The Pattern of Referrals to the Imaging Department of the Moi Teaching and Referral Hospital, Eldoret

Dr. Auka Joash
Master of Medicine Diagnostic Radiology
Lecturer, Kenya Medical Training College, Kenya
Kipchirchir Boen P.
Radiography Student, Kenya Medical Training College, Kenya
Mitei Patrick
Radiographer, Kenyatta National Hospital, Kenya

Abstract:
Advanced imaging modalities are not available in most health facilities in Kenya thus prompting a need for referral to other facilities that provide such services.Studying the pattern of radiology referrals is crucial for improving the service delivery, as well as providing valuable data for decision making. This cross-sectional audit was designed to establish the load of radiological examination referrals to the imaging department of Moi Teaching and Referral Hospital (MTRH), Eldoret over a three month period, with a major objective of documenting data for specific medical imaging referrals to the facility and hence radiology service utility. The target population comprised patients that presented with request forms from other facilities for radiology services apart from the Moi Teaching and Referral Hospital. Data collected focussed on the type of examination, the age of the referred subjects, the gender and the region from whence the referrals originated. From a total, 1499 cases comprising both referred and the non-referred subjects during the study period, 127 cases constituted referrals, of which 70 were female cases (55%) and 57 male cases (45%). Of these, the majority of those referred were aged between 21 to 40 years (41%). Geriatrics over 71 years constituted 6.3% of the cases. CT presented the highest referral rate with 50 cases forming 39.4% of the total referrals. Ultrasound referrals accounted for 33.07%. Female cases outweighed the males with a 55% stake of the referrals. Kitale, Kapsabet, and Plateau were the regions with the largest referral rates for CT, Ultrasound, and projection radiography respectively. The study revealed a low referral rate and recommends for investment in imaging equipment and a restructuring of medical insurance to cater for investigations as the some of the referrals had difficulty in paying for the services.

Key words: Radiology Referrals, Pattern of Referrals, Radiological examination referrals, Moi Teaching and Referral Hospital

1. Aims of the Study

The main goal of the study was to establish the magnitude and pattern of radiological examination referrals to the imaging department of Moi Teaching and Referral Hospital, with a major objective of documenting data for specific medical imaging referrals to the facility and hence radiology service utility.

2. Study Subjects

The study was conducted at the Moi Teaching and Referral Hospital, Eldoret (MTRH) which is an ISO 9001:2008 Certified Hospital. It is a full-fledged referral facility boasting an 800-bed capacity. The Hospital incorporates the Academic Model Providing Access to Healthcare (AMPATH), the Regional Blood Transfusion Centre (RBTC), Moi University's School of Medicine, the School of Public Health, Kenya Medical Training College, and the Alcoholic and Drug Abuse (ADA) Unit.
The target population comprised all patients referred from other health facilities to the Medical Imaging department of MTRH, Eldoret as outpatients or in-patients excluding those primarily referred from the MTRH facility itself.

3. Methods of Study

Audit of 1499 radiology request forms of patients that sought services at the MTRH radiology department were reviewed based on case study research design to obtain data on the number of referred patients for diagnostic and interventional imaging examinations to the MTRH. A checklist was used to gather the information from the request forms and where additional information was needed like

specific age of the client, consent was sought from the participants for clarification of the said detail. Ethical approval was obtained from the National Council of Research, Science and Technology in Kenya. Permission was also sought from the MTRH.

4. Data Analysis and Presentation

During the three-month period of the study, the total number of both referred and non-referred patients was 1499 at the imaging department of MTRH, Eldoret. Ultrasound (US) was the most utilized modality having 604 (40.3%) day cases. Projection radiography was second most utilized with 518 (34.6%) cases. CT scans had 351 (23.4%) cases coming in as the third most utilized modality at the Moi Teaching and Referral Hospital. Fluoroscopy screening procedures had 24 cases standing in at 1.6% while Interventional radiology cases had 2 cases (0.1%) all of whom were referred cases.

