

# Thyroid Surgery in a Resource-Limited Setting: Feasibility and Analysis of Short- and Long-term Outcomes

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## Abstract

**Objective.** The present study reviews a series of patients who underwent thyroid surgery in Eldoret, Kenya, to demonstrate the feasibility of conducting long-term (>1 year) outcomes research in a resource-limited setting, impact on the quality of life of the recipient population, and inform future humanitarian collaborations.

**Study Design.** Case series with chart review.

**Setting.** Tertiary public referral hospital in Eldoret, Kenya.

**Subjects and Methods.** Twenty-one patients were enrolled during the study period. A retrospective chart review was performed for all adult patients who underwent thyroid surgery during humanitarian trips (2010-2015). Patients were contacted by mobile telephone. Medical history and physical examination, including laryngoscopy, were performed, and the SF-36 was administered (a quality-of-life questionnaire). Laboratory measurements of thyroid function and neck ultrasound were obtained.

**Results.** The mean follow-up was  $33.6 \pm 20.2$  months after surgery: 37.5% of subtotal thyroidectomy patients and 15.4% of lobectomy patients were hypothyroid postoperatively according to serologic studies. There were no cases of goiter recurrence or malignancy. All patients reported postoperative symptomatic improvement and collectively showed positive pre- and postoperative score differences on the SF-36.

**Conclusion.** Although limited by a small sample size and the retrospective nature, our study demonstrates the feasibility of long-term surgical and quality-of-life outcomes research in a resource-limited setting. The low complication rates suggest minimal adverse effects of performing surgery in this context. Despite a considerable rate of postoperative hypothyroidism, it is in accordance with prior studies and emphasizes the need for individualized, longitudinal, and multidisciplinary care. Quality-of-life score improvements suggest benefit to the recipient population.

## Keywords

humanitarian, global health, thyroidectomy, thyroid, quality of life, resource limited

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Thyroid goiter disproportionately affects individuals from underdeveloped regions such as sub-Saharan Africa.<sup>1</sup> Although the government has mandated salt iodization since 1978, Kenya remains an endemic area for goiter, with an estimated prevalence of 6.2%.<sup>2</sup> Nutritional factors such as selenium deficiency and consumption of thiocyanates found in the poorly detoxified cassava root—a carbohydrate-rich food commonly consumed in the region—also play a role in the prevalence.<sup>3,4</sup>

Due to a lack of access to health care, patients in sub-Saharan Africa often present with symptomatic, large, and complex thyroid pathology. Initial management of goiter typically involves treatment with iodine supplementation. However, due to unreliable or unavailable access to

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medications in this setting, surgery is often favored. Surgery is also indicated for patients with compressive symptoms, uncontrolled hyperthyroidism, or cosmetic concerns.<sup>5</sup>

Despite a high prevalence of surgical thyroid disease in sub-Saharan Africa, the area is also among the most medically resource limited. The region bears about a quarter of the overall global burden of disease but has only 3% of the medical workforce.<sup>6</sup> Kenya is no exception to this paradox. In 2009, only an estimated 40 otolaryngologists were in Kenya for >30 million people.<sup>7</sup> The result is a staggering unmet surgical need.

Many surgical teams have traveled to resource-limited areas to provide care not otherwise afforded by the local infrastructure. However, performing surgery in low- and middle-income countries harbors potential for undue harm and disruption of local health care systems.<sup>8</sup> Critical analysis of outcomes is paramount to avoid the potential pitfalls associated with humanitarian surgical trips and improve quality of care.<sup>9-11</sup>

In this study, we aim to understand the rate of short- and long-term complications for patients undergoing elective thyroid surgery during a yearly 2-week-long surgical trip to Eldoret, Kenya, between 2010 and 2015. The goal is to demonstrate the feasibility of conducting long-term surgical and quality-of-life outcomes research in the humanitarian setting. We also aim to evaluate our current methods of surgical intervention and their impact on the health and quality of life of the recipient population and inform future international surgical collaborations.

