Impact of Referral Guideline Enforcement on Orthopedic and Trauma Admissions at Kenyatta National Teaching and Referral Hospital, Kenya: A Pre-Post Test Design

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Abstract

BACKGROUND

The suboptimal utilization of tertiary health facilities and inadequate management of referral systems in low- and middle-income countries pose challenges to health system administration, characterized by frequent self-referrals and bypassing of lower-tier health facilities. On July 1, 2021, Kenyatta National Hospital (KNH) implemented referral guidelines, mandating that all admitted patients be referred from lower-tier health facilities, aligning with the KNH legal statute of 1987. This study aimed to evaluate the impact of enforcing referral guidelines on the spatial distribution of orthopedic and trauma admissions at KNH.

METHODOLOGY

A pre-posttest study design was employed, reviewing a total of 459 and 446 charts in 2021 before and after the enforcement of referral guidelines. Measures of central tendencies and Chi-squared tests were applied, and density plots were generated using Geographic Information System (QGIS 2.18.19) to illustrate the spatial distribution of admissions.

RESULTS

Of KNH admissions, 85.3% and 79.3% originated from Nairobi County and its environs. Admissions were geographically diverse, with a notable concentration from Nairobi County and its environs. Enforcement of referral guidelines led to a significant decrease in admissions from Nairobi County, dropping from 64.3% to 56.9% (p=0.019). Declines were particularly observed in Kamukunji, Embakasi, and Ruaraka sub-counties, serving as the catchment population for Mama Lucy Kibaki Referral Hospital. Conversely, admissions from Kibra and most of Kajiado County were notable. There was a concurrent increase in admissions from other parts of the country (p = 0.003).

CONCLUSION

Over four-fifths of KNH admissions are from Nairobi County and its environs. The enforcement of referral guidelines resulted in decreased local admissions and an uptick in admissions from other regions in the country.

Keywords: Referral Guidelines, Spatial Distribution, Orthopedic, Trauma Admissions, Enforcement.

Introduction

World Health Organization (WHO) developed guidelines for integrated healthcare service delivery, which prioritizes health service delivery as a main pillar towards ensuring a functioning universal healthcare (1). Classification of health facilities into various levels enables maximum utilization of facilities and patient satisfaction. Such classification

ensures smooth systematic referral of patients from lower levels to higher levels (2). A referral guideline is often developed and implemented by government authorities, with requirements of referral letters whenever a patient is transferred from one facility to another (3). The decision of a healthcare service provider to refer a given case to a higher facility is often influenced by the severity of the disease, availability of equipment, requests by the patient and previous experience (2).

Teaching and Referral hospitals in low and middle-income countries treat not only referral patients but also are the first point of contact for the majority of patients (2). One of the main challenges in health care delivery in low- and middle-income countries is the over-utilization of referral health facilities which results in patient' congestion. The vast majority of these patients are self-referred, bypassing lower-tier health facilities as a result (4-7). As a result, tertiary facilities are overwhelmed by the huge demand for primary health care while lower-tier health facilities remain underused and inefficient (8). The reason for bypassing the nearest health facilities seems to be multifactorial. Factors such as patients' perception of high quality of health care and resource availability at referral hospitals play a role (4, 5). The fact that for many urban populations, a referral hospital may simply be the closest health facility is one of the reasons for apparent bypassing peripheral facilities to seek health care at a tertiary-level health facility (2).

Kenya Essential Package for Health Services (KEPHS) identified six levels of healthcare facilities, of which the first five are managed by devolved subnational governing units (counties) while level six is managed by the national government (12). The movement of patients from one level of health facility to another is through a referral letter.

Kenyatta National Hospital was founded in 1901 but it became a State Corporation in 1987. It is the premier referral facility in Kenya's healthcare referral system (13). KNH Board order through the legal notice No. 109 of 1987 stipulates the functions of KNH as management of referral cases who need specialized health care, providing facilities for medical education for the Universities and other health-related courses and participating in national health planning (13). This understanding was reinforced by the Constitution of Kenya 2010 which tasks KNH with the responsibility for health policy formulation in Kenya (14, 15).

