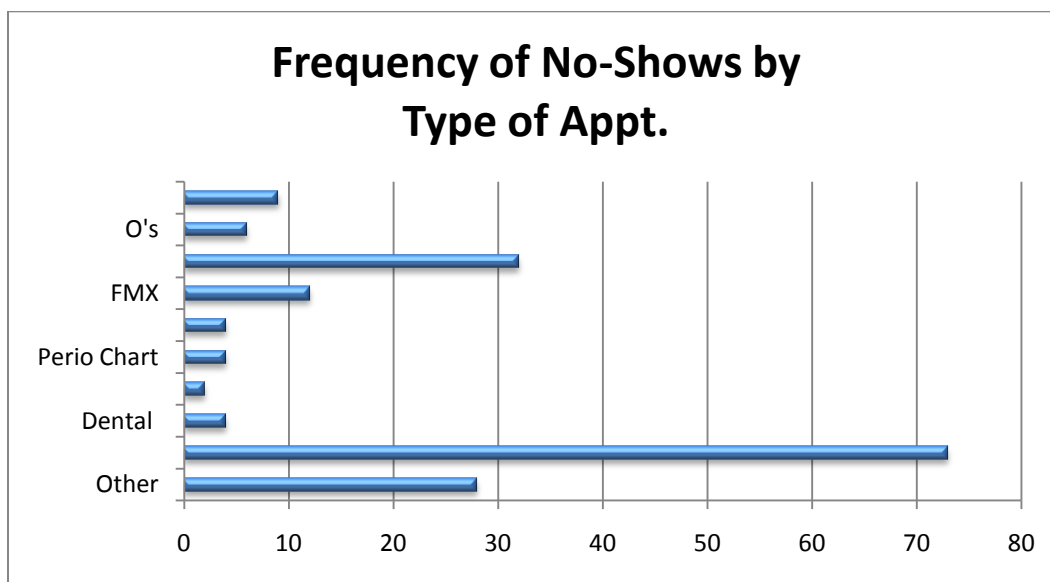


Figure 13: Frequency of No-Shows by Type of Appointment

4.2.3 Improve

In order to improve the problem of no-shows within the Dental Department of the Family Health Center of Worcester, the MQP team developed several solutions. The first was to utilize letters to send out to habitual no-shows to remind them of the cancellation policies of the clinic. Next, the team introduced a new process of confirming patient appointments; see section 4.2.3.2 Confirmation Calls for a detailed description. The team also suggested that the clinic consider double booking if the no-show rate remains high in the future.

4.2.3.1 No-Show Letters

The team realized that the letters used to reach patients are an effective means to notify them of the clinic's policies and procedures. It was decided that the letters should be reworked so they are easier to read. The original letters (Appendix B: Original Letters) were difficult to understand and were only provided in English. The rewritten letters can be seen in Appendix C: Modified Letters. This is important because many patients speak English as a second language. Additionally, the most important information has been put in bold font so even if the patient does not want to read the letter, the most important things will stand out. The new letters clearly state the cancellation policy and ask for the patient to contact the Dental Department. It is important for the patients to realize that they are affecting more than just themselves when they miss a scheduled appointment.

The team provided the new letters to the Dental Department, yet as of the projects' conclusion the clinic had not begun distributing them. The team also made a recommendation to the clinic to professionally translate the no-show letters into Vietnamese and Spanish, two of the most prominent languages in the clinic.

4.2.3.2 Confirmation Calls

The project team made the realization that a better system of confirming appointments needed to be put into effect. This came from the number of no-shows that occurred on Tuesdays as seen in section 4.1.1.2 Suggestions for Lowering the No Show Rate. The original thought was to confirm Tuesday appointments first on Friday and then again on Monday as a reminder. This system has been put in place for all weekdays. The first call takes place 48 hours, or two workdays, before the patient's appointment. If the patient does not pick up the call, the receptionist calls again 24 hours, or one workday, before the appointment. A flowchart of this new process can be seen in Figure 14. This changes the previous process that had receptionists only confirming the appointment one time, regardless of whether the receptionist was able to reach the patient or not.

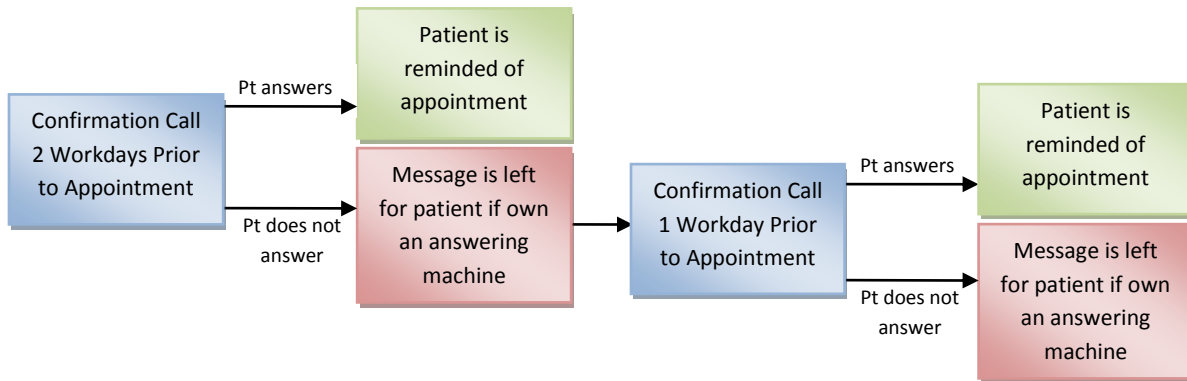


Figure 14: Confirmation Call Process

A table of when to place the confirmation calls can be seen in Table 2.

Table 2: When to Place a Confirmation Call

Day of Appointment	Day of First Confirmation Call	Day of Second Confirmation Call
Monday	Thursday	Friday
Tuesday	Friday	Monday
Wednesday	Monday	Tuesday
Thursday	Tuesday	Wednesday
Friday	Wednesday	Thursday

The goal is to maximize the amount of patient contact and minimize the total amount of no-shows due to forgotten appointments or patients forgetting to cancel. Calling the patient two workdays before his or her appointment allows, not only a reminder, but also the chance to properly cancel the appointment within the appropriate time frame. The patient would be able to cancel the appointment, rather than become a no-show, and the Dental Department would be able to fill the appointment and maintain the capacity for the day. While there remains the risk that a patient does not receive the first or the second confirmation call, the overall chance of reminder increases.

4.2.3.3 Double-Booking and Clinic Hour

The subject of double-booking patients is seen as detrimental to patient satisfaction by most health centers. However, as research has shown it can be helpful to both patients and providers when the patient that is a habitual no-show or the double-booked appointment type often results in no-shows. Izard (2005) described one clinic's approach to reducing their no-show rate effectively. The clinic did not want to terminate their typical no-show patients from care, but they did want to be able to provide a system to prevent them from causing the providers lost appointments and the clinic lost capacity. Instead they developed an innovative scheduling alternative where a new virtual doctor was added into the system. When the habitual no-shows schedule appointments they are placed on the virtual doctors' wide open calendar, therefore the primary care physician's schedule is not affected by the chronic no-shows appointment. If the no-show actually arrives then they are placed in a line behind the on-time patient. This is a form of double-booking that does not affect the actual providers' schedule. The clinic made a list of habitual no-shows and then scheduled them in the double-booking manner detailed above and in the event that the no-show was present at their next scheduled appointment, they would be taken off the "habitual no-show list". This method reduced habitual no-shows entirely from the physician schedules and increased provider productivity by supplying appointment slots for patients who are more likely to arrive. At this particular clinic the no-show rate was decreased by 20 percent proving that the virtual doctor is an inexpensive option toward managing reoccurring no-shows .

