MASTER OF PUBLIC HEALTH

Master international de Santé Publique

Improving the Performance of a Dental Clinic Using Management Strategies

Case of the Royale Hayat Luxury Hospital Dental Clinic in Kuwait

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Abstract

This project, carried out at the dental clinic of the Royale Hayat hospital in Kuwait as part of the masters of public health curriculum, targeted the performance of the dental clinic. The main objectives were to develop a system of key performance indicators to be used by the clinic, to develop the reporting system that would allow for the collection of data for these key performance indicators, and to strategize for the reduction of broken appointments impacting on the clinic's operations.

Literature review, observation of day to day operations, informal personnel feedback, analysis of existing data and investigation into the organizational objectives were the methods used in the scope of this project. A lack of organization and standardization was uncovered, as well as a lack of systematic reporting or patient follow-up.

A list of eight key performance indicators was selected for the clinic. An Excel workbook for recording data and automatically generating the key performance indicator dashboard was designed and implemented. A combination of different strategies was put into place in order to reduce broken appointments and improve the schedule's recovery from them.

The main focus was to develop a way to monitor and evaluate the performance of the dental clinic. Implementing the tools designed through the scope of this project will enable the clinic to better diagnose their problems and alert them to areas of the operations that require attention, setting the foundations for continually improving performance.

Résumé

L'amélioration de la performance d'une clinique dentaire en utilisant des stratégies de gestion

Cas de la clinique dentaire de la Royale Hayat Luxury Hospital au Koweït

Ce projet, réalisé à la clinique dentaire de l'hôpital Royale Hayat au Koweït, vise la performance de la clinique dentaire. Les principaux objectifs étaient de développer un système d'indicateurs clés de performance pour être utilisés par la clinique, développer le système d'information qui permettrait la collecte de données pour ces indicateurs, et d'élaborer des stratégies pour la réduction de rendez-vous manqués sans préavis et leur impact sur les activités de la clinique.

Les méthodes utilisées dans le cadre de ce projet sont l'analyse documentaire, l'observation des opérations quotidiennes de la clinique, les commentaires du personnel, l'analyse des données existantes et des objectifs de l'organisation. Un manque d'organisation et de normalisation a été découvert, ainsi que l'absence de déclaration systématique ou de suivi des patients.

Une liste de huit indicateurs clés de performance a été sélectionnée pour la clinique. Un fichier Excel a été conçu et mis en œuvre pour enregistrer des données et générer automatiquement les rapports sur les indicateurs. Une combinaison de différentes stratégies a été mise en place afin de réduire les rendez-vous manqués sans préavis.

L'objectif principal était de développer un moyen de suivre et d'évaluer la performance de la clinique dentaire. L'utilisation des outils conçus par ce projet permettra à la clinique de mieux diagnostiquer ses problèmes et de la sensibiliser aux domaines opérationnels qui nécessitent une attention, constituant une base pour l'amélioration continue des performances.

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And last but not least I would like to thank my family without whom I would not be here submitting this thesis. I would like to thank my parents for never failing to push me forward and for believing in me. And I would like to thank my sister; I truly appreciate all of her love and support during my stay in Kuwait and beyond.

Table of Contents

Introduction 6
Dental Health – a Public Health Issue 6
Dental Health in Kuwait 7
Producing Dentists 7
Studies on Dental Health Status 8
Dental Care in Kuwait 9
Context - Royale Hayat Dental Clinic 9
Objectives 10
Materials & Methods 12
Literature Review 12
Data Collection and Preliminary Analysis 14
Direct Observation 14
Informal Interviews / Personnel feedback 18
Preliminary Data Analysis 20
Organizational Objectives Analysis 21
Results 24
Key Performance Indicators 24
Reporting 25
Broken Appointments 25
Discussion 27
Limitations 30
Conclusion 31
Bibliography 33
Appendix 1 36
Appendix 2 37
Appendix 3 38
Appendix 4 44

List of Tables

Table 1: Statistics from the Royale Hayat Dental Clinic Jan-Mar 2014 17
Table 2: Summary of feedback collected from clinic staff 19
Table 3: Chair occupancy rate for the period Jan - Mar 2014 20
Table 4: Broken appointment rates for Jan-Mar 2014 21
Table 5: Compilation of the themes derived after analysis of the Royale Hayat hospital and dental practice mission statements 23
Table 6: Monthly report submitted to MOH 37

List of Figures

Figure 1: Hierarchy at the Royale Hayat dental clinic 10
Figure 2: Logic model of the Royale Hayat dental clinic project 11
Figure 3: Flow chart of daily operations at the dental clinic as observed by us 16
Figure 4: Illustration of daily time utilization – Receptionists 17
Figure 5: Illustration of daily time utilization – Dentists 17
Figure 6: Number of times there was no equipment available 38
Figure 7: Number of times Reserve stock is accessed 38
Figure 8: Number of medical errors that occurred 39
Figure 9: Number of complaints per dentist 39
Figure 10: Graph for daily chair occupancy percentages 40
Figure 11: Gauge chart for broken appointments 40
Figure 12: Graph of weekly broken appointment rates 41
Figure 13: Graph of incoming patients by week 41
Figure 14: Graph of new/old patient percentages per week 42
Figure 15: Graph of percentage of procedures that are high profit 42
Figure 16: Graph of chair occupancy rates by week 43
Figure 17: Screenshot of appointments input sheet in Excel workbook 44
Figure 18: Screenshot of Stock-out sheet in Excel workbook 44
Figure 19: Screenshot of 'no equipment' sheet in Excel workbook 44
Figure 20: Screenshot of complaints and errors sheet in Excel workbook 45
Figure 21: Screenshot of data aggregating sheet in Excel workbook 45

Introduction

Dental Health – a Public Health Issue

Dental Health has often been neglected in the Public Health sphere and does not garner as much attention as other domains of the field that are considered more pressing. From the point of view of the population, dental health is not among their priorities since people can survive despite having bleeding gums. This attitude is in the process of shifting, as research has linked poor dental health to numerous illnesses and conditions such as diabetes, respiratory illness and cardiovascular disease.

Dental problems in and of themselves constitute a sizeable chunk of disability days annually. In the United States, studies have shown that between 15 to 33 percent of the participants studied report work loss due to dental issues. In fact, in 1983, the most recent year for which in depth analysis of disability days has been completed in the US, 6.73 million days of bed disability and 7.05 million days of work loss were caused by dental problems (Reisine, 1985). These figures are thought to be similar, if not higher, considering the shift in diet that has occurred over the past 20 or so years resulting in higher consumption of foods that are detrimental to oral health.

Research has also been investigating possible links between dental health issues and other diseases, namely cardiovascular. A study investigating the association between “bad” bacteria in the mouth and the likelihood of a thickened carotid artery found positive association with 4 different pathogens, although cautioning that participants needed to be followed over time to see if the baseline findings would hold up (Desvarieux, 2005). A different study corroborated these findings, linking gum disease and the increased risk of stroke due to potential blockages of the main blood vessels to the brain causing thickening of the carotid artery (Science Letter, 2006).

The link between dental health and cardiovascular issues has been studied for quite a while, including a study in 1989 that found an association between poor dental health and incidence of myocardial infarction. The association remained even after adjusting for age, smoking, diabetes and social class (Kimmo J Mattila, 1989).

The reach of dental issues goes beyond the cardiovascular however, with attention being paid to the effects of poor oral health in children and pregnant women. In a study of schoolchildren in

Germany, it was found that there is a significant association between dental caries frequency and the BMI of school children. This association remained true after adjusting for age, and was applicable to both sexes although slightly more significant in boys (Brita Willerhausen, 2007). Medicine has shown that hormonal changes during pregnancy make pregnant women more vulnerable to oral infection and gingivitis (Salomon Amar, 1994). According to a study published in the Journal of the American Dental Association, proper gum treatment and oral health in a mother significantly reduces the risk of having a pre-term birth or an infant with low birth weight (Yiorgos Bobetsis, 2006). Other research has found a correlation between mothers with severe dental cavities and early cavities in babies after their teeth come in (Kim Bogess, 2006).

Even in the elderly, attention must be paid to oral care. Many elderly are on medications for chronic conditions that can cause dry mouth or other side effects which can lead to increased vulnerability to infection. Also the use of ill-fitting dentures can be a cause for a wide array of health complications and the risk for cancer of the gums increases with age.

As the field of medicine advances, and more research is geared towards dental health, it is becoming evident that oral health has so far played an underestimated role in public health. The results of poor oral health are many, and they tie into public health on different levels. On the flipside, maintaining good dental health is relatively easy in comparison to other fields. As awareness is raised on the importance of oral health, and more attention is paid to health care services and education in this domain, improvements on population health will begin to emerge.

Dental Health in Kuwait

The population of Kuwait is 3,250,000. Kuwaitis have an average life expectancy of 78, and the population annual growth rate is 2.2. There are no Kuwaiti citizens who live below the poverty line. The adult literacy rate of Kuwaitis is 94% (Bank, 2012).
In 2012 the total expenditure on health (THE) per capita was $1,309 (PPP int.) which amounted to 2.7% of GDP (WHO, 2012).
Immunization coverage is 95% and above for all of the different regular vaccines (Unicef, 2013).

Producing Dentists

Up until 1998 there was no dental program in Kuwaiti universities. The majority of dentists working in Kuwait were expatriates from various countries. A royal decree in 1996 made it

possible to create such programs, and in 1998 the first dental students were admitted to the Kuwait University's new faculty of dentistry. The mission of the faculty is to "promote oral health in Kuwait through education, research and cooperation with other professional health care institutions as well as the community at large". The 6.5 year curriculum was accepted by the University Council in 2001 (Behbehani, 2003).

The introduction of this academic program has demonstrated its success in the gradually increasing number of dentists in the country. In 2003 there were 3 dentists per 10,000 people. That number has gradually increased, and in 2012 reached 5 dentists per 10,000 people, with 1,171 in the government sector, 487 in the private sector and 190 working at oil companies (WHO, 2009) . In comparison, France reported 6.4 dentists per 10,000 population of the same year, Iraq 1.5 and Saudi Arabia 2.3 (World Health Organization, 2013).

All dentists in Kuwait are specialized in a particular area of dentistry. Dental practices usually include several dentists with different specialties and patients are assigned a dentist based on their chief complaint at the time of placing the appointment.

Studies on Dental Health Status

Although there are no governmental statistics available on the dental health of the Kuwaiti population, there have been several studies tackling different aspects of dental health across the past two decades.

In a study conducted by Vigild et al (1999) looking at the dental health status of 500 children, 71% of children reported needing dental hygiene instruction. 32% needed fillings, and 23% needed tooth extraction. For 53% of the children, the reason for the most recent visit to a dentist was pain or problems with teeth or gums. The consumption of sugary foods was extremely high. The study concluded that oral health education and oral health care programs should be established in secondary schools in Kuwait to influence the oral health behavior of the children to avoid further deterioration in their oral health (Vigild, 1999).

