The Effects of MRI Personnel Shortages on Waiting Time and Bed Stay Costs in a Tertiary Referral Hospital in Johannesburg, South Africa

Masters in Medicine – Diagnostic Radiology

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Declaration

I proclaim that the research project, The Effects of MRI Personnel Shortages on Waiting Time and Bed Stay Costs in a Tertiary Referral Hospital in Johannesburg, South Africa, is my very own work and that each wellspring of data utilized has been recognized by methods for an entire reference. This recommendation has not been submitted before for some other research undertaking, degree or examination at any university.

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ABSTRACT

The study evaluates the effects of the removal of overtime payment on MRI scan personnel on waiting time and bed-stay cost resulting from decreased MRI scanning hours, which occurred as a result of MRI personnel over-time pay withdrawal dated 20th April 2012, as a surrogate representation of the benefit of increasing scanning hours. The study motives are to determine the number of patients occupying hospital beds while awaiting MRI scans over a 6-month period in a tertiary referral radiology department, BEFORE and AFTER the 20th April 2012, when overtime payment for technologists was terminated, to determine number of 'waiting days' (waiting time), overall, and per patient, and bed stay cost for those patients identified in objective one BEFORE and AFTER the specific event above, where overtime payment was terminated. The researcher identified a target population of 300 MRI scanning patients registered at Charlotte Maxeke Johannesburg Academic Hospital MRI radiology department, during the period under study and employed a simple random sampling technique to choose the research sample frame. Different diagnostic tests were conducted in order to find whether the data collected was best fit or not for the research in question. These tests formed part of a data clean-up exercise. Tests conducted enabled the researcher to have objective and reliable research results. The data adequacy requirement tests include measures of central tendency, Pearson product moment correlation coefficient, coefficient of determination, autocorrelation, chi-square, stationarity, long-term relationship and Granger causality. The researcher found out that the impact of the removal of overtime on MRI scan personnel resulted in longer waiting times by patients and a corresponding higher bed stay costs at Charlotte Maxeke referral hospital over the period under the study. The research results further indicate the removal of overtime payment had a Granger effect on MRI scan patients' waiting time, which ultimately led to high bed stay costs. The researcher recommends that referral hospitals, in conjunction with the Ministry of Health, must ensure that MRI scan personnel are well trained and equipped to deliver quality health services. The MRI scan personnel must periodically be sent for retraining through medical workshops, seminars and refresher courses to ensure that the MRI scan personnel are up to date with the current trends in the medical fraternity.

TABLE OF CONTENTS

List of Tables

CHAPTER 1:

INTRODUCTION

1.1 Introduction

This chapter introduces the research that investigated the effects of the shortage of Magnetic Resonance Imaging (MRI) scan availability on patient waiting time and bed-stay costs in a South African referral hospital. It gives background information on the subject, problem statement and justification, indicating the importance of the study. Thereafter, the chapter specifies the scope of the study, its primary and secondary objectives, research questions, limitations encountered and organization of the whole research framework.

1.2 Background of the study

The South African health sector is one of the fastest growing and well-equipped health systems in the African continent and even beyond (Gardner et al., 2007). In the past decade, many developing countries have devised new and improved health policies to ensure that every citizen has a right and equal access to quality medical services at an affordable cost. However, in the recent global economic downturn and with severe pressure on public budgets, patients' waiting times for health services have notably increased internationally (Gardner et al., 2007).

Equally important, developing countries have significant health care resource restrictions (Ravangard et al., 2011). In diagnostic radiology, advanced imaging equipment, such as MRI, is severely burdened with high patient loads while servicing multiple internal departments and disciplines, as well as peripheral referral hospitals. Magnetic Resonance Imaging (MRI) is a preferred problem-solving tool with advanced imaging capabilities, which have, in turn, generated more referrals. In most departments, MRI has demonstrated superior contrast resolution using multiple sequences available in multiple planes, which are extremely useful (Rao et al., 2000). Multiple disciplines have become dependent on MRI for disease diagnosis, tumour staging, treatment planning and in preparation for surgical procedures.

Previous studies have noted that, while waiting for diagnosis, staging, planning and pre-surgical MRI scans, in-patients occupy hospital beds and require nursing care. On the other hand, rapid diagnosis and treatment often hastens patient rehabilitation and discharge. The

competition between referring departments for MRI bookings may result in exaggerated length of bed stay in hospitals (Ravangard et al., 2011). The limiting factor is often MRI personnel in MRI departments, as the machines themselves are capable of running 24 hours a day, maximising their output (Gardner et al., 2007). This has a knock-on effect by delaying essential activities and services rendered by the clinical departments in future. Solutions to decreasing MRI waiting lists include the purchase of additional and faster MRI scanners, training of more MRI personnel and allowing overtime to already trained MRI personnel (as an incentive) and utilising existing MRI equipment for extended times (Rao et al., 2007). Budgets set aside for radiology equipment and additional staff are often eroded through redistribution to new priorities in resource-restricted environments. This research audited a period of six months at a tertiary referral hospital in Johannesburg, South Africa, comparing waiting times before and after the withdrawal of MRI personnel overtime and evaluated the effects on bed-stay cost.

1.3 Statement of the problem

It appears, as a result of the removal of overtime pay, MRI scan patients have been experiencing longer waiting times before they are examined than before the removal of the overtime pay. Because of the long waiting times, the ailments become increasingly chronic to patients. Furthermore, the duration of conservative treatment increases with longer waiting periods. On 20 April 2012, overtime payment was removed from MRI scan personnel at Charlotte Maxeke referral hospital in Johannesburg, South Africa. As a result, many MRI scan patients at this medical centre had to experience long waiting times which resulted in deterioration in patients' physical function and high medical costs while waiting.

1.4 Research objectives

The objectives of this study are as follows:

Primary objective of the study

This study evaluates the impact on bed-stay cost resulting from increased MRI scanning hours, which has occurred as a result of MRI personnel over-time pay withdrawal dated 20th April 2012, as a surrogate representation of the benefit of increasing scanning hours.

The study is guided by an investigation of the following factors which have a direct impact on the primary objective of this study:

i. To determine the number of patients occupying hospital beds while awaiting MRI scans over a 6-month period in a tertiary referral radiology department, BEFORE and AFTER the 20th April 2012, when overtime payment for technologists was terminated.

ii. To determine number of 'waiting days' (waiting time), overall and per patient and bed stay cost for those patients identified in objective one, BEFORE and AFTER the specific event above, when overtime payment was terminated.

iii. To compare the period BEFORE and period AFTER withdrawal of the overtime services regarding waiting times and bed stay costs and to translate the exercise into a cost analysis based on bed stay and patient numbers, to yield a 'total cost' as well as 'per patient cost'

1.4.1 Research questions

The research questions below have been modelled in order to establish the following research objectives:

i. How many MRI scan patients occupied bed hospital at Charlotte Maxeke Johannesburg Academic Hospital over a 6-month period in a tertiary referral radiology department, BEFORE and AFTER the 20th April 2012 where overtime payment for technologists was terminated?

ii. What was the average number of waiting days per patient stays at Charlotte Maxeke Johannesburg Academic Hospital before MRI scan was conducted on them?

iii. What was the bed stay cost at Charlotte Maxeke Johannesburg Academic Hospital over a 6-month period in a tertiary referral radiology department, BEFORE and AFTER the 20th April 2012, when overtime payment for technologists was terminated?

iv. What was the difference in waiting times and bed stay costs at Charlotte Maxeke Johannesburg Academic Hospital over a 6-month period in a tertiary referral radiology department, BEFORE and AFTER the 20th April 2012, when overtime payment for technologists was terminated?

v. Was there any significant relationship between waiting time and bed stay costs at Charlotte Maxeke Johannesburg Academic Hospital over a 6-month period in a tertiary referral radiology department, BEFORE and AFTER the 20th April 2012, when overtime payment for technologists was terminated?

1.5 Research hypothesis

The research tested the following hypotheses:

H_0: The shortage of MRI scan personnel did not affect waiting time and bed stay cost at Charlotte Maxeke Johannesburg Academic Hospital in a tertiary referral radiology department, after the 20th April 2012 when overtime payment for technologists was terminated.

H_1: The shortage of MRI scan personnel led to increased waiting time and bed stay cost at Charlotte Maxeke Johannesburg Academic Hospital in a tertiary referral radiology department, after the 20th April 2012 when overtime payment for technologists was terminated.

1.6 Justification of the research

The researcher made the following justifications:

This research will benefit the South African health system if the recommendations made therein are adopted as they will have valuable information that will assist policy makers to make sustainable health policies. This will enable referral hospitals to offer quality MRI scan services to patients at the lowest possible waiting and bed stay cost. This will improve availability of the efficiency and effectiveness of South African MRI scan delivery system and this will improve health sector growth of the nation at large.

Apart from that, the study benefits management of private and public health institutions, health insurance managers and MRI scan manufacturers, in adopting effective management strategies for the delivery of high-quality health services. In addition, the study will enlighten the health authorities on some of the key missing ingredients required to facilitate effective MRI scan services by local health institutions.

1.7 Scope of the research

The research study is primarily centered on the effects of the removal of overtime pay for MRI scan personnel on waiting time and bed stay costs at Charlotte Maxeke referral hospital. The study used a sample frame of 300 MRI scan patients admitted at Charlotte Maxeke referral hospital. The sample frame was divided into two phases of 150 patients before and after 20th April 2012, when the overtime payment was removed for MRI scans personnel at Charlotte Maxeke referral hospital. There is a total of 18 referral hospitals, in South Africa, but the researcher studied the effects of shortage of MRI scan personnel at Charlotte Maxeke Johannesburg Academic Hospital over a 6-month period in a tertiary referral radiology department, BEFORE and AFTER the 20th April 2012 when overtime payment for MRI radiographer technologists was terminated. Consequently, the research is confined to Johannesburg because the city is considered the economic hub of South Africa and the African continent at large. Referral hospitals have the largest number of MRI scan patients in the country, hence control the largest proportion of the health system services. This study is limited to Charlotte Maxeke Johannesburg Academic Hospital within the period under review in South Africa.