Of the 1499 patients sampled, 127 of them constituted the total number of referrals to the radiology department of MTRH. In other words, the number of referrals constitutes 8.5% of the total number of clients to the MTRH radiology department.
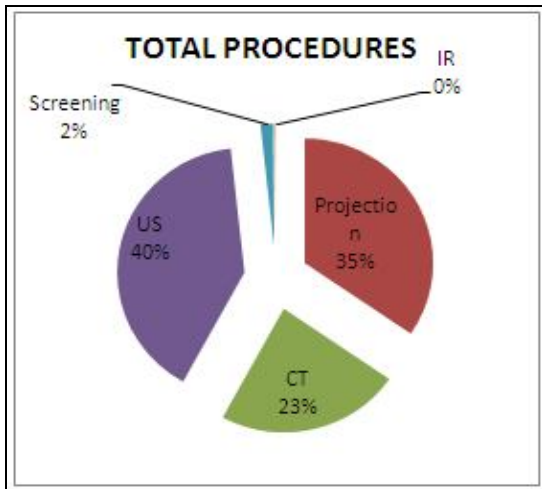
Total procedures		%
Projection	518	34.6
CT	351	23.4
US	604	40.3
Screening	24	1.6
IR	2	0.1
TOTAL	1499	

(Chart 1, Table1 showing combined total procedures for the period of study)
Key: US=Ultrasound, CT=Computed Tomography, IR= Interventional Radiology

The total of 127 procedures referred was made up of 70 female cases (55%) and 57 male cases (45%) (Table 2). Of these, a majority of both gender referred were the youth ages 21- 30 having 27 cases (21.3%) and ages 31- 40 having 25 cases (19.7%) while age 71 to 80 had 5 cases (3.9%), 81-90 had 2 referred cases (1.6%), and 91-100 had a single referred case which constituted 0.8%. (table 2, chart 2).
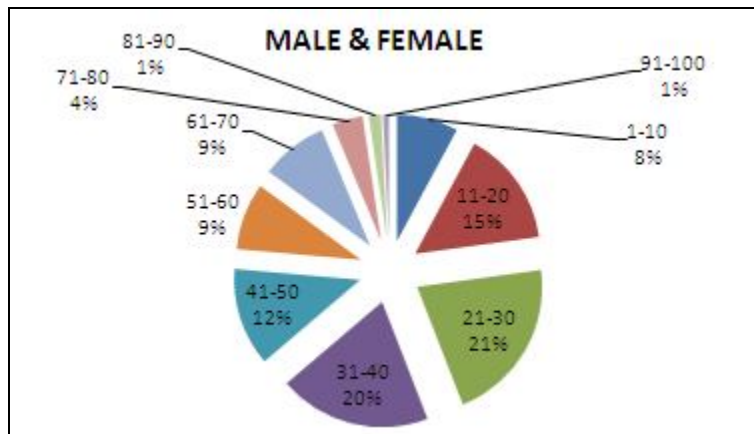

(Chart 2; total referred procedures in percentages in relation to age clusters)

| Age in years	FEMALE	%	MALE	%	TOTAL	%
1-10	6	8.6	4	7.0	10	7.9
11-20	9	12.9	10	17.5	19	15.0
21-30	19	27.1	8	14.0	27	21.3
31-40	17	24.3	8	14.0	25	19.7
41-50	7	10.0	9	15.8	16	12.6
51-60	7	10.0	4	7.0	11	8.7
61-70	3	4.3	8	14.0	11	8.7
71-80	2	2.9	3	5.3	5	3.9
81-90	0	0.0	2	3.5	2	1.6
91-100	0	0.0	1	1.8	1	0.8
TOTAL	70		57		127	

(Table 2; showing total referred procedures in figures in relation to age clusters)

Gender-wise, the majority (51.4%) of the female referrals were in the age range of 21-40 years while male referrals in the same age bracket constituted 28%.
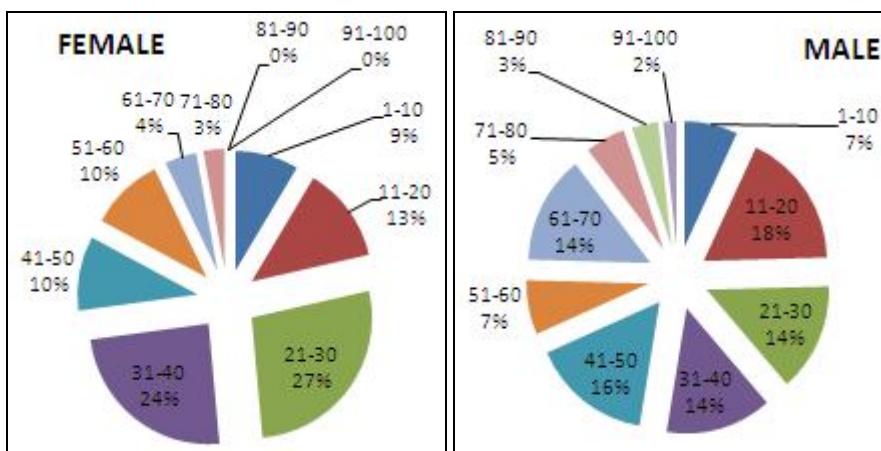