The ministry of public health in Kuwait conducted a national health survey before the Gulf war, collecting information on their population's health including information on oral health. Although the records of the study were destroyed during the Gulf war, the published findings are still available. The study showed that females brushed their teeth more often than males. Over one third of the population had visited a dentist during the previous 12 months. The proportion of the population with soft deposit was 66%, calculus 45%, intensive gingivitis 46%, and advanced

periodontitis 18%. Dental caries were also prevalent in the population with over 52% of the population suffering from them. The results of this survey indicate a high prevalence of preventable periodontal disease and dental caries. Health behavior improvement should be targeted by oral health promotion activities in order to impact these numbers and bring them down (Jawad M. Behbehani, 2002).

A study looking into the dental health behaviors and status of 603 pregnant Kuwaiti women in 2005 came up with several findings on the lack thereof. One third of the women interviewed self-reported belief that they had periodontal problems and one fifth felt that their oral health was poor. What was most alarming about the findings of the study was that although half of the women had visited a dentist during their pregnancy, most of them had received no instructions concerning oral health care during their pregnancy (Honkala S, 2005).

In 2001 a nationwide epidemiological survey of children aged 5-14 was conducted in Kuwait to determine the status of oral hygiene of Kuwaiti schoolchildren. The status was classified as Good, Fair, or Poor. 3294 children were examined by dentists to reveal an overall level bordering on fair. Only 3.9% of the children who participated in the survey were judged to have good oral hygiene. Oral hygiene measures need to be reinforced for the schoolchildren in Kuwait and should form a part of the school curriculum (S.A. Al-Mutawa, 2001).

Dental Care in Kuwait

Kuwait is one of the few countries in the world that provides dental care as part of the social security package to its citizens. Public hospitals receive and treat Kuwaiti patients free of charge, and often include a dentistry clinic on their premises.

There are also numerous private dental clinics across Kuwait, six in Kuwait city, which boast quality care and offer a wide variety of cosmetic procedures as well. These usually operate in cooperation with the national health insurance companies but also accept cash as a method of payment.

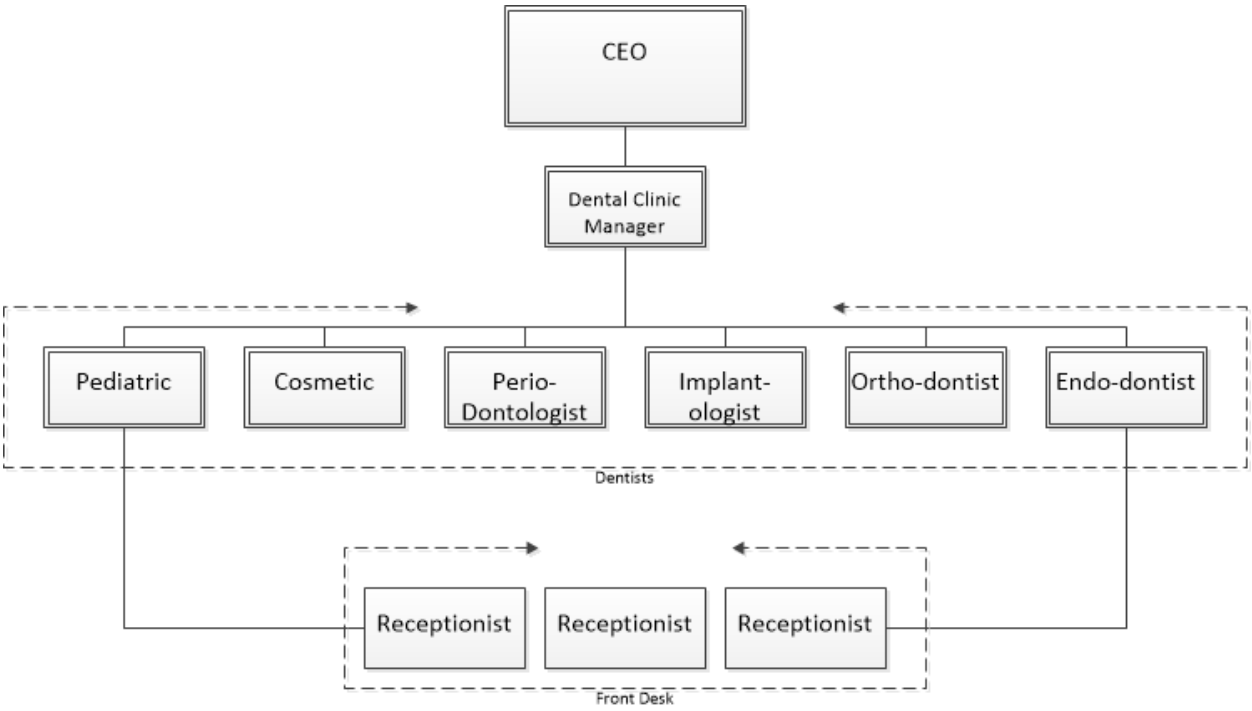
Context - Royale Hayat Dental Clinic

The Royale Hayat was established in Kuwait in 2006, and has become the standard of excellence winning the HERO award 4 consecutive times over the past 4 years. It is a hospital focused on the health of women and children, but also offering a wide range of services to the general public. These include general surgery, obesity surgery, a spa, family medicine and a dental clinic.

The dental clinic was expanded and its operations and facilities were stepped up in 2011, when it was outsourced to a private dentist. In 2012 however, the dentist decided to relocate and most of his patients relocated with him. The hospital management decided to take on the dental clinic as another hospital department, and recruited a team to manage and operate the clinic.

The current hierarchy of the Dental Clinic is as follows:

Figure 1: Hierarchy at the Royale Hayat dental clinic



NB: Illustrated for the purpose of this paper

After a year of operations however, the dental clinic's performance is not promising. The department has not been able to meet objectives and is currently in the midst of internal chaos. The dental clinic staff and their manager were at odds, and the hospital management was considering replacing the manager.

Objectives

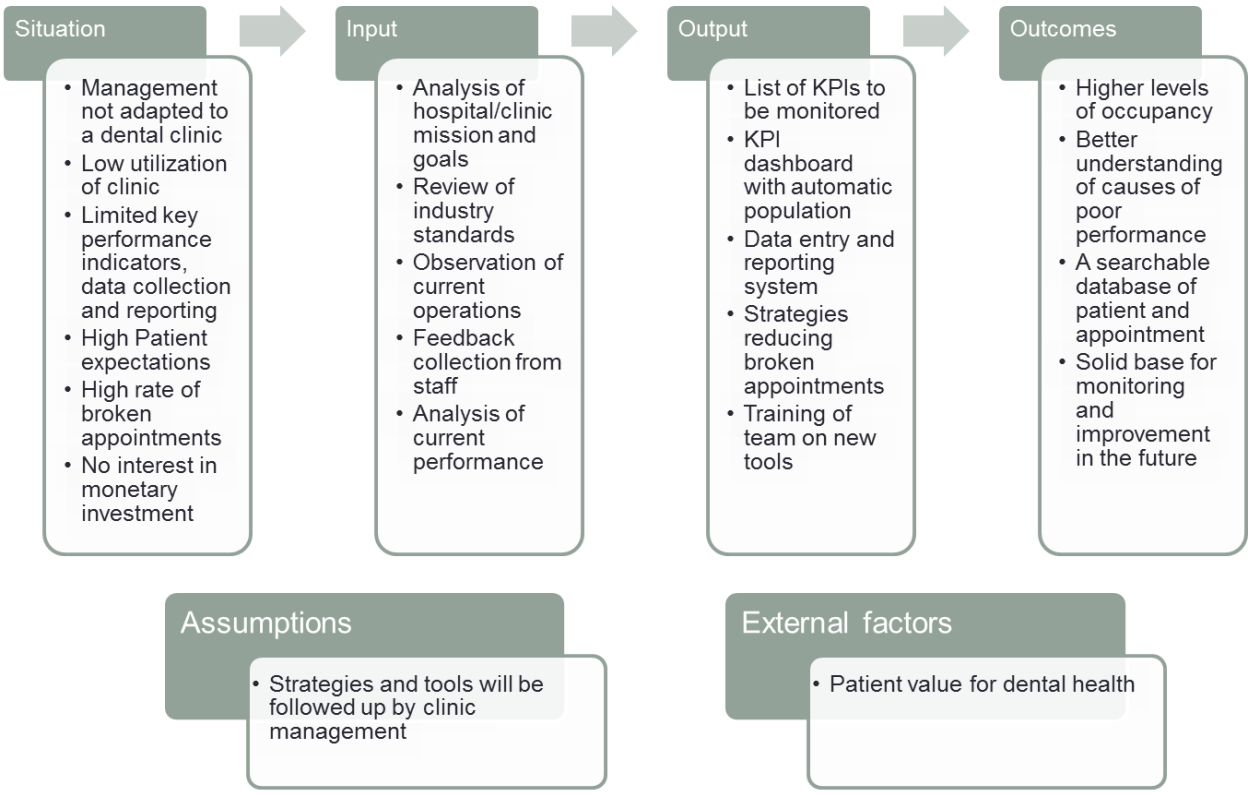
The main objective of the project, as a Master of Public Health internship at the EHESP, was to make recommendations towards the improvement of the dental clinic's performance. The scope of the projected was limited to three major problem areas due to the four month time constraint

on its fulfillment. The three problem areas that were selected as the objectives of our work are the following:

1. Key Performance Indicators
    - Building off of the existing KPIs, select a set of KPIs to be used and design them.
2. Reporting
    - Design a reporting system to monitor the clinic information and report on the KPIs.
3. Broken Appointments
    - Design strategies to reduce the impact of broken appointments on performance.

The work detailed in this paper tackling these three problem areas follows the logic presented in the figure below.

Figure 2: Logic model of the Royale Hayat dental clinic project



Materials & Methods

In order to prepare and carry out the objectives of the project, several different methods were used. For each objective a literature review was carried out to shape an understanding of the industry standards and previous work done on the matter. To understand the case of this dental clinic in specific, the general operations of the clinic were observed, informal interviews were carried out with the clinic staff, and preliminary statistics were calculated based upon the available data. Finally, the mission statement of the hospital and dental clinic were broken down into the organizational objectives and aims they represent. These methods are presented in more detail below.

Literature Review

The literature review for this project was done in two parts. The first part was based on a search of databases including PubMed, JSTOR, Science Direct, Sage, Elsevier, and Saab Medical Library. The MeSH terms used in the search included but were not limited to: [Dental clinic], [Dental clinic management], [Clinic management], [Key performance indicators], [Dental clinic key performance indicators], [clinic broken appointments]. The time period of the search covered articles published within a ten year range, 2004 – 2014. The search results were filtered first by title, then by abstract relevance, and finally the full-text selection delivered fifteen articles that were included in the final review.

The second part was based on a grey literature search for online dental resources which included consultancy firms and dental magazines among others. Some academic articles integral to this project but published before 2004 were discovered using this method and were included due to their high relevance. The main findings of the review are presented below.

One of the most common tips to increase dental clinic success is to focus on hygiene procedures. Screening every patient and recommending hygiene treatments is an important way of improving patient satisfaction and bringing in non-surgical high profit procedures (Rutledge, 2012).