Double-booking can be implemented in medical centers with high no-show rates, like FHCW's Dental Department. There may need to be a trial period within the clinic but there are some aspects that need to be considered before doing so. In the Dental Department, providers are usually booked with a full schedule without having any spare time. This is especially the case for hygienists who have the largest no-show rate compared to other provider types. Generally, double-booking is most effective when there are available operatories and providers with extra time in their schedules. However, in FHCW's case the providers have fully booked schedules and the operatories are usually filled to capacity.

Another solution would be to have no-show clinic hour/hours, which might be more feasible for the clinic, and might be more satisfactory for the patients. This would entail having an hour two days a week, or multiple hours in one day, specifically designed for patients who are habitual no-shows. These appointments would be scheduled for 20 minutes rather than the normal 30 minutes so that if all of the habitual no-show patients do show up during this hour, they will all still be able to be seen. One hygienist would be scheduled for the habitual no-show clinic hours, and the remaining hygienists would

be scheduled normally. This would help the clinic's capacity because the clinic would not have to depend on habitual no-show patients for capacity and can focus on treating other patients who regularly keep their appointments. The clinic's office manager keeps the charts of habitual no-show patients; a habitual no-show is a patient who has failed two consecutive appointments.

4.2.3.4 Provider-Patient Conversations

One of the most efficient means of transferring information is in a face-to-face conversation. The project team believed that by having the providers speak to their patients about the importance of their appointments, the patients might develop a deeper sense of appreciation for the clinic. Additionally, the providers would develop more ownership of the no-show problem within the clinic. They would be acting more proactively to reduce the number of no-show patients.

The team developed a checklist for the providers (Appendix D: No-Show Informational Checklist). This checklist provides key points that should be brought up in conversation with a habitual no-show patient. It states the importance of oral care, the cancellation policy of the clinic, and the repercussions of too many missed appointments. At the bottom of the checklist, there is an area for the patient to initial and date. The checklist is placed in the patient's chart for record.

4.3 Maximizing Effective Capacity through an Available Work Board

In order to maximize the capacity of the Dental Department, an available work board was implemented and analyzed by the project team. The results of the analysis led to the perception that more technical support would ultimately benefit the clinic.

4.3.1 Available Work Board

The team designed a way to manage the no-show appointments in the clinic through the usage of an available work board. Introducing the available work board into the Dental Department began with informing the employees at reception, as well as the hygienists and providers, how an available work board would help the clinic operate better. An informational sheet was passed out to all of the staff. This sheet included the goals that the team hoped to achieve while using the work board, how to utilize the board to achieve these goals, and an example of what the board would look like. The handout can be found in Appendix D: No-Show Informational Checklist

Informing everyone on how the board would work and making sure they completely understood was the most important aspect of implementing the available work board. In order for it to work the entire Dental Department had to be able to facilitate the use of it. The team introduced the work board into the clinic during the first week of December and spent the subsequent week observing its usage. The work board can be seen below in Figure 15.

Time	1 Smith	2 Doh	3 Ochoa	4 Linda	5 Linda	6 Ingrid	7 Lub	8 Sarah	9 Andrea
7:00									
7:30	X	X	X	X	X	X	X	X	
8:00	X	X	X	X	X	X	X	X	
8:30	X	X	X	X	X	X	X	X	
9:00	X	X	X	X	X	X	X	X	
9:30	X	X	X	X	X	X	X	X	
10:00	X	X	X	X	X	X	X	X	
10:30	X	X	X	X	X	X	X	X	
11:00	X	X	X	X	X	X	X	X	
11:30	X	X	X	X	X	X	X	X	
12:00 PM	X	X	X	X	X	X	X	X	
12:30	X	X	X	X	X	X	X	X	
1:00									
1:30									
2:00		X	X	X	X		X		
2:30		X	X	X	X		X		
3:00		X	X	X	X		X		
3:30		X	X	X	X		X		
4:00		X	X	X	X		X		
4:30		X	X	X	X		X		
5:00		X	X	X	X		X		
5:30		X	X	X	X		X		
6:00		X	X	X	X		X	X	
6:30									

Figure 15: Available Work Board

After learning how appointments were scheduled after a patient had just completed a visit, the team devised an expected process for how the available work board would be used. When a patient finishes a visit he or she will bring a patient next-appointment slip to the receptionist and the receptionist will schedule the next appointment 30 days out. The patient next-appointment slip contains information as to what the next visit will be for, i.e. will it be a cleaning, mouth x-rays etc. Working to fill extra appointments, the team expected the new process to incorporate the next-appointment slip in order to figure out whether or not, due to a no-show/cancellation, there is an immediate appointment that the patient can be given. The patient would bring the next-appointment slip to the receptionist and depending on what type of appointment it was, the receptionist would check the work board and see if there was an available operator and dentist/dental assistant available. If the type of next-appointment needed was a short procedure, such as a consultation or x-rays, that could be done by an available dentist or assistant, the receptionist could ask the patient if he or she wanted to stay or come back within the next 24 hours in place of a no-show or a cancellation (which the appointments available would be shown on the work board). The steps of the expected process are outlined and explained below:

1. The receptionist would receive the patient slip and determine if the next appointment could be done in the next 24 hours
2. The receptionist would check the available work board and see if there was an available operator
3. The receptionist would determine if an assistant could do the procedure. Then subsequently is an assistant available?
4. If the procedure must be done by a dentist or hygienist, is there a dentist or hygienist available to take the appointment?
5. Ask patient if they would like to either stay for the immediate appointment available or come back within the next 24 hours depending on when the next available open appointment is.

6. Fill empty appointment slot

In order to measure whether or not the expected process actually worked in the clinic, the team decided to observe the providers using the work board at different times. The team split a week up into shifts and each member spent time in the clinic observing the providers' responses to the board.

4.3.2 Pilot Testing

Once the work board was introduced into the clinic, the project team noticed that it was not being used to its fullest potential. Overall, it seemed as if the board itself was not needed. The software used could potentially perform the same steps without adding the additional hassle of maintaining a white board. Additionally, the initial reception to the board was negative. The providers and staff took one look at it and, overall, were unhappy of the added step in their daily process.

The differences in expected process versus the actual process that was observed at the clinic led the team to rework the work board in order to better suit the clinics' needs. The team realized that the tasks they were trying to accomplish with the work board could actually be done quickly and more efficiently on the computer scheduling system already put in place. The team, after observing the scheduling process at the clinic, came to the conclusion that the real opportunity for improvement lied was improving communication among receptionists as well as changing the mindset with which receptionists schedule appointments. For example, while observing the clinic, it was noticed that when a patient came in to schedule an appointment, even if there was an available appointment due to a cancellation, the patient was given an appointment 30 days out. Instead of going about scheduling in this way, the team suggests that the clinic try to fill the next immediate available appointment (this appointment could be open due to a cancellation or a no-show). In order to accomplish filling cancelled appointments the communication between the receptionists must improve so that when an appointment is cancelled by one receptionist, the other three receptionists are also aware of it.

The team brainstormed ways in which the work board could be reworked in order to help improve this communication. The idea that proved to have the most potential was that instead of showing every single appointment on the work board, to only write down when an appointment is a no-show or a cancellation, this way the receptionists could have a quick visual of all of the immediately available appointments and would not have to look through the scheduling system to root out the cancellations and the no-shows.