On 1st July 2021, the KNH Board of Management decided to enforce referral guidelines which mandated referring facilities to issue referral letters to patients seeking medical care at KNH. This would allow KNH to plan and invest in the management of complex medical conditions and to focus on its statutory functions. This study aimed to assess the effect of enforcement of referral guidelines on the spatial distribution of orthopaedic and trauma admissions at KNH.

Methodology

Study design and setting

This investigation adopted a pre-post-test design without a control group. The study focused on the Orthopaedic and Trauma Wards at Kenyatta National Hospital (KNH), situated in Nairobi, the capital city of Kenya. KNH boasts a substantial 2000-bed capacity, serving as a pivotal healthcare facility in the region. The research spanned from 1st February 2021 to 31st December 2021, encompassing a comprehensive assessment over five months before and after the enforcement of referral guidelines. The target population consisted of orthopaedic inpatients, both pre and post the implementation of the referral guidelines.

Sample size and sampling

The sample size was calculated using Casagrande formula for comparing two binomial distributions (16):

$$n = \frac{\left(Z_\alpha\sqrt{2pvqv} + Z_\beta\sqrt{p1q1 + p2q2}\right)^2}{(\delta)^2}$$

Where:

p_1 = Estimated non-referral proportion in pre-enforcement is 84% (0.84)

p_2 = Estimated non-referral proportion in post-enforcement is 77% (0.77)

q_1 = 1- p_1 = 1- 0.84 = 0.16

q_2 = 1- p_2 = 1 – 0.77 = 0.23

p_v = Mean of P_1 and P_2 and is represented by 80.5% (0.805)

qv = 1 – pv = 1 – 0.805 = 0.195

Z_β = The probability of type II error 20% is used for the study (-0.842)

Z_α = The probability of type I error is set at 5% level of significance (-1.645)

δ = desired level of precision set to 7% (0.07). This is represented by p1 – p2.

n = sample size per arm

A total of 459 and 446 files were abstracted pre- and post-enforcement of the referral guidelines.

Data on admissions were sourced from the Health Information System (HIS) at KNH Accident and Emergency (A&E) Unit, Orthopedic Clinic (OC) and Corporate Outpatient Care (COC). They were recorded in a logbook which served as a master register and therefore the sampling frame for the study. Data on the logbook were stratified by entry points which were A&E, OC and COC. Within each stratum (entry point), Proportional Population to Size (PPS) was then used to decide on the number of entries to be sampled per month from each of these three service points. Systematic random sampling was used to sample individual data for abstraction and inclusion in the analysis. The Kth number was arrived at by dividing the total monthly data in the strata (entry points) by the sample size for the same month, (Table 1).

Quality control procedures

A pilot study was conducted to ensure the relevance and appropriateness of data collection tools. Three Research Assistants were trained on the study protocol, and the Principal Investigator reviewed all abstracted forms for accuracy, completeness, and compliance with the research protocol.

Variables

Variables collected included patient age, sex, marital status, religion, education level, sub-county of residence and county of residence.

(SD 16.5), and among females, it rose from 32.2 years (SD 19.9) to 38.0 years (SD 20.4) post-enforcement (p=0.046). For males, there was a slight mean age increase from 32.8 years (SD 15.6) to 34.0 years (SD 15.00) post-enforcement (p=0.311).

Table 1:
Orthopedic and trauma admissions to KNH stratified by point of admission, 2021

	Months	Point of admission			
		A&E	OC	COC	Total
Pre	February	94	10	9	113
	March	68	4	9	81
	April	79	3	10	92
	May	67	3	11	81
	June	78	5	9	92
	Total	386	25	48	459
Post	August	62	10	15	87
	September	66	8	14	88
	October	82	8	12	102
	November	45	6	27	78
	December	66	6	19	91
	Total	321	38	87	446

Data management

The quantitative data was analyzed using SPSS version 21. Descriptive analysis was conducted using frequencies, measures of central tendencies, and measures of dispersions while inferential statistics were calculated using Pearson's chi-squared tests. All the calculations were done at a 95% confidence level with prior probabilities less than 5% deemed statistically significant. Density plots to depict the patterns and distribution of the orthopaedic admissions were analysed and mapping was done using the Geographic Information System (QGIS 2.18.19) [1].