Another important aspect to having an active clinic is communication. Clinics that communicate well with their patients are able to retain them, and to gain more patients through positive recommendations. Having regular team meetings to go over patient files and emphasize the importance of a warm and caring environment in the clinic can go a long way to improving the overall performance and bottom-line of the practice (Madow, 2012).

Conversation with a patient visiting a dental clinic is more often than not social in nature. Taking control of that conversation and gearing it towards patient education is a good investment of the time the patient is there. Patient education can include anything from general health tips to specific dental care information for the specific patient, and is an excellent opportunity to inform the patient about other services that are also provided by the practice that the patient could use (Kulakowski, 2012).

Managers of dental practices should not rely on the impressions they get about how a practice is performing. Statistics are easy enough to produce, and a dental clinic manager should stay up to date with the statistics of the practice and visual representations of the data in order to form educated opinions and make properly founded management choices (Morgan, 2012).

Key performance indicators (KPI's) are measures that focus on the aspects of an organizations' performance that are critical for the success of the organization (Bauer, 2004). They are generally not new to an organization, but simply have not been recognized or are not being monitored. Good KPI's tend to have the following to be non-financial measures that are measured frequently and have an impact on most of the organizations' critical success factors (Parmenter, 2007).

A KPI should tell you what action needs to take place. It should be deep enough in an organization to be tied to an individual or team that can be held responsible for its values. KPIs should be current measures, and not measures of the past or future. Any organization of any size should have no more than 10 KPIs (Sikka, 2013). These KPIs should have visual representations and should be displayed on a one-page dashboard providing an overview of operations (Olsen, 2013). Generally important things to keep track of in a dental practice are new customers, accounts receivable, production by provider, and whitening procedures among others (Levin, 2008).

Different KPIs can be represented visually in different ways. Setting up a clear and concise dashboard that displays the values of these KPIs is essential to a good monitoring and management system. There are generally three categories for KPIs: raw numbers, progress and change. Raw numbers are usually well represented with the use of bar graphs. Progress generally matches well with gauge displays. Change indicators are served well by line graphs (Olsen, 2013).

There are numerous software tools available to dental clinics, powered with automatic report generation on a wide range of clinic statistics and vital signs. In the United States, more than 70% of dental practices use computers to manage their administrative tasks and bookkeeping (Schleyer T, 2013).

One of the main problems faced by dental clinics is that of broken appointments. The main reasons behind them are financial strain, transportation, urgency and length of time between the time the appointment was taken and its actual date. A healthy dental clinic will likely have a broken appointment rate of no more than 15% (Hertz P, 1977).

Data Collection and Preliminary Analysis

Various methods exist for the collection of routine information on the operations of an organization. These include direct observation, questionnaires, interviews, and report/data analysis. In the context of this project we began with direct observation of the daily operations at the dental clinic. Next, we conducted informal short interviews and feedback queries with the clinic personnel. Finally we studied the reports generated by the clinic and explored the recorded data. The findings of each method are detailed below.

Direct Observation

In order to understand the flow of work at the dental clinic and better relate to the team, a month was spent at the front desk. The daily routine was observed, from opening to closing. This included learning to use their management software and becoming familiar with the printed reports they produced. The outcome of this observational period was an understanding of the workflow and the gaps therein.

The clinic opens its doors to patients at 8:30AM, but the staff begins their shift at 8AM. The receptionists print out the appointments by doctor for the day. They keep a copy and provide each doctor with a copy as well. Throughout the day as patients arrive for their appointments, the front desk welcomes them. If patients do not show up for their appointment this is noted down on the printed sheets.

At 11AM the front desk begins calling the broken appointments of the day before to ask them if they would like to reschedule. They do not inquire as to the reason for the missed appointment, and they do not call back if the phone is not picked up the first time. If a patient agrees to reschedule, a new appointment is booked and the printed t sheets of the day before are filed away.

After an appointment is completed, the dentist might request follow-up on a patient. This request is noted down on the printed appointment list of the front desk and the patient is called the next day in similar fashion to the broken appointments. Any feedback that is received from the patient is communicated to the doctor verbally.

If a patient walks in without an appointment but wishing to see a dentist, the front desk inquires as to the urgency of the situation. If there is no urgency, they book an appointment at the first opening in the following days. If the matter is urgent, they fit the patient in the schedule for the day with a dentist that has a gap in his or her schedule. There are however, no emergency hours at the dental clinic and if the schedule is full there is no guarantee the emergency patient will be able to see a dentist.

The information described above regarding the daily operations of the dental clinic has been illustrated for the purpose of clarity. Figure 2 on the following page depicts the flow of a day of work at the dental clinic. Figures 3 and 4 portray the timeline of a regular day of work for a receptionist at the clinic and for a dentist respectively.

There is no time set aside in the daily schedules for team meetings or briefings. Overall we get the impression that the hours of the shift are not utilized fully by any member of the team. Dentists are tasked only with seeing their patients, but their schedules are never complete. As for the receptionists, their tasks are not that plentiful and they are spread across three team members. This is all time that could be invested into activities that will generate more revenue in the long run.

Figure 3: Flow chart of daily operations at the dental clinic as observed by us

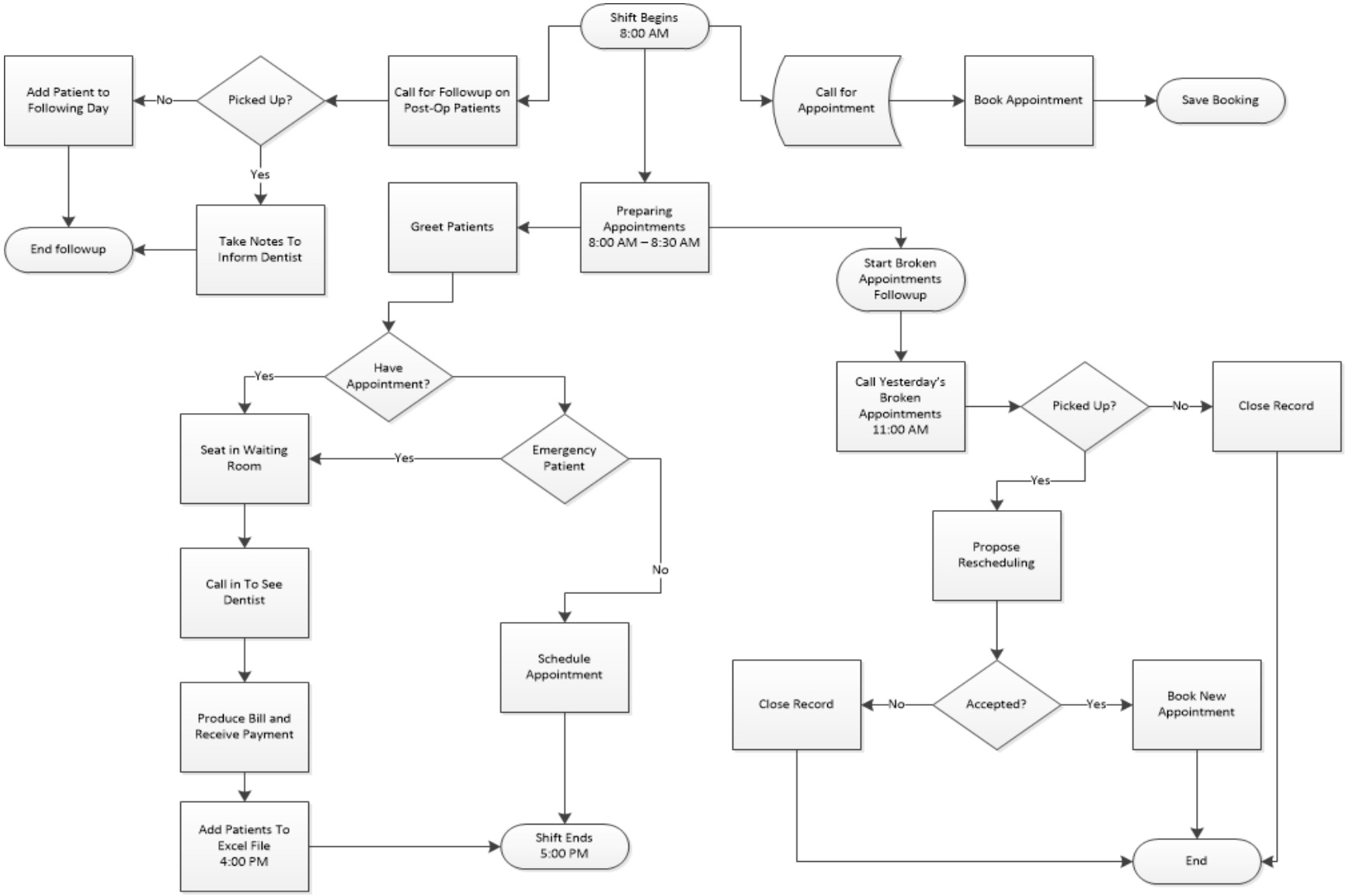


Figure 4: Illustration of daily time utilization – Receptionists

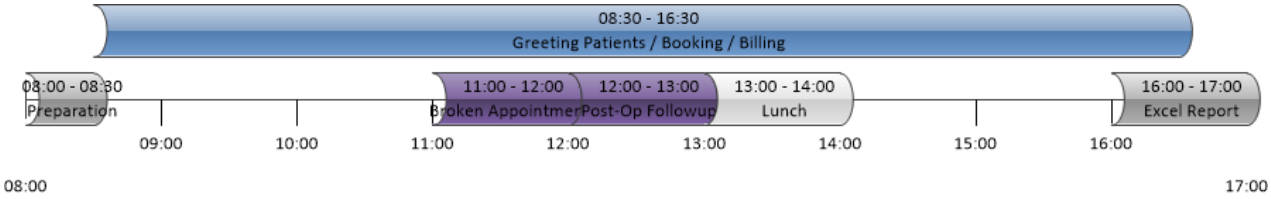
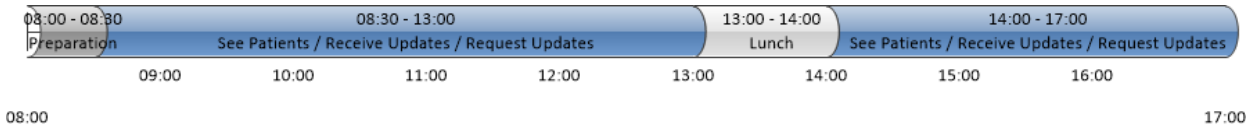


Figure 5: Illustration of daily time utilization – Dentists



The dental clinic does not have consolidated data storage or reporting systems. The only data compilation done at the clinic is for a monthly report that is submitted to the ministry of health. The report communicates the number of patients seen, the percentage that were new patients, and demographics such as gender and nationality as well as the method of payment. This report is produced on an Excel sheet manually; the front desk updates this file daily and generates the totals at the end of each month. An example of this report is available in appendix 2. All national dental clinics deliver a similar report to the ministry of health on a monthly basis.

We extracted the data from these reports over the months of January, February and March 2014 to get an overview of the activity of the dental clinic in the quarter under study. This information is compiled for reference in Table 1 on the following page.