The team realized through observation that most of the scheduling could be done using the scheduling system; however the knowledge of the software being currently used by the receptionists is limited due to the program being relatively new. The team decided the best possible results would come through a thorough understanding of the software. The next section will describe software questions investigated in order to better facilitate the scheduling of appointments.

4.3.3 Improve

The project team developed a list of questions to be given to the technical support staff member at FHCW. These questions were formulated to enhance the potential capabilities of the scheduling software currently being used by the receptionists at the Dental Department. The questions can be

found in Appendix F: Troubleshooting Questions. Additionally, the responses can be viewed below in Figure 16.

Can cancellations be determined in the system and can the receptionists be notified, even if they are not the ones that entered the cancellation?

- Yes. By using the multi-view screen anyone can see the schedules for all the providers. The schedules show all appointments scheduled (regardless by whom), all open slots, and appointments kept (which is triggered by the check-in process).

Do no-shows appear in the system immediately?

- No. The status of no-show happens overnight. However, by viewing the multi-view screen, one can see when and if a patient keeps their appointment.

Can notifications be set to appear every time there is a no show or a cancellation so all receptionists can see it? (i.e. a box pops up or the time slot is highlighted)

- No. The system does not recognize a patient as a no-show only if they did not check in that day, allowing for late arrivals. Again, the multi-view schedule provides a timely view of appointments. The system refreshes every minute. Therefore, if an appointment is made, kept, cancelled, or rescheduled, within a minute's time anyone watching the screen will be able to view the current status of the appointment book.

Is there a way to display a list of immediately available [open] appointments for each provider, hygienist, assistant, etc... for today and tomorrow, or for the next week or next month? For example, if a patient walks in or needs a follow-up appointment, is this list readily available?

- The multi-view schedule shows the appointment book for the current day. There are icons at the top of the screen that allow the viewer to look at any day desired. There is also an option to look at weekly schedules for a single provider or hygienist. Assistants are not included in the scheduling.

What is the quickest way to access scheduling appointments? (In the fewest amount of clicks, dropdowns, etc...)

- If the user's preferences are properly set up, upon opening the epm application they should see the appointment book for the current day. To view the later part of the day they need only scroll down. If there are more providers than fit on the screen they can scroll over to see the others.

Figure 16: Answers to Troubleshooting Questions

The project team had hoped to discover an easy way to make a recently cancelled appointment prominent in the system. For example, it would be convenient for a notification window to pop up once an appointment is cancelled. With these newly available appointments in view, the receptionist would be able to prioritize filling those appointments before scheduling future appointments 30 days out. The responses of the technical support questions indicate that the scheduling software does not allow this process to be completed. In order for the receptionist to view recently cancelled appointments or available time slots, they would have to scroll through the schedule day-by-day looking for an open space.

While it was not feasible to have notifications pop up or a message displayed on shared screens, the team discovered that a potential answer to this problem was to keep track of the cancelled appointments in the "To Do List" of the scheduling screen. A screenshot of the "To Do List" can be found in Figure 17. The scheduling software allows the "To Do List" screen to be edited by one receptionist and then those edits can be viewed by all receptionists. If the receptionists kept a list of the recently cancelled appointments in the "To Do List", it could be viewed by all receptionists. The list of cancelled appointments would be the first priority appointments to fill. When one of the appointments is successfully filled the receptionist would erase it from the "To Do List" section and then work on filling the next cancelled appointment. Figure 18 illustrates the process of utilizing the "To Do List" to fill cancelled appointments more efficiently.

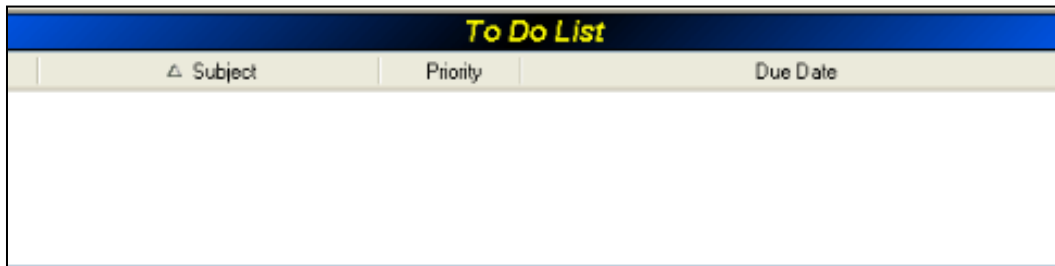


Figure 17: "To Do List" Screenshot

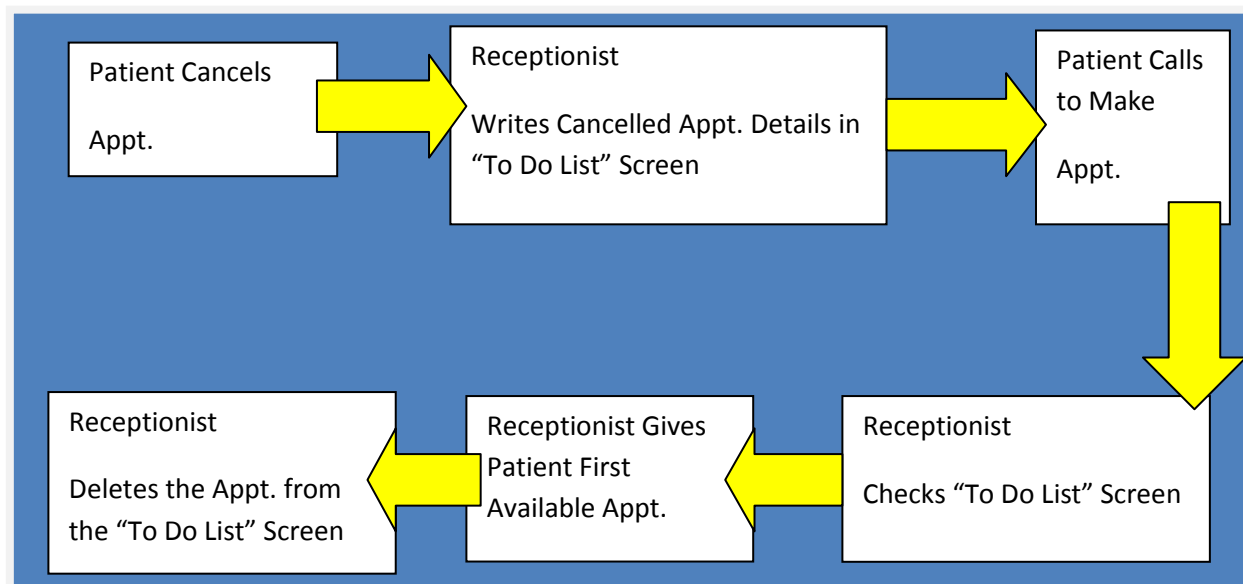


Figure 18: Utilizing "To Do List" Screen to Make Appointments

5 Control: January and February Data Collection

It is important that the Dental Department sustains the results of the project team's work. In order to do so, the clinic should periodically collect no-show data based on the previously tested areas including provider type, type of appointment, and day of the week. With this data, they would be able to visualize if the no-show improvements have been maintained or if there are further areas of improvement.

