

Head and neck surgical subspecialty training in Africa: Sustainable models to improve cancer care in developing countries

Johannes J. Fagan, MBChB, MMed, FCORL,^{1*} Mark Zafereo, MD,² Joyce Aswani, MBChB, MMed,³ James L. Netteville, MD,⁴ Wayne Koch, MD⁵

¹Division of Otorhinolaryngology, Faculty of Health Sciences, University of Cape Town, South Africa, ²Department of Head and Neck Surgery, University of Texas MD, Anderson Cancer Center, Houston, Texas, ³Department of Surgery, College of Health Sciences, University of Nairobi, Nairobi, Kenya, ⁴Department of Head and Neck Surgery, Vanderbilt Bill Wilkerson Center, Nashville, Tennessee, ⁵Department of Otolaryngology – Head and Neck Surgery, Johns Hopkins Head and Neck Cancer Center, Baltimore, Maryland.

Accepted 10 August 2016

Published online 23 November 2016 in Wiley Online Library (wileyonlinelibrary.com). DOI 10.1002/hed.24591

ABSTRACT: *Background.* Cancer poses a health crisis in the developing world where surgery is the mainstay of treatment for head and neck cancers. However, a shortage of surgeons with appropriate skills exists. How do we train head and neck surgeons in developing countries and avoid a brain drain? The ideal model provides appropriate affordable training leading to establishment of head and neck cancer centers that teach and train others.

Methods. Different head and neck surgery training models are presented based on the personal experiences of the authors. Surgical exposure of head and neck fellows in Cape Town and (potentially) in Nairobi is benchmarked against programs in the United States.

Results. Surgical exposure in Cape Town is equivalent to that in the United States, but more appropriate to a developing world setting.

Conclusion. Training can be achieved in a number of ways, which may be complimentary. Fellowship training is possible in developing countries. © 2016 Wiley Periodicals, Inc. *Head Neck* 39: 605–611, 2017

KEY WORDS: head and neck cancer, developing world, developing countries, Africa, surgery, training, fellowship, subspecialty, outreach, humanitarian

INTRODUCTION

Cancer poses a major public health crisis in the developing world. Developing countries already accounted for >50% of newly diagnosed cancers in 2010, and it is projected that this figure will increase to 70% by 2030 (Figure 1)¹ because of population growth, reduced mortality from infectious diseases, and an aging society.

Even though developing countries account for 67% of cancer-related deaths, they account for only 5% of cancer-related spending.¹ There is a wide disparity in cancer-related fatality that is aligned with income levels, ranging from 75% in low-income countries to 46% in high-income countries (Figure 2).¹

Therefore, it is apparent that innovation, expertise, resources, teaching, and research need to be directed to addressing cancer in the developing world if cancer outcomes are to be improved globally.

Head and neck surgical practice in developing countries

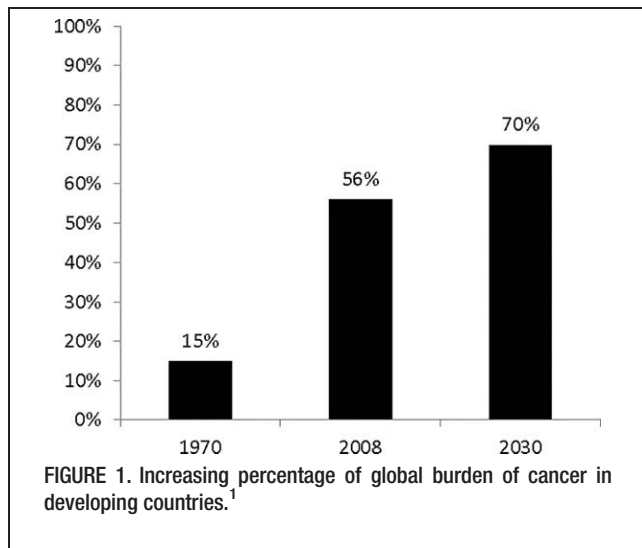
Management protocols from developed world centers cannot simply be applied in developing countries, as cancer management has to be adapted to local constraints relating to financial, infrastructural, and human resources. An example is radiotherapy that, even though central to

the treatment of head and neck cancer, is unavailable in much of the developing world. In 2013, Abdel-Wahab et al² reported that only 23 of 52 African countries had radiotherapy facilities (Figure 3); that brachytherapy resources were available in only 20 countries; and that, because only 2% of African countries had modern imaging equipment and treatment planning systems, treatment is generally based on 2D imaging and treatment planning.