Equally important, the study focuses on the period from January 2012 to July 2012. It is an appropriate period to assess the effects of the South African health sector reforms, during which there has been substantial transformation of the whole health system, in which the researcher advocates that this is the time in which the South African health sector saw erratic medical dynamics from the use of the general X-ray to a more modern MRI scan system.

1.8 Limitations of the study

The researcher had limited time frame to carry out the research and the researcher was not able to gather all the quantity and quality information to solidify the research. The researcher scheduled a time for each and every activity of the research so as to ensure efficient utilization of the limited time available.

The target population of this research involved all MRI scan patients who were recorded at Charlotte Maxeke Academic Hospital under the defined period of the research. To solve this problem the researcher collected secondary data from patients' MRI request/ reports/ files.

Financial constraints were experienced as the research involved a lot of travelling, paper work, capturing of patients' records, typing and printing information gathered to create a record for future reference. This limited the researchers' efforts in obtaining all the data

necessary to strengthen this research. However, the researcher prepared a flexible financial budget to cater for this constraint, to facilitate a smooth research project.

Also, due to the privacy and confidentiality policies of the South African health sector, some of the targeted information was not gathered on some sensitive pertinent patients' information, which negatively impacts the research findings. Consequently, the complexity of the South African health framework, might limit access to pertinent information essential for this research. In this regard, the researcher guarantees the patients' information gathered is used for academic purpose only and their privacy is fully secured so as to encourage maximum cooperation from the research audience and the names of the patients' files used remains anonymous to maintain privacy and confidentiality and other moral ethics.

1.9 Organisation of the study

Section one covers the starting piece of the exploration, which involve the foundation of the issue, proclamation of issue, targets of the investigation, examine questions, centrality of the examination, confinements and delimitations of the examination. Section two comprises of a writing audit concerning the impacts of deficiency of MRI check staff in South Africa and around the globe on waiting time and hospital bed stay costs. Theoretical and empirical studies of different scholarly, academic views and medical journals on MRI scan are evaluated. Specific countries where this research was carried out previously are noted and their results are used as the basis for comparison with this research finding. Chapter three focuses on research methodology, design and tools to be used and their justification. The part talks about the examination rationalities embraced and different research techniques used to address the announcement of the issue; answer the exploration questions and meeting the investigation goals. Information gathering devices and information investigation techniques are talked about in this area. This section manages how the examination was directed and gives defense for different advances taken. This likewise includes illumination of the means taken towards information accumulation and information investigation. Section four displays the examination discoveries and dialogs of the discoveries in detail. The discoveries frame the premise of ends and suggestions of the examination got straightforwardly from the exploration results. Part five layouts the rundown, ends and suggestions of the examination demonstrated straightforwardly from research discoveries. Results are talked about with regards to what other comparative research, cited in the writing audit, found and further proposals for future research are demonstrated.

CHAPTER 2:

LITERATURE REVIEW

2.0 Introduction

This section talks about the literature review that establishes the framework for the exploration. The focal point of this part is to review literature relating to the effects of removal of overtime pay for MRI scanning personnel on patient waiting time and bed stay costs in a tertiary referral hospital in Johannesburg, South Africa. Review of the theoretical and empirical existing literature on the subject under study is imperative to the current study as it helps the researcher to consider whether theories suggested or suggested analytical frameworks could help in establishing the effects of MRI scanning personnel shortages on waiting time and bed costs in a South African tertiary referral hospital. The literature review helps in answering the main research questions. This chapter forms the crux on which the research findings are to be discussed.

2.1 Theoretical literature review

To enhance comprehensive understanding of the effects of MRI scanning personnel shortages on waiting time and bed stay costs, various definitions of key terms, such MRI scan, waiting time, bed stay costs and tertiary referral hospital are depicted, as they have been postulated by various academics, scholars and authorities in the subject matter. Micro and macro factors that influence MRI scanning hospital waiting time and bed stay costs at large are assessed.

2.2 Tertiary referral hospital

A tertiary referral hospital additionally called a tertiary doctor's facility, tertiary referral focus, or tertiary consideration focus, or tertiary focus (Croft et al., 2002). In accordance with Forster (2008), it is a clinic that gives tertiary consideration, which are social insurance masters in an extensive doctor's facility after referral from essential consideration and optional consideration focuses.

A general term for any healing facility more often than not additionally assigned as a centre of brilliance, which offers tertiary consideration administrations, for example, neurosurgery and radiotherapy and has complex symptomatic instruments, for example, imaging, atomic pathology, hereditary qualities capacities (Tubman, 2010).

Past the above general definition, there is no exact smaller or more formal definition, however tertiary focuses more often than exclude the accompanying, as per Shojanja (2013):

- a real healing centre that typically has a full supplement of administrations including paediatrics, obstetrics, general drug, gynaecology, different parts of medical procedure and psychiatry, or
- A forte clinic committed to particular sub-claim to fame care which incorporates paediatric focuses, oncology focuses and mental healing centres. Patients will frequently be alluded from littler healing facilities to a tertiary doctor's facility for significant tasks, counsels with sub-authorities and when advanced serious consideration offices are required.

2.3 Waiting time

For the reasons for this exploration, the meaning of a sitting tight time for clinic confirmation is the time experienced by a patient (in days) from the date when they were added to the elective holding up rundown to the date they were conceded into healing centre, as explained by Magnam (2012). The holding up times are review, that is, they identify with those patients who were conceded in the period and in this manner reject individuals still on a holding up rundown and the estimation depends essentially on the slipped by time from the supposed "Chose to Admit" date and the affirmation date. The following are the three sub-classes of holding up time.

i. Waiting times for treatment services

The quantity of days between the date when a patient's treating doctor has verified that the patient needs a MRI examine and the date of the MRI check is performed.

ii. Waiting times for diagnostics

The amount of days between the time when a patient from outside the recuperating focus makes a game plan for the use of MRI diagnostic technique and the time when that MRI check symptomatic methodology is associated. This definition applies to patients who are constantly alluded by an outsider, and don't happen to their very own agreement for a MRI check.

iii. Waiting times for outpatient clinic

The number of days between the dates when a patient makes an arrangement for the MRI examine outpatient centre and the date of the arrangement.

2.4 Waiting times for MRI

Feasby (2014) said that the course to MRI examinations, as other analytic tests, depends to some degree on the jurisdictional arrangements that decide access to these administrations. As a rule, patients alluded for MRI examinations may encounter holding up times like those talked about above for medical procedure, to be specific, sitting tight for an essential consideration conference and for an underlying master counsel. The creator declared that there are likewise a few alternatives for characterizing sits tight for MRIs which are examined underneath:

i. Waiting time for receipt of request for MRI

Feasby (2014) chronicled that in a couple of zones, MRIs are simply requested by an ace; in various districts, they are requested by a fundamental thought proficient. The basic holding up period, from now on, is depicted as the time between the excitement for a MRI and when the interest is seen by the radiologist. This waiting period is likely insignificant if requests are made lucky.

ii. Waiting time for MRI

The more essential sitting tight period for MRIs begins after the interest has been gotten and investigated by the radiologist (Feasby 2014). This holding up period is portrayed as the time between when the excitement for a MRI has been seen by the radiology division or MRI office and the date of the MRI examination.

2.5 Empirical Literature review

To enhance comprehensive understanding of the subject of MRI scan waiting times, the study provided an empirical analysis of aspects surrounding the subject. This section gives general information on MRI scan waiting times in emerging, developing and developed health systems in countries such as India, Nigeria and France respectively. Discussions are focused particularly on MRI scan machines in a country per population and how the waiting times are varied in these countries and the costs of the MRI scan.

2.5.1 Waiting time as factor that affects health care services on MRI scan

The measure of time a patient holds up to be seen is one factor which influences usage of social insurance administrations. Patients see long holding up times as boundaries to really getting administrations and keeping patients holding up pointlessly can be a reason for worry for both patient and specialist (Jayawadi, 2006). Fielden et al. (2005) discovered that more extended holding up times were related with higher aggregate expenses and disintegration in physical capacity of MRI filter patients while pausing.

Hajat et al. (2002) set up that long sitting tight occasions for human services are an imperative wellbeing approach issue in numerous nations and many have presented some type of national holding up assurances. Universal examinations of trusting that nations will enhance approach and for patients to ready to settle on educated decisions.

Harold (2010) verbalized that patients invest considerable measures of energy in the facilities trusting that administrations will be conveyed by doctors and other associated wellbeing experts. How much wellbeing shoppers are happy with the consideration got is unequivocally identified with the nature of the holding up involvement. Simon et al. (2009) declares that social insurance associations that endeavor to convey excellent administrations should adequately deal with their center pause. Inability to fuse buyer driven highlights into the plan of hold up experience could prompt patient and supplier disappointment.

Brealey et al. (2012) featured that holding up time alludes to the time a patient holds up in the facility before being seen by one of the center therapeutic staff. Quiet center holding up time is a critical pointer of nature of administrations offered by doctor's facilities. The measure of time a patient holds up to be seen is one factor which influences usage of social insurance administrations (Kim et al., 2012). Patients see long holding up times as a hindrance to really getting administrations. Keeping patients holding up superfluously can be a reason for worry for both patient and specialist. Holding up time is a substantial part of training that patients use to pass judgment on wellbeing staff, much more than their insight and ability. Unnecessary sit tight occasions for some medicinal services mediations have grabbed the eye of governments, suppliers and general society, as indicated by Sanmartin et al. (2000). Important to these gatherings are heart medical procedure, joint substitution medical procedure, malignant growth care and progressed analytic imaging, particularly, attractive reverberation imaging (MRI). Sit tight occasions for indicative imaging are especially vital on the grounds that they may result in deferrals in authoritative treatment.

Sentella et al. (2010) found that endeavors to lessen sit tight occasions for MRI have concentrated on working up the extent of symptomatic imaging contraptions, as Canada holds up a long ways behind different nations in such way. For example, Japan and the United States have 35.3 and 19.5 MRI units per million masses, uninhibitedly, regardless Canada has beginning late 4.6 MRI units open (Stein 2005). The extent of MRI scanners in Canada is lower than the purpose of assembly of 6.1 scanners per million for all nations inside the Organization for Economic Co-errand and Development, as appeared by Stein (2005). The ideal number of MRI machines per capita has not been set up, and the extent of scanners does not exhibit the extent of patients isolated; in any case, it gives a sign of limit. While Canadian district have beginning late extended the extent of imaging contraptions, it is incomprehensible that Canada will have such arranged access to imaging as different nations. As necessities be, evident ways to deal with oversee coordinate hold up time diminish are required.