As Table 1 shows, over 20% of the patients that attended the clinic through the months of January to March were new patients, and the larger part of patients was female. More than 4/5 of the patients were of Kuwaiti nationality.

Table 1: Statistics from the Royale Hayat Dental Clinic Jan-Mar 2014

Month	Kuwaiti	Non Kuwaiti	Female	Male	Old	New	Total
January	460	73	341	192	381	152	533
February	472	92	340	224	467	97	564
March	436	92	315	213	397	131	528

Source: Royale Hayat dental clinic records

Also scheduled on a monthly basis but not consistently delivered, the dental clinic manager prepares two reports based on performance indicators: chair occupancy rate per dentist and revenue per dentist. These indicators have not been calculated since December 2013.

The chair occupancy rate per dentist is a calculation of the number of hours a dentist spends with patients in his or her chair divided by the number of hours the dentist was on duty for the month. The chair occupancy rate (COR) per dentist "i" is given by:

$$COR_i = \frac{\sum hours\ seeing\ patients}{\sum hours\ on\ duty}$$

The current formula utilized by the clinic uses constant dental visit times; one hour for regular patients and thirty minutes for pediatric patients per visit, regardless of real-time duration of visits.

The revenue per dentist report is produced by the clinic billing system automatically. The total monthly revenue of each dentist is divided by the number of patients they saw to obtain the average revenue per patient which is used to determine the bonuses for the dentists; the higher the average revenue per patient the higher the bonus. The revenue rates were considered confidential information and were not shared with me.

Although not calculated consistently, whenever they were the calculations were performed by the dental clinic manager who simply communicated them via email, with no standard reporting mechanism in place.

Through the observation of the dental clinic operations it became evident that there was a lack of standardization for data collection and reporting and no appreciation of the importance of monitoring operations. There was also a great deal of manual data entry in the day to day tasks, extending to the historical records and necessitating manual data mining for any report generation.

Informal Interviews / Personnel feedback

During the month spent assisting at the front desk we managed to collect feedback on what the different staff members believed to be the most pressing issues facing the dental clinic. Due to internal restrictions, formal interviews were not allowed with the clinic staff. The information provided below was attained in the form of informal and casual exchanges and as such is presented only to give additional context and not to provide an analytical view.

The front desk employees complained about the large number of broken appointments and attributed the cause to the Kuwaiti nonchalant attitude. They also complained about the limited number of features that they could access through the clinic management software that they used to book appointments, and the fact that they had to enter the appointment information into the system but then continue the remainder of the work manually on printed sheets or Excel files.

The dentists mentioned two main problems that they felt should be attended to before all others. First of all they were bogged down by the fact that their patients did not have accessible electronic medical files. The files of scheduled patients had to be retrieved from the filing room prior to appointments and as hard-copies could not be searched or indexed as quickly or effectively. The second problem that they were encountering was conflict over the equipment they needed in some of their procedures as some of the new and advanced devices that had been purchased for the clinic had to be shared amongst the dentists.

The dental assistants or dental nurses only reported one problem which affected the performance of the dental clinic; that of stock-outs. They explained that quite often they would run out of basic material needed during the dental procedures, such as certain types of cotton or wiring. They were not in charge of procurement, and although they had voiced their concerns and suggestions over the quantities that should be ordered, they were still running out from time to time.

The dental manager had a somewhat different view of the dental practice's performance. In her opinion the practice was doing well, and the only problem was that there was not enough marketing being done for the services provided by the clinic. She believed that more marketing, aimed at the younger generation, would bring in more patients and boost the clinic's performance.

Table 2: Summary of feedback collected from clinic staff

Position	Main Problems	Reasons
Front Desk	Broken appointments, Software system	Kuwaiti temperament Cost
Dental Assistant	Stock-outs	Purchasing strategy
Dentist	Software System Equipment conflict	Cost Cost
Manager	Lack of marketing	Cost

Preliminary Data Analysis

The chair occupancy rate had not been calculated for the first quarter of 2014. Provided with the number of patients and the working hours of the dentists we were able to estimate the rate. The values are available in table 3 below. Our calculation employed the clinic's own formula detailed earlier. The difference in patient time for the pediatric dentist was accounted for in the sum of the calculation.

Table 3: Chair occupancy rate for the period Jan - Mar 2014

Month	Adult Patients	Ped. Patients	Total Patients	Patient Hours	Dentist Hours	Occupancy Rate
January	400	247	533	523.5	1164	45%
February	368	215	564	475.5	1080	44%
March	312	192	528	408	1188	34%

Source: Compiled from Royale Hayat dental clinic records

The occupancy rate at the clinic never exceeds 45%. Similar rates were observed for the months in 2013 that were reported on, with an average occupancy rate of 42% in 2013. It is definitely a red flag to have a clinic with six dentists and three receptionists that only have patients in their chairs half of the time they are on duty. To try to find an explanation for these low occupancy rates, we went to the daily appointments and investigated the trends in scheduling.

From the first day that we examined it was evident that there were many more appointments booked than patients arriving into the clinic. We went through the appointments for each day and calculated the broken appointment rate by dentist and for the clinic as a whole. Table 4 presents the main results.

The Prosthodontist had the highest average broken appointments rate across the 3 months, but the rate was consistently above 25% for all the dentists throughout the period which is a significantly high percentage of broken appointments to have in a practice. Interestingly, although the dental clinic was aware of the broken appointments problem, they did not have these rates already calculated nor did they have any strategies in place to attempt to minimize them.

There were no days for any dentist that did not have a single broken appointment, although there were some days where all of the appointments scheduled for a dentist were not fulfilled. These rates are in tandem with the low rates of occupancy that were demonstrated in the previous table and could be a good doorway to increase the productivity of the clinic.

Table 4: Broken appointment rates for Jan-Mar 2014

Month	Doctor	Completed	Broken	% Broken
January	Periodontist	30	11	27%
	Endodontist	81	29	26%
	Pediatric	172	65	28%
	Prosthodontist	75	88	53%
	Cosmetic	88	30	24%
	Orthodontist	99	43	30%
January TOTAL		**545**	**266**	**33%**
February	Periodontist	28	15	35%
	Endodontist	125	31	20%
	Pediatric	179	61	25%
	Prosthodontist	64	29	31%
	Cosmetic	70	37	35%
	Orthodontist	110	42	28%
February TOTAL		**576**	**215**	**27%**
March	Periodontist	30	16	35%
	Endodontist	98	69	41%
	Pediatric	179	71	28%
	Prosthodontist	67	22	25%
	Cosmetic	85	32	27%
	Orthodontist	64	44	41%
March TOTAL		**523**	**254**	**33%**

Organizational Objectives Analysis

To begin setting performance indicators we must first understand what the mission of the team is. Their objectives are all based on this mission, and the performance indicators must measure the level at which these objectives are met. We retrieved the mission statements of both the hospital and the dental clinic and studied them to form an understanding of the key themes and goals that the Royale Hayat would be interested in achieving. This work is detailed below along with a table to demonstrate the extracted concepts.

Hospital Mission Statement

"Royale Hayat promises to deliver safe, modern and quality medical care and services to society in an environment of compassion, comfort and care. We will achieve this by redefining and setting global benchmarks in hospitality and through providing a culture of continuous learning, innovation and excellence in healthcare." (Royale Hayat, 2013)

Dental Clinic Description

"Our Royale Dental Clinic provides the latest techniques using the most advanced dental technology. Whether its pediatric dentistry for your little ones or cosmetic dentistry, restorative treatment and full rehabilitation of the mouth for you, we offer the most luxurious ambience, state-of-the-art technology combined with the expertise of specialized dentists who will listen to and address all your needs." (Royale Hayat, 2013)

These two texts reveal themes in the intended operations and services provided, which can then be used to verbalize the goals that the dental clinic has to achieve. With the goals in mind, performance indicators can be set to measure how well they are being met. The interpretation of the mission statement into its themes and goals can be subjective, which is why it was done in coordination with the Royale Hayat Hospital management, who contributed to the interpretation and approved the final result as containing the main points they would like to focus on. They also added the unspoken but well-known theme of profitability to the equation. Research was also done into existent dental clinic KPI's used internationally and these standards influenced the final list. The expansion from the texts of the mission statement and dental description to performance indicators is documented in the table on the following page.

Although table 5 contains many performance indicators, only a subset can qualify as *key* performance indicators. The final subset selected can be seen in the results section of this paper.

Further details on how the KPIs were selected are available in appendix 1.

Table 5: Compilation of the themes derived after analysis of the Royale Hayat hospital and dental practice mission statements

Theme	Vocabulary	Goals	Performance Indicators
Medical care	Safe, modern, quality, continuous learning, innovation, excellence	Abide by all safety protocols at all times. Use newest EBM approaches. Provide highest quality care. Stay up to date with new medical developments. Dentists and nurses trained with the latest techniques. Develop new methods and improve existing ones. Provide excellent care up to all medical standards	1. # safety incidents 2. # medical errors 3. Test scores for staff 4. # patients with post-op problems
Environment	Compassion, comfort, care, listening, luxurious	Patients feel understood and cared for. Patients are comfortable throughout their clinic path. Patients are given the full attention of all staff members. Patients are pampered during their visits at the clinic.	1. Patient satisfaction score 2. Empl. satisfaction score 3. Waiting times 4. patient complaints / dentist 5. Treatment acceptance
Technology	Latest techniques, most advanced technology, state-of-the-art	The equipment is up to date. The equipment is well-maintained. The stock of needed tools/materials is sufficient. The staff training is up to date with the technology.	1. # times machine repaired 2. Time / repair 3. Age of on hand equipment 4. # of times out of stock 5. # of equipment conflict 6. # of times no equipment
Profitability	Unspoken	Steady flow of new patients into the clinic. Existent patients are maintained and have continuous visits. Low cost high profit procedures are performed often. Operating expenses are kept to a minimum. Services of the clinic are marketed. Operating hours of the clinic are fully utilized.	1. # new patients 2. # visits / old patients 3. # patients lost to follow-up 4. # high profit procedures 5. # high cost procedures 6. Chair occupancy rate 7. # Cancellations/no-shows 8. # Total patients / month 9. Accounts receivable

Results

Key Performance Indicators

The eight KPIs selected are detailed below and simulations of the graphs can be found in Appendix 3.

Number of times with no equipment (1/8)

It is calculated on a daily basis for rapid notification and correction. It is represented by a bar chart for each day of the week.

Number of times out of stock (2/8)

Tracked by the number of times the reserve stock is accessed, this indicator is represented by a line graph to show the increasing rates of access as the week progresses.

Chair occupancy rate (3/8)

With a goal of 80% daily occupancy, the occupancy rate will be tracked on a daily basis and represented in a bar chart with a bar for each day of the week and a trend line to emphasize the way things are flowing.

There will also be a week to week representation of chair occupancy to give an overview of the entire month. This will be represented by a line graph.

Percent Broken Appointments (4/8)

The reduction of broken appointments being one of the main objectives of the dental clinic, this indicator will be calculated on a weekly basis to account for appointments rebooked during the same week. It will be represented by a gauge graph, with broken appointments over 25% being in the red.

There will also be a week to week representation of broken appointments to give an overview of the entire month. This will be represented by a line graph.