## Methods

### Study Site

The Moi Teaching and Referral Hospital is a tertiary public hospital in Eldoret, Kenya, approximately 300 km from Nairobi. The hospital is affiliated with a consortium of North American academic health centers led by Indiana University in a partnership with the Government of Kenya, known as AMPATH (Academic Model Providing Access to Healthcare). This 800-bed hospital is equipped with 8 operating rooms and an otolaryngology (ear/nose/throat) clinic, staffed by 4 otolaryngologists. Since 2010, the Moi Teaching and Referral Hospital has been the site of an annual 2-week humanitarian trip led by the senior author (S.R.C), along with faculty, residents, nurses, and medical students from several institutions. The purpose of the trip is to provide free ear/nose/throat surgical care otherwise unavailable to the community and to support academic and training opportunities. The host institution prescreens about 100 to 120 patients for operative intervention prior to the team's arrival (**Figure 1**).

### Ethics and Enrollment

After approval by the Institutional Research and Ethics Committee at the Moi Teaching and Referral Hospital and Indiana University Institutional Review Board, a 6-year retrospective review from 2010 to 2015 was performed on all adult patients (>18 years old) who underwent primary thyroid surgery, defined as a thyroid lobectomy or subtotal/total



**Figure 1.** Preoperative photo: patient with thyroid goiter (consent for use provided by patient).

thyroidectomy, during the surgical trips. A Kiswahili-speaking clinical staff member contacted eligible patients via mobile telephone for follow-up clinical evaluation. Patients were subsidized 1000 Kenyan shillings (about US\$10) for transportation expenses. There was no patient cost for clinical, laboratory, or radiographic evaluation associated with participation.

### Surgical Treatment

The extent of surgery was guided by the patient's clinical symptoms and pathology. Whenever possible and based on the intraoperative gross appearance of the gland, preservation of thyroid tissue was attempted to minimize potential issues with affordability or access to thyroxine postoperatively. Thyroid lobectomy was defined as removal of 1 lobe; subtotal thyroidectomy was defined as removal of tissue >1 lobe but leaving remnant gland (about 3-5 g) on the less-affected side; and total thyroidectomy was defined as removal of all thyroid tissue. Although data were not routinely gathered on the size of the surgical specimens, many of the goiters were large (10-15 cm).

An experienced visiting attending otolaryngologist directly supervised or performed all surgeries. Operations were performed under general anesthesia through a standard cervical incision, dissection of the thyroid gland along the capsule, and identification of the recurrent laryngeal nerves and parathyroid glands. Specimens were sent for pathologic evaluation. The wounds were typically closed with a Penrose-type drain and subcuticular suture. The drain was removed prior to discharge. All patients were admitted to the hospital postoperatively for monitoring. Patients were instructed to return to the clinic for clinical review about 2 weeks after surgery.

### Short- and Long-term Surgical Outcomes

After informed consent, the complete medical records were reviewed and recorded, including demographic information and pre-, post-, and intraoperative notes, as well as pathologic,

**Table 1.** Patient Demographics (n = 21).

	Study Group	
	n	%
Age at time of surgery, y <sup>a</sup>	49.1 ± 13.4 (20-81)	
Follow-up duration, mo <sup>a</sup>	33.6 ± 20.2 (12-72)	
Sex		
Male	2	9.5
Female	19	90.5
Occupation		
Homemaker	7	33.3
Businessperson	6	28.6
Farmer	5	23.8
Other	3	14.3
Distance traveled, km		
0-50	10	47.6
51-100	5	23.8
>100	6	28.6
Insurance status		
Insured	7	33.3
Uninsured	5	23.8
Unavailable	9	42.9
Indication for surgery		
Cosmesis	15	71.4
Dyspnea	8	38.1
Dysphagia	6	28.6
Hyperthyroidism	1	4.8
Symptom duration, y		
0-5	10	47.6
6-10	9	42.9
>10	2	9.5
Preoperative thyroid function		
Euthyroid	20	95.2
Hyperthyroid	1	4.8
Preoperative diagnosis		
Goiter	16	76.2
Nodule	4	19.0
Toxic goiter	1	4.8
Postoperative diagnosis (pathology)		
Colloid goiter	19	90.5
Follicular adenoma	2	9.5
Diagnostic workup		
Thyroid function tests	21	100.0
Ultrasound	19	90.5
Fine-needle aspiration	12	57.1
Computerized tomography	2	9.5
Procedures performed		
Lobectomy	13	61.9
Subtotal thyroidectomy	8	38.1