In 2001, Tatsuzaki & Levin³ reported significant unavailability of radiation facilities in Asia and the Pacific regions; and Zubizarreta et al⁴ reported a major restriction to access to radiotherapy in 16 of 18 South American countries because of an insufficient number of specialists. Consequently, radiation services in the developing world are generally basic and mainly deliver palliative care.⁵ Therefore, radiation therapists need to be cautious about extrapolating favorable treatment results emanating from modern radiotherapy centers of excellence to situations in which outcomes are dependent on dated technology. Patients who undergo radiation to the head and neck also require long-term follow-up to detect and manage delayed radiotherapy-related complications (eg, hypothyroidism that occurs in 25% of patients at 5 years).⁶ Reliability of follow-up and the ability to monitor thyroid function and to treat hypothyroidism have to be considered when planning treatment.

Chemoradiation is widely used as an organ-sparing treatment strategy with squamous cell carcinoma of the upper aerodigestive tract in developed countries. However, to achieve favorable outcomes, the “package of care”

*Corresponding author: J. Fagan, Division of Otorhinolaryngology, University of Cape Town, H53 OMB Groote Schuur Hospital, Observatory, Cape Town, 7925, South Africa. E-mail: johannes.fagan@uct.ac.za



must include modern imaging (CT, MRI, positron emission tomography) both for treatment planning and follow-up; medical and intensive care support for chemotoxicity, percutaneous endoscopic gastrostomy feeding, and complex salvage surgery for persistent cancer or for recurrence, as well as dental, speech, swallowing, and audiologic rehabilitation. Salvage surgery requires high levels of surgical expertise, including proficiency with free tissue transfer flaps. Because chemoradiation embodies an expensive and toxic “package of care” not available in many developing world centers, it has to be used with great circumspection. Patients need to be carefully selected to predict favorable outcomes by considering factors, such as age, general health, and presence of common comorbid conditions, such as human immunodeficiency virus and tuberculosis, and social support.

Because of these difficulties associated with (chemo)radiation, surgery is the mainstay of curative treatment for head and neck cancers in developing countries. However, there is a severe shortage of surgeons with appropriate skill sets in much of the developing world. In 2005, there were no subspecialist-trained head and neck surgeons in Sub-Saharan Africa, and relatively simple curable operations, such as parotidectomy, laryngectomy, neck dissection, and pectoralis major flaps, were not commonly performed in many countries.⁷

This raises questions about how to train more head and neck surgeons practicing in developing countries, and how to avoid a brain drain from developing countries after completion of such training.