Naylor et al. (2000) passed on that redesigning the relationship of hold up records passes on another way to deal with oversee direct diminishing hold up times. This rational soundness may join the upgrade of criteria for picking the fittingness of imaging demands, which everything considered, could be utilized to help triage their relative inconvenience. As appeared by Gardener et al. (2007), a relative reasoning was utilized for heart remedial framework. In this setting, these criteria make hold up chart errand more target and sensible while in like way refreshing everything mulled over productivity. Despite the way that the overhaul of fittingness criteria for MRI isolating has gotten some idea, as per the Canadian Association of Radiologists (2005) and ACR (2000), there is no affirmation that these endeavors have affected practice. The advancement of influenced ways to deal with figure out how to direct triaging demands for MRI does not understand.

The Institute of Medicine (IOM, 2007) suggests that at any rate 90% of patients ought to be seen inside thirty minutes of their booked arrangement time. This is, in any case, not the situation in most creating nations like South Africa, as a few investigations have demonstrated that patients spend more than two to four hours in the outpatient divisions before observing the specialist. A wellspring of disappointment with social insurance revealed by patients is that they should hold up an extensive stretch of time in the facility and a few examinations have archived the negative relationship between expanded holding up time and patient fulfilment with essential consideration. The term of holding up time changes from nation to nation, and even inside nation, it shifts from focus to focus. Long holding up

times have been accounted for in both created and creating nations. In the USA, a normal holding up time of around a hour was found in Atlanta and a normal of one hundred and eighty eight minutes in Michigan.

In Nigeria, a normal holding up time of around one hundred and seventy three minutes was likewise found in Benin, while at the University College Hospital Ibadan, a mean holding up time of one hour and thirteen minutes was watched.

Time spent holding up is an asset speculation by the patient for the coveted objective of being seen by the doctor and along these lines might be directed by the result. This examination went for surveying the determinants of patients' holding up time in the general outpatient division (GOPD) of a tertiary wellbeing establishment in northern Nigeria .

2.5.2 MRI scans waiting times in France

According to Ward (2014), the shortage of MRI equipment in France is becoming increasingly alarming as patients must wait almost 40 days to undergo an MRI examination, the longest delay in the past 10 years, according to figures from Cemka-Eval, which specialises in health economics, epidemiology, and outcomes research in France.

In France, an oncologic patient in need of an emergency MRI lumbar scan must wait an average of 37.7 days, 7.2 days more than last year. The figures, posted on the website of the French Society of Radiology (Société Française de Radiologie, SFR) on 7 July 2014, represent the worst outcome since Cemka-Eval started its annual assessment 11 years ago and are a serious threat to France's newest Cancer Plan, which aims to reduce waiting times to 20 days by 2019. The delays continue to be very worrying, Ward (2014) noted.

Equally important, Dr. Soyer (2014), the general secretary of the Syndicate of Radiologists of Public Hospitals (Syndicat des Radiologues Hospitaliers) in France, pinpointed that the worst thing is that the delays in question may reach up to two months for a patient with a suspicion of liver cancer ... it is almost criminal to let a patient wait so long to confirm the diagnosis and start further treatment. Waiting two months is a lost chance for the patient.

Dr. Soyer (2014) articulates that the main problem is that many MRI units are also used for musculoskeletal indications. In addition, the growth of cardiac MRI was anticipated by the government, so there has been a dramatic increase in the potential indications, and these

emerging indications had not been anticipated. The major problem in France is that it is still underequipped and one of the worst countries in Europe in terms of MRI services.

The results of the study came as another blow to the under-siege French MRI sector, which already lags behind its neighbours. While Western Europe, as a whole, has an average of 20 MRI machines per million citizens, France has only 10.7 machines per million, prompting less than flattering comparisons from the radiological community. France has fewer machines than Slovenia and Croatia, and three times fewer than Germany, whose average hovers around 30 per million.

As most countries continue to expand their equipment, the 38 French machines added in 2013 do little to fill the gap. In fact, experts say that 50 new scanners per year are needed to meet the objectives defined by the various public health plans and good practice guidelines.

Unfortunately, the planned growth of MRI in France may add to the problems and is incompatible with the objectives defined by the healthcare organisation regional schemes (les schémas régionaux d'organisation des soins, SROS), according to Imagerie Santé Avenir (ISA), an association of medical imaging and healthcare professionals, which commissioned the study.

Nearly 60 systems were due to be introduced by the end of 2014, and 100 osteo-articular MR examinations had already been planned for the next two years, straining the examination authorisation potential to its limits in most regions. A rapid and substantial revision of MRI objectives is needed to face the demands of the various government plans, ISA recommended.

MRI indications continue to increase by 5% to 10% each year and are in line with radiation protection demands from health and nuclear safety authorities, but there seems to be a persistent misunderstanding as to the urgency of the situation. Recent comments from the National Health Insurance Fund for Salaried Workers (Caisse Nationale d'Assurance Maladie des Travailleurs Salariés, CNAMTS) added fuel to the fire by alleging that rapid growth in MRI risks is encouraging an increase in unnecessary exams. The SFR vigorously reacted to the comments and released a strong statement, calling for a halt to the confusion over MRI caused by the CNAMTS' position.

"MRI meets a concrete need for quality and appropriate care as specified in the Good Practice Guidelines for Imaging (GBU) developed by the SFR and the French Society for Nuclear Medicine," the SFR stated. "The catch-up plan in MRI, sought for many years by imaging professionals, is more pertinent than ever if we wish to respond to issues in public health, with regard to quality and emergency care, and also equality in access to innovation across the country." Soyer (2014).

Waiting times increased across France, except in Midi-Pyrénées, Languedoc Roussillon, and Provence-Alpes-Côte d'Azur (PACA). Regional discrepancies are on the rise, despite a political discourse permanently stressing the need to fight against social and geographical inequalities, according to ISA (2014).

Commenting on this latest report from Cemka-Eval, another senior French radiologist, Dr. Dhiaby, in 2014 said there is a strong industrial lobby behind this recurrent study and there are some pitfalls in it, particularly the clinical case used for appointment seeking, which is far from real life. Regional agencies (ARS) had their own policies and may not give their support for MRI in some parts of the country, as is the case in Paris/greater Paris," Dr. Dhiaby reiterated.

2.5.3 MRI scans in Nigeria

Dr Tayo Hartstrup, the Head, Management Information Service of the doctor's facility in January 2012, reported that the National Hospital of Abuja lessened its charges for Magnetic Resonance Imaging (MRI) examine from N90,000 to N60,000 with impact from January 2012. Dr Hartstrup expressed that a MRI check is utilized to examine any piece of the body, including the cerebrum and spinal rope, bones and joints, bosoms, heart and veins, and also lungs and liver. He underscored that a MRI examine is a medicinal imaging system utilized in radiology to picture inner structures of the body in detail and in this manner it is a human ideal to approach quality present day wellbeing administrations. Hartstrup said that the Nigerian administration of the doctor's facility cut the charges in people in general enthusiasm, clarifying that administration organizations ought to give moderate social administrations to subjects.

2.6 Differences between MRI and X-Ray

Tokur et al. (2000) announce that MRI stays for appealing resonation imaging; it on a very basic level uses inconceivable magnets and radio waves to make point by point photos of within your body. It will in general be done with or without separation. Separation is a sort of shading that is injected intravenously either just already, or in the midst of the framework. Certain abnormalities, for instance, tumours, hold the shading and show up clearly on the MRI with separation .

A MRI check is not the same as a customary x-beam or a CT filter, which both utilize ionizing radiation to make pictures. X-ray checks for the most part create clearer pictures with substantially more detail than a x-beam or CT filter (Rao, 2005). Little tumours, which might be undetectable on a x-beam or CT filter, might be recognized by MRI. On account of most malignant growths, the prior treatment is started, the better the result of treatment, so an early MRI output of any suspicious region can truly mean the distinction among life and passing (Ravangard et al. 2011). On a par with a standard MRI picture is, the picture can be enhanced considerably advance by including contrast. Tumours and different irregularities will ingest the complexity colour as it advances through the veins, and on the MRI examine, this zone will gleam. This takes into consideration the discovery of even the littlest tumours, and it likewise gives the specialist a clearer thought regarding the area and size of a tumour and which organs or tissues are included. What's more, differentiate enables a specialist to watch useful irregularities that are not obvious on a standard output, especially issues with how well blood is moving through your vessels.

As per Kim et al. (2012), the difference medium utilized in MRI, for the most part gadolinium, is distinctive to the differentiation colours utilized in x-beams or CT filters. Unfriendly responses to gadolinium are significantly rarer than iodine-based colours. In any case, if the patient has unusual kidney work, s/he might be at expanded hazard for nephrogenic fundamental fibrosis caused by the MRI colour. This entanglement is to a great degree uncommon, yet specialist and radiology expert should know about any medicinal issues or hypersensitivities the patient may have, before the patient is infused with a difference colour. A great many people endure MRI with differentiation fine and dandy, and the advantages of early tumours identification by and large exceed the minor dangers related with the colour.

A MRI with difference is for the most part easy, yet the patient may encounter some inconvenience with the IV or needle used to infuse the colour (Sentella et al., 2010). The patient is set on a table and situated with the goal that the output demonstrates the influenced territory generally obviously. The patient may be slid inside a long tight cylinder in a shut standing MRI, in which the examining gear is moulded like a vast donut and just outputs a specific part of the patient's body at any given moment. The imaging procedure itself may take 45 minutes up to two hours, and the patient may be offered earphones to tune in to music amid the output. When the filtering is finished, radiologists read and translate the output and the specialist examines the outcomes with the patient.