<sup>a</sup>Mean ± SD (range).

radiographic, and laboratory data. Chart review sought documentation of short-term (<1 year postoperatively) complications, such as hematoma, wound infection, dysphonia, and hypocalcemia.

At the follow-up visit, long-term (≥1 year postoperative) data were obtained. Patients underwent a head and neck examination, including scar assessment and fiber-optic laryngoscopy to assess vocal fold mobility, and they completed a health-related quality-of-life (HR-QoL) questionnaire. To evaluate residual gland function, laboratory measurements were obtained for thyroid-stimulating hormone (reference range = 0.27-4.20 mIU/L) and free thyroxine (reference range = 0.932-1.71 ng/dL). When indicated, parathyroid gland function was evaluated by measuring serum calcium levels (reference range = 2.20-2.55 mmol/L). Neck ultrasound (Hitachi Aloka IPF-1901 and Phillips HD11XE) was also performed to assess remnant thyroid tissue.

For patients with abnormal thyroid hormone levels, pharmacologic management with thyroxine was initiated or the preexisting hormone replacement regimen was adjusted, with follow-up arranged with the Kenyan otolaryngologists and/or medical specialists to monitor replacement therapy.

### HR-QoL Outcomes

HR-QoL was assessed with the SF-36 (Short Form-36 Health Status Questionnaire). The form was available in an English and validated Kiswahili version.<sup>12</sup> The SF-36 has a numeric range of 0 to 100 and includes 8 domains: physical function, social function, role-physical, role-emotional, mental health, vitality, bodily pain, and general health. Physical and mental composite scores were computed through an obliquely rotated factor solution as described by Farivar et al.<sup>13</sup> A higher score indicates a better HR-QoL.

To provide a comparative analysis, the postoperative SF-36 results of patients in the study group were compared with results of a distinct group of patients newly presenting (preoperative) for surgical management of thyroid disease. The results from the preoperative group were used for only this portion of the study.

### Statistical Analysis

The chi-square test was used for discrete variables, and a *t* test assuming equal or unequal variance was used for continuous variables, based on determination by an *F* test. *P* < .05 was considered significant. For surgical outcomes, lobectomy patients were compared with subtotal thyroidectomy patients. For SF-36 data, preoperative goiter patients were compared with all postoperative patients (lobectomy and subtotal thyroidectomy combined).

### Results

A total of 54 patients underwent thyroid surgery during the study period: 32 (59.3%) of these patients were successfully contacted via mobile telephone for follow-up, and 22 (40.7%) were not able to be contacted and were essentially lost to follow-up. Of 29 patients, 26 (86.7%) who underwent surgery within the 3 years prior to the study had a listed and functioning number, compared with 24.0% (6 of 25) who underwent surgery >3 years prior. Of the contacted patients, 6 were unable to participate due to distance or life circumstance (eg, childbirth). Twenty-six patients were scheduled