(Chart 3 and 4; total referred cases in percentages according to different age clusters and gender)

The referral pattern according to the Age-Modality criteria saw projection radiography presenting the bulk of the work in the 21-30 years age bracket for either gender. The paediatric population from age 1to age 10 presented a higher number of females than males while some age brackets (41-50 and 81-90) had single sex presentation (graph 1).
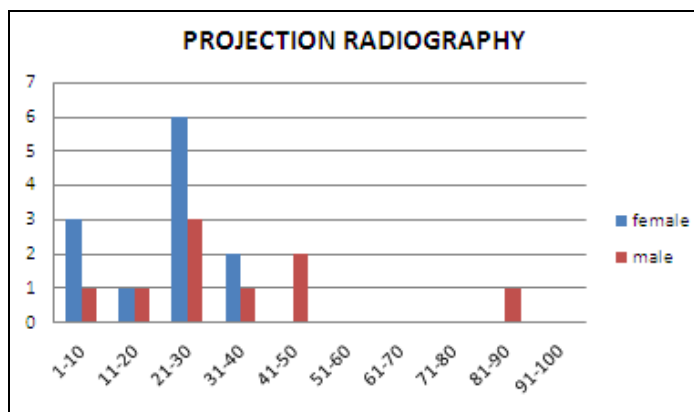

(Graph 1; frequencies of total projection radiography cases as regards different age clusters and gender)

CT scanning kept with the same trend as projection radiography for the female cases while the males maintained a uniform peak for the age groups 11-20, 21-30, 31-40, and 41-50. The pattern of single gender representation is repeated for the gap 61-100 years all of which being male.
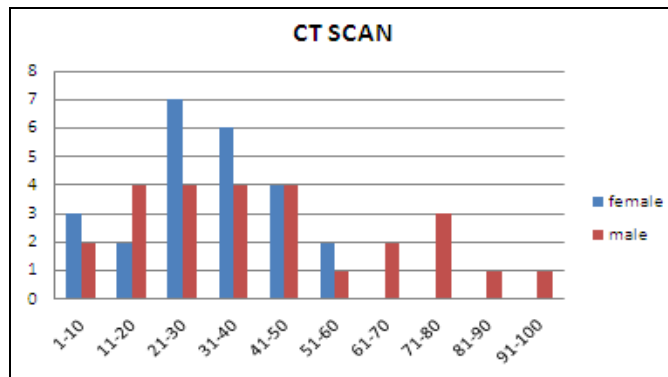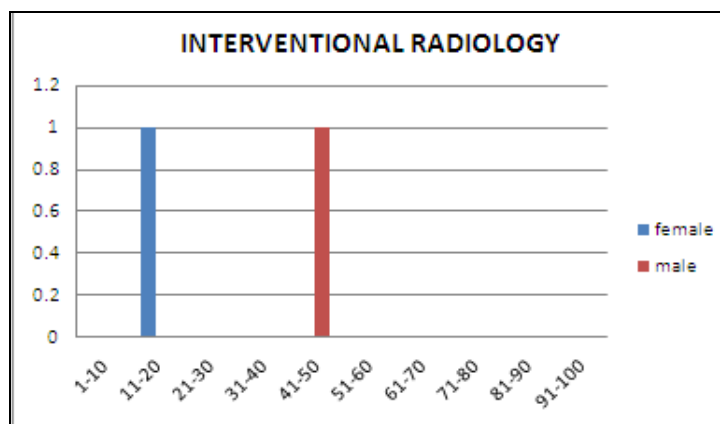

(Graph 2; total CT scan frequencies as regards different age clusters and gender)