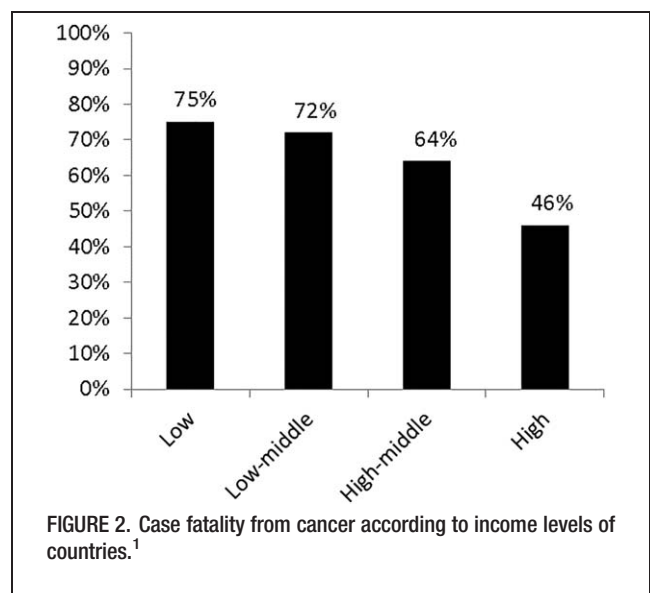
Surgical training requirements

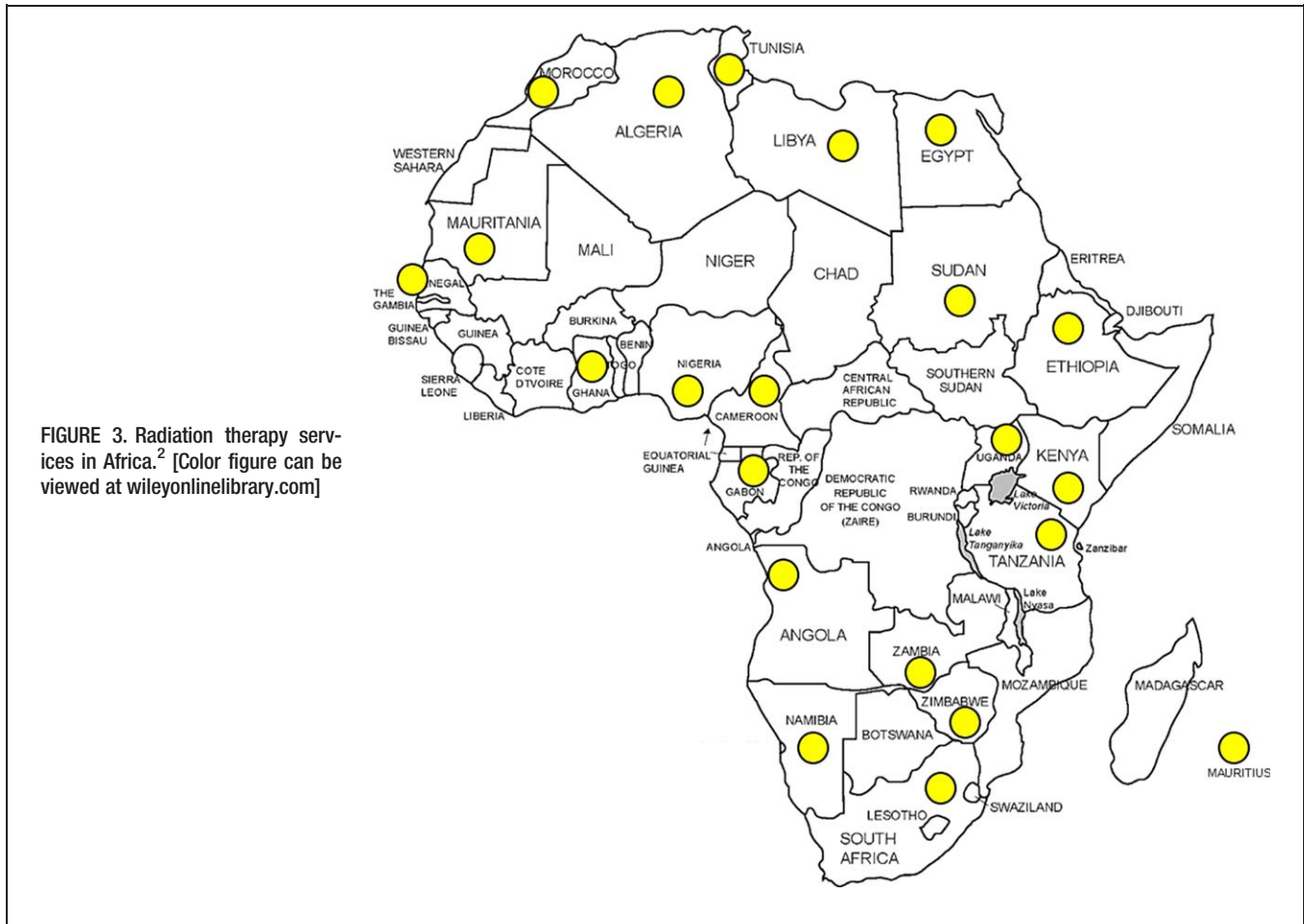
Surgeons in developing countries face very different challenges to those practicing in developed countries. They must apply different selection criteria in the face of overwhelming burdens of disease, unreliable follow-up, and limited/unavailable radiotherapy. They also frequently lack modern surgical technology (bipolar cautery, laser, transoral robotic surgery, and endoscopic surgery), frozen section, blood products, adequate operating time, and good anesthesia and intensive care support.