The frequency of the cases recorded from a given sub-county was calculated and density was arrived at and expressed in a graduated map. Graduated maps were generated for residents of orthopaedic cases admitted at KNH before and after the referral regulations were enforced.

Ethical considerations

The study was approved by the University of Nairobi and KNH Ethics and Research Committee through approval number (ERC No: P852/10/2021). In addition, administrative approval was also provided by the KNH Medical Research Department and the KNH Orthopaedics Department.

Table 2:
Socio-demographic profile of Orthopedic and Trauma admissions at KNH pre (n=459) and post (n=446) enforcement of the referral guidelines, 2021

Variable	Category	Pre	Post	Chi-square, p-value
Age	0 – 14 years	59 (59.6%)	40 (40.4%)	7.121 (p=0.068)
	15 – 24 years	83 (50.0%)	83 (50.0%)	
	25 – 64 years	303 (50.5%)	297 (49.5%)	
	Above 65 years	14 (35.0%)	26 (65.0%)	
Sex	Female	83 (41.9%)	115 (58.1%)	7.866 (p=0.005)
	Male	374 (53.2%)	329 (46.8%)	
Marital status	Married	218 (48.9%)	228 (51.1%)	4.450 (p=0.349)
	Minor	61 (55.5%)	49 (44.5%)	
	Separated & divorced	20 (40.8%)	29 (59.2%)	
	Single	147 (53.5%)	128 (46.5%)	
	Widow	13 (54.2%)	11 (45.8%)	
Religion	Atheist	2 (66.7%)	1 (33.3%)	2.113 (p=0.609)
	Christian	433 (50.1%)	432 (49.9%)	
	Hindu	1 (33.3%)	2 (66.7%)	
	Muslim	15 (62.5%)	9 (37.5%)	
Occupation	Businessman/woman	60 (52.6%)	54 (47.4%)	1.416 (p=0.841)
	Casual	204 (50.6%)	199 (49.4%)	
	Employed	64 (47.4%)	71 (52.6%)	
	Other	33 (55.9%)	26 (44.1%)	
	unemployed	92 (50.3%)	91 (49.7%)	
Education	None	33 (60.0%)	22 (40.0%)	0.001
	Pre-school	18 (81.8%)	4 (18.2%)	
	Primary	157 (51.0%)	151 (49.0%)	
	Secondary	166 (52.4%)	151 (47.6%)	
	Tertiary	74 (40.7%)	108 (59.3%)	
Smoking	No	348 (51.2%)	332 (48.8%)	0.078 (p=0.780)
	Yes	89 (50.0%)	89 (50.0%)	
Alcohol	No	258 (50.1%)	257 (49.9%)	0.410 (p=0.522)
	Yes	180 (52.3%)	164 (47.7%)	

Legend: Pearson's chi-square test was used to test for association at a 5% level of significance.

Results

Basic profile of the sample population

A total of 905 files were reviewed, comprising 459 (50.7%) before and 446 (49.3%) after the enforcement of referral guidelines. The mean age increased from 32.7 years (SD 16.4) to 35.0 years (SD 16.6) pre- and post-enforcement (p=0.038). The overall mean age was 33.8 years There was a decrease in male admissions from 374(81.8%) to 329(74.1%) and an increase in female admissions from 83 (18.2%) to 115 (25.9%) post-enforcement of the referral guidelines (*p*=0.005). Education and sex were noted to be statistically significant between the two groups at (p<0.05) (Table 2). Most of the admissions were from Nairobi County and the neighbouring counties of Kiambu, Machakos, and Kajiado. However, there was a decline in Nairobi County admissions from 64.3% to 56.9% after referral guidelines enforcement (*p* = 0.019).

Table 3:
Distribution of Orthopedic and Trauma admissions by their County of Origin pre and post-referral guidelines enforcement, 2021.