2.7 Conclusion

This section dissected hypothetical and experimental writing to improve comprehension of the subject of MRI check waiting time and clinic bed cost in the South African wellbeing framework. The MRI scan was discussed in emerging, developing and developed countries. This writing is a significant establishment of the present examination and is utilized in talking about the investigation discoveries. The following chapter presents the methodology used to enable an evaluation of the effects of personnel shortage in MRI scan waiting time and hospital bed cost in the South African health sector. It explains the secondary data collection methods employed, sample populations chosen and data analysis. Justifications for different stages taken in the research methodology are also highlighted.

CHAPTER 3:

RESEARCH METHODOLOGY

3.0 Introduction

This part centres around the strategies and systems that were utilized to direct the examination. The optional information was gathered, identified with holding up expense and bed expenses of patients sitting tight for MRI checks when withdrawal of MRI staff additional time administrations at a tertiary referral radiology office. The issues talked about incorporate research configuration, target populace, inspecting strategy, examine information, inquire about instruments and information investigation strategies that were utilized in the examination. The part clarifies the different strategies and systems utilized in completing the exploration. The procedure which was embraced is in accordance with the targets, investigate questions and issue articulation of the examination. It likewise clarifies the precise and methodical methodology connected in social occasion information utilized in the examination.

3.1 Research design

The research adopted a survey research design, which was cross-sectional because it enabled the evaluation of the bed stay cost because of reduced MRI scanning hours, as overtime payment was withdrawn. Since this design evaluates the bed stay cost resulting from decreased MRI scanning hours, before and after withdrawal of overtime pay allowed a meaningful comparison of changes in the quantity of MRI scanning services available.

3.1.1 Target population

The study is entirely based on the MRI scanning patients who were at Charlotte Maxeke Johannesburg Academic Hospital MRI radiology department. The research was based on 300 MRI scanning patients registered at Charlotte Maxeke Johannesburg Academic Hospital MRI radiology department, during the period under study.

3.1.2 Sampling

The research identified a target population of 300 MRI scanning patients registered at Charlotte Maxeke Johannesburg Academic Hospital MRI radiology department, during the period under study and employed a simple random sampling technique to choose the research sample frame.

3.1.3 Justification of sampling methods

The simple random sampling technique was used because it gives every MRI scanning patient's file data in the targeted population an equal opportunity of being selected for research purposes, hence reducing the bias and subjectivity element of the researcher.

3.2 Data Collection

The study used mainly secondary data. The secondary data was obtained from patients' MRI scanning report files and other sources, such as the research related academic articles, journals which were relevant to the study, past research work, dissertations and other theses containing the necessary data relevant to the study.

3.2.1 Secondary Data

The study used monthly data of MRI scanning patients for a period of six months, categorised into three months before and three months after the withdrawal of overtime pay. Quantitative data used in the study was obtained from secondary data sources such as MRI scan patients' reports. Secondary data was incorporated because it enables trend analysis to be carried out easily.

3.2.2 Justification for the use of secondary data

The research used secondary data for the following reasons:

i. The strategy was productive, fast and less expensive to make utilization of effectively existing information.

ii. Optional information enabled the analyst to broaden the extent of subjective and quantitative information examination to enhance the nature of discoveries.

iii. Auxiliary information was promptly accessible and in a handled state, in this manner making it less demanding to utilize.

3.2.3 Challenges faced in collection of secondary data.

There were limited challenges faced in the collection of secondary data except that the data needed to be sorted to suit the research requirements. Unnecessary data also needed to be removed from the data collected. Careful searching was also needed to find relevant sources for secondary data in order to give the context meaning. Secondary data was less useful as

some of information was stale and its original purpose for which it was gathered was unknown.

3.2.4 Types of information collected

The data were extracted from the patients' request or report forms filed in the MRI department archive room. The information that was collected comprised patients' request dates, scan reports dates and the number of MRI scanning patients on hospital beds for the period under study. The number of waiting days for MRI was considered as the number of days between the request and the scan report date. This is mathematically expressed as:

MRI waiting days = MRI scan dates - MRI request date.

The other important data gathered included a variety of disciplines such as orthopaedics, pre-surgery and oncology staging, etc.

Equally important, the number of patients who occupied beds while awaiting MRI scans during the period under study and bed stay cost per day per patient was collected. The hospital cost per day used in this research was in line with the patient fee schedule for paying patients attending public facilities (User Guide-UPFS for 2012 by Department of Health). The researcher found patient fee schedule guide cost as a standard cost to all MRI scanning patients across South Africa. All costs in this research are denominated in South African rand.

The secondary data for the research was gathered in two phases. The first phase of data collected was before the withdrawal of overtime facility to workers of MRI scanning and the second phase was after the withdrawal of the overtime payment facility to MRI scanning staff at Charlotte Maxeke Johannesburg Academic Hospital MRI radiology department.

3.3 Data analysis techniques and presentation

The data analysis and presentation process took the following steps:

i. Secondary data gathered was mostly quantitative and it was analysed using an Excel spread sheet. The researcher collected the MRI patients' reports and quantitative data collected was coded in line with the research objectives in an Excel spread sheet.

ii. Coded data was captured into a master file using an Excel spread sheet. Excel software was chosen because it is user friendly and easy to analyse research results once the information is loaded.

iii. Data cleaning process was run for the removal of outliers, inconsistencies, extremes and influential values, which could have distorted the findings.

iv. The analysis was run on an Excel spread sheet and results are presented in form of graphs, tables and averages depending on what needed to be identified.

v. The outcome of MRI scan was captured and analysed in the following categories:

-treated

-complicated

-died from the index disease that required MRI

-discharged before MRI was done

The two classes of data gathered was analysed, compared, contrasted, explained, conclusions and recommendations derived.

3.4 Diagnostic tests of the research data

Different tests were conducted in order to find whether the data collected was best fit or not for the research in question. These tests formed part of the data clean up exercise. Tests conducted enabled the researcher to have objective and reliable research results. The data adequacy requirement tests include measures of central tendency, Pearson product moment correlation coefficient, coefficient of determination, autocorrelation, chi-square, stationarity, long-term relationship and Granger causality.

3.4.1 Measures of central tendency

The researcher computed measures of central tendency such as mean, mode and median on MRI's waiting time of the two-phase period under consideration.

i. Mean

The researcher used the mean to describe an entire set of observed waiting times and corresponding bed stay costs with a single value representing the centre of the data. The statistical mean was used as a standard reference point to show the average waiting time per patient of MRI scan at Charlotte Maxeke referral hospital. The mean is the sum of all observations divided by the number of observations. The researcher used statistical mean because of simplicity to compute and equally sensitive to location of every set of data in a given a sample frame. However, the mean value may be affected by extreme values. The

statistical mean values are calculated for the two period phases under comparison using the waiting times and bed stay costs at Charlotte Maxeke referral hospital three months before 20th April 2012 and three months after overtime payment was discarded for the MRI scan personnel.

ii. Median

The median is the center regular esteem when a set request is masterminded by size. It distinguishes the centre value, given an arrangement of information. It is dictated by positioning the information and discovering perception number [N + 1]/2. In the event that there is a considerably number of perceptions, the middle is extrapolated as the esteem halfway between that of perception numbers N/2 and [N/2] + 1. The scientist utilized the measurable middle to decide the spread of holding up times and bed stay costs from the focal estimation of the information assembled under the period in thought. The middle gives a steady number, not influenced by extraordinary information esteems, anyway it has feeble particular properties.

iii. Mode

The mode is the value that happens most oftentimes in an arrangement of perceptions. In this examination, mode alludes to most seeming holding up time and bed stay costs at Charlotte Maxeke hospital under the exploration time frame. Mode was utilized with mean and median to give a general portrayal of holding up time and bed remain costs' information dissemination. The mode was anything but difficult to recognize as it is found basically by tallying the occasions each esteem happens in an informational collection. Be that as it may, it may not exist or may not find purposes of focus.

3.4.2 Sample Standard Deviation.

Standard deviation is a proportion of how spread out the holding up times and bed stay costs are. The scientist utilized standard deviation to decide the hazard presented to the MRI examine patients because of the elements that occurred in a half year under thought. The standard deviation was computed for the two periods of data under consideration and contextual meaning was derived. The standard deviation was determined by the formula below:

$$s = \sqrt{\frac{1}{N-1}\sum_{i=1}^{N}(x_i - \overline{x})^2}$$

Where s = sample standard deviation

N= number of data observation

x= the observed waiting times or bed stay costs

x-=the observed mean of waiting times or bed stay costs.

The researcher used sample standard deviation because the data was collected using a random sampling techique in picking MRI scan patients' file records. The higher the sample standard deviation, the higher the risk exposure to MRI scan patients as a result of the removal of overtime payment of MRI scan personnel at Charlote Maxeke referral hospital in 2012.

3.4.3 Chi-Square Test for Independence

The Chi-square test is directed to decide information freedom. The test is connected when the scientist has two straight out factors from a solitary populace. It was utilized to decide if there is a critical relationship between the MRI scan patients' waiting times and bed stay costs. The Chi-square test for independence was appropriate because the data for the waiting periods and bed stay costs was gathered by a simple random sampling technique and the sample frame data was easily displayed in a contingency table. The chi-square was computed based on the following hypothesis.

H_0: MRI scan waiting time and bed stay costs are independent.
H_1: MRI scan waiting time and bed stay costs are not independent.

The alternative hypothesis states that the level of MRI scan waiting period can assist the researcher to predict the bed stay costs. The chi-square test for independence was conducted using 95% confidence or 5% significance interval.

The researcher used sample data of waiting times and bed stay costs collected from MRI scan patients' files to find the degrees of freedom, expected frequencies, test statistic, and the P-value associated with the test statistic. The researcher used the approach described below:

i. **Degrees of freedom.**

The degrees of freedom (DF) are equivalent to:

DF = (r - 1) * (c - 1)

Where r is the quantity of levels for one clear cut variable, and c is the quantity of levels for the other straight out factor.

ii. Expected frequencies.

The normal recurrence tallies are registered independently for each dimension of one downright factor at each dimension of the other all out factor. Figure r * c expected frequencies, as indicated by the accompanying equation.

$$E_{r,c} = (n_r * n_c)/n$$

where $E_{r,c}$ is the normal recurrence mean dimension r of MRI check holding up time and level c of bed stay cost, n_r is the aggregate number of test perceptions at level r of MRI examine holding up time, n_c is the aggregate number of test perceptions at level c of bed stay cost, and n is the aggregate example estimate.

iii. Test statistic.