**Table 2.** Short- and Long-term Surgical Outcomes.

	Lobectomy		Subtotal Thyroidectomy		Overall		P Value
	n	%	n	%	n	%	
Operative time, min <sup>a</sup>	92.5 ± 16.4		175.8 ± 77.1		120.3 ± 59.4		NS
Hospital stay, d <sup>a</sup>	2.9 ± 0.6		3.6 ± 1.2		3.3 ± 1.1		NS
Subjective symptomatic improvement							
Yes	13	100	8	100	21	100	N/A
No	0	0	0	0	0	0	N/A
Short-term outcomes (<1 y postoperative)							
Death	1 <sup>b</sup>	N/A	0	0.0	1 <sup>b</sup>	N/A	N/A
Transient voice change (self-resolved within 2 wk)	0	0.0	1	12.5	1	4.8	NS
Transient hypocalcemic symptoms	1	7.7	2	25.0	3	14.3	NS
Long-term outcomes (≥1 y postoperative)							
Subjective hypothyroidism symptoms	6	46.2	5	62.5	11	52.4	NS
Postoperative thyroid function							
Euthyroid (TSH = 0.27-4.20)	11	84.6	4	50.0	15	71.4	NS
Hypothyroid (TSH >4.20)	2	15.4	3	37.5	5	23.8	NS
Hyperthyroid (TSH <0.27)	0	0.0	1	12.5	1	4.8	NS
Permanent subjective voice change	2	15.4	1	12.5	3	14.3	NS
RLN injury (fiberoptic laryngoscopy)							
No	11	84.6	8	100	19	90.5	NS
Yes	1	7.7	0	0.0	1	4.8	NS
Refused (normal voice)	1	7.7	0	0.0	1	4.8	NS
Unfavorable scar	2	15.4	1	12.5	3	14.3	NS
Ultrasound findings							
Goiter recurrence	0	0.0	0	0.0	0	0.0	N/A
New concerning nodule	1	7.7	1	12.5	2	9.5	NS
Hypocalcemic symptoms	1	7.7	0	0.0	1	4.8	NS

Abbreviations: N/A, not applicable; NS, not significant; RLN, recurrent laryngeal nerve; TSH, thyroid-stimulating hormone.

<sup>a</sup>Mean ± SD.

<sup>b</sup>Patient not included in study.

**Table 3.** SF-36 Outcomes: Quality of Life.

	Preoperative (n = 15)	Postoperative (n = 21)	P Value
Physical function	55.6	73.0	.069
Role-physical	40.0	66.7	.078
Role-emotional	33.3	62.1	.055
Vitality	42.7	67.3	<.005
Mental health	55.5	75.3	<.05
Social function	50.0	73.9	<.05
Bodily pain	40.0	79.9	<.005
General health	34.8	71.3	<.005
Physical component summary	50.1	82.8	<.005
Mental component summary	50.6	77.9	<.005

Abbreviation: SF-36, Short Form–36 Health Status Questionnaire.

for follow-up evaluation, and 21 patients presented, consented, and completed all components of the study.

Thyroid surgery constituted 23.9% (54 of 229) of all operations performed by the surgical team between 2010

and 2015. On chart review, two thyroidectomy patients had died, one due to an anesthetic-related complication during thyroid surgery and another due to an unrelated medical event at a later date. The patient who died due to an anesthetic-related complication suffered cardiac arrest near the conclusion of uncomplicated surgery and was unable to be resuscitated. The expired patients were not included in the study group, but are referred to in this review for descriptive purposes.

The mean age at the time of surgery was 49.1 ± 13.4 years (range = 20-81 years). The majority of patients were female (90.5%). There was no difference in mean age at the time of surgery (47.1 ± 12.0 years, *P* = .53) or sex (female = 92.6%, *P* = .76) between the overall cohort of thyroid surgeries performed during the study period and the 21 members of the study group. The most common occupation was homemaker (33.3%). The highest proportion of patients traveled from within 50km of the hospital (47.6%). The mean follow-up duration was 33.6 ± 20.2 months (range = 12-72 months). Cosmesis was the most common indication for surgery (71.4%) and the greatest proportion of patients were symptomatic for <5 years (47.6%).

All patients underwent preoperative thyroid function testing and were euthyroid (95.2%), with the exception of one who presented with a toxic goiter. Thirteen thyroid lobectomies (61.9%), and 8 subtotal thyroidectomies (38.1%) were performed. The majority of patients presented with multi-nodular goiter (76.2%,  $n = 16$ ). None of the patients had malignancy, as determined by postoperative pathology evaluation. There was no difference in type of surgery performed ( $P = .45$ ) or postoperative pathology diagnosis ( $P = .43$ ) between the overall cohort of thyroid surgeries performed and the study group.

