

Response of patients to the introduction of a private Magnetic Resonance Imaging service in Western Jamaica

Lennox Anderson-Jackson¹, Donovan A. McGrowder², Paul A. Bourne³, Tazhmoye Crawford⁴, Wayne H. A. Whittaker⁵

¹International University of the Caribbean, Montego Bay Campus & Radiology West, Montego Bay, Jamaica.

²Departments of Pathology, ³Community Health and Psychiatry and ⁴Basic Medical Sciences, Faculty of Medical Sciences University of the West Indies, Mona Campus, Kingston 7, Jamaica.

⁵Department of Mathematics, North Cestrian School, Alrincham Cheshire, WA14 4AJ, United Kingdom.

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Abstract

Background: Magnetic Resonance Imaging (MRI) is one of today's fastest growing imaging modalities, spurred in part by rapid advances in technology and important new applications in patient care. It was introduced in Western Jamaica in March 2005 at a non-hospital-based facility called North Coast Imaging MRI Service. **Aims:** The study examined the socio-demographics, accessibility and affordability of the services to patients. **Materials and Method:** A random sample of 100 patients was used and the research instrument was a questionnaire. The study was conducted between August and November 2008. **Results:** The findings of the study showed that majority of the respondents lived in rural areas and were within the age group 30 - 59 years. One-half of the respondents resided in St. James, were employed; earned more than US\$1,351.00 per month and could afford the cost of the MRI procedure. More than one half of the respondents indicated that it took 15 – 30 minutes to be examined after arrival at the Centre; most (81%) of the respondents indicated that the MRI procedure was adequately explained, and 99% indicated that questions about the procedure were satisfactorily answered. The MRI Scans performed at the North Coast Imaging MRI Service showed an increase of 157.49% in 2006 when compared with 2005, and 70.90% in 2007 when compared with 2006. Our findings suggest that the number of MRI scans done at the North Coast Imaging MRI Service is likely to increase. **Conclusion:** Although most of the respondents were able to afford the procedure there are concerns about persons in the lower socio-economic group who are unable to afford expensive diagnostic imaging tests such as MRI scans. There is an urgent need for government-owned hospital-based MRI Units in Jamaica to offer lower cost MRI scans to the public.

Keywords: Magnetic resonance imaging, rural, scans, Jamaica, respondents, North Coast.

Correspondence to: Donovan A. McGrowder. Department of Pathology, Faculty of Medical Sciences, University of the West Indies, Mona Campus, Kingston 7, Jamaica. Email: dmcgrowd@yahoo.com

Introduction

Magnetic Resonance Imaging (MRI) is one of today's fastest growing imaging modalities, spurred in part by rapid advances in technology and important new applications in patient care. It is the newest, and perhaps most versatile, medical imaging technology available. Medical doctors can obtain highly refined images of the

body's interior without surgery, with the use of MRI [1]. By using strong magnets and pulses of radio waves to manipulate the natural magnetic properties in the body, this technique makes images of organs and soft tissues with higher spatial resolution than those of other scanning technologies. MRI provides the most detailed images of soft tissues such as the brain, eyes, inner ear, blood vessels,

organs (heart, liver, kidney, spleen and pancreas), the female reproductive system, the bladder and prostate, and joints (shoulder, knee, wrist, ankles and feet) [2]. This is based on the principles of nuclear magnetic resonance (NMR), used as a spectroscopic technique to obtain microscopic chemical and physical information about molecules [3].

In Jamaica, primary care facilities comprise 316 health centers offering services ranging from maternal and child health services to curative, dental, sexually transmitted infections (STI), and mental health services. Public sector hospitals provide more than 95% of hospital-based care on the island. The private sector dominates pharmaceutical and diagnostic services and provides about half of the ambulatory care through an extensive network of professionals offering specialist and general practice services. Non-governmental organizations and other groups provide health services at a nominal fee [4]. Up to early 2005, only two MRI Units were in Jamaica and these were located in Kingston, the capital of Jamaica. As a result, all the patients who resided outside of Kingston and required an MRI examination had to travel to Kingston. In July 2007, the Jamaican Government approved the award of a contract (valued at US\$487,430.00) to Arel Limited for the procurement of a Cassette modular building to house a MRI unit, and a 1.5 Telsa MRI scanner for the Kingston Public Hospital (KPH), the main Government-owned hospital. The acquisition of the unit was in keeping with the Government's continued efforts to enhance the capacity of the existing health infrastructure, by providing health care professionals with improved facilities and equipment [5].

