Evaluating Diagnostic Errors And Referral Practices For Ear, Nose, And Throat Disorders In A Resource-Constrained Environment

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ABSTRACT

Although ENT disorders have a big effect worldwide, not much information exists about their epidemiology and diagnosis in poor regions. We conducted a backwards-looking analysis of the clinical records of people treated at a specialty hospital with few resources. Using descriptive statistics, precise diagnosis and the appropriateness of patient referrals to ENT doctors were evaluated. The κ statistic for Cohen's kappa was used to assess how often non-specialists agree with the notes of the ENT specialist and logistic regression was employed to see what factors might lead to such disagreements. From the 1,543 patients examined (ranging in age from 0 to 87 years, mean age 25 ± 21 years), non-ENT practitioners gave the wrong diagnosis in 67.4% and suggested unnecessary referrals in 50.4% of cases. Patients aged 51–87 years were 1.77 times as likely to have received an incorrect referral diagnosis compared to children 0–5 years, according to the research. More patients with ear or sinonasal problems were likely to be misdiagnosed on referral than those with head and neck conditions. ENT specialists' diagnoses were only slightly similar to those of non-specialist clinicians (κ = 0.0001). Higher-speed and focused educational programs for practitioners may help doctors be more precise in countries with few resources.

Key words: Diagnostic accuracy, Referral appropriateness, Ear, nose, and throat (ENT) diseases, Resource-limited settings, Cohen's kappa coefficient

INTRODUCTION

At healthcare facilities, ENT disorders account for 20 to 50% of all cases [1]. In places where resources are scarce, these situations usually lead to worse health outcomes [2]. ENT diseases are found a lot but have generally been ignored in global health priorities [3]. In many developing regions, ENT services do not have enough funding, good facilities, equipment, drugs or trained personnel [4, 5]. ENT specialists tend to be located in relatively few urban areas because they are so overstressed. As a result, the majority of ENT patients are treated by clinicians who are not trained to manage ENT problems [4]. Even though these healthcare providers are responsible for basic ENT health issues, a number of countries believe their education is not enough for reliable ENT care [6]. As a result, many cases of delayed, missed or wrong diagnoses and incorrect or late referrals, by non-ENT specialists are likely happening. About 70% of medical mistakes are caused by diagnostic errors [8]. If a healthcare system has the resources needed, the likelihood of a diagnostic error is between 0.7% and 15% and over half may result in harm [9, 10]. Yet, in limited resource areas, there is a lack of data on harmful diagnostic errors due to poor access to equipment, not enough specialists and inefficient computer systems for health records [11]. While mistakes in referring patients can affect treatment, misdiagnoses boost the risk of death, escalate healthcare costs and often cause legal issues [13]. So far, the study of diagnostic errors in these health facilities has been limited. The purpose of this study was to judge how accurately diagnoses were made and to review why patients were referred to this ENT treatment center. It also looked at how well ENT professionals and referring clinicians agreed on making a diagnosis.

METHODS

How and where the story takes place
Between 1 July and 30 October 2019, we analyzed the medical records of all patients whom we treated at the ENT outpatient clinic in a tertiary teaching hospital. Non-ENT specialists from various health centers referred their patients to the study. Because there was inadequate logging of patient records before July 2019 and after October 2019, a complete retrospective analysis could not be done [14]. From July to October 2019, using the trial filing system helped create better patient records where there wasn't an electronic medical record system. As the main referral center, the hospital

complex is responsible for the only ears, nose and throat clinic in the region, receiving patients from all underlined provinces and 18.5 million people [15]. Before September 2019, it was the single public medical institution with a surgeon who treated ear, nose and throat problems. In general, patients are seen first by health center doctors or nurses who then refer them to one of three main hospitals. Most minor diseases are treated in level 1 hospitals, intermediate cases in level 2 and complex ones are looked after in level 3 centers [16]. Level 1 hospitals and clinics have the basic tools to conduct imaging (X-ray and ultrasound) and laboratory analyses, but higher hospitals can depend on advanced diagnostic machines.