Ultrasound had single sex representation (all female) for age cluster 21-30 and 71-80. Geriatric cases between 81-100 years were not present while in overall, the female gender had more utilisation of this modality for all the age groups except from age 61 to 70 (Graph 3).
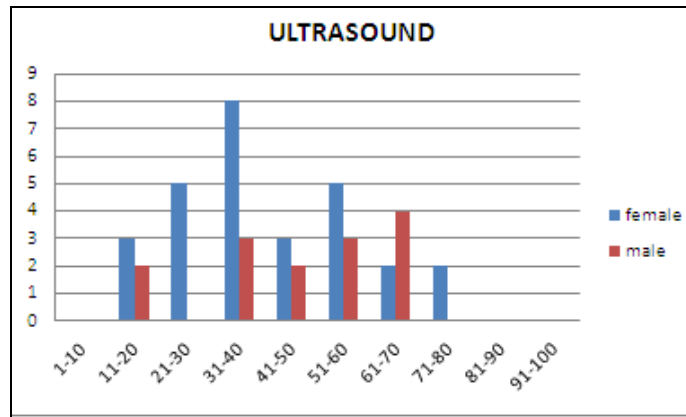

(Graph 3; total ultrasound frequencies as regards different age clusters and gender)

Interventional Radiology (IR) imaging didn't have large number representation of the procedures with only 2 cases being referred for both gender at age 17 (female) and 41 (male) (Graph 4).


(Graph 4; total IR frequencies as regards different age clusters and gender)

Fluoroscopic screening procedures presented higher numbers of the male gender than the females for all the age clusters with a repeated single sex representation and absence of representation for the geriatric patients and from age 41up till 60 (Graph 5).
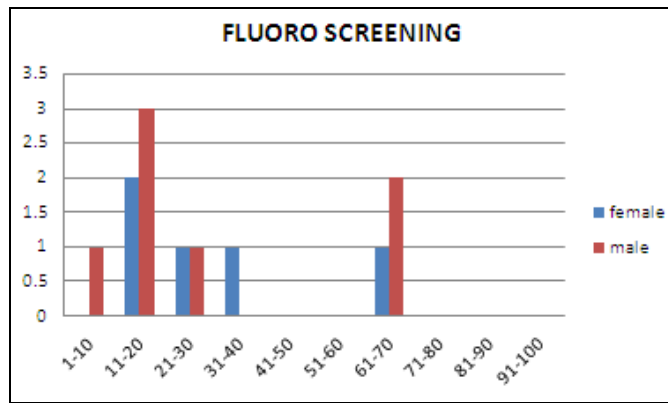
(Graph 5; total Fluoro screening frequencies as regards different age clusters and gender)

In accordance with the body region of imaging and the type of examinations, projection radiography presented the highest number for the thoracic region with Chest X-ray having four referred cases followed by spinal X-ray with lumbo-sacral (L/S spine) having three referred cases. Orthopaedic oriented imaging carried the lion's portion with 15 out of 21 cases (71%) while soft tissue imaging had 6 cases referred at 28.6% (Chart 5).
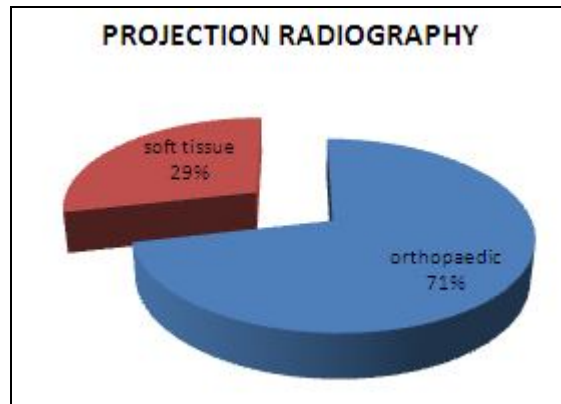

(Chart 5; exhibiting percentages of images tailored for orthopaedic or soft tissue survey)