Number of patients seen (5/8)

Keeping track of the total number of patients seen and the subset that are new patients will be done on a weekly basis. A bar graph will be used to illustrate the percentage of the week's

patients that are returning versus those that are newcomers. A line graph will be used to depict the total number of patients per week.

Number of medical errors (6/8)

A medical error being a grave occurrence, this indicator will be monitored on a daily basis and represented by a bar graph with a bar for each day of the week.

Number of patient complaints per dentist (7/8)

Monitored on a daily basis to maintain control over complaints and customer satisfaction, the complaints reported per doctor will be displayed in a bar graph with all dentists' numbers displayed side by side.

Number of high profit procedures (8/8)

With a goal of reaching 30% high profit procedures, this indicator will be monitored on a weekly basis, and represented by a line graph for each week of the month.

Reporting

We designed an Excel workbook template with different sheets serving different purposes for use in the dental clinic. One workbook should be created for each month. The workbook includes data entry sheets for the general appointment information as well as for specific data needed for some of the KPIs. The file also includes a sheet that represents the KPI dashboard and automatically populates data into the charts and graphs based on the data entry that has been done. Screenshots from the workbook can be seen in Appendix 4.

Once the workbook was prepared, all of the team was trained on its use. The receptionists were trained on filling it in, while the entire team was made familiar with the dashboard and the interpretation of each of the items it contained. It was placed in a shared location on the computer network with permission to edit for each of the receptionists and the dental clinic manager, and permission to view for the entire dental team. Everyone was encouraged to study it on a daily basis at the beginning of their shift.

Broken Appointments

With no data collected by the dental clinic surrounding broken appointments it was difficult to analyze the main causes for it. Based on the feedback received from the dental clinic staff themselves, the main causes were length of time between the date the appointment is booked

and the actual appointment date, and the lack of understanding on the part of the patient of the importance of dental care notably in the absence of pain or trouble eating.

In the reporting section, the workbook described includes fields to track the status of appointments and filter to all broken appointments in a given month. It also includes a sheet dedicated to the broken appointments which the receptionists will use during their callbacks the following day. They will record information such as whether or not the patient picked up, the number of times they tried calling him/her, and whether or not they had rescheduled the appointment. The receptionists will also have to fill a field with the reason the patient did not come to their appointment.

Over time as this workbook is used and information is collected about broken appointments, tendencies will begin to appear and analysis will be possible in order to better understand the issue as it pertains to the Royale Hayat dental clinic case. This includes being able to isolate repeat offenders and treat their bookings differently.

There are many different strategies to minimize broken appointments. Their effectiveness depends on the manner in which they are implemented as well as on the attitudes of the patients. With the Royale Hayat dental clinic in mind, four different strategies were selected to be used together in order to reduce and deter broken appointments.

1. **Reminders**
   Texting or emailing the patient the day before their appointment to remind them of its date and purpose can encourage patients to honor their commitment. Also, providing them with information on the due process should they desire to cancel can increase the number of patients who notify the clinic of their inability to make the appointment, giving the clinic a heads up that there will be gaps that need to be filled. This could be done by personal phone calls rather than texting or emailing, but phone calls may be seen as too intrusive in some cases.
2. **Delayed Rebooking**
   If a patient does not show up to an appointment, rather than reschedule them at the earliest available slot, usually in the same week, push the appointment back. This will emphasize the importance of making it to appointments and remind patients that their time slots with their dentist are valuable and not easily replaced. This can be explained to patients when they book their first appointment with the clinic, letting them know that if

they miss the appointment they will lose their place in the line and re-enter the queue for a time with the dentist at the back.

3. **Restrict Appointment Times for Repeat Offenders**
   Repeat offenders disrupt the dental clinic schedule perpetually. If a patient has broken their appointment on more than one occasion then one way to curb the impact that has on the operations is to restrict their future appointments to times of the day that are generally less desirable. If there are generally more patients looking for appointments in the afternoon than in the morning then don't give repeat offenders afternoon slots.
4. **Don't Schedule too far in Advance**
   While some practices and patients might find it helpful to be able to schedule an appointment four or six months in advance, it is usually more difficult to keep appointments that were set so long ago. Try to keep the range of appointments down to two months, and even less if possible. If appointments need to be schedule that far in advance, set a reminder to call the patient for confirmation of the specific date one month to two weeks beforehand; they will have a more realistic view of their time-table for that date and will have the opportunity to make slight modifications if that suits them better.

Strategies that rely on financial deterrents to discourage broken appointments were dismissed as they would not be effective on the Kuwaiti population.

Discussion

How can the performance of a running and fully staffed dental clinic in a luxury hospital be improved? In the case of the Royale Hayat dental clinic the three main problem areas to be tackled in order to begin improving performance were developing key performance indicators, setting up a standard and consistent reporting system and reducing the number and impact of broken appointments.

Key performance indicator experts such as David Parmenter tell us that KPIs are essentially the pulse of an organization; they are the window into its health and activity (Parmenter, 2007). KPIs are specific, and their outcomes can help pin-point problem areas within an organization quickly. Each KPI reports on one or more critical aspects of a business's performance. When designed to represent the main objectives of the organization, they are an indispensable tool for managers to keep their ship on track.

In the case of Royale Hayat there were no key performance indicators for the manager to rely on to assess the performance of the clinic. Designing a set of indicators drawn from the mission statement of the hospital and clinic and endorsed by management delivers a dashboard that can provide instant snapshots of the health of the clinic. The eight KPIs that were selected ranked highest in importance as per the vision of the hospital and once they are reported on consistently will provide managers with up to the day information so that they can react to changes and problems as soon as they appear and even predict them.

In terms of the chair occupancy rate, the formula used by the clinic was maintained although the constants that it uses to represent patient visit time potentially skew the results and as such do not play their role in highlighting issues in the performance of the dental clinic. The reporting system implemented however, discussed below, includes appointment start and finish times. Each day that appointments are filled out using the new data entry system is a day where accurate chair occupancy rates can be calculated.

The utilization of the indicators will also affect how well they are received. For example, the current system of giving dentists bonuses based on the average revenue per patient that they make is unfair and does not encourage healthy competition or incentive. Some procedures may have a lower price-tag on them but also a higher profit margin, such as whitening. A dentist that sees a larger number of patients but performs lower cost procedures, such as the pediatric dentist, could never compete with the revenue of a dentist who sees fewer patients for surgical procedures, such as the implantologist.

The standard time for designing and implementing KPI reporting is six weeks. The last four weeks of the project were dedicated to familiarizing the staff with the new data entry tools they were to use and the reports and KPIs they would be generating. It stands to reason that having become comfortable with the tools in those four weeks, two additional weeks would be enough to start producing KPI dashboards with relative ease.

This leads us to the second part of this project, a prosthetic reporting system. It is prosthetic in the sense that it does not flow naturally out of the structure of the dental clinic and the software they are already using, but has been designed and pasted on top of said structure. Data collection and reporting is at the heart of the clinic operation. Nothing can be assessed or evaluated without data to work with. This is not only true for performance and business points of view but also for patient follow-up and care.

Designing an Excel workbook as the data entry and reporting tool was the best fit because it required no additional charges on the hospital and no training cost for the staff. Making the workbook available to all of the clinic staff to view implicates the entire team in the performance of the dental clinic as opposed to the previous approach of calculating two indicators privately and communicating them only with management.

With the occupancy rate ceiling at 45% the dentists already have a lot of patient-free time on their hands without the additional gaps created by broken appointments and yet they are plagued by them. Reducing the number and impact of broken appointments will reflect on the occupancy rate, especially with a current minimum of 25% broken appointments every month.

Reducing broken appointments should be based on strategies that are customized to the specific context and case. The lack of information however, renders that difficult to achieve. Prospectively speaking this information will become available through the new reporting system and the strategies can be tweaked accordingly. There is no shortage of guidelines on general strategies however, as broken appointments are chronic problems in most health practices. As such, a combination of strategies was selected for the dental clinic to employ.

Kuwaiti nationals are well known for their pride and their nonchalance with money. Although in many practices around the world implementing financial deterrents for patients to avoid breaking appointments is effective, in Kuwait it would not be. Most patients would not be affected at all, while a small proportion might be offended that they are being penalized. It was thus agreed that financial deterrents could be dismissed from the list of strategies and focus could be directed to other methods.

Another strategy that was dismissed is that of double-booking. Although scheduling two appointments within ten minutes of each other could save the day if one of them is canceled, it adds pressure on the dentist to work faster if both patients show up. Pushing the dentists to work faster in order to see more patients does not align with the hospital and dental clinic vision where excellence in quality and patient treatment are the priorities.

It was surprising to find that there were virtually no monitoring systems in place at the dental clinic to keep track of operations. Management was relying mainly on revenue reports which indicated poor performance but were not helpful in diagnosing the causes. It is this gap that pushes KPIs and reporting to the top of the list of priorities in problem areas for the dental clinic.

Once they are implemented and running more meaningful vitals on the clinic will be produced and actions to remedy the situation will be easier to design.

Among the keys to improving performance and increasing success in a team environment, such as the clinic, is nurturing team spirit and ownership. The more the team feels united and personally implicated in the success of the clinic, the harder they will try to achieve that success. There are very many resources and schools of thought on team management and motivation, and just as many exercises to build team spirit and incentivize the team to perform better. These need to be looked into for the case of the Royale Hayat dental clinic, especially in the aftermath of the problems with the dental clinic manager.

A luxury dental clinic must deliver more than just quality in the procedures the dentists perform. Patients must feel cared for in every aspect of the clinic operations, and satisfied patients are the best way to grow the clinic business. One good approach is to become more involved in patient health. Utilizing the patient visit time to educate the patient on dental health issues and best practices, inform them of packages on offer, and take the time to notice symptoms or signs of non-dental health issues is a sure way of increasing patient satisfaction. The patient will not only be encouraged to purchase more services from the clinic, but will also feel that it is their health that is important to the clinic and not just their money. Achieving this form of interaction between the dental clinic staff and patients requires training, guidance and follow-up from the dental clinic manager and should be looked into in the future.

Limitations

Access to information from previous time-periods was denied, as was access to the production figures of the dental clinic. Interviews with the dentists working in the department were also refused due to the internal conflict between them and their manager. This limited the research that could be done into the actual performance of the dental clinic and barred the project from the in depth insights of the main players at the clinic; the dentists.

The hospital management was not willing to invest in their clinic management software and unlock the reporting features that are bundled with it. This had a negative impact on the work being done at the clinic. For one, it meant that all the reporting had to be done manually. For another, it meant that despite the introduction of a custom design Excel template for data management, there would still be some redundancy in data entry as appointments would still have to be booked on the system even if they are entered on the Excel workbook.

The feature-poor clinic management software also had a crippling effect on the types of indicators that could be realistically tracked. For example, tracking the number of patients who were lost to follow-up is a tedious and impractical task without the help of software that combines both the complete patient database and the patient appointments.