Choosing the Group of Participants and Sampling
In the beginning, we collected physical copies of the notes for each of the 1,873 patients treated at the clinic while our study was taking place. Two rounds of screening were used to choose the records for final analysis. I handled duplicates in Phase 1 and ended up with 1,701 files that were not duplicated. Next, Phase 2 looked over all 1,701 records to review presentation dates and referral details such as the referring center and the reason and diagnosis for referral. Only records that provided referral information were considered for analysis and this process excluded 92.

Coming up with the actual results
The main results were based on the diagnoses given by both the referring clinicians and the ENT specialist. Following proper testing, the ENT specialist confidently made a final diagnosis. A match between diagnoses given by referring clinicians and ENT specialists was labeled 'concordant,' and missing diagnoses were considered 'unknown.' Assumptions were made that the clinicians' and specialists' diagnosed conditions were correct, since they generally fell into the widely recognized category of the primary pathology, by the principal investigator's experience. All cases where the referral and ENT specialist made different diagnoses were considered misdiagnoses. When appropriate, ENT diagnoses were coded using the International Classification of Diseases 11th Revision (ICD-11). Referrals that are referred earlier than advised (primary care was not the first option), address the wrong specialty or lack needed testing because the primary MR scanner was not used, were all classed as 'inappropriate referrals' for this study according to Blundel et al. [17].

RESULTS

Table 1: Univariate and multivariate logistic regression of the pre-ENT referral misdiagnosis among the different patient groups

Variable	Univariate Analysis			Multivariate Analysis		
	OR	p-value	95% CI	aOR	p-value	95% CI
Age groups						
0–5 years	Reference					
6–12 years	1.05	0.720	0.78–1.41			
13–18 years	0.80	0.320	0.50–1.28			
19–35 years	1.20	0.150	0.92–1.58			
36–50 years	1.65	0.006	1.15–2.38			
51–87 years	1.95	0.002	1.34–2.85	1.68	0.045	1.01–2.79
Departments						
Medicine	Reference					
Paediatric	0.42	0.002	0.26–0.68	0.58	0.018	0.36–0.91
Surgery	0.65	0.020	0.44–0.95			
Women and Newborn	0.20	0.090	0.02–1.98			
ENT subspecialty						
Head and Neck	Reference					
Otology	1.75	0.001	1.30–2.35	1.58	0.010	1.12–2.23
Rhinology	1.65	0.001	1.25–2.18	1.72	0.002	1.25–2.37
Medical problem	0.60	0.350	0.18–2.02			
No ENT pathology	1.45	0.001	1.18–1.78	1.69	0.030	1.05–2.73

Table 2: Univariate and multivariate logistic regression of inappropriate referrals among the different patient groups

Variable	Univariate Analysis			Multivariate Analysis		
	OR	p-value	95% CI	aOR	p-value	95% CI
Attendance status						
Review	Reference					
First attendance	1.45	0.004	1.12–1.87	1.42	0.006	1.11–1.84
Attendance not stated	0.85	0.830	0.58–1.24			
Referral within UTH						
No	Reference					
Yes	1.25	0.038	1.01–1.56	1.28	0.034	1.02–1.60