The project team evaluated the work completed in 2009 by collecting no-show data in January and February 2010 to measure the consistency of the no-show rate and the consequences of newly implemented ideas. The data collected was from the weeks of January 25 and February 1, 2010. The data for each week was processed separately, as the group wanted to see the change in no-shows from January to February. They needed to be assured that their work in the clinic had been sustained in the short term. The results of the control data are described in the following sections.

Continuously surveying the staff of the FHCW Dental Department would be another means to evaluate the work completed in the MQP. Such surveys are vital for maintaining employee satisfaction and making sure the staff is continuously up-to-date with the current no-show issues and that they continue to be proactive in their practices.

5.1 Provider Type Effect

The January and February no-shows were collected and organized by provider type. The data is consistent with the August through December data in that dental hygienists experience the largest volume of failed appointments; see Figure 19 and Figure 20, which show the percentage of no-shows attributed to each type of provider. In Figure 21, it is shown that in January and February DHYG (hygienist) still experiences the largest no-show percentage, relative to the total appointments. The FHCW Dental Department's quarterly audit data confirmed that hygiene was the area with the biggest potential for improvement. The team, along with Dental Department employees, came up with several methods for reducing the hygiene no-show rate specifically. The clinic is in the process of setting up an automated system for informing patients when it is time for a cleaning; currently the patients have to manually fill out appointment cards. Manual appointment cards are risky because there is the chance the patient will lose the card and forget entirely about the scheduled cleaning appointment. The staff hopes the automated system will generate more kept cleaning appointments. Another method that could be implemented in the future by the clinic is having a two hour window once a week where patients who have failed one or more cleanings are scheduled to be seen in twenty minute intervals, instead of the usual thirty minutes. This would allow up to six patients to be scheduled with the mindset that if one of the patients fails to make the appointment then the clinic will have over-scheduled to make up for the loss in capacity. Although this method may not work well with other appointment types that require the full appointment time, it could work well with cleanings. Another idea the team had was to give incentives to dental hygienists to improve efficiency: quality cleanings in less time. Being able to perform a cleaning in less time means that more patients would be seen and the patients that receive quick, good quality appointments will be more likely to return because the cleaning did not greatly impose on their schedule.

January No-Shows By Provider Type

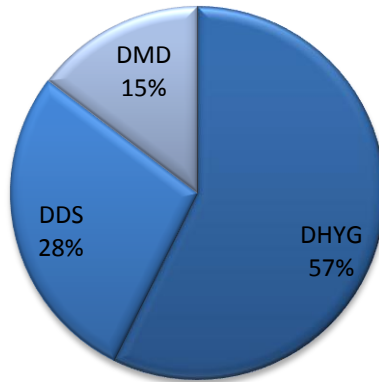


Figure 19: January No Shows by Provider Type

February No-Shows by Provider Type

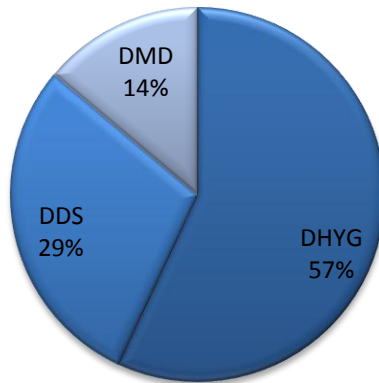


Figure 20: February No Show Percentage by Provider Type

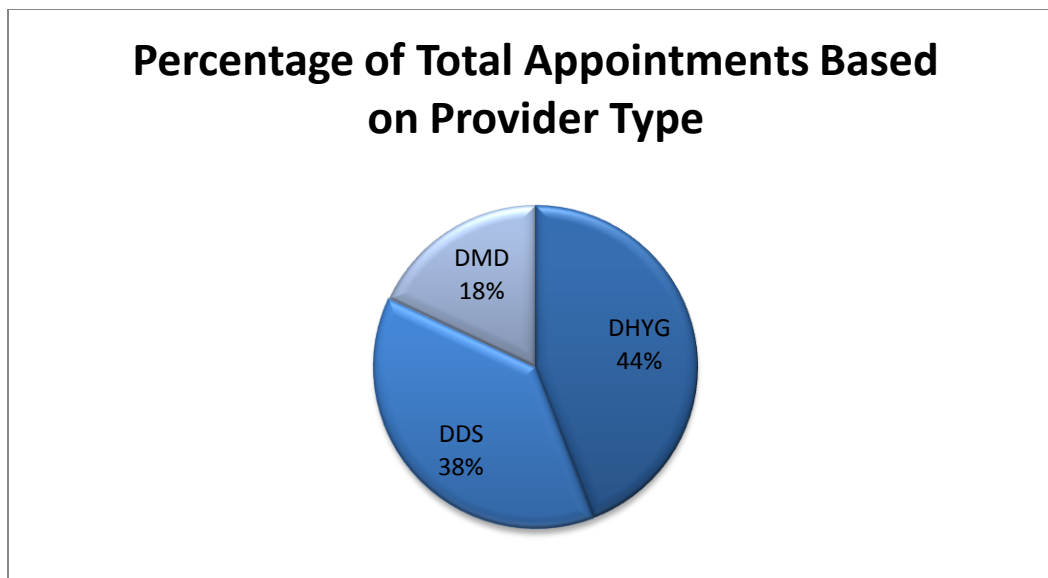


Figure 21: Percentage of Total Appointments Based on Provider Type in January and February

5.2 Day of Week Effect

The team decided to collect additional data in January because they wanted to see the impact of the new confirmation calling system. Figure 19 shows that there has been a substantial change in no-shows on Tuesdays. In the data from August – December, 2009, Tuesday no-show appointments represented 38% of the total no-shows. In January, 2010 data, the team determined that Tuesday no-show appointments represented 13% of the total no-shows. Monday no-show appointments increased from 14% to 29% but every day of the week has similar no-shows in January, and there is not an enormous difference between the days of the week.

The team analyzed February data to examine the consistency on the outcomes of the changes implemented at FHCW’s Dental Department. One idea that was brainstormed by the team was to increase the number of confirmation calls to remind the patients of their appointment date and time. Confirmation calls were done 48 hours prior to the appointment, but if the call was not received, another confirmation call was never made to the patient. In section 4.2.1.2 Day of Week Effect, Tuesday no-shows were analyzed in more detail from August through December, and were measured to be 38% of all no-show appointments. The team believed that Tuesday no-shows were higher compared to other days of the week because the confirmation call for Tuesday appointments was on the preceding Friday. If the call was made on Friday, patients would be more likely to forget about their appointments since nearly 72 hours had passed after the confirmation call. The team believed that a second confirmation call should be made on Monday’s to remind the patients of their Tuesday appointment. This system was implemented by the Dental Department staff the first week of February, and no-shows on Tuesdays decreased substantially compared to the August through December data. Figure 22 shows that even though Tuesday has a large number of total appointments, the total number of no-shows was reduced in the month of February, representing 15% of total scheduled visits. This could have been

directly related to the new confirmation calling system that was put into place. The data from February indicated that the number of no-shows was more equally distributed among the days of the week. Figure 23 illustrates the new distribution as compared to the August-December distribution. The percentage of no-shows that occur on Tuesday decreased to a similar level when compared with other days of the week. The new confirmation calling system was applied to all days of the week. A more detailed description of the confirmation calling process can be found in section 4.2.3.2 Confirmation Calls.