The work on the project shed the light on many different issues that need to be tackled at the Royale Hayat dental clinic in order to improve performance. The recommendations however, were limited to three problem areas, leaving many of those issues unmanaged. It was thought, that the selected three problem areas would form a base from which to build upon. This is especially true in establishing key performance indicators which will later on be useful in determining what areas of the dental clinics' performance need to be improved. Also, many of the issues that would need to be addressed, such as employee satisfaction or team unity and spirit, cannot be before the internal conflict in the department is resolved.

An unexpected obstacle limiting the results of this project was the lack of standard durations for the different medical procedures performed by dentists. Some data could be found on the average time for major dental surgeries but not much on the daily procedures dentists perform. The dentists themselves when questioned would not give standard times insisting that each patient was unique in the care he or she required. As such, the constants used in calculating the chair occupancy rate could not be modified. Clinic management software is available that tracks the actual time of patient appointments for the calculation rather than using averages. The list of dental clinic management software is long, but popular solutions include AceDental, DoveTail and Dentrix (Top Ten Reviews, 2014).

A final limitation of this paper is that the project was concluded at four months while the recommendations made herein were still in their beginning phases of implementation. As such, the impact of these recommendations could not be measured for the scope of this study.

Conclusion

Oral health, long underestimated, is beginning to get the attention it deserves in the public health sphere. Although the process is gradual, requiring changes on every level from the personal to government policy, it is happening as science continues to link poor oral health to negative health outcomes.

As different players take up their roles in affecting the aforementioned change, dental clinics must take up theirs; which is one of the most valuable as dispensaries of care. But similar to any

other organization, before dental clinics can begin to influence the outside world they need to have their internal systems under control; they need to have good management of their operations.

Perhaps among the most important things that good management can do is foresee or diagnose problems with performance and identify their causes. Without the proper tools however, this is virtually impossible. At the Royale Hayat dental clinic we worked on establishing a dataset, deriving information from it, and strategizing based on that information. This information can reveal problem areas and also track the effect of implemented solutions. A quick analysis of the appointment data for example, led to identifying the rate and significance of broken appointments on the clinic's performance.

The Royale Hayat Hospital promises excellence to its patients. It falls short on delivering this promise when it comes to the dental clinic, a problem that the hospital management is not blind to. Improving the performance of the dental clinic will add to the image of the hospital as a whole and potentially generate more revenue as well. More importantly though, improving the performance of the dental clinic will have benefits that are reflected in each and every patient who visits it and ultimately an impact on the population's public health.

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Appendix 1

Appendix Table 1: Performance indicators and the areas they affect

	Medical Care	Environment	Technology	Profitability	Total
# of times equipment conflict	Yes	Yes	Yes	Yes	4
# of times no equipment	**Yes**	**Yes**	**Yes**	**Yes**	**4**
# of times out of stock	**Yes**	**Yes**	**Yes**	**Yes**	**4**
Chair occupancy rate	**Yes**	**Yes**	**Yes**	**Yes**	**4**
# Cancellations/no-shows	**Yes**	**Yes**		**Yes**	**3**
# medical errors	**Yes**	**Yes**		**Yes**	**3**
# new patients	**Yes**	**Yes**		**Yes**	**3**
# patient complaints / dentist	**Yes**	**Yes**		**Yes**	**3**
# patients lost to follow-up	**Yes**	**Yes**		**Yes**	**3**
# safety incidents	Yes	Yes		Yes	3
# Total patients / month	Yes	Yes		Yes	3
# visits / old patients	Yes	Yes		Yes	3
Treatment acceptance	Yes	Yes		Yes	3
# high profit procedures done		**Yes**		**Yes**	**2**
# patients with post-op problems	Yes	Yes			2
# times machine repaired	Yes		Yes		2
Age of on hand equipment	Yes		Yes		2
Employee satisfaction score	Yes	Yes			2
Patient satisfaction score		Yes		Yes	2
Time / repair	Yes		Yes		2
Waiting times		Yes		Yes	2
# high cost procedures done				Yes	1
Accounts receivable				Yes	1
Test scores for staff	Yes				1

Appendix 2

Table 6: Monthly report submitted to MOH

TOTAL-January 2014

Dr.Name	Nationality		Gender		Status		Payer		
	Kuwaiti	Non Kuwaiti	Female	Male	Old	New	Cash	Insurance	Employee
Dr.Saud	161	13	84	90	133	42	108	65	
Dr.Ghaleb	74	14	62	26	71	17	68	14	6
Dr.Noor	89	6	68	26	53	41	91	2	1
Dr.Khalid	61	9	47	23	44	26	48	17	5
Dr.Roland	55	25	58	22	57	22	55	13	12
Dr. Abdulaziz	20	7	22	5	23	4	24	2	1
Total	460	74	341	192	381	152	394	113	25

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REVIEWED BY: SOUAD MOWAFI
DATE:1/2/2014