Magnetic Resonance Imaging technology was introduced in Western Jamaica in March 2005 at a private facility called North Coast Imaging MRI Service, situated in Freeport, Montego Bay. North Coast Imaging MRI Service is situated less than one mile west of the Montego Bay Town Centre and is accessible to Western Jamaicans. Since the introduction of MRI service three years ago, it is of vital importance to evaluate its impact on patient care in Western Jamaica. A key aspect of the MRI services is the affordability of the MRI examination, as some patients may be unable to pay for an MRI scan. The MRI scans are considered expensive when compared to other high quality imaging modality, because purchasing, installing, operating and maintaining the MRI equipment is extremely expensive. It is important to investigate the number of persons in Western Jamaica that utilizes the MRI services in Montego Bay and to ascertain whether patients are satisfied with their MRI diagnosis. These are essential and can make a significant difference in their diagnosis, treatment and prognosis.

Rural populations generally experience excessive deficiencies in healthcare access, social services and other goods and services needed for healthy living. Rural residence has significantly influenced healthcare access and health status. Urban residents consistently reported better health status than rural residents, and greater

satisfaction with their health care [6]. Rural residents are more often uninsured [7], have a greater distance to travel for their healthcare needs [6] and are more often plagued by resource inaccessibility [8]. A greater proportion of people from the rural population in Jamaica reported having chronic illnesses, with a smaller population having insurance of any kind (7.6% in rural areas versus 25.0% in urban areas) [9]. Furthermore, 23% of the respondents from rural Jamaica who reported having a chronic illness were not actively engaged in seeking health care because of affordability issues, compared with 9.4% from urban areas who fit the said category.

A thorough investigation revealed that there is a lack of literature concerning MRI services in Jamaica (specifically in the Western region) since its introduction three years ago. Most of the residents in the Western region of the island are of low socio-economic status. It is hypothesized therefore that individuals in Western region, who are of low socio-economic status, will find it difficult to afford the cost of MRI scans compared to their financially viable counterparts. The study examined the socio-demographics, accessibility and affordability of the MRI service to patients. This study also evaluated the awareness of the patients who undergo MRI procedure of the precautionary and safety measures, and the extent to which these affected their decision to have the MRI procedure.

Materials and Methods

The research was performed at the North Coast Imaging MRI Service located in Freeport, Montego Bay, Jamaica. This was conducted primarily by a trained Medical Ultrasound Practitioner and Radiographer, who were employed with Radiology West, which is directly associated with North Coast Imaging MRI Service. In addition other members of the research team included the Operations and Business Manager for North Coast Imaging MRI Service and Radiology West (for consultancy), a MRI Technologist and Radiographer, and the Receptionist for North Coast Imaging MRI Service. The initial interviews were conducted by members of the team. The convenience sample size represented 100 patients, aged 10 years and over.

The study was conducted between August and November 2008. Questionnaire was the assessment instrument, which consisted of demographic characteristics (age, gender, employment status, and parish of residence); nature of employment; initial knowledge of North Coast Imaging MRI Service; reason for utilizing the MRI scan; number of experience with MRI procedure; nature of referral (public hospital/clinic or a private hospital/clinic); length of time to travel to the North Coast Imaging MRI Service; mode of transportation getting to the North Coast Imaging MRI Service; period of wait between arrival to facility and access to MRI service, clarity in explaining the MRI procedure prior to the examination; satisfactory response to MRI procedure; satisfaction with medical care received at the North Coast Imaging MRI Service; type of MRI scan requested by the attending physician;

ability to afford the cost of the MRI scan affordable; and cost of your procedure.

The study also examined the number of MRI examinations performed at the North Coast MRI Centre from 2005-2007. The data was sorted and analyzed using Statistical Package for Social Sciences (SPSS, Chicago, IL). Results are given as percentages.