The test measurement is a chi-square arbitrary variable (X2) characterized by the accompanying condition.

$$X2 = \Sigma [(O_{r,c} - E_{r,c})2/E_{r,c}]$$

where $O_{r,c}$ is the watched recurrence tally at level r of MRI examine holding up period and level c of bed stay cost, and $E_{r,c}$ is the normal recurrence tally at level r of MRI filter holding up time and level c of bed stay cost.

iv. P-value

The P-value is the likelihood of watching an example measurement as outrageous as the test measurement. Since the test measurement is a chi-square, the analyst utilized Chi-Square Distribution Calculator to evaluate the likelihood related with the test measurement.

Be that as it may, if the example discoveries are far-fetched, given the invalid speculation, the analyst rejects the invalid theory. Normally, this includes contrasting the P-value with the centrality level, and dismissing the invalid speculation when the P-value is not exactly the essentialness level.

3.4.4 Pearson product moment correlation coefficient

The amount r, called the direct relationship coefficient, measures the quality and the course of a direct connection between two factors .The numerical equation for figuring r is:

$$r = \frac{n\sum xy - \left(\sum x\right)\left(\sum y\right)}{\sqrt{n\left(\sum x^2\right) - \left(\sum x\right)^2}\sqrt{n\left(\sum y^2\right) - \left(\sum y\right)^2}}$$

Where n is the amount of sets of data. X and Y are the data factors under the examination. X is MRI check holding up time and Y is the bed stay cost. The estimation of r is with the true objective that - 1 < r < +1. The + and – signs are used for positive direct associations and negative straight connections, independently.

A positive: - If x and y have a strong positive straight relationship, r is close to +1. A r estimation of decisively +1 demonstrates a perfect positive fit. Positive characteristics demonstrate an association among x and y elements to such a degree, to the point that as characteristics for x increase, values for y moreover augment.

A negative relationship:- If x and y have a strong negative straight association, r is close - 1. A r estimation of absolutely - 1 exhibits a perfect negative fit. Negative characteristics exhibit an association among x and y with the ultimate objective that as characteristics for x increase, values for y lessen.

A no relationship: - If there is no or a slight direct association, r is

close to 0. A motivator near zero suggests that there is an unpredictable, nonlinear association between the two variables. Note that r is a dimensionless sum; that is, it doesn't depend upon the units used. A perfect association of ± 1 happens exactly when the data centers all lie correctly around a straight line. In case r = +1, the inclination of this line is certain. If r = - 1, the grade of this line is negative. A relationship more essential than 0.8 is all things considered delineated as strong, however an association under 0.5 is overall depicted as

weak. These characteristics can move subject to the "type" of data being examined. An examination utilizing consistent data may require a more grounded relationship than an examination using human science data.

3.4.5 Stationarity

Stationarity refers to a condition where statistical properties like mean, variance and auto correlation remain constant over time. Challis (1991) indicates that if the mean and variance do not change with time, the process is stationary. Stationarity of a process enables accurate production of model results as well as good future prediction of outcomes, future behaviours or effects of independent variables on the dependent variable. Non-stationary series are associated with varying outcomes due to persistence and existence of shocks over time; hence resulting in spurious regression. In this study, stationarity was measured using an Augmented Dickey-Fuller Test.

3.4.6 Long-term relationship

Long haul relationship is estimated utilizing Cointegration. Cointegration is a factual property of time arrangement that estimates presence of long haul connections. Two arrangement are cointegrated in the event that they share a typical stochastic float. Incorporation of factors and presence of a stationary straight relationship after some time suggests the presence of a long haul harmony relationship. Misleading relapse animates the estimation of cointegration in models, as a method for decreasing odds of making one-sided ends. In this examination, Johansen tests were directed to set up the presence of a long haul relationship (cointegration) between the autonomous factors and the reliant variable. However, series may be non-stationary but cointegrated. The following hypothesis conditions were tested:

H_0: There is no long-term relationship between waiting time and bed stay costs due to removal of overtime payment.

H_1: There is existence of long-term relationship between waiting time and bed stay costs due to removal of overtime payment.

3.4.7 Granger causality

Causality estimates the connection between an occasion (cause) and the second occasion (impact), where the second occasion is comprehended to be the outcome of the first. It endeavors to characterize the connection between an arrangement of elements (causes) and

the marvel (impacts). Causes are recognized into two, in particular, vital and adequate. On the off chance that X is an essential reason for Y, the nearness of Y fundamentally infers the nearness of X and on the off chance that X is an adequate reason for Y, the nearness of X adequately infers the nearness of Y. Henceforth, in this examination, the information factors were tried whether they are adequate to be influenced by extra time instalment expulsion. The Granger-Causality tests were led to test for causality. The accompanying speculations was tried:

H_0: The removal of overtime payment does not granger cause waiting time and bed stay costs.

H_1: The removal of the overtime payment granger cause waiting time and bed stay costs

3.5 Conclusion

This chapter has discussed the research methodology employed in this study. It has outlined the research design, sampling procedure, research instruments, and justification for each stage taken. Further, the chapter highlighted the various types of information that were collected by each instrument, the data analysis techniques employed, diagnostic tests of the research data variables and how they were presented. The next chapter focuses on the analysis, presentation and discussion of the findings.

CHAPTER 4:

DATA ANALYSIS AND PRESENTATION

4.0 Introduction

This chapter presents the research findings and discussion. This chapter presents the results on the effects of personnel shortages of MRI scan at Charlotte Maxeke referral hospital, gathered from the secondary sources of the patients' MRI requests/report files. The secondary data was analyzed with reference to key areas of the research questions that needed to be answered. The MRI scan patients' waiting time and bed stay costs were collated, tested diagnostically and presented in the contingency tables and charts, after which, simple percentages and mean were used to analyze the data.

4.1 Demographic information

The simple random sample used in this research study was categorized into two major classes, namely male and female MRI scan patients and further sub-categorized into adults and children class sections. The research populations used in this study are tabulated in table 4.1. A total of 300 MRI requests forms were randomly picked. The total of 78 MRI scan male patients constituted 26% of the total population under study and a total of 222 female MRI scan patients contributed 74% of the research population. Adult males MRI request form of data collected were 17% while male children constitute a mere 9%. Adult females MRI scan requests forms used contributed 59% and female children were 15%. Adult females contributed the largest proportion of the secondary research data gathered for this research because most women required MRI scan services due to pregnancy complications.

Table 4. 1 MRI scans research population composition

Details	Total	%	Adults	%	Children	%
Males	78	26%	50	17%	28	9%
Females	222	74%	177	59%	45	15%
Total	300	100%	227	76%	73	24%

Source: Researcher's Own Calculations

4.2 Number of MRI scans patients occupied hospital bed

A random sample of 300 MRI scan patients' record files was used in this research. A total of 150 patients' files information was recorded per each period, before and after the removal of

overtime payment to MRI scans personnel on 20 April 2012. Of the 150 patients' record files used before the removal of overtime payment, the researcher observed that 50 % of MRI scan patients at Charlotte Maxeke Hospital spent less than 10 days occupying hospital beds for MRI scan examination before 20 April 2012, when overtime was still used to incentivize the MRI scan personnel. About 35 % spent up to 30 days and 15% spent more than 30 days occupying hospital beds, while awaiting MRI scan examinations. During this period, patients were quicker to be scanned and treated or recommended a solution, according to MRI scan reports of their ailments.

However, of the 150 MRI scan patients' record files that were used for this research, for the period after the removal of overtime payment was affected to MRI scan personnel at Charlotte Maxeke hospital, about 45% took 60 days on hospital beds while waiting for their turn for the important MRI scan examination. 30 % of the patients spent over 30 days to be examined, while a mere 25 % of the patients managed to spend less than 30 days to get their booked MRI scan at Charlotte Maxeke referral hospital after 20 April 2012. The overall effect of removal of overtime payment was that more patients spent longer waiting times and higher total bed stay costs while waiting for MRI scan at Charlotte Maxeke tertiary referral hospital after 20 April 2012.

4.3 Number of waiting days and bed stay costs for MRI scan patients

The number of waiting days and bed stay costs of MRI scan patients was determined using the statistical measures of central tendency, such as mean, mode and median. The results are tabulated in table 4.2 and discussed thereafter, deriving a more contextual meaning to the results in line with the research objectives.

4.3.1 MRI scan's measures of central tendency and standard deviation

The researcher calculated the measures of central tendency which comprise mean, mode and median of the gathered MRI scan waiting times and bed stay costs at Charlotte Maxeke tertiary referral hospital for the three months before and three months after the removal of overtime payment to the personnel of MRI scan on 20 April 2012. The MRI scan measures of central tendency waiting times results are tabulated in table 4.2.

Table 4. 2 MRI scan waiting times measures of central results

	Before overtime removal		After overtime removal		
Measure	Waiting time	Bed stay cost	Waiting times	Bed stay cost	% Change
Mean	18 days	R 18 900	27 days	R 28 350	40%
Mode	3 days	R 3 150	15 days	R 15 750	500%
Median	15 days	R 24 150	25 days	R 36 750	67%

Source: Researcher's Own Calculations

Based on the results on table 4.2, MRI scan mean of 18 days implies patients waited for 18 days to be scanned before the overtime payment was removed from the MRI scan personnel. The MRI scan patients were on average spending R18 900 on bed stay costs before the removal of overtime payment and after the overtime payment was removed from the MRI scan personnel, the bed stay costs sky rocketed to an average of R28 350 per patient. Consequently, the MRI scan patients waited for an average of 27 days to be examined, which is 40% times more, after the removal of overtime payment to the MRI scan personnel at Charlotte Maxeke tertiary referral hospital. The removal of overtime payment to MRI scan personnel resulted in patients having longer waiting times before being scanned. This also resulted in tax payers paying more for bed stay costs. The longer the waiting times, the higher the bed stay costs to be paid by tax payers for MRI scan services at Charlotte Maxeke tertiary referral hospital after the removal of overtime payment to MRI scan personnel after 20 April 2012.