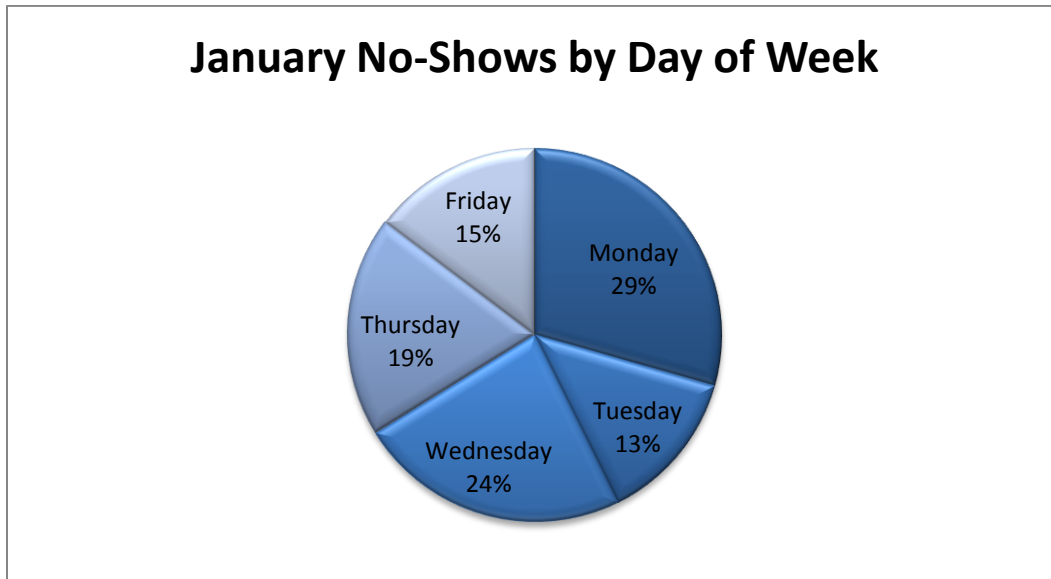


Figure 11: January No Show Percentage by Day of Week

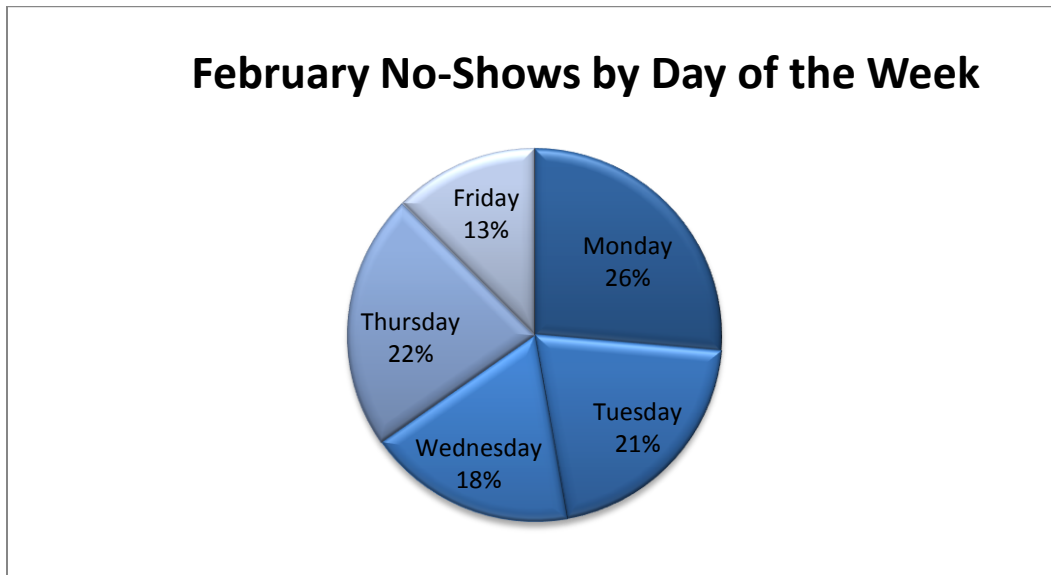


Figure 12: February No Shows by Day of Week

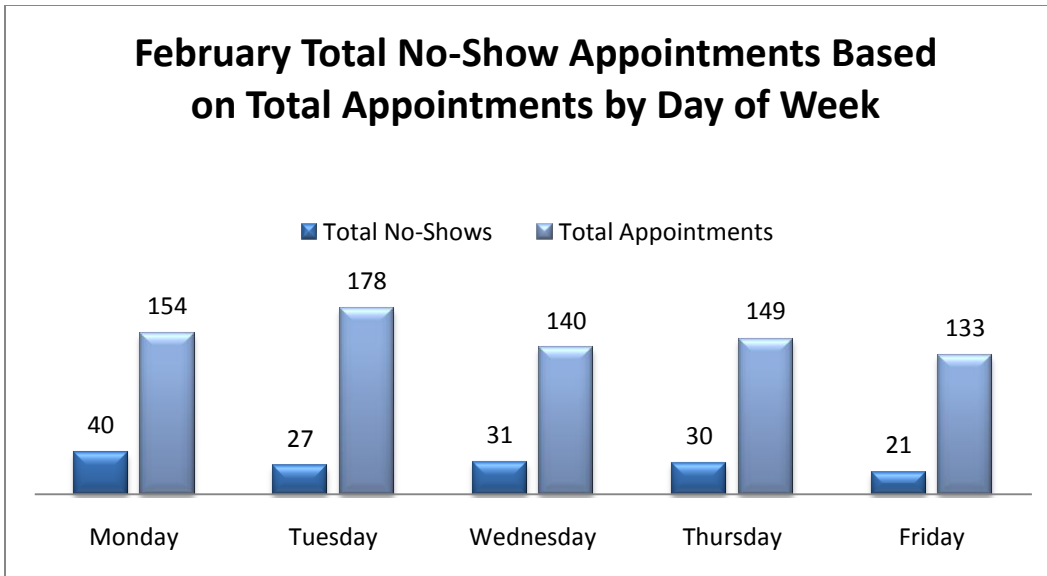


Figure 22: February Total No-Show Appointments Based on Total Appointments by Day of Week

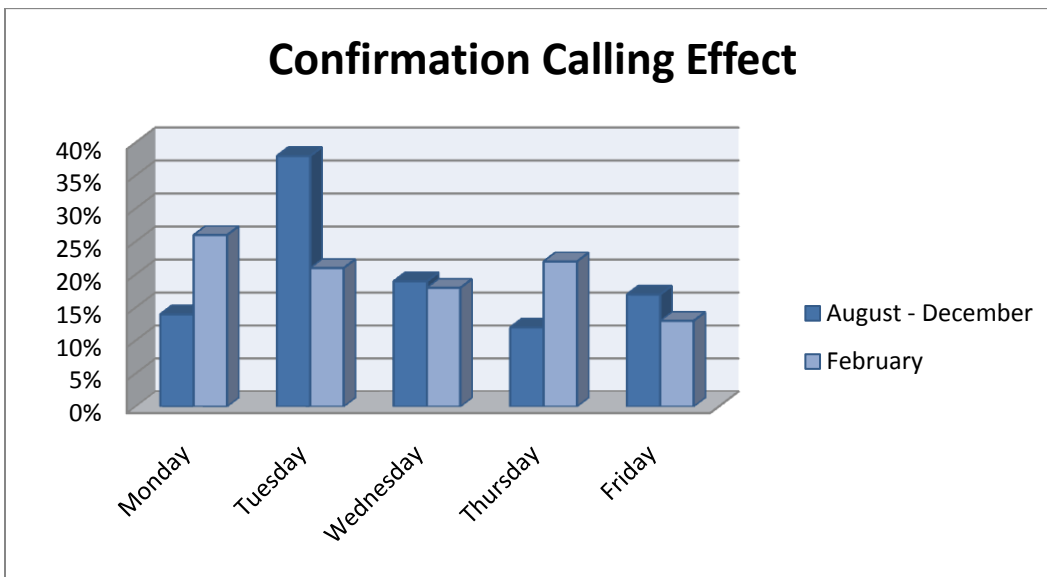


Figure 23: Confirmation Calling Effect on the No-Show Percentage by Day of Week

5.3 Appointment Type Effect

Another category that the team desired to measure again in January and February was the number of no-shows due to specific appointment types. In August through December, there was a significantly higher number of no-shows for cleaning appointments, which are performed by hygienists. In January, as shown by the figure below, the majority of the no-shows were also cleaning appointments.