Country	County	Pre	Post	p-value
Kenya	Nairobi	294 (64.3%)	253 (56.9%)	*0.019*
	Kiambu	56 (12.3%)	59 (13.2%)	0.660
	Kajiado	40 (8.8%)	41 (9.2%)	0.817
	*Others – Eastern	33 (7.2%)	33 (7.4%)	0.918
	**Others	34 (7.4%)	60 (13.5%)	*0.003*
	Total	457 (100.0%)	466 (100.0%)	

Legend: *Others – Eastern refers to Machakos and Eastern counties in Kenya. **Others refers to admissions from the rest of the country
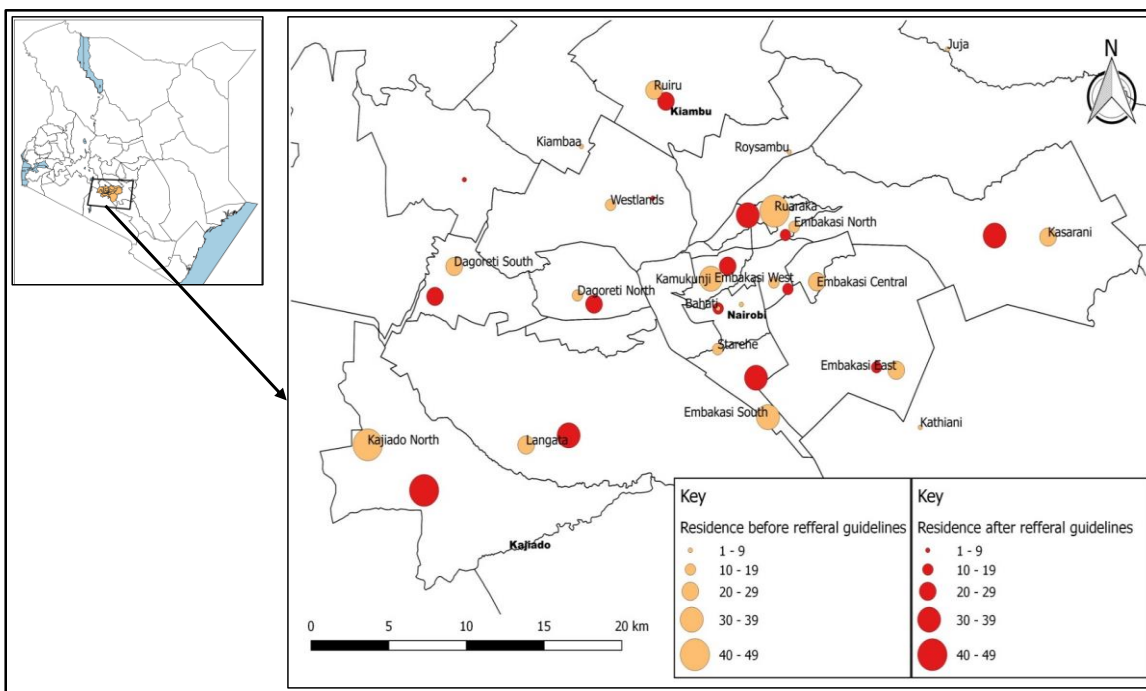

Figure 1:
Distribution by sub-county of residence among Orthopedic and Trauma admissions reported at KNH hospital pre and post-referral guidelines enforcement ((https://www.igismap.com/kenya-shapefile-download-boundary-line-administrative-state-and-polygon/)

On the other hand, enforcement of the referral guidelines increased admissions from the rest of the country (p = 0.003) (Table 3).

Spatial distribution of orthopaedic and trauma admissions

Geographical Information System (GIS) coordinates were generated from the areas of residence of admissions as reported at KNH records and density plots generated using QGIS software and stratified as pre- and post-referral guidelines enforcement. Sub-county was used as a reference unit to calculate the total number of cases reported and these were expressed in a graduated map.