According to table 4.2, a mode of three days means that most MRI scan patients under this research only took three days to be attended to and spent R3 150 on bed stay costs, before overtime payment was removed. However, after the removal of overtime payment most MRI scan patients took 15 days to be scanned and consequently R15 750 on bed stay costs, on tax payers which is 500% times higher than before the personnel overtime payment was, removed at Charlotte Maxeke tertiary referral hospital.

4.3.2 MRI scans measure of standard deviation

The impact of the removal of overtime on MRI scan personnel resulted in longer waiting by patients and a corresponding higher bed stay costs at Charlotte Maxeke tertiary referral hospital over the period under the study.

Table 4. 3 MRI scans waiting times and Bed stay costs Standard Deviation

	Before overtime removal		After overtime removal		
Measure	Waiting time	Bed stay cost	Waiting times	Bed stay cost	% Change
Standard deviation	32 days	R 33 369	37 days	R 38 614	16%

Source: Researcher's Own Calculations

As depicted in table 4.3, the MRI scan waiting time at Charlotte Maxeke tertiary referral hospital standard deviation was 32 days with a related bed cost of R33 369 for the MRI scan patients before the removal of overtime payment to MRI scan personnel on 20 April 2012. The researcher found out that the standard deviation of the MRI scan waiting, and bed stay costs went up by 16% to 37 days at an approximated cost of R38 614 as a result of the cut off of overtime of the MRI scan personnel at Charlotte Maxeke tertiary hospital. The 16% increase in standard deviations was a key indicator of the high risk to which MRI scan patients were exposed by the delayed MRI scanning and treatment of their acute chronic ailments and possibly, death as a result of the removal of overtime payment at Charlotte Maxeke referral hospital. The higher the standard deviation, the more MRI scan patients are exposed to risk of deteriorating health conditions and at times, may lose their lives.

4.4 Relationship between MRI waiting times and hospital bed stay cost

4.4.1 Chi-square test for independence

The researcher found the results tabulated in table 4.4 through a Chi-square test:

Table 4. 4 Chi-square test results for waiting time and bed stay costs

Data variables	**critical values**	**probability**
Waiting time	0.05	0.003
Bed stay costs	0.047	0.0012

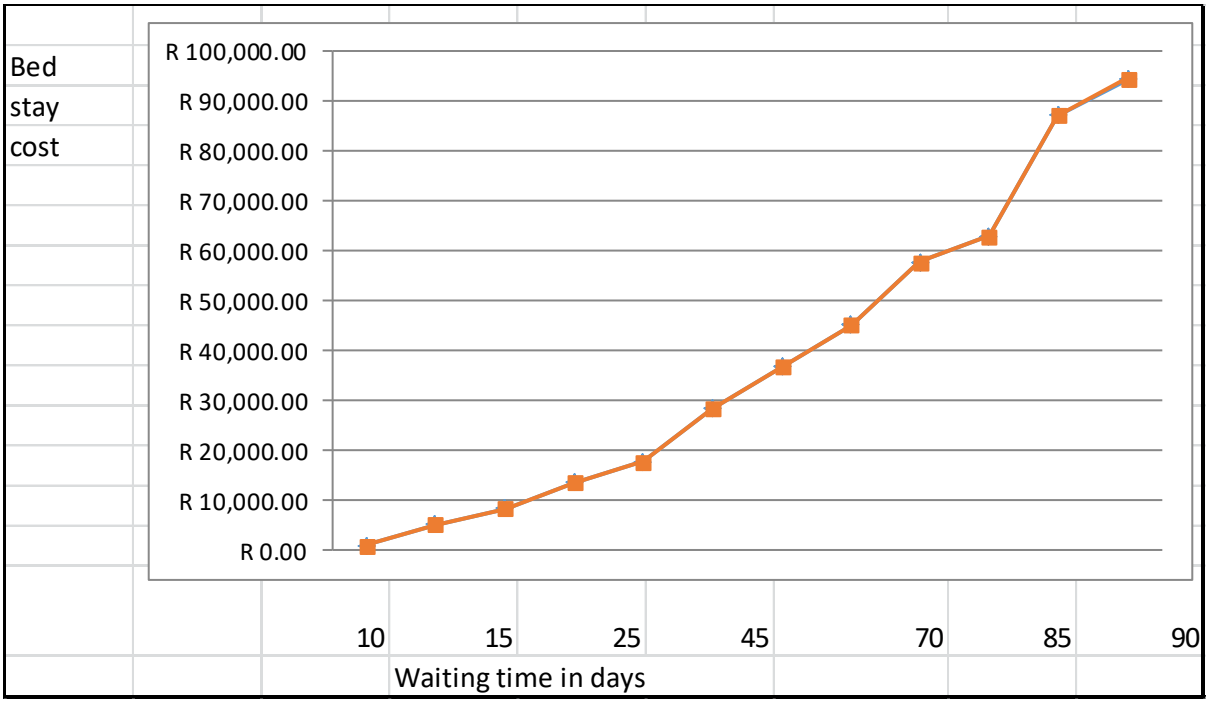
Source: Researcher's Own Calculations

Since the P-values of 0.003 and 0.0012 for waiting times and bed stay costs respectively are below the critical values and the significance level of 0.05, therefore the researcher rejected the null hypothesis. The researcher concludes that there is a relationship between waiting times and bed stay costs as a result of overtime payment removal and MRI scan personnel shortage at Charlotte Maxeke tertiary referral hospital over the period under study. The Chi square test was relevant to this research because the waiting time and bed stay costs was gathered through a random sampling technique, the research variables were categorical and expected frequency was greater than 5 in each cell of the contingency table.

4.4.2 Correlation coefficient of waiting and bed stay costs

The researcher established that there is a high positive correlation between MRI scan waiting time and total bed stay cost before and after 20 April 2012, when overtime was cut on MRI personnel at Charlotte Maxeke tertiary referral hospital. The Pearson's product moment correlation coefficient of 0.93 before and 0.97 after the removal of overtime payment implies that there is a high positive linear relationship between the MRI scan waiting times and hospital bed stay costs. The high positive correlation coefficient between the MRI scan waiting time and hospital bed stay cost at Charlotte Maxeke tertiary referral hospital indicated that the longer the waiting time per MRI scan patient, the higher the total bed stay cost incurred by the tax payers. The positive relationship between MRI scan waiting time and bed stay cost at Charlotte Maxeke tertiary referral hospital under research is presented graphically in Figure 4.1

Figure 4.1 Positive relationships between waiting time and bed stay cost



Source: Researcher's Own Calculations

4.4.3 Stationarity Tests

The same conditions, which have been used above when measuring stationarity, were deployed. The key condition states that for stationarity to exist the Augmented Dickey-Fuller Test Statistic should be greater than the Critical Values or the probability value should be less than 5%. Stationarity was also tested for waiting time, which has an effect on bed stay costs. The results of the test are shown in Table 4.6 below:

Table 4. 5 Stationarity Test Results for waiting time and bed stay costs as affected by removal of MRI scan personnel overtime.

Variables affected by overtime payment removal	**Augmented Dickey Fuller Test Statistics**	**Critical values**			**Probability**
		1%	5%	10%	
Waiting times	5.098	3.73	2.99	2.51	0.001
Bed stay costs	5.811	3.78	3.02	2.65	0.001

Source: Student Own Calculations

The results shown in Table 4.4 reveal that waiting time and bed stay costs were in a stationary state because all their probability values were less than 5% and their A.D test statics were greater than their respective critical values.

4.4.4 Cointegration Test

The researcher further tested the existence of a long-term relationship between waiting time and bed stay costs. Cointegration was measured using the Johansen Test, and the results are shown in Table 4.7 below:

Table 4.6 Cointegration test results for MRI scan waiting times and bed stay costs due to overtime payment removal

Data variables influenced by overtime payment removal	Trace test values	Critical values	Probability
MRI waiting times	33.66	12.47	0.0362
Bed stay costs	19.12	15.49	0.0134

Source: Researcher's Own Calculations

Using the economic condition which states that if the probability values of the Johansen test are less than 5% a long-term equilibrium relationship exists between two variables. The above results generally show that the probability values for all variables tested were less than 5%; hence depicting the existence of a long-term equilibrium relationship between waiting time and bed stay costs after and before the removal of overtime on 20 April 2012. To strengthen this, further tests were conducted to establish the existence of causal relationships between waiting time and bed stay costs.

4.4.5 Granger Causality Test

Despite having established the existence of relationships, the researcher further tested whether the removal of overtime payment of MRI scan personnel at Charlotte Maxeke referral hospital has a real effect on patients' waiting and total hospital bed costs. The researcher carried out the Granger-Causality test to ascertain if the removal of overtime payment has a necessary effect on the patients' waiting time and total bed stay costs. The condition used for determining existence of Granger-Causality of the data variables, states that if the probability value of the Granger-Causality test is less than 5%, the null hypothesis is not accepted and vice-versa. The results of the Granger-Causality test are tabulated in Table 4.8 below:

Table 4.7 Granger causality test results on MRI scan waiting times and bed stay costs

Null hypothesis	F-statistics	Probability value
Removal of overtime payment does not Granger cause waiting time	4.4061	0.02208
Removal of overtime payment does not Granger cause bed stay cost	3.40367	0.03863
Waiting time does not Granger cause bed stay cost	2.33177	0.03003

Source: Researcher's Own Calculations

The results on Table 4.8 depict that removal of overtime payment on MRI scan personnel Granger-cause increase in waiting time by patients and higher bed stay costs. The results further indicate that removal of overtime payment Granger effect on MRI scan patients' waiting time, which ultimately leads to high bed stay costs.

4.5 Conclusion

In this chapter, raw data related to consequences of overtime payment removal was gathered and processed into meaningful information, which was then analyzed and interpreted. Diagnostic tests were carried out and analyzed. Results from secondary data were presented using various forms of statistical description. Based on detailed analysis made in this chapter, research findings, conclusions and recommendations were drawn by the researcher, which are presented in the next chapter.