Surgeons need to keep abreast of and adapt modern surgical principles and techniques to a lower technology practice, such as substitute transoral microsurgery for early laryngeal cancer with laryngofissure and other open partial laryngectomy procedures; ensure wide tumor resection margins in the absence of frozen section control and postoperative radiotherapy; liberally use elective neck dissection in the absence of sophisticated imaging; and rely on a range of pedicled rather than microvascular free tissue transfer flaps to reconstruct surgical defects.

In the absence of a CO₂ laser or reliable radiation resources, early laryngeal cancers are treated by open approaches, such as laryngofissure, vertical partial, supraglottic, supracricoid, and near-total laryngectomy, or total laryngectomy for advanced cancers. When performing total laryngectomy, the surgeon should attempt to preserve both thyroid lobes and the parathyroids to minimize the risks of hypothyroidism and hypoparathyroidism, particularly when thyroid and calcium monitoring and replacement are difficult. With a dedicated speech therapy service, fistula speech results can be achieved that match those of developed world centers even with poor, illiterate patients living long distances from treatment centers.⁸ However, voice prostheses are expensive, hence, the adoption of strategies, such as using removable prostheses as opposed to indwelling prostheses are used to reduce the expense.⁸ Heat moisture exchange devices are used in developed world centers to humidify and warm inspired air, however, a homemade cloth stoma cover/bib is as effective at a fraction of the cost.⁹ Although esophageal speech does not cost anything, only 27% of patients in a Brazilian study mastered esophageal speech¹⁰ and, because there is a severe shortage of speech therapists in many developing countries, an electrolarynx is a reasonable alternative to achieve postlaryngectomy speech.

Most thyroidectomies in developing countries are done by surgeons not specializing in endocrine surgery, and I¹³¹ therapy and fine-needle aspiration cytology are often not available. Bilateral recurrent laryngeal nerve injury causing airway compromise or hypoparathyroidism





causing hypocalcemia in situations in which monitoring serum calcium and treating hypocalcemia with calcium and vitamin D are not possible may have fatal consequences. Regardless of surgical expertise, complication rates rise with the extent of resection. In the absence of convincing evidence that total thyroidectomy confers survival benefit in favorable differentiated thyroid cancer,^{11,12} coupled with the morbidity and mortality of total thyroidectomy where calcium monitoring and replacement are suboptimal, the occasional thyroid surgeon practicing in a developing world center may be wise to perform thyroid lobectomy or subtotal thyroidectomy for such cases.

Head and neck surgery training models

The ideal model is one that provides appropriate, structured training, which is affordable to trainees, and leads to the establishment of head and neck cancer centers of excellence that continue to teach and train others in the region. Whether one elects to train an otolaryngologist, general surgeon, maxillofacial surgeon, or plastic surgeon is immaterial. Such training can be achieved in a number of ways, some of which are complimentary, and are discussed below in the context of personal experiences of the authors, principally in Africa.

Head and neck fellowships in the developed world

Although American fellowships provide excellent surgical training, such training is becoming less and less appropriate to developing world practice, as the gap widens between the developed and developing worlds in terms of available technology and resources. Another concern is that many surgeons do not return to their country of origin, leading to a brain drain.

Head and neck fellowships in developing countries

The first author of this article, Dr. Johannes J. Fagan, established the University of Cape Town Karl Storz Fellowship in Advanced Head and Neck Surgery in 2005. The 10th head and neck fellow recently completed training. Fellows have emanated from Uganda, Kenya, Senegal, Ghana, Nigeria, Rwanda, Malawi, Tanzania, and Zimbabwe and all of them have returned to teaching hospitals in their home countries to teach and train others what they have learned. The next 2 fellows are from Nigeria and Ethiopia.

Fellows are funded by Karl Storz Endoskopie, a German medical equipment company. Its format is similar to American fellowships, with a hands-on, 12-month clinical fellowship in a high volume head and neck cancer center (Groote Schuur Hospital in Cape Town). The fellow is in the operating room almost every day, attends

TABLE 1. Comparison of surgical exposures (assisted and primary surgeon) per annum of fellows at the University of Cape Town compared to the average number of cases per fellow at MD Anderson Cancer Center and Johns Hopkins Medical Institutions.