Factors contributing to pre-ENT referral errors were studied with logistic regression analysis. Both single and combined analyses of variables related to misdiagnosis before ENT referral are provided in Table 1. Age mattered a lot; patients aged 51 to 87 years were almost twice as likely to be misdiagnosed as those in the reference group of patients 0 to 5 years old (aOR: 1.68; 95% CI: 1.01–2.79; p=0.045). Therefore, diagnosing older patients can be more complicated because their conditions tend to vary widely. Departments varied and pediatric referrals witnessed a notable improvement in diagnostic accuracy or referral suitability, compared with referrals in medicine. The risk for univariate mortality was less in the surgical department, though this difference did not remain in the dataset after other variables were adjusted in the multivariate model. ENT specialists from different subspecialties also played a role. There was a greater risk of misdiagnosis in cases of otology and rhinology (aORs: 1.58 and 1.72). Those without ENT pathology had a slightly higher chance of being referred to the wrong specialist (aOR: 1.69; 95% CI: 1.05–2.73; p=0.030). In Table 2, we studied factors related to inappropriate referrals. Patients coming to the clinic for the first time had a higher chance than those having a review of being referred inappropriately (aOR: 1.42; 95% CI: 1.11–1.84; p=0.006). Similarly, inappropriate referral risk was greater when the patient's first medical appointment was inside the hospital campus (aOR: 1.28; 95% CI: 1.02–1.60; p=0.034). All in all, these results suggest that age, type of referral and the type of clinical specialty can help improve both accurate diagnosis and referrals to ENT specialists.

Figure 1: Pre-ENT Referral Misdiagnosis Analysis Univariate and Multivariate Logistic Regression Results
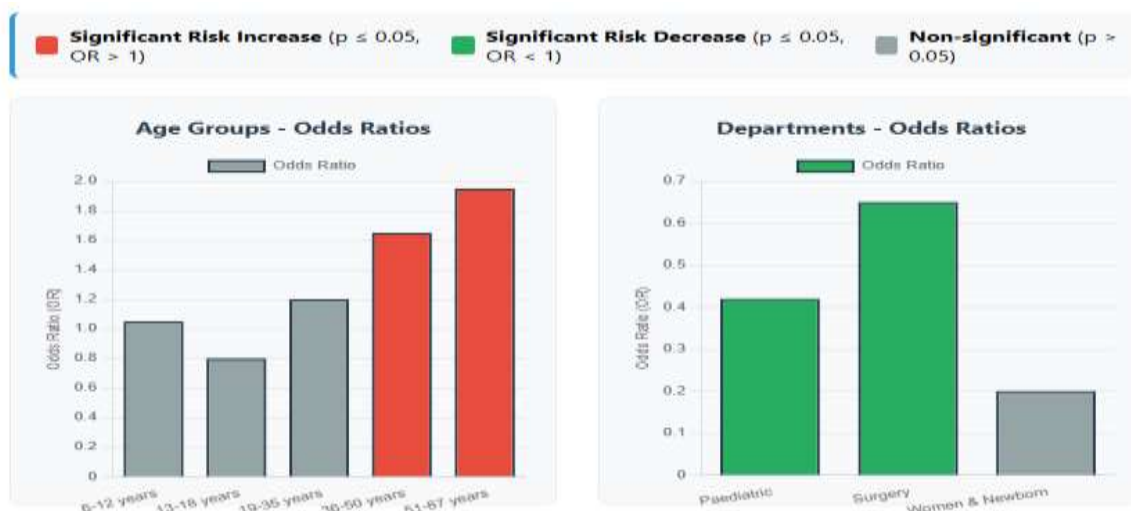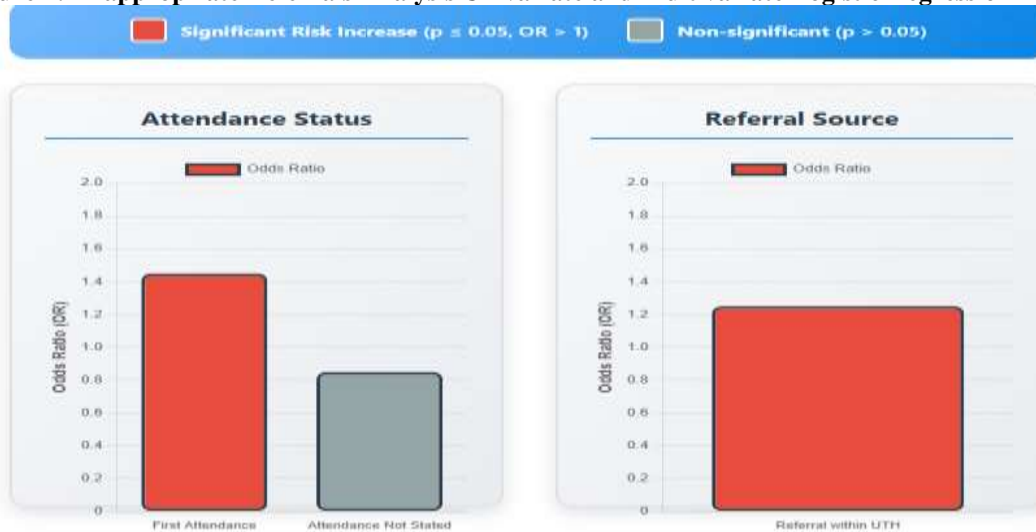
Figure 2: Inappropriate Referrals Analysis Univariate and Multivariate Logistic Regression Results