Results

One hundred respondents constituted the sample (73% females and 27% males) and the majority (67%) was ages 30 to 59 years. One-half (50%) of the respondents resided in St. James, equal percentage in Westmoreland (13%) and other parishes (13%), 18% in Hanover and 6% in Trelawny. Majority (63%) of the respondents indicated being employed; 53% earned more than US\$1,352.00 while 7% earned less than US\$362.00 (Table 1). In terms of cost of MRI scan, 32% reported a cost of less than US\$338.00, 58% US\$338.00 – US\$541.00 and 10% more than US\$541.00. Just over three-quarters (76%) of the respondents indicated that the MRI examination was affordable compared with 24% who found it unaffordable (Table 1). In addition, 38% of the respondents indicated that family members assisted with paying for the MRI scan, 31% reported self, 25% insurance coverage and 6% borrowed a loan.

Table 1 Socio-demographic characteristics of respondents in study

Variables	Percentage (%)
<i>Age Group</i>	
10 – 14 years	2
15- 29 years	6
30 – 59 years	67
60 years and older	25
<i>Gender</i>	
Male	27
Female	73
<i>Area of residence (parish)</i>	
Hanover	18
St. James	50
Trelawny	6
Westmoreland	13
Other	13
<i>Employment status</i>	
Employed	63
Unemployed & unemployable	37
<i>Income group (per month)</i>	
Less than US\$362.00	7
US\$362.00 – US\$676.00	13
US\$677.00 – US\$1,351.00	17
More than US\$1,352.00	53
<i>Cost of MRI procedure(s)</i>	
Less than US\$338.00	32
US\$338.00 to US\$541	58
More than US\$541.00	10
<i>Affordability of MRI procedure</i>	
Yes	76
No	24

JA\$74.00 = US\$1.00

Of the total respondents, 75% were referred by a medical doctor at a private facility, while 25% by a medical doctor at a public hospital or clinic; 93% indicated that they experienced difficulties in making an appointment in a suitable time from the North Coast Imaging MRI Service. Less than half (42%) of the respondents decided to access the services at North Coast Imaging MRI Service because it was near their homes or places of work, 27% because they were referred by their personal physicians, 14% by other physicians, 7% another patient and 2% based on telephone listings (Table 2). Majority (44%) of the respondents indicated that it took less than 15 minutes to reach the North Coast Imaging MRI Service, 25% more than 1 hour and 31% from 15 - 59 minutes. Most (62%) of respondents travelled by private cars to the North Coast Imaging MRI Service, 25% used public transportation and 13% by the service of an ambulance. More than one half (61%) of the respondents reported a waiting time before examination at the North Coast Imaging MRI Service of 15 - 30 minutes, with 29% more than 1 hour and 10% less than 15 minutes (Table 2).

Table 2 Awareness and referral of patients to the North Coast Imaging MRI Service

Variables	Percentage (%)
<i>Had previous MRI examination</i>	
No	70
Yes	30
<i>Awareness of North Coast Imaging MRI Service</i>	
Magazine	1
Other	3
Newspaper	6
Radio Advertisement	7
Friend	13
Family	17
Physician	53
<i>Referred by</i>	
Private medical doctor	75
Medical doctor in public hospital/clinic	25
<i>Reason for Visit</i>	
Telephone Listing	2
Referral by another patient	7
Other	8
Referral by another physician	14
Referral by own physician	27
Near home or place of work	42
<i>Time taken to arrive at North Coast Imaging MRI Service</i>	
Less than 15 minutes	44
15 – 59 minutes	31
More than 1 hour	25
<i>Waiting time at North Coast Imaging MRI Service</i>	
Less than 15 minutes	10
15 – 59 minutes	61
More than 1 hour	29

Most (81%) of the respondents indicated that the MRI procedure was adequately explained; 99% reported that questions that they asked about the procedure was satisfactory answered and 81% indicated that the MRI Technologist did converse with them during the examination. All of the respondents indicated that the length of the MRI examination was 'tolerable', and 87% were reasonably comfortable (Table 3). They all indicated satisfaction with the patient care at the North Coast Imaging MRI Service and suggested that they would recommend other patients.

Different MRI procedures were accessed by the respondents and it was found that 37% had MRI scan of the spine, 25% lower extremities, 13% brain, and 6% chest and abdomen (Table 3). Less than one-tenth (9.0%) of the respondents reported that they had bullets, bullet fragments or dental works that could cause significant safety hazard during the MRI examination, while 11% had other items or devices that could affect the quality of MRI scan. Majority (57%) of the respondents indicated that they were given contrast solution during their MRI examination compared to 43%; 91% report that they wore a gown during the MRI examination (Table 3).