	Cape Town		MD Anderson / JHMI		Nairobi
Radical/modified radical neck dissection	162	20	9	107	73
Selective neck dissection	41	3	98		
Mouth and oropharynx resections	87		52		29
Total laryngectomy	45		12		10
Parotidectomy	57		24		26
Thyroidectomy	20		46		2
Maxillectomy (medial/inferior/total)	11		11		–
Orbital exenteration	7		2		1
Pectoralis major flap	8		7		11
Buccinator flap	15		–		6
Free flaps*	61		57		28

Abbreviations: MD Anderson, MD Anderson Cancer Center; JHMI, Johns Hopkins Medical Institutions.

The last column lists the cases done in the head and neck unit in Nairobi, Kenya.

*Fellows are exposed to but are not trained to perform free flaps procedure.

multidisciplinary head and neck cancer clinics, attends microvascular surgery and head and neck cadaver dissection courses, and is fully integrated into the Division of Otolaryngology, including being on call for general ear, nose, and throat (ENT) cases, so as to derive maximum benefit from working in a sophisticated hospital. Even though resource-intensive surgical techniques, such as CO₂ laser and free microvascular transfer flaps are used, the patient management is appropriate to a developing world setting because specialized imaging and chemoradiation are used more sparingly than in the developed world.

A clinical fellowship should provide sufficient surgical cases for a fellow to become competent at a range of head and neck procedures and to be exposed to a variety of clinical scenarios. Table 1 presents the surgical exposure of a Cape Town fellow compared to fellows at Johns Hopkins and MD Anderson in the United States (head and neck fellows are not trained to do free flaps at these programs unless doing a microvascular fellowship). The surgical case volumes in Cape Town are comparable to that of the United States, although there is a greater exposure to pedicled flaps and radical/modified radical neck dissections in Cape Town, procedures that are important for a developing world practice. The case load in the head and neck cancer unit in Nairobi under the auspices of Dr. Joyce Aswani, a past Cape Town fellow, is included for comparison, and is such that a 2-year fellowship program is possible in that center.

Head and neck fellowships through outreach

Another of the authors of this article, Dr. Wayne Koch, has been instrumental in establishing a Pan African Academy of Christian Surgeons (PAACS)/Cameroonian Baptist Convention (CBC)/Hopkins Head and Neck Fellowship program that will commence in 2016 at the Mbingo Baptist Hospital (MBH) in northwest Cameroon. It is a cooperative project of the Department of Otolaryngology–Head and Neck Surgery at Johns Hopkins Medical Institutions (JHMI), the CBC, and the PAACS. The PAACS is a faith-based organization that trains African surgeons at mission hospitals in 8 African countries (Kenya, Ethiopia,

Malawi, Tanzania, Gabon, Niger, Egypt, and Cameroon). It is a commission of the Christian Medical and Dental Association and the PAACS residency programs are accredited through Loma Linda University. Established programs for general surgical residency training have existed for over a decade and more than 80 surgeons have been trained. PAACS provides stipend support for African doctors who are willing to commit at least 5 years' surgical service in underserved African hospitals in their home country or a neighboring region once they have completed training. It oversees surgical training programs, each of which is led by at least 2 qualified surgeon-educators, most of whom are full-time American missionaries. Curricula, examinations, electronic medical record software, and educational conferences are provided for each residency program. PAACS works closely with the College of Surgeons of East, South, and Central Africa and the West Africa College of Surgeons, which offer fellowship credentialing for PAACS graduates through a rigorous board examination process. Partnerships with volunteer head and neck surgeons on the PAACS ENT committee from around North America provide regular rotations in head and neck surgery to PAACS general surgical residents.