DISCUSSION

It was found that, in settings with limited resources, diagnostic errors and inappropriate ENT specialist referrals were common. The results highlight that more accurate diagnoses by physicians are critical to raising the quality of ENT patient care. ENT is considered a surgical field, yet it forms the basis for many skills found in all medical and surgical professions [19]. For this reason, healthcare providers need to know how to assess and manage standard ENT issues and make care referrals when needed [19]. Ear-related conditions make up most of the ENT problems seen at healthcare clinics worldwide [20]. Our results indicate that head and neck problems were the most common reason for individuals to visit the ENT clinic (34.8%), whereas ear diseases were found in a fewer amount (25.7%). In other different developing areas, including India [21] and Nigeria [22], hear doctors regularly manage ear related diseases. The main reason for this difference could be that many patients with ear diseases such as hearing impairment and chronic otitis media, cannot easily reach ENT support because they live in poor conditions, the infrastructure isn't well developed or because they prefer not to seek medical care [4, 5, 23]. Because about three quarters of people in Ghana are poor, live in the countryside and ENT services mostly focus on cities [4, 15], many rural patients may not be aware of the special care they require [24, 25]. Better health information, higher living standards for all and a larger number of specialists available to patients might bring about changes in how public health problems are recognized. We found that many healthcare workers working in low-resource areas do not correctly identify ENT problems. Although data on diagnostic errors in different areas of medicine and surgery are not widespread, evidence available indicates that physicians and pediatricians have better results. According to one survey, American doctors had a 4.5% diagnostic error rate, compared to the 3.6% rate seen among primary care providers in Malaysia [26;27]. In addition, close to 60% of the surveyed pediatricians mentioned face errors during diagnosis every month and fairly common error resulted in harm each year [28]. A Dutch report found that medical residents scored an accuracy average of 0.42 when diagnosing using these questionnaires, with scores possible between 0 (wrong) and 1 (correct) [29]. Our study found that most allergic rhinitis cases (96.7%), laryngopharyngeal reflux (95.7%) and ear wax impaction (87.0%) were missed by non-specialists, leading probably to many patients receiving wrong treatments and procedures. Sometimes, not getting patients to cancer specialists in a timely manner can negatively impact the outcome and greatly increase treatment costs through longer stays in hospitals. A late diagnosis of a benign ENT disease can result in serious threats to life like blocking the airway or developing brain infections. Diagnostic agreement ($\kappa = 0.0001$) is negligible and the high number of mistakes in referrals (56.6%) suggest most clinicians know little about the basic treatment of common ear, nose and throat illnesses. In much of the world, ENT is not a main topic in medical education and students usually get only 1–2 weeks to observe [30]. Therefore, after graduation, many ENT practitioners still feel unsure and poorly skilled in treating ear, nose or throat diseases. There are views in the literature that comprehensive undergraduate ENT training suits students better than practical learning during general practice, even so, regular professional training is required to further develop clinical skill. Improved teaching of ENT topics in schools, hospitals and after qualifying places, would empower clinicians to handle common ENT diseases. Investigations are ongoing to learn more about how well health workers understand, feel about and carry out basic ENT management which could explain why some easy and accurately recognized cases are still sent to specialists without need. Researchers have not agreed on the age group that makes the most misdiagnosis, with some saying it is higher among older people and some arguing it is higher for younger people.