مستشفى رويال حياة
ROYALE HAYAT HOSPITAL

Appendix 3

Figure 6: Number of times there was no equipment available

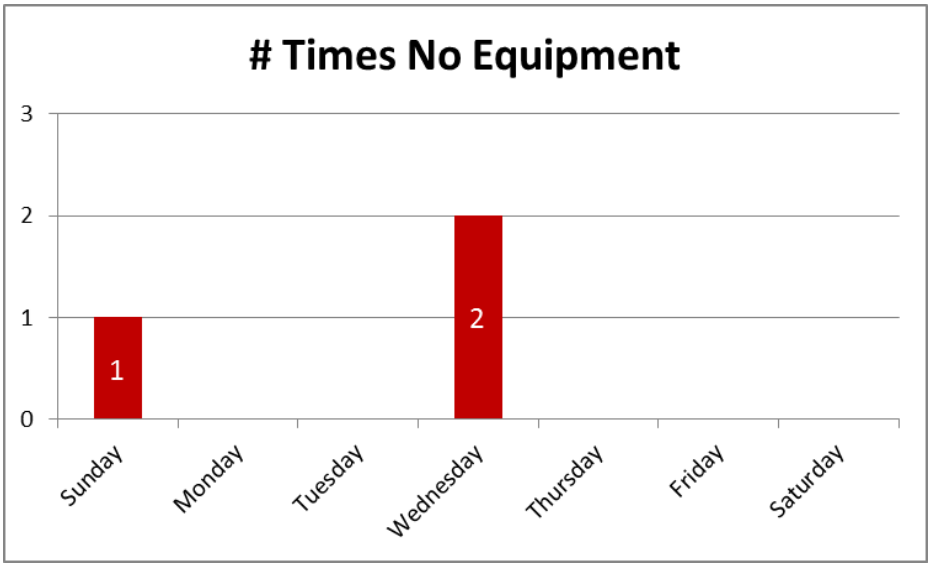


Figure 7: Number of times Reserve stock is accessed

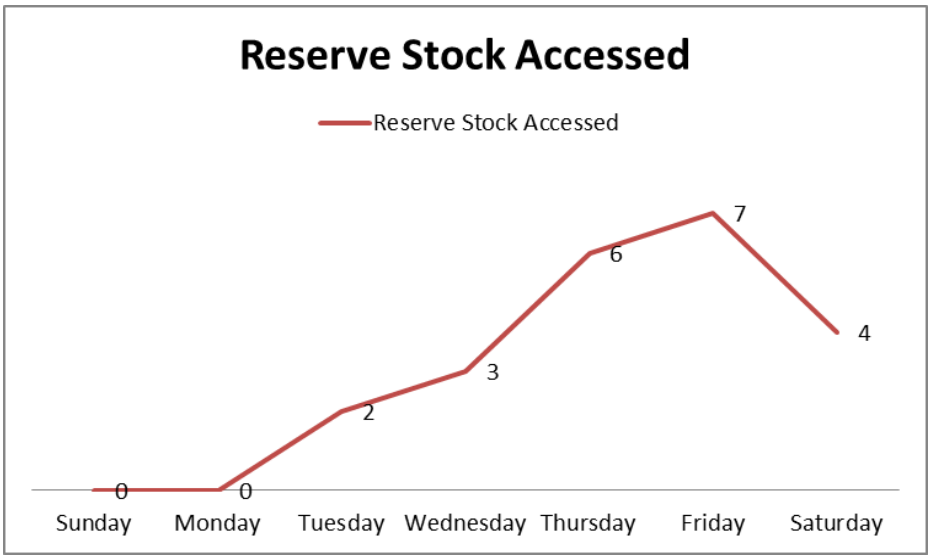


Figure 8: Number of medical errors that occurred

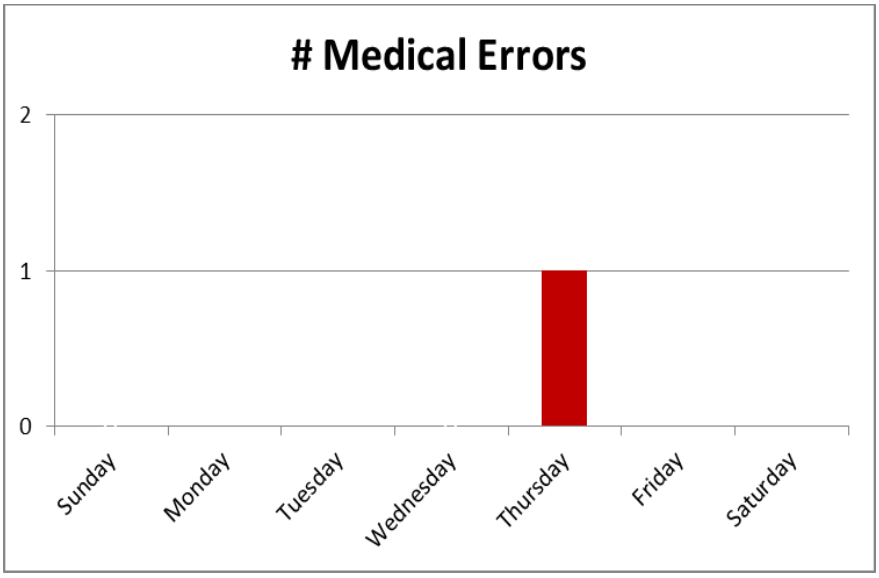


Figure 9: Number of complaints per dentist

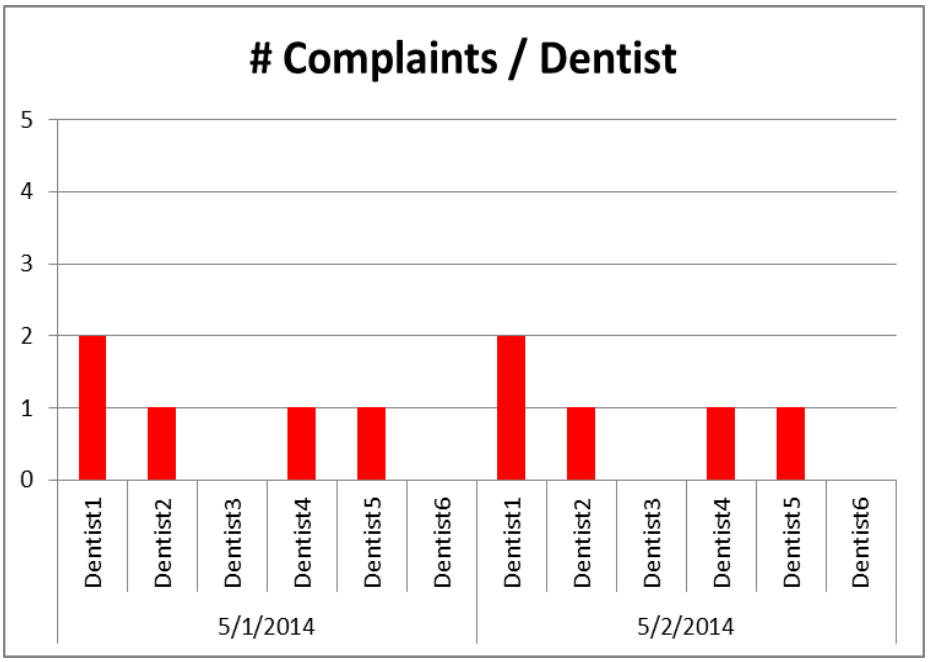


Figure 10: Graph for daily chair occupancy percentages

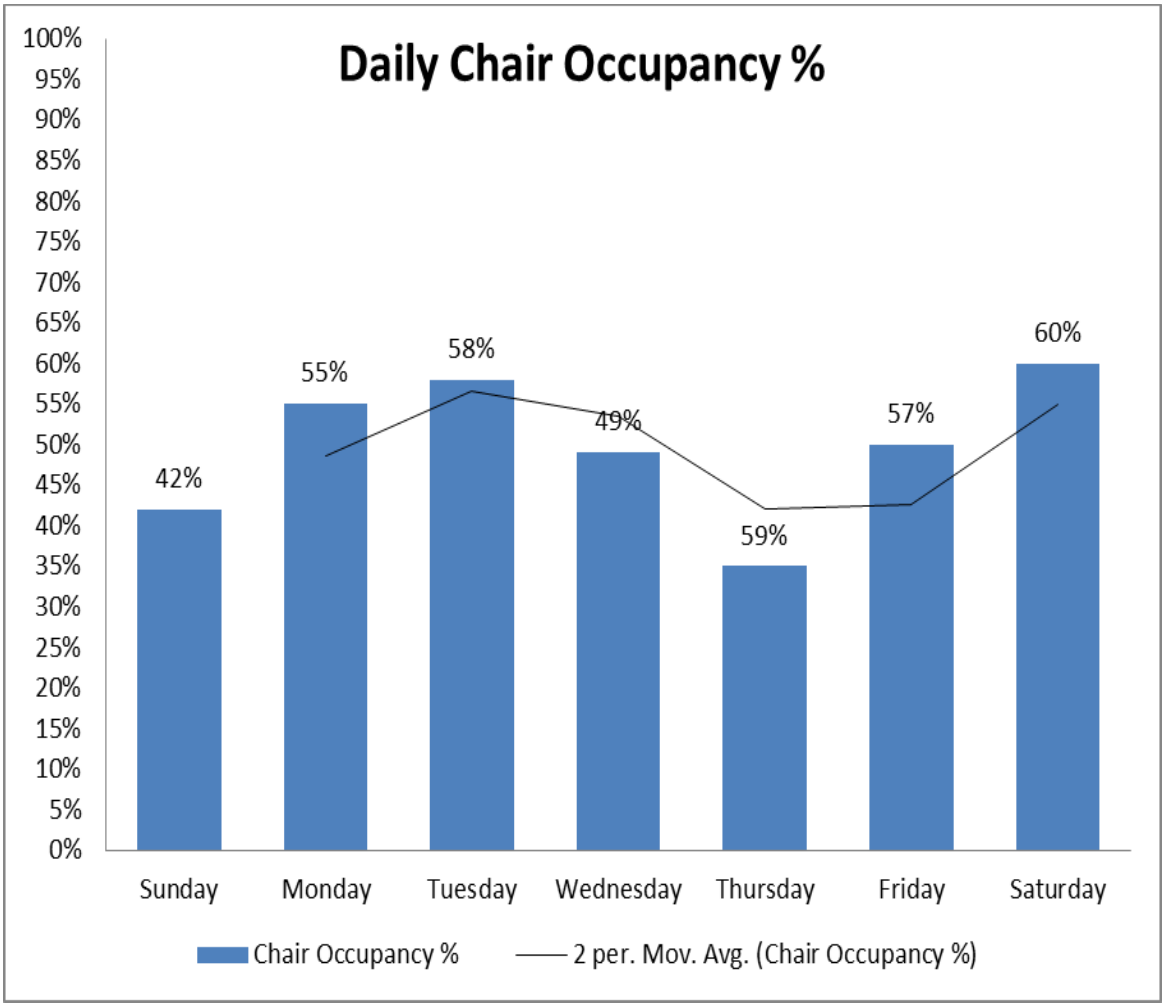


Figure 11: Gauge chart for broken appointments

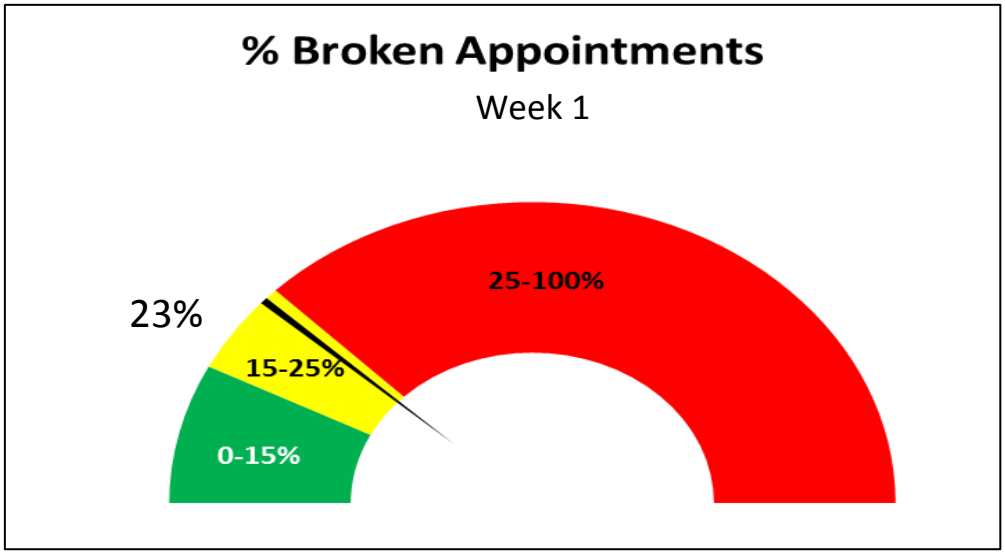


Figure 12: Graph of weekly broken appointment rates

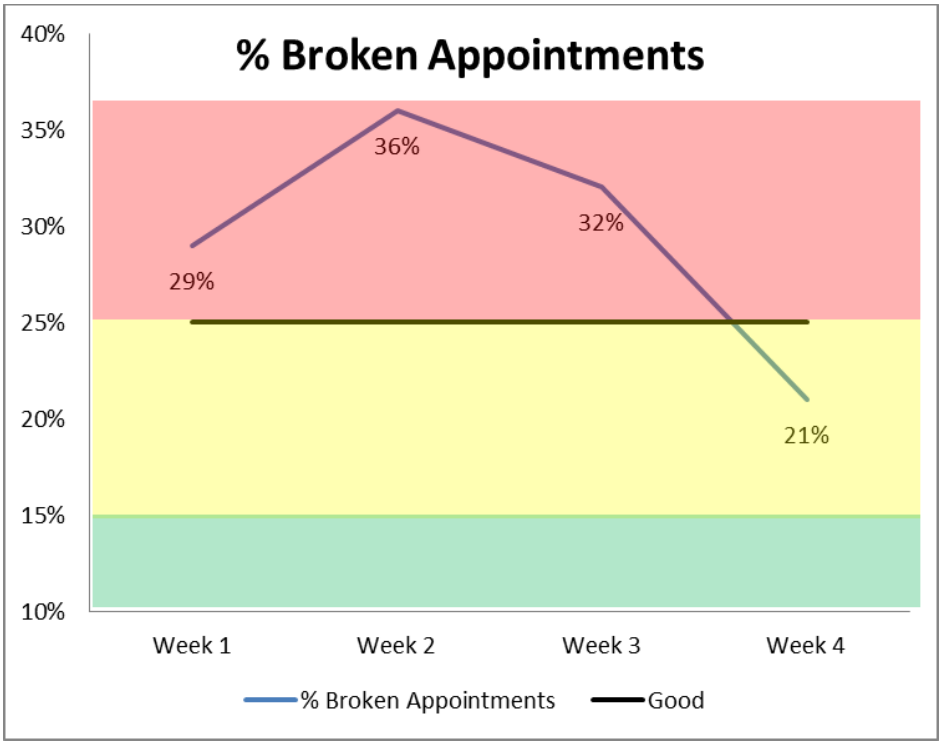


Figure 13: Graph of incoming patients by week

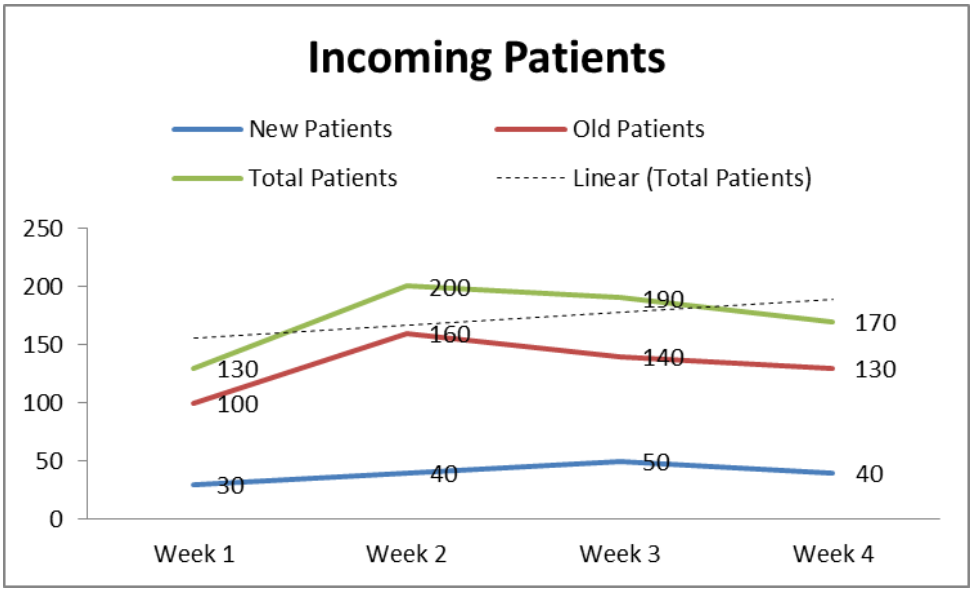


Figure 14: Graph of new/old patient percentages per week

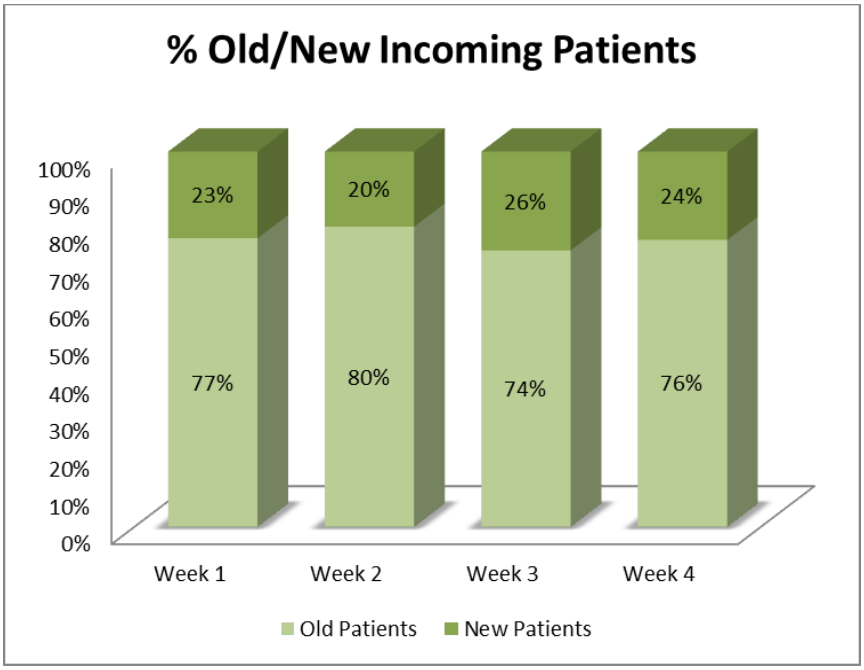
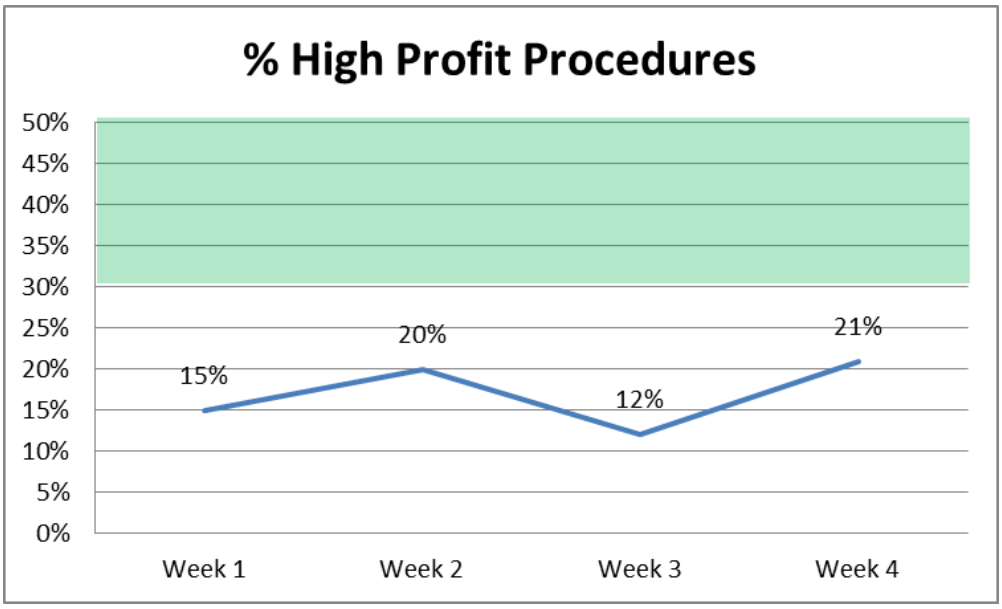
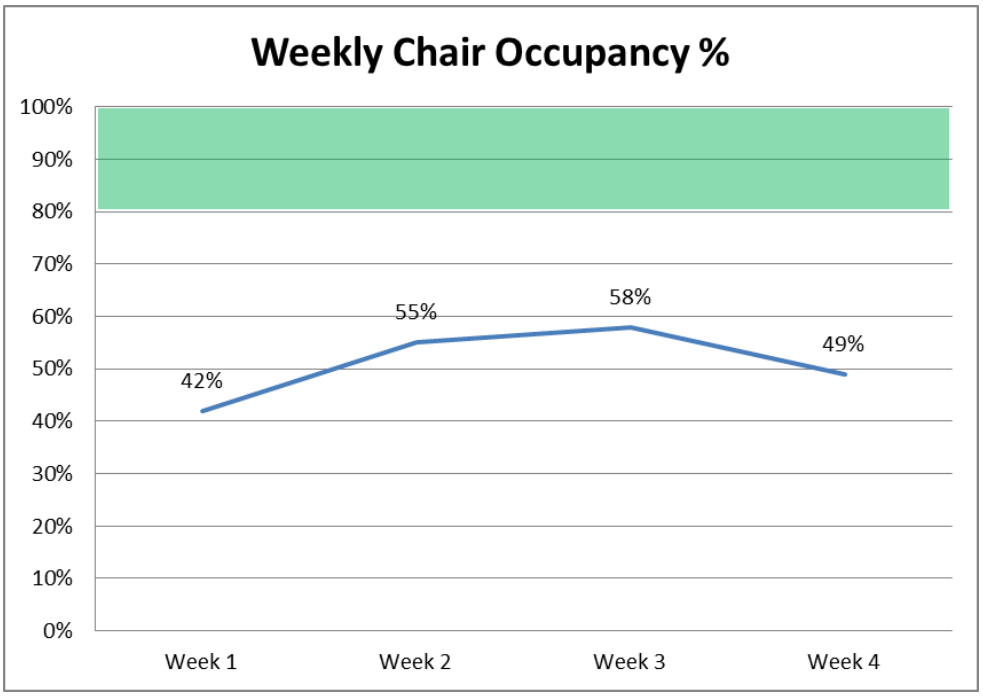


Figure 15: Graph of percentage of procedures that are high profit



NB: Target is highlighted in green on the graph.

Figure 16: Graph of chair occupancy rates by week



NB: Target is highlighted in green on the graph.

Appendix 4

Figure 17: Screenshot of appointments input sheet in Excel workbook

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Date	Dentist	Patient	is New?	Scheduled Start	Status	Actual Start	Scheduled End	Actual End	Actual Duration	Procedure	Followup?	Comments
2	5/1/2014	D1	125	No	8:30	Canceled	8:35	9:30	9:15	0:40	Whitening	Booking	
3	5/1/2014	D1	125	Yes	8:30	Arrived	8:35	9:30	9:15	0:40	Surgery	Post-Op	
4	5/1/2014	D2	125	Yes	8:30	Arrived	8:35	9:30	9:15	0:40	Whitening		
5	5/1/2014	D2	125	Yes	8:30	Arrived	8:35	9:30	9:15	0:40	Whitening		
6	5/1/2014	D3	125	No	8:30	Arrived	8:35	9:30	9:15	0:40	Whitening		
7	5/1/2014	D3	125	Yes	8:30	Arrived	8:35	9:30	9:15	0:40	Surgery	Post-Op	
8	5/1/2014	D4	125	Yes	8:30	Arrived	8:35	9:30	9:15	0:40	Whitening		
9	5/1/2014	D4	125	Yes	8:30	Arrived	8:35	9:30	9:15	0:40	Whitening		
10	5/1/2014	D5	125	Yes	8:30	Broken	8:35	9:30	9:15	0:40	Whitening	Booking	
11	5/1/2014	D5	125	No	8:30	Arrived	8:35	9:30	9:15	0:40	Whitening		
12	5/1/2014	D6	125	Yes	8:30	Arrived	8:35	9:30	9:15	0:40	Whitening		
13	5/1/2014	D6	125	Yes	8:30	Arrived	8:35	9:30	9:15	0:40	Whitening		
14	5/1/2014	D1	125	Yes	8:30	Broken	8:35	9:30	9:15	0:40	Whitening	Booking	
15	5/1/2014	D2	125	No	8:30	Arrived	8:35	9:30	9:15	0:40	Whitening		

All of the information about appointments is entered here on a rolling basis. The duration of appointments is calculated automatically. The “is New”, “Status”, “Procedure” and “Followup” columns are data lists.