CT scanning presented the bulk of the cases with the head/ brain scans at 35 scans out of 50 referred scans followed by the multi-series abdominal and chest scans (six and five cases respectively). Head/ Brain CT lead also the pack in the contrast enhanced scan series with 16 cases out of 35 (45.7%) having contrast enhanced series being performed. All the abdominal and chest CT scans were contrast-enhanced series. Orthopaedic oriented CT scans were the least with only one pelvic scan representing this group although others had them in combination with soft tissue scans (graph 6).
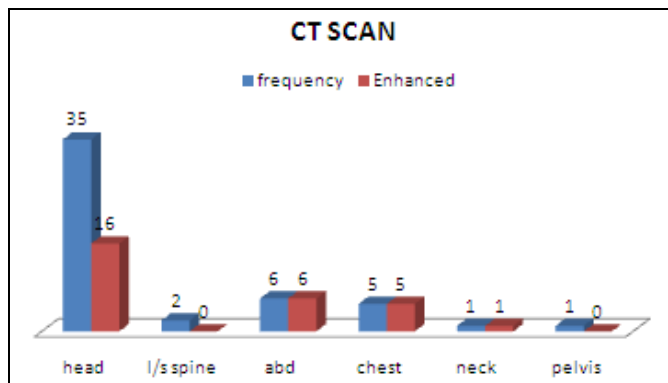
(Graph 6; total CT scan frequencies as regards the regions of scan)

Ultrasound presented the abdominal ultrasound as the most referred case with 19 cases (45%) followed by the pelvic scan 5 cases, (11%). (Graph 7)
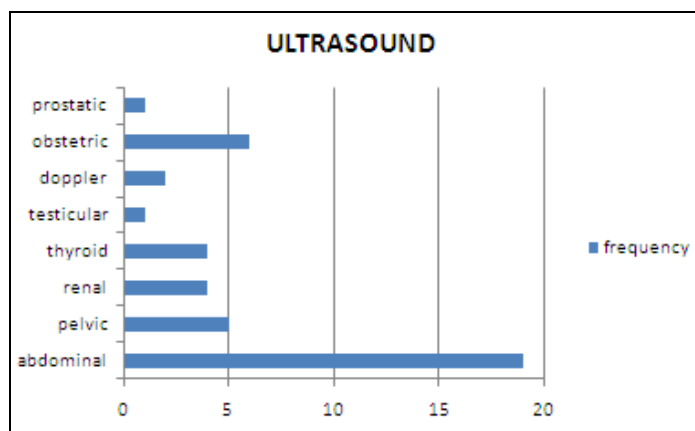
(Graph 7; total ultrasound frequencies as regards the type of scan)

The referring regions were supernumerary with the projection radiography work emanating from centres proximal to the study facility and as such were pooled together. Most of them originated from the constituent wards of Eldoret municipality with a few cases coming from areas other than Eldoret. Facilities like St. Luke's hospital, Huruma health centre and Eldoret district hospital were the major referring facilities from within Eldoret town which contributed 8 cases (38%). Plateau sub- region contributed 6 cases (29%) with Plateau Mission hospital coming out as the single largest referring facility. Kitale, Metkei and Kamwosor all had representations albeit the fact that they were minimal in number (Table 3, Chart 6).

	region	frequency	Percentage	%
1	Kaptagat	2	9.5	10
2	Eld	8	38.1	38
3	Metkei	2	9.5	10
4	Plateau	6	28.6	29
5	Kesses	1	4.8	5
6	Kitale	1	4.8	5
7	Kamwosor	1	4.8	5
	TOTAL	21	100	

(Table3; percentages and figures from different referring regions for projection radiography)
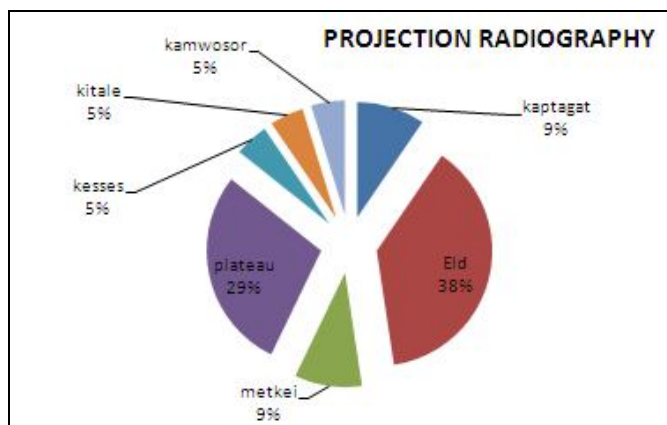
(Chart 6; percentages of projection radiography cases from different referring regions)