Table 3 Responses to questions about the MRI procedure

Variables	Percent (%)
<i>MRI Procedure adequately explained</i>	
Yes	81
No	19
<i>Questions about MRI procedure adequately answered</i>	
Yes	99
No	1
<i>Converse with Radiology Technologist during MRI procedure</i>	
Yes	81
No	19
<i>MRI scans</i>	
Spine	37
Lower extremities	25
Brain	13
Chest and abdomen	6
Other	19
<i>Given contrast solution during MRI examination</i>	
Yes	57
No	43
<i>Wore a gown during MRI examination</i>	
Yes	91
No	9
<i>Felt comfortable during the examination</i>	
Yes	87
No	13
<i>Satisfied with MRI examination</i>	
Yes	100
No	0

In 2005, 327 MRI examinations were performed at the North Coast Imaging MRI Service and 842 in 2006. This

represented an increase of 157.49% in 2006 compared with 2005. At the end of 2007, 1439 patients had an MRI procedure which represented an increase of 70.90% in 2007 compared with 2006.

Discussion

Magnetic Resonance Imaging is one of today's fastest growing imaging modalities. Up to early 2005, only two MRI Units were in Jamaica due to the high cost of implementing and operating such as service. They are the MRI Units at University Hospital of the West Indies and St. Josephs Hospital. Most hospitals that implement MRI programs do so to improve the quality of patient care. MRI capabilities can lead to faster and more accurate diagnoses; earlier and more specific treatment of medical conditions; and can support and enhance the work of other departments. These two hospitals having MRI capabilities can attract patients who might go elsewhere for their imaging procedures. MRI broadens the range of services available to patients, draws patients to work with in-house specialists, and helps to support the image of these hospitals as leading providers of health care services [10].

Majority of the respondents in the study were from rural areas of Jamaica, indicated employed status, as well as an earning of more than US\$1,352.00 per month (53%). Over three-quarters of the respondents indicated that the MRI examination was affordable. Studies have showed that rural residents throughout the world generally have reduced access to health care and less favorable health status and outcome when compared to urban populations [11]. Individuals living in both rural and urban areas with higher socio-economic status (SES) may demonstrate greater utilization of more sophisticated technologies such as computed tomography (CT) and MRI. They may be more likely to have a regular family physician; be better educated about sophisticated imaging technologies and are more assertive health care consumers. They tend to have better access to specialists who would refer them for imaging studies. The rationale for the converse relation is that poorer health status in lower SES groups may disproportionately affect the utilization of MRI or CT [12]. Interestingly, these said researchers found that people living in poorer neighborhoods had fewer diagnostic imaging tests than people living in wealthier neighborhoods [12]. The accessibility to MRI services for persons living in Western Jamaica is challenging. Medical doctors are at times reluctant in requesting MRI scans for patients because of lack of accessibility. In addition waiting times after making appointments for MRI scans were very long. In some cases the patients maybe too ill to travel lengthy distances. Some patients may be elderly people with limited mobility.

Non-hospital-based MRI units such as the North Coast Imaging MRI Service are located in proximity to hospitals largely to facilitate referrals. The cost to setup and install a MRI Unit in a developing country such as Jamaica is very expensive. In addition, the average monthly cost for servicing the MRI unit is approximately US\$4,000.00 and

monthly expenses including electricity and medical supplies is approximately US\$8,000.00. The average cost of MRI scans in both public and private MRI units in Jamaica ranges from US\$270.00 for public patients and US\$338.00 for private patients, to a maximum of US\$1,350.00. Majority (58%) of the respondents in this study reported a cost of US\$338.00 – US\$541.00 followed by 32% who reported a cost of less than US\$338.00, and 10% over US\$541.00.