The residents of orthopaedic and trauma admissions reported at KNH were spread across the country with the majority being from Nairobi County and its environs. The enforcement of the referral guidelines showed a decline in the number of admissions from Nairobi sub-counties namely Kamukunji, Embakasi, and Ruaraka which are the catchment population for Mama Lucy Kibaki Referral Hospital. Admissions through Kibra, Westlands sub-counties also declined. There were also notable declines in admissions from Kiambu sub-counties namely Ruiru and Kiambaa. Most of the admissions from Kajiado County were from Kajiado North and there was no change in the admissions caseload from this subcounty despite enforcement of the referral guidelines.

Geographical Information System (GIS) coordinates were generated from the health facilities that were referring orthopaedic and trauma admissions to KNH and density plots were generated using QGIS software and stratified as pre and post-referral guidelines enforcement.
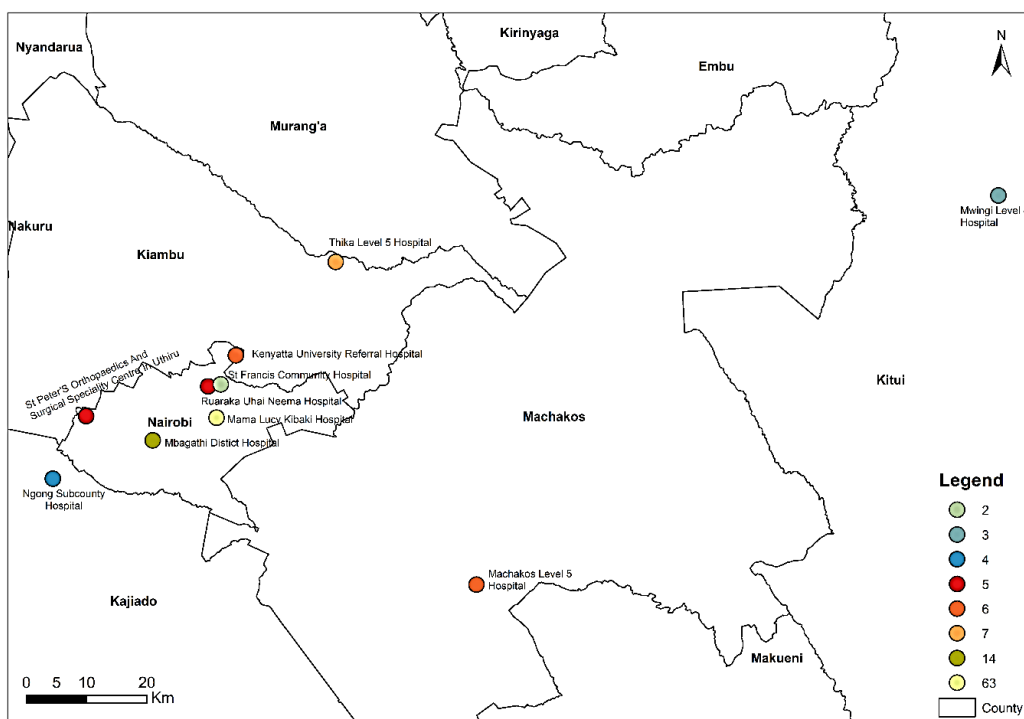

Figure 2a:
Distribution of orthopaedic and trauma admissions by health facility reported at Kenyatta National Referral Hospital pre-enforcement of referral regulations ((https://www.igismap.com/kenya-shapefile-download-boundary-line-administrative-state-and-polygon/)

The health facility was used as a reference unit to calculate the total number of cases reported and these were expressed in a graduated map.

There was a reduction in the admissions from Mama Lucy Kibaki Hospital and Kenyatta Teaching and Referral Hospital due to the referral guidelines enforcement. However, most of the major health facilities namely Mbagathi Hospital, Thika Level 5 Hospital, Machakos Level 5 Hospital, Mwingi Level 4 Hospital, St Peters Orthopedic Hospital, Ngong sub-county Hospital, St Francis Community Hospital did not experience a reduction in admissions (Figures 2b & 2c).