### Short-term Surgical Outcomes

All patients subjectively endorsed overall symptomatic improvement from the procedure at the follow-up visit. The most common early complication was transient symptoms of hypocalcemia (numbness and/or tingling around mouth or fingertips; 14.3%,  $n = 3$ ). One patient reported transient voice change, which self-resolved. The operative duration was lower in the lobectomy group, as compared with the subtotal thyroidectomy group, but this did not reach statistical significance ( $92.5 \pm 16.4$ ,  $175.8 \pm 77.1$  minutes, respectively,  $P = .073$ ). There was no significant difference in length of hospital stay between the groups ( $2.9 \pm 0.6$  vs  $3.6 \pm 1.2$  days,  $P = .128$ ). There were no instances of hematoma, seroma, or infection.

### Long-term Surgical Outcomes

At long-term follow up visit, the majority of the study patients were euthyroid (71.4%,  $n = 15$ ) on serological studies. 11 patients (52.4%) reported at least 1 clinical symptom potentially related to hypothyroidism (fatigue, weakness, weight gain or difficulty losing weight, coarse/dry hair or skin, hair loss, sensitivity to cold, constipation), but had a wide range of thyroid-stimulating hormone levels ( $1.51$  to  $>100$ ). Of the 11 symptomatic patients, 3 were indeed hypothyroid based on serological studies. Additionally, 2 asymptomatic patients were hypothyroid (thyroid-stimulating hormone, 4.27 and 4.56), yielding a total of 5 confirmed hypothyroid patients (23.8%). As expected, a larger proportion of patients who underwent subtotal thyroidectomy were hypothyroid (37.5%,  $n = 3$ ) on serological studies when compared with patients undergoing a lobectomy (15.4%,  $n = 2$ ). One patient was hyperthyroid due to over-treatment with thyroxine.

One patient reported persistent hypocalcemia symptoms but did not have decreased calcium on serological studies. 14.3% of patients ( $n = 3$ ) reported permanent voice changes, and of those, 1 patient was found to have recurrent laryngeal nerve paralysis as assessed by fiber-optic laryngoscopy. This patient underwent injection laryngoplasty to address her voice complaints. There were no goiter recurrences detectable on ultrasound examination of the patient group assessed at follow-up, although 2 of these patients (9.5%) were found to have new, small ( $>1.0$  and  $<2$  cm), asymptomatic nodules within the remnant gland; these underwent fine-needle aspiration. The result from one of these

specimens was benign, but results were not recoverable for the second patient. Three patients reported an unfavorable surgical scar (14.3%), but none elected to undergo triamcinolone injection.

### HR-QoL Outcomes

All 21 patients enrolled in the study (1-5 years posttreatment) completed the SF-36, as well as 15 patients presenting for preoperative evaluation for thyroid goiter (0-2 weeks before treatment, untreated control; mean age,  $46.9 \pm 14.9$  years). There was no difference in mean age ( $47.5 \pm 15.01$  years,  $P = .74$ ) or sex (female = 100.0%,  $P = .22$ ) between the study group and the patients presenting for preoperative evaluation.