CHAPTER 5:

RESEARCH, FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

This section shows an outline of the exploration discoveries, ends and proposals from the examination discoveries. The study conclusions were derived from the data analyzed in the previous chapter. An area of further study is also presented in this chapter.

5.1 Summary of findings

The research findings assisted in meeting the set objectives, which were an evaluation of the effects before and after the overtime payment removal on MRI scans personnel at Charlotte Maxeke tertiary referral hospital in Johannesburg on 20 April 2012.

Findings of this research study showed that 76% of MRI scans at Charlotte Maxeke tertiary referral hospital were adults, while children contributed a mere 24%. Adult females contributed the largest proportion of the secondary research data gathered for this research because most women required MRI scan services due to pregnancy complications.

Apart from that, the study discovered that there were many MRI scans patients who occupied hospital beds after the removal of overtime payment to the MRI scan personnel at Charlotte Maxeke tertiary referral hospital. 45% of the study population spent 60 days waiting period, after the overtime payment was cut.

Moreover, findings of the study showed that the mean waiting time was 18 days before 20 April 2012 and it sky-rocketed to 27 days after 20 April 2012 when overtime payment was cut for the MRI scan personnel. This overtime cut resulted in patients experiencing longer waiting times. The mode waiting times were three days before and 15 days after the removal of overtime payment. According to the median, the research showed that half of the patients experienced 15 days wait time before and half experienced 25 days wait time after 20 April 2012 to get their MRI scans medical services.

The research depicted that the MRI scan waiting time at Charlotte Maxeke tertiary referral hospital standard deviation was 32 days before the removal of overtime payment to MRI scan staff on 20 April 2012. The researcher found out that the standard deviation of the MRI scan waiting, and bed stay costs went up by 16% to 37 days as a result of the cut off of overtime of

the MRI scan personnel at Charlotte Maxeke tertiary hospital. The 16% increase in standard deviations was a key indicator of the high risk to which MRI scan patients were exposed, namely, late examination and treatment of their chronic ailments as a result of the removal of overtime payment at Charlotte Maxeke tertiary referral hospital. The higher the standard deviations, the more MRI scan patients are exposed to risk of deteriorating health conditions and at times loss of life before being examined.

This summary of findings has laid a solid basis for the conclusions and recommendations put forward and discussed in this report.

5.2 Conclusions

The following conclusions were made from the aforementioned research findings:

5.2.1 MRI scan patients occupied bed hospital at Charlotte Maxeke Johannesburg Academic

The researcher concluded that during the three months before 20 April 2012, patients were quicker to be examined and treated or recommended a solution accordingly, to monitor their ailments at Charlotte Maxeke referral hospital. This was due to the fact that MRI scans technologists were incentivized to work through an overtime payment scheme. Fewer MRI scans patient occupied beds at Charlotte Maxeke referral hospital during the period aforementioned.

However, the overall effect of the removal of overtime payment was that more patients occupied hospital beds, spent longer waiting times and had higher total bed stay costs while waiting for MRI scans at Charlotte Maxeke referral hospital after 20 April 2012.

5.2.2 The average number of waiting days per patient stays at Charlotte Maxeke Johannesburg Academic Hospital

Based on the results of the research, the researcher concluded that MRI scans patients mean waiting time of 18 days implies patients waited for 18 days to be examined before the overtime payment was removed from the MRI scan personnel. Subsequently, the MRI scan patients waited for an average of 27 days to be examined, which is 50% times more, after the removal of overtime payment to the MRI scan personnel at Charlotte Maxeke referral hospital. The removal of overtime payment to MRI scan personnel resulted in patients having longer waiting times before being examined.

Apart from that, a mode of three days means that most MRI scan patients under this research only took three days to be attended to before overtime payment was removed. However, after the removal of overtime payment most MRI scan patients took 15 days to be examined, which was much higher than before the overtime payment was removed at Charlotte Maxeke referral hospital for MRI scans personnel.

5.2.3 The bed stay cost at Charlotte Maxeke Johannesburg Academic Hospital

The researcher concluded that the MRI scan patients were on average spending a mean amount of R 18 900 on bed stay costs before the removal of overtime payment and after the overtime payment was removed from the MRI scan personnel, the bed stay costs sky-rocketed to an average of R28 350 per patient. The removal of overtime payment to MRI scan personnel resulted in patients having longer waiting times before being examined. This also resulted in patients paying more for bed stay costs. The longer the waiting times, the higher the bed stay costs to be spent by patients for MRI scan services at Charlotte Maxeke referral hospital after the removal of overtime payment to MRI scan personnel after 20 April 2012.

5.2.4 Relationship between waiting time and bed stay costs at Charlotte Maxeke Johannesburg Academic Hospital

The researcher established that there is a high positive correlation between MRI scan waiting time and total bed stay cost before and after 20 April 2012 when overtime was cut on MRI scan personnel at Charlotte Maxeke referral hospital. The high positive correlation coefficient 0.93 and 0.97 between the MRI scan waiting time and hospital bed stay cost at Charlotte Maxeke referral hospital indicated that the longer the waiting time per MRI scan patient, the higher the total bed stay cost incurred by the patient. The positive relationship between MRI scan waiting time and bed stay cost at Charlotte Maxeke referral hospital under research signifies that the more the patient waits, the higher the bed stay costs.

The researcher found that removal of overtime payment on MRI scan personnel Granger-cause increase in waiting time by patients and higher bed stay costs. The results further indicate that removal of overtime payment Granger effect on MRI scan patients' waiting time, which ultimately led to high bed stay costs.

5.3 RECOMMENDATIONS

The study sets out the following recommendations:

5.3.1 South African government must set a high budget to subsidize MRI scan patients

The researcher recommends that the South African government must set aside more funds to subsidize and cushion the bed stay costs of MRI scan patients across all referral hospitals. Also, the funds budgeted by the government for MRI scans could be used to incentivize the MRI scans medical staff and this could reduce patients' overall waiting time.

5.3.2 Referral hospital must set out waiting time target schemes

The Ministry of Health must set out waiting time target schemes for all hospitals in South Africa. These waiting time target schemes must be well monitored to ensure that all hospitals are adhering to them, to ensure delivery of quality health services timeously. Those hospitals who meet their set waiting time target schemes must be incentivized by the Ministry of Health and attract competition from other hospitals to follow suit.

5.3.3 Training and re-training on MRI scan personnel

The referral hospitals in conjunction with the Ministry of Health must ensure that MRI scans personnel are well trained and equipped to deliver quality health services. The MRI scan personnel must periodically be sent for retraining through medical workshops, seminars and refresher courses to ensure that the MRI scans personnel are up to date with the current trends in the medical fraternity.

5.3.4 Area of further study

The study presents an area of further study to investigate the the effectiveness of MRI scan technology in detecting patients' chronic ailments.

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APPENDIX

Waiting times and bed stay costs data

BEFORE APRIL 2012	BED	TOTAL BED	AFTER APRIL 2012	BED	TOTAL BED
DURATION	COST	COST	DURATION	COST	COST
30	R 1,050.00	R 31,500.00	11	R 1,050.00	R 11,550.00
1	R 1,050.00	R 1,050.00	7	R 1,050.00	R 7,350.00
38	R 1,050.00	R 39,900.00	15	R 1,050.00	R 15,750.00
1	R 1,050.00	R 1,050.00	10	R 1,050.00	R 10,500.00
88	R 1,050.00	R 92,400.00	8	R 1,050.00	R 8,400.00
77	R 1,050.00	R 80,850.00	78	R 1,050.00	R 81,900.00
10	R 1,050.00	R 10,500.00	10	R 1,050.00	R 10,500.00
13	R 1,050.00	R 13,650.00	45	R 1,050.00	R 47,250.00
3	R 1,050.00	R 3,150.00	71	R 1,050.00	R 74,550.00
1	R 1,050.00	R 1,050.00	60	R 1,050.00	R 63,000.00
67	R 1,050.00	R 70,350.00	11	R 1,050.00	R 11,550.00
13	R 1,050.00	R 13,650.00	8	R 1,050.00	R 8,400.00
51	R 1,050.00	R 53,550.00	50	R 1,050.00	R 52,500.00
6	R 1,050.00	R 6,300.00	86	R 1,050.00	R 90,300.00
1	R 1,050.00	R 1,050.00	2	R 1,050.00	R 2,100.00
91	R 1,050.00	R 95,550.00	16	R 1,050.00	R 16,800.00
15	R 1,050.00	R 15,750.00	98	R 1,050.00	R 102,900.00
67	R 1,050.00	R 70,350.00	22	R 1,050.00	R 23,100.00
2	R 1,050.00	R 2,100.00	1	R 1,050.00	R 1,050.00
5	R 1,050.00	R 5,250.00	1	R 1,050.00	R 1,050.00
56	R 1,050.00	R 58,800.00	64	R 1,050.00	R 67,200.00
5	R 1,050.00	R 5,250.00	6	R 1,050.00	R 6,300.00
1	R 1,050.00	R 1,050.00	1	R 1,050.00	R 1,050.00
76	R 1,050.00	R 79,800.00	1	R 1,050.00	R 1,050.00
1	R 1,050.00	R 1,050.00	1	R 1,050.00	R 1,050.00
2	R 1,050.00	R 2,100.00	7	R 1,050.00	R 7,350.00
1	R 1,050.00	R 1,050.00	80	R 1,050.00	R 84,000.00
2	R 1,050.00	R 2,100.00	1	R 1,050.00	R 1,050.00
1	R 1,050.00	R 1,050.00	1	R 1,050.00	R 1,050.00
42	R 1,050.00	R 44,100.00	94	R 1,050.00	R 98,700.00
32	R 1,050.00	R 33,600.00	1	R 1,050.00	R 1,050.00
1	R 1,050.00	R 1,050.00	1	R 1,050.00	R 1,050.00
1	R 1,050.00	R 1,050.00	5	R 1,050.00	R 5,250.00
64	R 1,050.00	R 67,200.00	1	R 1,050.00	R 1,050.00