Discussions

Children and those above 65 years represented the least admissions during the study period pre- and post-enforcement of the referral guidelines while the majority of the admissions were young. This compares with a retrospective study on Orthopedic admissions done in India that showed the average age was 41.14 years [17]. A similar study also revealed low pediatric Orthopedic and Trauma admissions [18]. However, this contrasts with a study done in PCEA Kikuyu Mission Hospital, Kenya that showed 18.84% of Orthopedic admissions were of the pediatric age group [19]. This could be because PCEA Kikuyu Mission Hospital is a private and established Orthopedic Mission Hospital in Kenya with a reputation for orthopaedic pediatric care.

Casual labourers comprised a significant majority of orthopaedic and trauma admissions pre (45.5%) and post (45.1%) referral guidelines enforcement when compared with other forms of occupation. This compares favourably with a study done in Taiwan that revealed orthopaedic fractures were associated with patients of low socio-economic status [18].
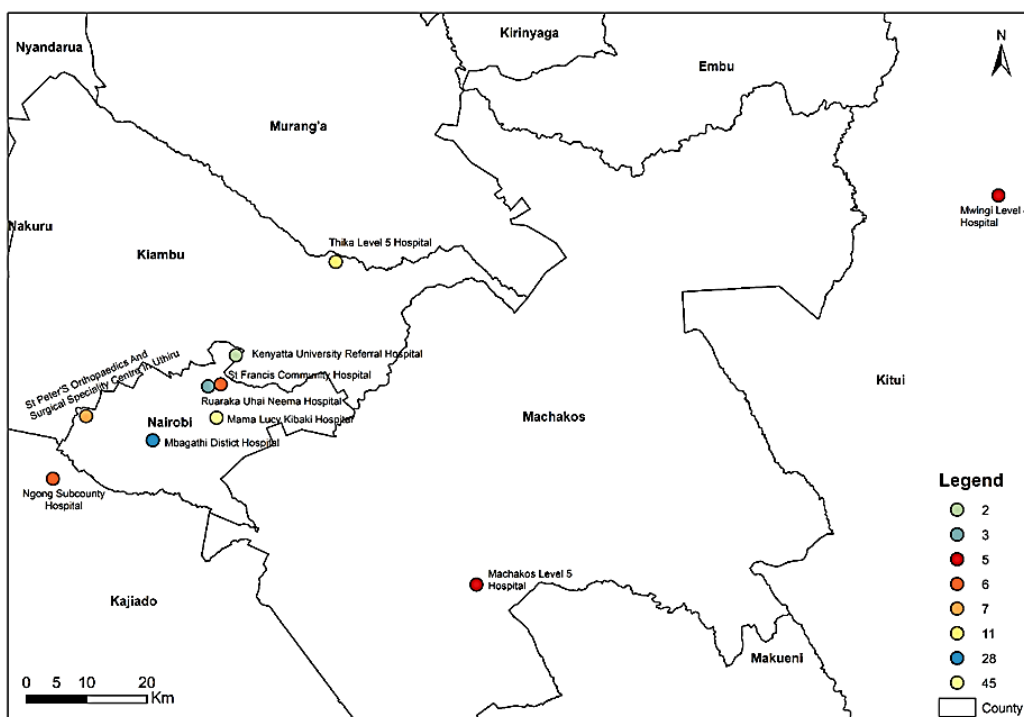

Figure 2b:
Distribution of orthopaedic and trauma admissions by health facility reported at Kenyatta National Referral Hospital post enforcement of referral regulations ((https://www.igismap.com/kenya-shapefile-download-boundary-line-administrative-state-and-polygon/)

However, it contrasted with studies done on orthopaedic admissions in Kilimanjaro Christian Medical Centre (KCMC) in Northern Tanzania showed the three most common occupations were farmers, businessmen, professional drivers, and students (20, 21). This could be because KCMC is a private facility as opposed to KNH which is a public health facility.