Patients between 51 and 87 years old suffered from misdiagnoses twice as often as patients younger than 5 years. Even though we have not found the deeper reasons, stronger studies using more participants should be carried out. Because most healthcare facilities lack basic tools for diagnosing ear and nasal conditions, like nasal specula, otoscopes and endoscopes, many patients are likely underdiagnosed, since complete examinations are rarely done. Except for laryngeal problems, most cases in the head and neck need little instrumentation. Besides, the use of limited skills and tools in basic hospitals, together with bad coordination throughout the system, might account for some unnecessary referrals seen.

Our data did not indicate that clinical experience decreases diagnostic mistakes, although there was a sharp difference between referrals from tertiary hospitals (66.8% misdiagnosis) and the greatest misdiagnosis found in primary hospitals (74.1%). This suggests that learning stops advancing after college for doctors which is why ongoing education is necessary. Our research also advises checking referral processes in top hospitals to confirm that senior specialists take part, to prevent junior doctors from sending patients unnecessarily. Level 1 hospitals have doctors called Senior Resident Medical Officers, who work at these sites for at least 1.5 years after finishing their basic studies. Level 3 hospitals also admit students, post-doctor Junior Resident Medical Officers and specialists in training. Educating regular healthcare workers to treat simple ENT cases is a demonstrated strategy that helps increase quality ENT services, as testing it has shown in Malawi. Evidence from developing nations indicates health workers can be skilled in providing ENT care. For ear pathology diagnoses in Malawi, ENT specialists and clinical officers governing together were reported to show nearly perfect agreement ($\kappa = 0.7$) and moderate agreement ($\kappa = 0.5$) with the nurses. It means that on some occasions, general practitioners could be involved in ENT assessments. Teaching adoption of basic equipment for ENT can improve how patients are treated where specialists are not available. At the same time, partnering with professionals from other countries could help grow the ENT workforce more slowly. As a result, ENT services in Africa are now more developed, due in part to CBM International, special fellowships and projects such as Operation Ear Drop Kenya. Bringing in ENT telemedicine can provide better access for those who live far from specialists. Even though telemedicine is now being used by other medical fields here, it is not yet explored in ENT. The right implementation methods should line up with national priorities for healthcare. The WHO considers accurate diagnosis to be a vital safety concern in primary care. Seeing that up to half of all general physician visits are for ENT issues, getting the diagnosis right is very important for good care. Because misdiagnosis affects up to 36% of cases, any growth in experts should be accompanied by measures to guarantee clinician expertise. Though the recommended ratio is one otolaryngologist for 40,000 people, that ratio is far from what is available locally [4]. Because up to 70% of medical mistakes are due to diagnostic errors [8], low clinician quality would add even more pressure to the healthcare system. Many health workers seem reluctant to admit if they misdiagnose a patient, putting healthcare quality at risk .

CONCLUSION

This study highlights a significant burden of diagnostic errors and inappropriate referrals for ENT specialist care in resource-limited settings, emphasizing the urgent need to improve ENT diagnostic skills among healthcare providers. The lack of adequate training, limited access to essential diagnostic tools, and poor coordination within referral systems contribute to suboptimal patient management and increased healthcare costs. Strengthening undergraduate and continuing medical education in ENT, expanding the role of trained non-specialist healthcare workers, and investing in specialist workforce development are critical strategies to enhance care quality. Additionally, leveraging telemedicine and fostering international collaborations can improve access to specialized services. Addressing these challenges is essential to reduce misdiagnosis-related morbidity and mortality and to ensure timely, appropriate care for patients with ENT conditions. Future research with more comprehensive data and improved record-keeping systems is warranted to better understand and mitigate these issues.

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