1	R 1,050.00	R 1,050.00	1	R 1,050.00	R 1,050.00
7	R 1,050.00	R 7,350.00	3	R 1,050.00	R 3,150.00
7	R 1,050.00	R 7,350.00	96	R 1,050.00	R 100,800.00
1	R 1,050.00	R 1,050.00	81	R 1,050.00	R 85,050.00
1	R 1,050.00	R 1,050.00	89	R 1,050.00	R 93,450.00
1	R 1,050.00	R 1,050.00	16	R 1,050.00	R 16,800.00
1	R 1,050.00	R 1,050.00	6	R 1,050.00	R 6,300.00
6	R 1,050.00	R 6,300.00	89	R 1,050.00	R 93,450.00
1	R 1,050.00	R 1,050.00	67	R 1,050.00	R 70,350.00
11	R 1,050.00	R 11,550.00	2	R 1,050.00	R 2,100.00
1	R 1,050.00	R 1,050.00	8	R 1,050.00	R 8,400.00
1	R 1,050.00	R 1,050.00	1	R 1,050.00	R 1,050.00
1	R 1,050.00	R 1,050.00	1	R 1,050.00	R 1,050.00
1	R 1,050.00	R 1,050.00	2	R 1,050.00	R 2,100.00
1	R 1,050.00	R 1,050.00	87	R 1,050.00	R 91,350.00
1	R 1,050.00	R 1,050.00	72	R 1,050.00	R 75,600.00
1	R 1,050.00	R 1,050.00	9	R 1,050.00	R 9,450.00
1	R 1,050.00	R 1,050.00	70	R 1,050.00	R 73,500.00
1	R 1,050.00	R 1,050.00	1	R 1,050.00	R 1,050.00
144	R 1,050.00	R 151,200.00	1	R 1,050.00	R 1,050.00
73	R 1,050.00	R 76,650.00	92	R 1,050.00	R 96,600.00
128	R 1,050.00	R 134,400.00	1	R 1,050.00	R 1,050.00
1	R 1,050.00	R 1,050.00	19	R 1,050.00	R 19,950.00
1	R 1,050.00	R 1,050.00	62	R 1,050.00	R 65,100.00
1	R 1,050.00	R 1,050.00	91	R 1,050.00	R 95,550.00
1	R 1,050.00	R 1,050.00	92	R 1,050.00	R 96,600.00
32	R 1,050.00	R 33,600.00	2	R 1,050.00	R 2,100.00
2	R 1,050.00	R 2,100.00	2	R 1,050.00	R 2,100.00
1	R 1,050.00	R 1,050.00	79	R 1,050.00	R 82,950.00
4	R 1,050.00	R 4,200.00	72	R 1,050.00	R 75,600.00
146	R 1,050.00	R 153,300.00	1	R 1,050.00	R 1,050.00
144	R 1,050.00	R 151,200.00	1	R 1,050.00	R 1,050.00
4	R 1,050.00	R 4,200.00	1	R 1,050.00	R 1,050.00
17	R 1,050.00	R 17,850.00	58	R 1,050.00	R 60,900.00
8	R 1,050.00	R 8,400.00	3	R 1,050.00	R 3,150.00
1	R 1,050.00	R 1,050.00	3	R 1,050.00	R 3,150.00
9	R 1,050.00	R 9,450.00	56	R 1,050.00	R 58,800.00
7	R 1,050.00	R 7,350.00	77	R 1,050.00	R 80,850.00
1	R 1,050.00	R 1,050.00	88	R 1,050.00	R 92,400.00
1	R 1,050.00	R 1,050.00	20	R 1,050.00	R 21,000.00
63	R 1,050.00	R 66,150.00	28	R 1,050.00	R 29,400.00

1	R 1,050.00	R 1,050.00	84	R 1,050.00	R 88,200.00
1	R 1,050.00	R 1,050.00	1	R 1,050.00	R 1,050.00
1	R 1,050.00	R 1,050.00	92	R 1,050.00	R 96,600.00
1	R 1,050.00	R 1,050.00	92	R 1,050.00	R 96,600.00
1	R 1,050.00	R 1,050.00	27	R 1,050.00	R 28,350.00
1	R 1,050.00	R 1,050.00	92	R 1,050.00	R 96,600.00
2	R 1,050.00	R 2,100.00	1	R 1,050.00	R 1,050.00
2	R 1,050.00	R 2,100.00	75	R 1,050.00	R 78,750.00
41	R 1,050.00	R 43,050.00	83	R 1,050.00	R 87,150.00
1	R 1,050.00	R 1,050.00	35	R 1,050.00	R 36,750.00
8	R 1,050.00	R 8,400.00	55	R 1,050.00	R 57,750.00
1	R 1,050.00	R 1,050.00	1	R 1,050.00	R 1,050.00
89	R 1,050.00	R 93,450.00	7	R 1,050.00	R 7,350.00
3	R 1,050.00	R 3,150.00	70	R 1,050.00	R 73,500.00
9	R 1,050.00	R 9,450.00	79	R 1,050.00	R 82,950.00
3	R 1,050.00	R 3,150.00	29	R 1,050.00	R 30,450.00
1	R 1,050.00	R 1,050.00	61	R 1,050.00	R 64,050.00
2	R 1,050.00	R 2,100.00	93	R 1,050.00	R 97,650.00
1	R 1,050.00	R 1,050.00	11	R 1,050.00	R 11,550.00
1	R 1,050.00	R 1,050.00	1	R 1,050.00	R 1,050.00
1	R 1,050.00	R 1,050.00	37	R 1,050.00	R 38,850.00
1	R 1,050.00	R 1,050.00	8	R 1,050.00	R 8,400.00
90	R 1,050.00	R 94,500.00	8	R 1,050.00	R 8,400.00
1	R 1,050.00	R 1,050.00	15	R 1,050.00	R 15,750.00
79	R 1,050.00	R 82,950.00	22	R 1,050.00	R 23,100.00
1	R 1,050.00	R 1,050.00	4	R 1,050.00	R 4,200.00
3	R 1,050.00	R 3,150.00	19	R 1,050.00	R 19,950.00
25	R 1,050.00	R 26,250.00	24	R 1,050.00	R 25,200.00
1	R 1,050.00	R 1,050.00	32	R 1,050.00	R 33,600.00
22	R 1,050.00	R 23,100.00	1	R 1,050.00	R 1,050.00
78	R 1,050.00	R 81,900.00	87	R 1,050.00	R 91,350.00
53	R 1,050.00	R 55,650.00	91	R 1,050.00	R 95,550.00
1	R 1,050.00	R 1,050.00	66	R 1,050.00	R 69,300.00
2	R 1,050.00	R 2,100.00	96	R 1,050.00	R 100,800.00
1	R 1,050.00	R 1,050.00	79	R 1,050.00	R 82,950.00
1	R 1,050.00	R 1,050.00	1	R 1,050.00	R 1,050.00
1	R 1,050.00	R 1,050.00	7	R 1,050.00	R 7,350.00
1	R 1,050.00	R 1,050.00	1	R 1,050.00	R 1,050.00
1	R 1,050.00	R 1,050.00	9	R 1,050.00	R 9,450.00
1	R 1,050.00	R 1,050.00	1	R 1,050.00	R 1,050.00
56	R 1,050.00	R 58,800.00	1	R 1,050.00	R 1,050.00

1	R 1,050.00	R 1,050.00	59	R 1,050.00	R 61,950.00
1	R 1,050.00	R 1,050.00	92	R 1,050.00	R 96,600.00
1	R 1,050.00	R 1,050.00	2	R 1,050.00	R 2,100.00
1	R 1,050.00	R 1,050.00	5	R 1,050.00	R 5,250.00
1	R 1,050.00	R 1,050.00	2	R 1,050.00	R 2,100.00
2	R 1,050.00	R 2,100.00	78	R 1,050.00	R 81,900.00
1	R 1,050.00	R 1,050.00	1	R 1,050.00	R 1,050.00
2	R 1,050.00	R 2,100.00	92	R 1,050.00	R 96,600.00
76	R 1,050.00	R 79,800.00	92	R 1,050.00	R 96,600.00
45	R 1,050.00	R 47,250.00	3	R 1,050.00	R 3,150.00
36	R 1,050.00	R 37,800.00	99	R 1,050.00	R 103,950.00
61	R 1,050.00	R 64,050.00	43	R 1,050.00	R 45,150.00
21	R 1,050.00	R 22,050.00	3	R 1,050.00	R 3,150.00
65	R 1,050.00	R 68,250.00	26	R 1,050.00	R 27,300.00
8	R 1,050.00	R 8,400.00	11	R 1,050.00	R 11,550.00
1	R 1,050.00	R 1,050.00	1	R 1,050.00	R 1,050.00
48	R 1,050.00	R 50,400.00	1	R 1,050.00	R 1,050.00
8	R 1,050.00	R 8,400.00	97	R 1,050.00	R 101,850.00
13	R 1,050.00	R 13,650.00	14	R 1,050.00	R 14,700.00
1	R 1,050.00	R 1,050.00	67	R 1,050.00	R 70,350.00
1	R 1,050.00	R 1,050.00	82	R 1,050.00	R 86,100.00
1	R 1,050.00	R 1,050.00	98	R 1,050.00	R 102,900.00
24	R 1,050.00	R 25,200.00	10	R 1,050.00	R 10,500.00
4	R 1,050.00	R 4,200.00	78	R 1,050.00	R 81,900.00
1	R 1,050.00	R 1,050.00	1	R 1,050.00	R 1,050.00
1	R 1,050.00	R 1,050.00	90	R 1,050.00	R 94,500.00
5	R 1,050.00	R 5,250.00	11	R 1,050.00	R 11,550.00
1	R 1,050.00	R 1,050.00	90	R 1,050.00	R 94,500.00
1	R 1,050.00	R 1,050.00	19	R 1,050.00	R 19,950.00
2	R 1,050.00	R 2,100.00	76	R 1,050.00	R 79,800.00
1	R 1,050.00	R 1,050.00	79	R 1,050.00	R 82,950.00
16	R 1,050.00	R 16,800.00	28	R 1,050.00	R 29,400.00
14	R 1,050.00	R 14,700.00	2	R 1,050.00	R 2,100.00
4	R 1,050.00	R 4,200.00	7	R 1,050.00	R 7,350.00
2759		R 2,896,950.00	5481		R 5,755,050.00