Of the three other advanced modalities (CT, Ultrasound and IR) according to the referring regions, CT contributed the highest percentage of referred cases at 53% followed by Ultrasound at 45% and the least was Interventional radiology work at 2% (Chart 7).
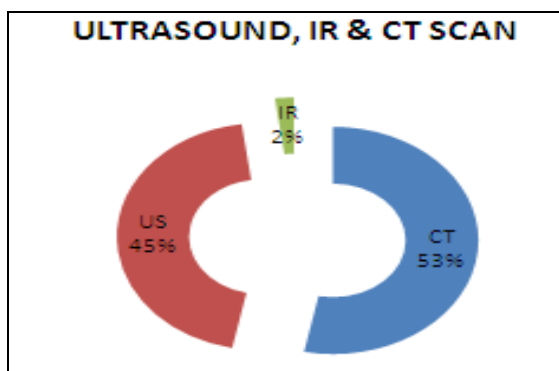
Chart 7; relative percentages of Ultrasound, IR, and CT cases for their respective cases

The sources of referral for CT scan, Ultrasound and interventional radiology work as shown in table 4 emerged with Kapsabet being the overall main referral source with18 cases (19%) followed by Kitale at 17 cases (18%). Kitale was the overall largest referrer for CT scans at 12 scans followed by Kapsabet at 7 cases over the period of the study. Kapsabet was the chief referrer for Ultrasound work at 11 cases followed by Kitale at 5 cases.

	Region	**CT**	**US**	**IR**	**TOTAL**
1	Iten	0	3	0	3
2	Soi	0	0	0	0
3	Eldoret	1	2	0	3
4	Turbo	1	2	0	3
5	B. Forest	0	1	0	1
6	Plateau	1	2	0	3
7	Kaptagat	0	0	0	0
8	Kesses	0	1	0	1
9	Kapsabet	7	11	0	18
10	Mosoriot	0	3	0	3
11	N. Hills	0	2	0	2
12	Kabarnet	6	1	0	7
13	E. Ravine	2	0	0	2
14	Nakuru	1	0	0	1
15	Kericho	6	0	0	6
16	Bomet	1	0	0	1
17	W. Pokot	0	1	0	1

18	Kapsowar	0	2	0	2
19	Tot	1	0	0	1
20	Kitale	12	5	0	17
21	Kaimosi	0	1	0	1
22	Nambale	1	0	0	1
23	Kimilili	1	0	0	1
24	Bungoma	5	1	1	7
25	Kakamega	1	1	0	2
26	Teso	1	0	0	1
27	Webuye	2	1	0	3
28	Mumias	0	1	0	1
29	Lugari	0	1	0	1
30	Busia	0	0	1	1

(Table 4; frequencies of referrals from different regions as regards CT, US and IR with their totals for the different regions)

5. Discussion

In this study, Ultrasound examinations emerged the leading radiological utility as it accounted for 40.3% of 1499 patients that were a combination of both the referred and non-referred cases at the MTRH. This is in contrast with what Mkumbo (2002) found at University of Nairobi at Kenyatta National Hospital (KNH) whereby Projection plain Film Radiography were the majority and accounted for 51.4%.

Referrals to the MTRH radiological facility constituted about 8.5% as only 127 of the 1499 patients were referred to the facility while the rest came from the mainstream MTRH over the three-month period. Most of the referrals were released back to the referring centres for continued management while some were absorbed into the MTRH healthcare system due to severity of their conditions or the patient's/ family opting to transfer care. Adherence to this practice of respecting the referring clinicians by the radiology staff at the MTRH is a commendable ethical practice to emulate and uphold in order foster continued trust.

Of the 127 referral cases, the majority were for CT scans 39.4% (n=50) followed by Ultrasound 33.07% (n=42). Magnetic Resonance Imaging had null cases owing to the fact that MTRH had no MRI unit at the period of conduction of this study. These numbers, if compared to the total cases (1499) exhibit a poor referral rate especially for Ultrasound at 7% of the total followed by CT scanning at 14.25% of the total imaged cases during the period of the study. Fluoroscopic imaging fronted a 50% stake of referred cases while day Interventional Radiology (IR) cases had a 100% showing.