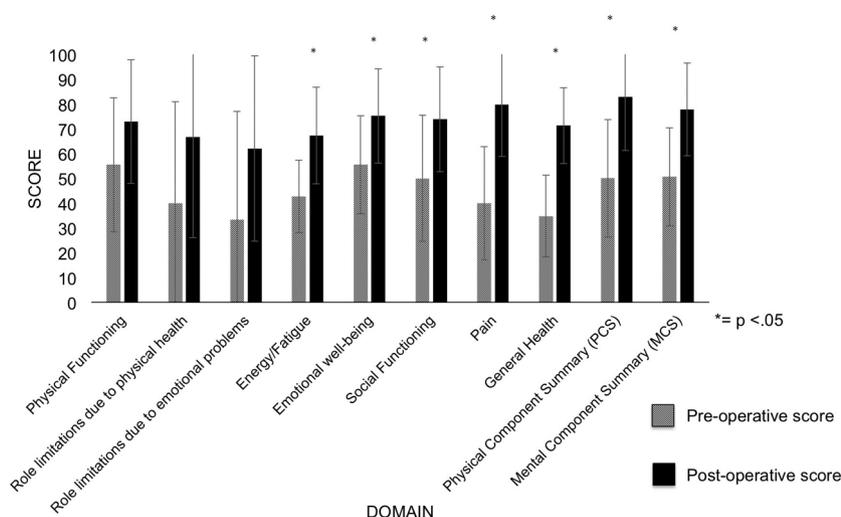
The mean preoperative scores were lower in all measured domains. The energy/fatigue, emotional well-being, social functioning, pain, and general health domains were significantly different between the groups, favoring the posttreatment group ( $P < .05$ ). The physical component summary scores (50.1 vs 82.8) and the mental component summary scores (50.6 vs 77.9) were also significantly different between the groups, with the posttreatment group demonstrating better scores ( $P < .005$ ; **Figure 2**).

### Conclusion

For decades, surgery in resource-limited settings has been perceived as too logistically complex and costly to address global disease.<sup>14</sup> However, the recent report by the Lancet Commission on Global Surgery<sup>15</sup> and inclusion of *Essential Surgery* as a volume in the latest edition of the World Bank's *Disease Control Priorities*<sup>16</sup> indicates increasing recognition and prioritization of surgery as a cost-effective tool in global health.<sup>17</sup>

Prior research in thyroid surgery in resource-limited settings has largely focused on short-term outcomes. Collectively, these studies demonstrate low complication rates in the hands of experienced surgeons and advocate for long-term international partnerships.<sup>18-20</sup> To our knowledge, no previous authors have evaluated long-term ( $\geq 1$  year) surgical results based on follow-up evaluation and quality-of-life assessment in humanitarian thyroid surgery.

The present study describes the short- and long-term outcomes of a cohort of 21 patients who underwent thyroid surgery in Eldoret, Kenya. Patients had a low rate of short-term complications, with transient hypocalcemia symptoms (14.3%) as the most prevalent, although no patients had permanent hypocalcemia. Hypothyroidism was the most common long-term complication, with a rate of 15.4% in the lobectomy group and 37.5% in the subtotal thyroidectomy group, results that are in accordance with prior studies in Western settings.<sup>21,22</sup> The different rates of postoperative hypothyroidism between subtotal and lobectomy groups, in our cohort and generally, emphasize a significant benefit of preserving thyroid tissue whenever possible. In addition, the considerable rate of hypothyroidism underscores the need to have a robust plan to identify and manage hypothyroidism during follow-up.



**Figure 2.** Pre- vs postoperative scores on the SF-36 (Short Form–36 Health Status Questionnaire). Whiskers indicate standard deviation.

It has been suggested that long-term outcomes research in resource-limited settings is prohibitively difficult because patients may not return for follow-up and are difficult to trace.<sup>11</sup> We found that mobile telephone contact, previously described in emergency and disaster situations, was a relatively simple, inexpensive, and effective method of contacting patients.<sup>23</sup> About 59% (32 of 54) of patients eligible for the study were successfully contacted, and 66% (21 of 32) subsequently presented for follow-up and completed all components of the study. Not surprisingly, patients who underwent surgery within the most recent 3 years were much more likely to have a functioning phone number available than patients who underwent surgery in the more distant past. This highlights the importance of timely follow-up and maintenance of mobile phone contact information, as records may be lost and information may become outdated over time. To our knowledge, no prior studies have evaluated the use of mobile telephones as a means to contact patients for postsurgical follow-up in a resource-limited setting.