Figure 18: Screenshot of Stock-out sheet in Excel workbook

	A	B	C	D	E	F	G
1	Date	Dentist	Item Needed	Quantity Withdrawn	Unit	Patient	Entered by
2	5/1/2014	D1	Cotton fillers	10	pcs	1452	Sandra
3	5/1/2014	D2	Cotton fillers	12	pcs	1241	Sandra
4	5/1/2014	D3	Cotton fillers	18	pcs	8541	Sandra
5	5/2/2014	D4	Cotton fillers	20	pcs	1425	Sandra

Whenever an item is out of stock and the reserve must be accessed, the item and the amount withdrawn from the reserve are entered here. The columns “Item Needed” and “unit” are data lists.

Figure 19: Screenshot of 'no equipment' sheet in Excel workbook

	A	B	C	D	E	F	G
1	Date	Dentist	Equipment Needed	In use by	Patient	Outcome	Entered by
2	5/1/2014	D1	Portable Peer Light	D2	1452	Waited	Sandra
3	5/1/2014	D1	Portable Peer Light	D3	1453	Rescheduled	Sandra
4	5/1/2014	D3	Portable Peer Light	D1	1974	Left	Sandra
5	5/1/2014	D2	Portable Peer Light	D1	152	Performed without equipment	Sandra

Lack of availability of equipment that affects operations is entered here. The “Equipment Needed” and “Outcome” columns are data lists.

Figure 20: Screenshot of complaints and errors sheet in Excel workbook

	A	B	C	D	E	F	G
1	Date	Dentist	Patient	Nature	Complaint	Action Taken	Entered by
2	5/1/2014	D1	1452	Complaint	Late to start appointment	20% discount	Sandra
3	5/1/2014	D2	1453	Error	Punctured tooth	Corrective procedure done immediately	Sandra

The medical errors made by dentists and the complaints lodged against them are recorded in this sheet. The column “Nature” loads from a data list and refers to whether the entry is a complaint or an error.

Figure 21: Screenshot of data aggregating sheet in Excel workbook

	A	B
1		5/1/2014
2	Stock Out	3
3	No Equipment	4
4	Complaints D1	1
5	Complaints D2	0
6	Complaints D3	0
7	Complaints D4	0
8	Complaints D5	0
9	Complaints D6	0
10	Errors D1	0
11	Errors D2	1
12	Errors D3	0
13	Errors D4	0
14	Errors D5	0
15	Errors D6	0
16	New Patients D1	1
17	New Patients D2	2
18	New Patients D3	1
19	New Patients D4	2
20	New Patients D5	0
21	New Patients D6	2
22	Returning Patients D1	0
23	Returning Patients D2	1
24	Returning Patients D3	1
25	Returning Patients D4	0
26	Returning Patients D5	1
27	Returning Patients D6	0
28	New Patients	8
29	Returning Patients	3
30	Total Patients	11
31	Broken Appointments	2
32	Canceled Appointment	1

All of the data entered in the sheets previously described is aggregated in this sheet. All reports and graphs are based on the information that is accumulated here. It is populated automatically as information is entered in the other worksheets.