The PAACS/CBC/Hopkins Head and Neck Fellowship program will be located at MBH, a PAACS surgical training site with an overwhelming need for head and neck services. Dr. Wayne Koch, Professor of Otolaryngology – Head and Neck Surgery at JHMI, has provided regular head and neck surgery rotations to PAACS surgical residents at MBH since 2008, in partnership with Dr. Everistus Acha, a Cameroonian ENT surgeon and Chief Medical Officer of MBH who ensures continuity of care, regional and institutional cultural awareness, and administrative integration. In the 20+ weeks that Dr. Koch has been on site, they have performed >25 laryngectomies, an equal number of maxillectomies, and numerous thyroid, salivary gland, congenital, trauma, sinonasal, and other head and neck cases. Dr. Gregg Schmedes, an American otolaryngologist, joined MBH in 2014 as a full-time faculty member; his growing expertise in managing head and neck cases has been another key component of the new Fellowship. PAACS faculty and general

surgical residents provide ancillary surgical services, night call, intensive care unit coverage, and joint training conferences, administration, and atmosphere. Volunteer surgeons with expertise in maxillofacial surgery, plastic surgery, and other disciplines are frequent visitors to MBH.

The PAACS/CBC/Hopkins Head and Neck Fellowship program is modeled on the American Head and Neck Society fellowships. Candidates are qualified otolaryngologists or general surgeons. Fellows will be selected based on their intention and commitment to serve in areas of need in Africa throughout their career. It will be a 1-year comprehensive, hands-on surgical and academic training with an optional second year for fellows with greater need for experience, or desire for a higher level of academic exposure and thesis development.

Dr. Koch (program director) will be on-site for a substantial portion of the year, and Drs. Acha and Schmedes will be assisted by short-term volunteer faculty. The fellow will be sponsored as a visiting scholar at JHMI for 1 month to gain exposure to a multidisciplinary head and neck cancer center, which will include rotations with neuroradiology, pathology, radiation oncology, medical oncology, and speech-language pathology, and will attend an international head and neck conference. As with American fellows, the fellow will be mentored in clinical research as well as in training PAACS general surgical house-staff, as the goal is development of skills needed for an academic teaching career.

The PAACS/Johns Hopkins fellows will be evaluated using an open-source-appropriate technology format for surgical proficiency, and will take periodic examinations based on a rigorous reading curriculum. They will be evaluated by the faculty on a quarterly basis, given formative feedback, and will be globally assessed by the program committee (under PAACS and JHMI) to determine qualification for graduation and award of a certificate of competency.

Head and neck training through clinical missions and academic support

Although a formal fellowship is certainly the best method of producing a well-trained surgeon, very few surgeons from resource-limited environments have the opportunity to undergo formal head and neck fellowship training. As surgeons transition from a fellowship to establishing head and neck units in their respective countries, they face many challenges. A notable challenge is the lack of head and neck surgery colleagues to support their technical and academic development, as almost all the fellows represent the only surgeon trained in advanced head and neck surgical oncology in their respective countries. These highly trained surgeons often return to hospitals with large numbers of head and neck patients, but limited resources. They are often the only surgeon with advanced training in the region and do not have the benefit of support of other colleagues with advanced training. Despite the large actual volume of patients, they also have limited operating theater time in which to provide surgical care and teaching. This creates opportunities for surgeons from developed countries to collaborate with

them to provide ongoing educational support, including encouraging otorhinolaryngology residents to develop head and neck surgery skills and pursue additional head and neck training.

Two more authors of this article, Dr. Mark Zafereo and Dr. Jim Netterville, have extensive experience of surgical educational mission trips (SEMTs) or “camps,” as referred to in Africa, as well as providing academic support. The major objectives of these SEMTs have been to work with and support the efforts of university-based head and neck surgeons, most of who were trained through the University of Cape Town Karl Storz Fellowship.

SEMTs are 1 to 2-week camps that include individual and group didactic sessions concentrating on decision-making and surgical care of patients treated each day. If well planned, SEMTs provide concentrated high-volume surgical exposure that bolster the trainees’ experience as well as provide a period of intense collaboration and support for the regional head and neck surgeons. Each SEMT is carefully planned in conjunction with the regional head and neck surgeon(s). The visiting team of experienced academic surgeons collaborates with the regional head and neck surgeons to select surgeons and trainees who attend the camp. The number of local surgeons attending a camp is aligned with the numbers of operating theaters and patients. Many camps have 2 to 4 operating beds, staffed for 8 to 10 days. This can permit 40 to 100 surgical procedures to be done, depending on the complexity of the cases. The organization of the camps must be suited to the local hospital facility and staff resources, which can be a limiting factor even at many of the major teaching institutions. Another surgical camp model has been to incorporate didactic sessions, cadaver dissections, and more limited live surgeries into the existing framework of resident education at major national referral hospitals and academic centers.