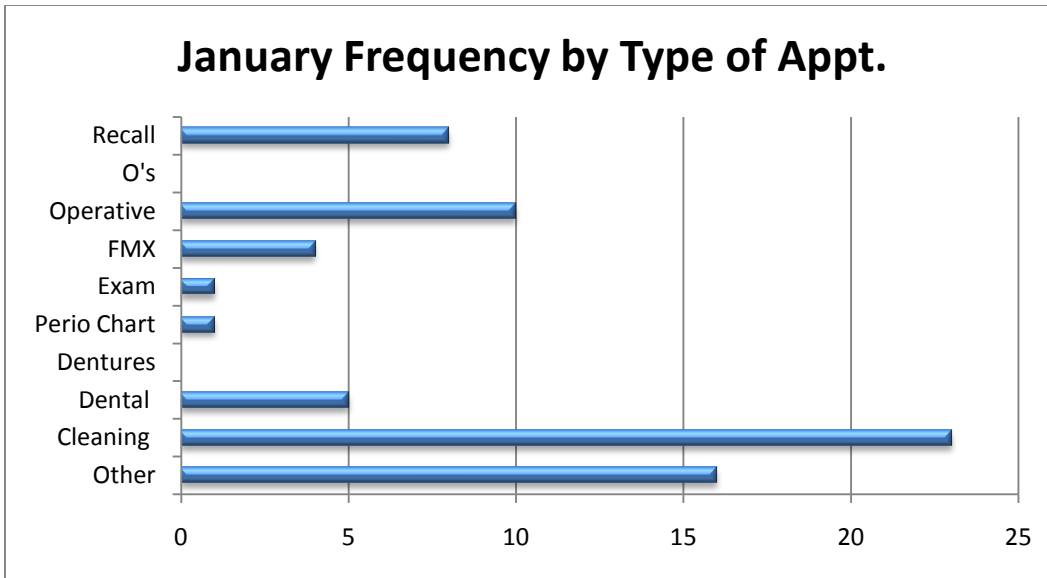


Figure 24: January Frequency by Type of Appointment

Additionally, cleanings were the most frequently missed type of appointment in February. This data shows that there remains to be a significant problem of no-shows in hygiene appointments, and more specifically, in cleaning appointments. This data provides supplementary support for the Dental Department to host a clinic hour for hygiene appointments.

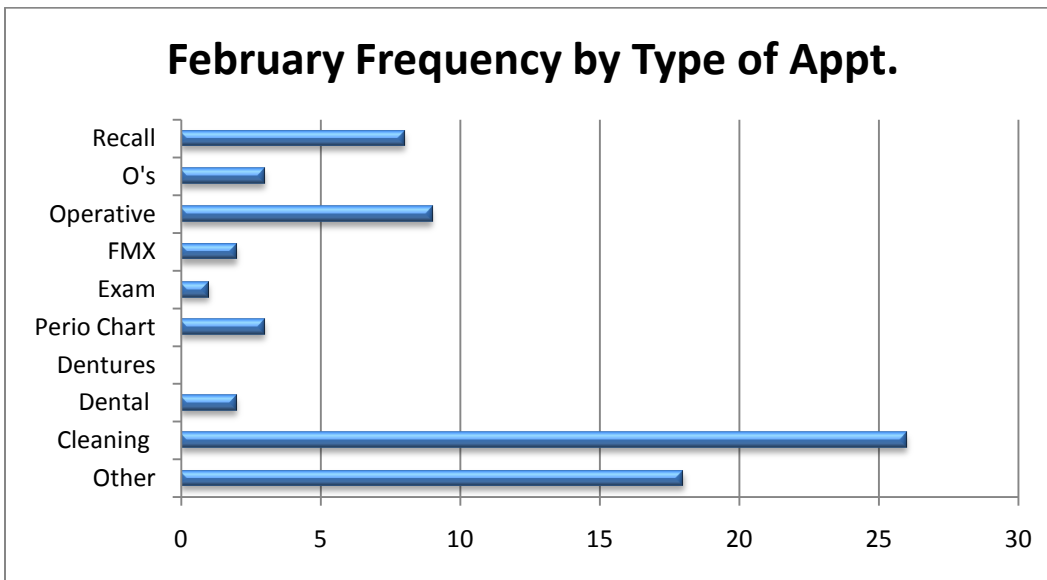


Figure 25: February Frequency by Type of Appointment

6 Conclusion and Recommendations

Providing quality dental care is the mission of the Family Health Center of Worcester's Dental Department. However, a significant percentage of their patients are homeless, disabled, and economically unstable. This type of patient base makes the Dental Department susceptible to a large number of no-shows, patients who fail to make their appointments, consequently leading to capacity issues within the clinic. Each year the federal government sets aside money for federally funded health centers based on their operational capacity. If a health center fails to meet the operational capacity upon which they were funded, some of the funding may be taken away or reduced in the coming years. For this reason meeting capacity goals is extremely important to the Dental Department.

The project team was present in the Dental Department from August 2009 to February 2010. Throughout this time span, the team collected and analyzed data to formulate solutions in three main areas: understanding employee operations, managing the no-show rate, and maximizing the effective capacity.

One result of the team's presence in the clinic throughout this seven month span was to make the employees more aware of the no-show problem, and to inspire employees to become more proactive when dealing with patients known to be habitual no-shows. The team distributed a survey to the providers that asked about the no-show rate and how they, personally, could reduce it. The most important factor in improving the teamwork of the Dental Department, and any other company, is to maximize overall staff communication between employees and management. Giving employees recognition for exceptional work and incentives to continue to do their job well will ultimately help the Dental Department. Improving office communication can also help the clinic.

By collecting data on the Dental Department's no-shows, the team was able to develop solutions to lower the overall no-show rate. A number of solutions were developed through the data analysis. One such solution was to confirm patient visits both 48 hours and 24 hours before their scheduled appointment. Another improvement was made on the letters that are sent out to patients who fail to keep their appointments. The original letters were difficult to understand and were only provided in English. By simplifying the sentence structure and also offering more languages, the letters could be understood by a greater number of patients. The desired outcome is that more patients would understand the importance of the Dental Department's guidelines. The team also recommended, introducing a clinic hour specifically for habitual no-show patients who need hygiene appointments, as these were the most common no-show appointment types.

By implementing provided solutions and recommendations, the Family Health Center of Worcester has been able to improve the overall operations of the Dental Department. Collaboration between employees has increased, the no-show rate has decreased, and the capacity is being maximized. This is based on observation of the dental director and the quarterly review of the clinic which showed that the no-show rate decreased from 26% in September to 18% in February. By continuously monitoring the progress in these three areas, the Dental Department will be able to further improve these ratings.