Thyroxine in Kenya is inexpensive by Western standards (US\$ 0.12 for 50 mcg and US\$ 0.18 for 100 mcg) but can be prohibitively expensive for many Kenyans. Performing subtotal thyroidectomy bears an inherent risk of recurrence while providing similar safety with total thyroidectomy for thyroid goiter.<sup>24</sup> We had no recurrent goiters or thyroid malignancies on final pathology evaluation in our study. However, our results may be limited in number of subjects, follow-up duration, and intensity of pathologic review. In a single-institution study over a 30-year period by Seiler et al,<sup>25</sup> the rate of recurrence was between 11.8% and 8.5% (depending on technique). Since subtotal thyroidectomy spares many patients from lifelong thyroid replacement, it is a reasonable treatment strategy for patients who may not be able to afford treatment despite the recurrence risk.

Health has been increasingly understood as a multidimensional construct with physical and mental components.

Since a goal of thyroid surgery is to improve the health of the recipient population, self-reported HR-QoL instruments play an important role in outcomes assessment. This study is the first to include a validated HR-QoL instrument, SF-36, in a resource-limited setting. All patients in the cohort reported symptomatic improvement following surgery, and we demonstrate differences in posttreatment quality-of-life across all domains and subscores. While our results are limited due to their retrospective nonlongitudinal nature, they offer valuable adjunctive information useful for future policy and resource advocacy.

The strengths of this study include the relatively long follow-up period and the use of validated instruments. Limitations include the small sample size and retrospective nature of the study. A larger sample size (thereby improving statistical power and limiting type II error), a prospective study design, and the use of disease-specific HR-QoL instruments would facilitate additional understanding of patient motivations and elucidate more meaningful treatment success. In addition, because our ability to contact patients for follow-up was disproportionately more successful among those who were within 3 years of surgery, outcomes may not have been revealed that would have otherwise over a longer period. Last, we report results of an established long-term academic surgical partnership, and our results may not be representative of the resources available to other surgical groups practicing in resource-limited settings.

Our data suggest that thyroid lobectomy and subtotal thyroidectomy surgery for benign thyroid disease in a resource-limited setting may be performed with potentially minimal short- and long-term adverse effects by demonstrating complication rates that are in accordance with Western standards. These results, in addition to broad quality-of-life differences in the pre- and posttreatment groups, suggest benefit to the recipient population. However, future HR-QoL analyses of the same patient population before and after surgery may be more informative.

Our lessons learned include the utility of mobile telephone contact, the importance of collection and maintenance of patient contact information, the need for longitudinal follow-up of thyroid function given the rate of postoperative hypothyroidism, and need for multidisciplinary and collaborative care in the treatment of thyroid disease in developing countries.

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### Author Contributions

**Aria Jafari**, data collection and primary role as author of the manuscript; contribution to conception and design, acquisition of data, or analysis and interpretation of data; drafting the article or revising it critically for important intellectual content; final approval of the version to be published; **David Campbell**, contribution to conception and design, acquisition of data, or analysis and interpretation of data; drafting the article or revising it critically for important intellectual content; final approval of the version to be published; **Bruce H. Campbell**, contribution to conception and design, acquisition of data, or analysis and interpretation of data; drafting the article or revising it critically for important intellectual content; final approval of the version to be published; **Henry Nono Ngoitsi**, contribution to conception and design, acquisition of data, or analysis and interpretation of data; drafting the article or revising it critically for important intellectual content; final approval of the version to be published; **Titus M. Sisenda**, contribution to conception and design, acquisition of data, or analysis and interpretation of data; drafting the article or revising it critically for important intellectual content; final approval of the version to be published; **Makaya Denge**, contribution to conception and design, acquisition of data, or analysis and interpretation of data; drafting the article or revising it critically for important intellectual content; final approval of the version to be published; **Benjamin C. James**, contribution to conception and design, acquisition of data, or analysis and interpretation of data; drafting the article or revising it critically for important intellectual content; final approval of the version to be published; **Susan R. Cordes**, establishment, conception of humanitarian collaboration; ascertainment of institutional review board approval; contribution to conception and design, acquisition of data, or analysis and interpretation of data; drafting the article or revising it critically for important intellectual content; final approval of the version to be published.

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