Increasingly, MRI services are being offered by private entities due to increased demands for MRI scans, and most are owned by physicians. In a study by Hillman and Schwartz [13], almost one-half (47%) of non-hospital-based MRI units were owned by groups of physician investors. Most of these physicians were radiologists who also supervised the operation of the unit and interpreted the studies [13]. The North Coast Imaging MRI Service is a private facility. This study found that there had been a significant increase in the number of MRI scans performed at the North Coast Imaging MRI Service in 2006 and 2007 respectively. A review of the literature showed that in Ontario, Canada, from fiscal years 2002/03 to 2006/07, there were substantial increases in the volume of MRI scans (from 183,729 to 389,261 scans, a 112% increase) and in age and sex-adjusted population rates of MRI scanning (from 1,511 per 100,000 to 2,976 per 100,000, a 97% increase) [14]. In 2002/03, the rate of scanning among individuals living in neighborhoods in the wealthiest quintile was 25% greater than among individuals residing in neighborhoods in the lowest income quintile (age- and sex-adjusted rates of 1,702 per 100,000 versus 1,358 per 100,000) [14]. In the another study, it was found that in 2004/05, the highest rate of MRI scanning was observed in those aged 65 to 74 years; women under 65 years of age had a higher rate of MRI scanning than men in the same age group [15]. In this study, majority of the respondents were female and those in the age group 30 - 59 years had the highest number of MRI scans. In addition, MRI scans of the spine and the lower extremities were the most frequently done. According to Laupacis et al. [15] in 2004/05, an MRI scan of the brain was the most frequently performed type of scan, while in another study, MRIs of the head, spine and extremities were 39%, 30% and 21% of all scans respectively, in 2001 [16].

The main risk associated with MRI is that posed by the effects of the strong magnetic field on metallic implants inside a patient's body (e.g., pacemakers or bionic ears). Neither the magnetic field nor the radio waves are harmful [17]. Pacemakers are generally considered an absolute contraindication towards MRI scanning, though highly specialized protocols have been developed to permit scanning of selected pacing devices. Several cases of arrhythmia or death have been reported in patients with pacemakers who have undergone MRI scanning without appropriate precautions. Ferromagnetic foreign bodies (e.g. shell fragments), or metallic implants (e.g. surgical prostheses, aneurysm clips) are also potential risks, and safety aspects need to be considered on an individual basis

[18]. Less than one-tenth of the respondents reported that they had bullets, bullet fragments or dental works that could cause significant safety hazard during the MRI procedure, while approximately one-tenth had other items or devices that could affect the quality of the MRI scan. In addition, majority of the respondents wore a gown during the MRI examination and most (57%) of the respondents indicated that they were given contrast solution during their MRI examination. The most frequently used intravenous contrast agents are based on chelates of gadolinium. In general, these agents have proved safer than the iodinated contrast agents used in X-ray radiography or CT [19].

In this study majority of the respondents indicated that the MRI procedure was adequately explained, and indicated that questions they asked about the procedure were satisfactory answered. The establishment of thorough and effective screening procedures for patients and other individuals is one of the most critical components of a program to guard the safety of all those preparing to undergo MRI procedures or to enter the MRI environment [20, 21]. An important aspect of protecting individuals from MRI system-related accidents and injuries involves an understanding of the risks associated with the various implants, devices, accessories, and other objects that may cause problems in this setting [22, 23]. This requires obtaining information and documentation about these objects in order to provide the safest MRI setting possible. Certain aspects of screening patients for MRI procedures may take place during the scheduling process. This should be conducted by a health care worker or MRI Technologist who is specially trained in MRI safety [24, 25]. Preliminary screening helps to prevent scheduling of patients who may be inappropriate candidates for MRI examinations. Comprehensive patient screening involves the use of a printed form to document the screening procedure, a review of the information on the screening form, and an oral interview to verify the information and allow discussion of any question or concern that the patient may have [26].

Our study has several limitations. First, we used a sample of 100 patients was used in this study and we felt that the study would have benefited from a larger sample, bearing in mind that the larger the sample size, the better [27]. Secondly the study was conducted at only one non-hospital-based MRI unit and therefore the results may not be generalized to hospital-based MRI units. However the authors believes that the findings of this study can serves as a platform for future studies, that could investigate the rate and factors which affects utilization of MRI scans and other diagnostic modalities in Jamaica.

Conclusions

The data showed that majority of the respondents were able to afford the cost of the MRI scans although there were concerns about persons in the low socio-economic group. The number of MRI scans performed at the North Coast Imaging MRI Service more likely will continue to

increase, owing to rising health care costs and the difficulties experienced by persons in the lower socio-economic group to afford expensive diagnostic imaging tests such as MRI. Further studies will be required to examine MRI utilization rates in hospital-based compared with non-hospital-based MRI units in Jamaica. This study is therefore recommending that there is an urgent need for government-owned hospital-based MRI units which could offer lower fees for MRI scans to the public, owing to socio-economic challenges that are faced by the unemployed, as well as those who earn on average, approximately US\$677.00 per month.

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