The project team also benefited from the project, developing new insights while at the same time utilizing their previous knowledge to make an improvement on a real life problem. They were able to learn and utilize proper techniques for problem analysis and how to use the DMAIC process. They learned that, while not every solution will have an impact, it was still important to experiment in many directions so that no opportunity would be missed.

This project addressed the capacity in the Dental Department as affected by the high no-show rate. Part of any good process includes maintaining the achievements and preventing future problems. It is important to continuously evaluate the capacity of the clinic and search for new means of improvement. Opportunities exist to increase both the theoretical capacity, as well as to build demand and to ensure effective utilization.

6.1 Recommendations: Increasing Clinic Capacity

A few additional suggestions were researched by the MQP team that could be implemented in the future if additional improvements are required.

6.1.1 Dental Hiring & 5S Dental Cart

Currently, the clinic has enough providers to serve its patient base, however if the clinic takes on new patients it may need to manage this additional capacity by hiring more providers. There are only nine operatories in the clinic and currently they are all being utilized by dentists, hygienists, and oral surgeons. There is flexibility with the schedules in which these operator room are being used, however for example, on Monday and Tuesday the oral surgeon only works a ½ day and on Wednesdays the oral surgeons do not operate at all. During these times, there are two rooms that are open and being unused resulting in an inefficient use of the clinics' resources. The MQP team did a quick capacity calculation to understand the impact of a part time dentist hired to work in one of the operator rooms during the times that the oral surgeons were not working. If the dentist was able to complete visits in the current average appointment time which is 45 minutes, then that part-time dentist could generate 1,664 more visits per year for the clinic. This would allow an approximately 10% increase in the current number of visits. Although this is a rough calculation, it still proves that the hiring of even a part-time licensed employee would be effective in meeting new patients the clinic wishes to take on.

The main issue with the above scenario is that the newly hired dentist would have to utilize one of the operatories that is currently used by only oral surgeons. There is a level of discomfort with sharing the same dental equipment and most of the employees do not like to do this because they feel that it will lead to poor performance and lower quality dental visits. To try to cope with this issue, the team developed the idea of 5S dental carts. The dental carts would be stocked with each instrument and tool that a dentist or hygienist would need to complete a visit and could be easily wheeled from room to room. 5S is a practice utilized by major manufacturing companies and it is the custom of having everything one needs exactly in the place where one needs it to be (Markovitz, 2009). The 5S dental cart would do exactly this, it would provide everything the dentist would need to see patients and could be used when needed in the rooms that were open. It would also prevent the sharing of tools between oral surgeons and dentists. In order for the clinic to utilize 5S, it would need to find out exactly which tools

are routinely used and how expensive it would be purchase the cart and equipment versus the benefit of actually having these items and another part time dentist to use them.

6.1.2 Collaboration with a Social Service Agency

A social service agency is a federally funded institution that helps adults, children and families to recover from the effects of mental illness, substance abuse, poverty and homelessness. This institution finds housing, employment, healthcare and other services to help these people to rejoin the community. (██████████ 2009).

A person entering a social service agency obtains healthcare or treatment for an average stay-length of thirty days. This agency might be used to increase capacity by having patients come in as walk-ins to the Dental Department. Additionally there is the possibility that they can be substituted if there is a no-show at the Dental Department because of the close proximity. In order to achieve this, when the patients are admitted to the social service agency, they might be asked if they want to receive dental healthcare. If so, the Dental Department can be notified of the patients who want or require dental healthcare. Since patients stay in the social service agency for an average of thirty days, the Dental Department could ask them to come in at 7.00 am for the walk-in clinic or they can be substituted in if there is a no-show appointment.

On the other hand, this might be problematic for the Dental Department. The Dental Department prefers to have routine patients as they would like to have stable capacity. Social service agency patients are not only from Worcester but also from the North Central Massachusetts area. If a patient is not from Worcester, he or she is not likely to desire routine care from Family Health Center as a provider. While problems may persist, the team believes it is worthwhile to further explore involving these patients to increase the capacity of the clinic.

Involving this social service agency will ultimately increase FHCW's Dental Department's capacity and fully utilize their operatories. This process focuses on their patient population and communication with the Dental Department.

The first step the Dental Department could take would be to add two more questions to the admissions process to the social service agency: "Are you a resident of Worcester?" and "If yes, would you like to receive dental healthcare throughout your stay here?" The first question's purpose is to obtain routine patients in to the clinic which is one of the main goals of Dental Department. The second question's purpose is to learn if the patient would like to receive dental healthcare, and if so, to learn and inform the Dental Department of the number of patients. After these questions are added the patients would be put on a waiting list for dental care.

6.2 Recommendations: Managing Clinic Capacity through Additional Marketing

The MQP team also brainstormed additional ideas for better utilizing capacity, if the Dental Department experiences a shortage of patients in the future.

Utilizing the rest of the Family Health Center of Worcester as a marketing base could help the Dental Department attract more patients, for example patients that have been coming to the center for other health related reasons and were not aware that a Dental Department existed on the third floor. By marketing within the health center itself, the Dental Department will be able to find more local Worcester patients. The team created a design for doorknob hangers to be placed around FHCW to inform patients of the Dental Department on the third floor. The team also created a template for informational flyers to be handed out to doctors and nurses throughout the health center. The informational flyers would ask the doctors and nurses to remind their patients of the Dental Department and the services that it provides. Both the flyers and the informational door tags would stress the important of dental care and in particular fluoride treatments for young children. The sample templates for the flyer and the informational door tag can be found in Appendix G: Dental Department Flyer and Appendix H: Dental Department Door Tag.

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Appendix A: Provider Survey

We are a team from Worcester Polytechnic Institute doing a project on increasing capacity in the Dental Department. Our names are Abigail Piva, Jillian Cohen, and Batuhan Glzer.

The purpose of this survey is to gain insight about the reasons why patients fail to keep their appointments (no-shows). Please know that your answers will be kept confidential, but if for any reason you do not feel comfortable answering these questions, you do not have to do so.

Please complete the following questions using the back of the sheet if necessary. When you have finished, please place the survey into the provided envelope and seal it. Please give sealed envelopes to [REDACTED].

Maintaining confidentiality is important because the opinions given in the survey may reflect poorly on management, or may put the individual responder's career at risk. Although, this risk is minimal, it is still apparent and the MQP team aims to do everything possible to prevent it.

If you decide you would like to be contacted for a personal interview, then there is a separate detachable sheet where you may provide whatever contact information you are comfortable sharing.

After the team has collected all of the surveys, we will transcribe the answers into one document in order to protect your handwriting. We will provide a summary of responses in our report, the summary information will not include data that can be used to identify you.

Thank you for your participation,

The Dental Department capacity team at WPI

1. Why do you think patients fail to keep their appointments?

2. Do you have any suggestions for lowering the no-show rate?

3. Do you feel that your position in the clinic has any control over the no-show rate? Why or why not?

4. What do you think you could do to help lower this rate?

5. What are your suggestions for filling the open time that results from a patient missing their appointment?

6. If it would increase the number of patients that could be seen by the clinic, would you be willing to share your operatory with another provider while you are not in the clinic? Why or why not?

Would you be interested and willing to partake in a 5-10 minute interview with the project team to provide us with further feedback? If you are interested please leave an email address or other contact information where you can be reached. Please know that the information you share with us in the interview will be anonymous.

*** Please detach this sheet and hand in to [REDACTED] separately to insure that your answers to the survey will remain anonymous.