A majority of the female CT cases were adults between the age of 21 and 50 years with a peak at 21 to 30 years while males had a majority between 11 and 50 years with a uniform distribution. Contrast enhanced CT scans presented 46% of the total head/ brain scans while chest and abdominal scans were also contrast enhanced. It is noteworthy that out of all the referred CT cases, the majority were between age 11 and 50 while the male cases had representation throughout the board up to the geriatric cases not encountered among female patients. The utilization of CT scan is getting phenomenal growth worldwide just as Brenner and Hall, (2007) cited in Martino et al. (2008, p. 10) put it due to the fact that CT is an accurate, rapid and convenient diagnostic tool.

In this study, Ultrasound presented the second highest rate of referred cases with 42 cases referred standing in at 33.07% of the total referred cases. Abdominal ultrasound had the highest frequency of referred cases (19), followed by obstetric sonography (6) and thirdly, pelvic sonography (5). Eleven cases (58%) of the abdominal scans were female ranging between age 15 and 75 years while 8 cases were male (42%) from the age of 12 years to70. There was a single case of prostatic ultrasound at 57 years of age that is consistent with the literature concerning age and detection of prostatic malignancies or prostatic hyperplasia. Prostate cancer is uncommon in men younger than 50 years though the incidence rises rapidly with each decade thereafter with a median detection age

of 67 years (Howalder, et al. 2011). Medical practitioners often make decisions for referrals basing the decisions on patient determinant issues, physician determinants, health-care system determinants and discretionary referrals (Forrest, et al. 2006, p. 83).

6. Conclusion

This study presented an overall low rate of referrals cutting across the board for all the modalities and more so for the rather basic modalities like general x-ray and fluoroscopic screening. CT emerged as the single modality with the highest referral rates at the MTRH echoing the global trends in imaging. The utilization of CT scan is getting phenomenal growth worldwide just as Brenner and Hall, (2007) cited in Martino et al. (2008, p. 10) put it due to the fact that CT is an accurate, rapid and convenient diagnostic tool.

The relative high cost of CT imaging compared to the other modalities may have been a prohibitive factor to even higher numbers of CT referrals with the majority of the population having no medical insurance or having insurance that did not cater for imaging services as such the patient had to pay directly for the services. In other cases, the practitioners may have been under constraint of patient determinant factors considering the cost affordability to the patient and as such predisposed them to a scenario where they had to depend on their primary diagnosis without further investigations as such tolerating uncertainty without choice. These factors may have been the driving force behind a low turnout of CT referrals.

Projection radiography and fluoroscopic screening examinations had a low turnout for all ages and gender to the MTRH. This may have been due to a widespread availability of x-ray and fluoroscopy machines and trained personnel in the private health sector and other government health facilities within the Eldoret town environs.

Interventional imaging at MTRH is mostly under ultrasound guidance due to its robust applicability and easy manoeuvrability. The cost for CT guided and fluoroscopy guided interventional procedures is prohibitive to most patients. At the time of conduction of this study, there was only one interventional radiologist catering for all the cases at this study facility. IR is still a new field in radiology with most studies at MTRH tailored for diagnostic work (Fine Needle Aspirates and biopsies for laboratory testing) rather than therapeutic for example hepato-biliary and renal stent placement.

7. Recommendations

Sensitization of the Practitioners at the referring centres regarding the available imaging modalities (CT, Interventional Radiology, and US) at the MTRH could increase the number of referrals and thus promote evidence-based medicine.

The management at the MTRH should consider setting up satellite radiological clinics at the areas from which the referral numbers are high and hence bring service delivery closer to the people. Professor Sir Michael Rawlins (2011) avers that timely diagnostic procedures and the decision to refer them to a specialist have a huge implication in the medical management of patients, the course of medication and ultimately it may determine the fatality of a health condition. However, before setting up such satellite radiologic clinics, a detailed study to deduce radiology referral trends over time based on a longitudinal prospective or retrospective audit of the radiology request forms to the MTRH to uncover long-term patterns regarding utility of radiological services could be crucial for decision-making.

The referring regions to MTRH apart from those within Eldoret have some distance of travel with the farthest being Busia. The cost of transport back and forth adds to the cost of radiological investigation and this contributed to some of the challenges for clients in meeting the cost of radiology services at the MTRH. In order to avoid such challenges, the Kenyan authorities could consider how the government managed medical insurance particularly National Hospital and Insurance Fund (NHIF) could help such clients access the essential services.

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