Spatial distribution of orthopaedic and trauma admissions

The study revealed that while orthopaedic and trauma admissions were spread across the country, about three-fifths were from Nairobi County. These are followed by the neighbouring counties of Kiambu, Kajiado, Machakos and Kitui Counties. Cumulatively these comprised over 92% of total admissions to KNH. This could be attributed to its proximity to KNH and the fact that KNH is better resourced, and equipped to handle a wide variety of orthopaedic and trauma cases by being a premier health referral facility in Kenya. This compares with a review of orthopaedic admissions in KCMC in Northern Tanzania showed 65.7% of the patients came from the state of Kilimanjaro where the hospital is located, 12.7% from Arusha,6.4% from Tanga, 5.9% from Manyara and 1.5% from Singida (20). A similar study done at Muhimbili National Hospital in Tanzania showed only 0.8% of admissions were from outside Dar Es Salaam (23). A similar study done in Blantyre Malawi also revealed majority of referrals come from within the Tertiary facility catchment areas (24). This implies that the KNH catchment population is largely within a radius of 40km from KNH and therefore to decongest KNH requires that the focus be placed on capacity building of health facilities surrounding within a radius of 40km from KNH.

The referral guidelines enforcement was associated with a reduction in admissions from within Nairobi County. This is easily explained by the fact that more than half of KNH admissions are from within Nairobi County.

Admissions from Embakasi, Kamukunji, and Ruaraka sub-counties of Nairobi County which are the catchment areas served by Mama Lucy Kibaki Hospital revealed a decline. This is corroborated by the fact that Mama Lucy Kibaki Hospital (MLKH) recorded significant reductions in referrals to KNH during the review period. Kenyatta Teaching and Referral Hospital (KTRH) also recorded reductions in referrals to KNH. This could be due to the re-organization of these facilities in terms of human personnel, and resources to manage orthopaedic and trauma cases as a result of enforcement of the referral guidelines. Other health facilities referring patients to KNH did not record a decline in referrals despite the referral guidelines enforcement. This could partly reflect the fact that they have genuine capacity issues from human personnel, and poor resources to handle common orthopedic and trauma conditions.

The study revealed there was an increase in the proportion of admissions from the rest of the country and this could be due to a decline in admissions from Nairobi County. This reflects the referral nature of KNH as a premier referral health facility in Kenya.

It is important to observe that Medicins Sans Frontiers was a key referring health facility before the enforcement of referral guidelines but no longer referred orthopaedic and trauma cases for admissions after the referral guidelines enforcement. This was because all these lower-level facilities were instructed to refer patients to the nearest Level 5 public health facilities as the first referral point. Medicins Sans Frontiers has been referring all their cases to Mama Lucy Kibaki Hospital as a result of the referral guidelines enforcement.

Conclusions

The orthopaedic and trauma admissions were young males in the pre-enforcement era but there was a significant increase in the proportion of female admissions after the enforcement of the referral guidelines. Most of the admissions were

spread across the country with the majority being from Nairobi County and its environs. Over four-fifths of KNH admissions are from Nairobi County and its environments. There was a significant reduction in the admissions from Nairobi County after enforcement of the referral guidelines. The decline in admissions was noted in Kamukunji, Embakasi, and Ruaraka sub counties in Nairobi County which are the catchment population for Mama Lucy Kibaki Referral Hospital. It is possible to enforce referral guidelines, allowing referral hospitals to handle complex cases while lower-level health facilities manage simple conditions.

Recommendations

The study suggests several recommendations to enhance the efficiency of the healthcare system. Firstly, it advises Kiambu, Machakos, and Kitui counties to bolster the capacity of their referral hospitals, aiming to diminish the volume of referrals to Kenyatta National Hospital (KNH). Secondly, within Nairobi County, particularly at Mama Lucy Kibaki Hospital (MLKH) and Mbagathi Hospital, improvements in infrastructure, supplies, equipment, and human resources are recommended to alleviate the strain on KNH. Thirdly, Ngong Sub-County Hospital, the primary referral facility in Kajiado County, should undergo substantial capacity enhancement to effectively handle the diverse orthopaedic and trauma cases seeking services. Additionally, Kenyatta University Teaching, Referral, and Research Hospital (KTRH) should be strengthened to receive referrals from Kiambu and neighboring counties, contributing to KNH's decongestion. Lastly, the study advocates for the widespread adoption of enforced referral guidelines by major referral hospitals across the country. This approach not only aids in decongesting referral hospitals but also enhances the utilization of lower-tier health facilities.

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