Appendix B: Original Letters

1st Letter

Date ___/___/___

Dear _____

We're sorry you were not able to keep your scheduled appointment with us on ___/___/___
Please call to reschedule.

When an appointment is made, we reserve a block of time specifically for you. As a consequence of the missed appointment, everyone loses, including the person needing the treatment, those providing the treatment and a third person who would have been pleased to come in for that time.

Please be attentive to the date and time of your appointment and realize that these times are important and valuable to all involved. Remember there is a **24 hours** cancellation notice for a 30 minute appointment and 48 hour cancellation notice for a 60 minute appointments.

Sincerely,

██████████

Dental Office Manager

██████████

2nd Letter

Date ___/___/___

Dear _____

This is to let you know that you missed a dental Appointment at Family Health Center on _____ . Our record indicated that one or more additional appointments were missed during the past twelve months, on the following dates _____ . Missed appointments interfere with your dental treatment and delays access for other patients.

We want to remind you of the guidelines for our office. We require a 24 hr cancellation notice for 30 minute appointments, and a 48 hr cancellation notice for 60 min appointments.

Please call the Practice Manager [REDACTED] at [REDACTED] to discuss this matter and provide us with a reasonable explanation of your missed appointments for any specific consideration to continue care with us. Otherwise, you will be unable to receive routine dental care at Family Health Center.

We are available to assist you with any dental **Emergencies** that might present Monday thru Friday. Emergencies are triaged Monday thru Friday at 7:00 am.

All appointments that you have made with the Dental department at Family Health center will be cancelled, unless we hear from you within two weeks of receiving this letter.

Sincerely,

[REDACTED]
Dental Office Manager
[REDACTED]

3rd Letter

Date ___/___/___

Dear _____

You have missed several dental appointments in our office. Failed dental appointments are very disappointing to everyone. They interfere with your dental treatment and create unnecessary scheduling problems for other patients as well as the office.

As you know, we make every effort to schedule appointments that are the most convenient for you and that fit your personal schedule.

Realizing that we all have busy schedules and that unforeseen situations may occur, we wish to remind you of the scheduling guidelines for our office. Unless you take a moment of your busy schedule to call as with a reasonable explanation of your missed appointments, you will be unable to receive routine dental care at Family Health Center of Worcester.

We will however assist you with any dental emergencies that you might present. Emergencies are seen Monday thru Friday at 7:00 am.

You may contact our office and ask to speak with [REDACTED] for more information or make arrangement on how to schedule a follow up appointment. We look forward to hearing from you.

Sincerely,

[REDACTED]
Dental Office Manager
[REDACTED]

Family Health Center of Worcester
26 Queen St
Worcester, MA 01610

Appendix C: Modified Letters

Date:

Dear _____,

Oops! We missed you. Our records indicate that you had a dental appointment scheduled on _____ with _____.

Please remember that we require a:

- 24 hour notice of cancellation
- 48 hour notice of cancellation

Please call the office at [REDACTED] to reschedule.

Thank you, and hope you call to reschedule soon!

The Dental Team at Family Health Center of Worcester

Office Manager/ Scheduling Coordinator: [REDACTED]

Insurance Questions: [REDACTED]

1st Letter: Cancellation Notice Required

Date:

Dear _____,

Oops! We missed you. Our records indicate that you had a dental appointment schedules on _____ with _____.

Please remember that we require a:

- 24 hour notice of cancellation
- 48 hour notice of cancellation

If you would like to reschedule, follow the directions below:

- Please call the office at [REDACTED] to reschedule.
- Please contact the office manager, [REDACTED], for assistance and requirements in booking future appointments.

Thank you, and hope you call to reschedule soon!

The Dental Team at Family Health Center of Worcester

Office Manager/ Scheduling Coordinator: [REDACTED]

Insurance Questions: [REDACTED]

Letter of Multiple Missed Appointments

Appendix D: No-Show Informational Checklist

Family Health Center of Worcester: Dental Department

No-Show Informational Checklist for Patient _____

- We want you to have the best dental health care as possible
- We want you to keep your regular appointments
- The patient:
 - Did not cancel appointment and failed to show up
 - Cancelled in either less than 24 hrs or less than 48 hrs.
- Our cancellation policy is as follows:
 - 24 hour notice for a 30 minute appointment
 - 48 hour notice for a 45-60 minute appointment
- If patient has had multiple (3 or more) failed appointments:
 - I'm going to allow you to make one more appointment. If you fail to make this appointment without proper cancellation notice, you will only be allowed our emergency services, M-F at 7am.

Date:	Patient Initials:
Date:	Patient Initials:
Date:	Patient Initials:
Date:	Patient Initials:
Date:	Patient Initials:

Appendix E: Work Board Handout

Purpose: To increase the number of patients that the clinic sees on a daily basis.

Goals:

1. To make your jobs easier
2. To fill empty appointment times with a patient
3. To use our dentists and assistants to their full potential
4. To have a set system for viewing appointments and empty operatories
5. Improve communication between providers & receptionists

Using the Work Board to Achieve Goals:

1. Checking counter slips for appointment type
2. Checking work board for operatory availability
3. Checking work board for provider availability
4. Asking patient if he/she would like to stay and have procedure done now
5. Fill empty appointment space

Example of Work Board below:

Operatory:	1-Provider	2-Provider	3-Provider	4-Provider	5-Provider	6-Provider	7-Provider	8-Provider	9-Provider
8:00	X		X		X	X	X		X
8:30	X	X	X				X	X	
9:00	X	X	X			X		X	
9:30			X		X			X	
10:00					X		X	X	X
10:30		X			X	X	X	X	X
11:00	X	X	X		X	X	X	X	X
11:30	X	X	X			X	X	X	
12:00	X	X	X				X		
12:30			X		X				X
1:00		X			X			X	X
1:30		X			X	X		X	X
2:00			X					X	X
2:30	X		X			X	X	X	X
3:00	X		X				X	X	
3:30			X		X		X		
4:00			X		X	X	X	X	X
4:30	X		X		X	X	X	X	X
5:00	X				X	X	X	X	X
5:30	X				X	X	X	X	X

Any questions or concerns, please feel free to email us at FHCW09@WPI.EDU

Appendix F: Troubleshooting Questions

1. Can cancellations be determined in the system and can the receptionists be notified, even if they are not the ones that entered the cancellation?
2. Do no-shows appear in the system immediately?
3. Can notifications be set to appear every time there is a no-show or a cancellation so all receptionists can see it? (i.e. a box pops up or the time slot is highlighted)
4. Is there a way to display a list of immediately available [open] appointments for each provider, hygienist, assistant, etc... for today and tomorrow, or for the next week or next month? For example, if a patient walks in or needs a follow-up appointment, is this list readily available?
5. What is the quickest way to access scheduling appointments? (In the fewest amount of clicks, dropdowns, etc...)
6. Is there a way to easily notify providers about no-shows (on their computers...) so they can be proactive about filling them/ asking patients to stay for a follow-up?

Appendix G: Dental Department Flyer



Family Health Center
of Worcester

Dental Department

DENTAL CARE AWARENESS

- Please remember to ask your patients if they are in need of dental care
- Please remind them of the dental department located on the 3rd floor

Do you have a patient between ages 2- 18 years? Or do you have a patient with a child?

Please send them to the 3rd floor for an annual fluoride treatment to help:

1. Prevent tooth decay
2. Promote stronger teeth

Dental Department: 508-860-7910

Appendix H: Dental Department Door Tag