The major goal is to teach students to think through disease processes, to go beyond simply performing “surgical steps,” and to learn how to modify surgical and reconstructive procedures based on the specific histopathology and its predicted aggressiveness. Each day’s surgical schedule is intermixed with group and individual didactic sessions based on the type of surgical cases being performed. A large inexpensive dry erase whiteboard is an invaluable teaching aid. Throughout the process, surgeon educators concentrate on teaching relevant anatomy and pathophysiology of diseases being treated. To maximize surgical teaching, the visiting surgeons function as teaching surgeons and allow 2 to 3 African surgeons to scrub in with each case and to perform as much of each operation as their skills allow. Several others observe when they are not scrubbed in on another case. Most surgical patients are recruited for camps by the regional surgeons. One should avoid burdening the schedule with overly complex and advanced cases. Ideally, case selection should lean toward common benign and malignant tumors, which are common in the region, as well as congenital and vascular malformations. Although there is a place for advanced free flap education, if it is performed in the region, such resource-intensive cases should not

overwhelm a camp's operating time and reduce exposure to regional flaps.

During these camps, as the "word spreads" in the region, many patients present for evaluation and care. Where surgery is not indicated, such patients often benefit from evaluation and medical management. A daily clinic, although not the core purpose of these camps, is beneficial to identify new surgical patients and to provide a care plan for those in whom surgery is not indicated. This can be very time-consuming and removes the surgeons from the surgical teaching environment. The addition of an advanced trained head and neck oncology nurse practitioner to staff and oversee this clinic is a tremendous benefit. Surgeons are only consulted about patients who might benefit from surgery or advanced combined treatment. On 1 recent trip utilizing this model, over 20 new patients per day were evaluated during a 2-week camp.

Nonsurgical disciplines can be extremely beneficial to the success of camps. Although intraoperative frozen section analysis is almost impossible to obtain, perioperative and intraoperative cytopathology analysis significantly increases the accuracy of treatment planning. A pathology colleague, often accompanied by a pathology resident, can provide this service for a surgical camp. Preoperative fine-needle aspiration cytology can be performed on each tumor or mass with high diagnostic accuracy. Samples brought back to the United States for histopathology analysis have confirmed >95% diagnostic accuracy of the on-site frozen section analysis in Africa. More recently, the addition of a speech pathologist has considerably increased the quality of patient care and education for African partners. Patients are counseled before laryngectomy, and tracheoesophageal prosthesis speech is an option for laryngectomy rehabilitation.

Head and neck training through collaborative workshops

Collaborative workshops that incorporate didactics, cadaver dissections, and live operating experience present an opportunity for surgeons with advanced head and neck surgical training in developed countries to collaborate with colleagues in less developed countries. Authors, Dr. Mark Zafero and Dr. Jim Netterville, have run many such workshops with graduates of the University of Cape Town Karl Storz Fellowship in Advanced Head and Neck Surgery program. These collaborative efforts address many of the potential pitfalls of short-term humanitarian medical outreach, which include failure to appreciate cultural/social differences that affect medical care in developing countries, failure to collaborate with local physicians, and lack of appropriate follow-up. Combined educational efforts also led to development of deeper relationships, which encourage head and neck surgeons in developing countries to attend regional and national head and neck oncology joint meetings and to become part of the head and neck surgery global community. As surgeons with the head and neck fellowship training in Africa build head and neck programs in their respective countries and build relationships with international colleagues, further opportunities for joint efforts in research will naturally develop.

Such short educational surgical camps, planned in partnership with the regional head and neck surgeons, provide a concentrated learning period for multiple younger

surgeons as well as provide an intense update for the regional expert. These camps allow more regional surgeons to participate in a concentrated learning experience. This rich experience produces lifelong relationships with ongoing communication that will indefinitely continue the shared learning experience.

Head and neck training through correspondence

The International Federation of Head and Neck Oncologic Societies established a global online fellowship program in 2014 to teach and train young head and neck surgeons and to test their knowledge and approaches to cancers of the head and neck. It is a 2-year learning education process of self-learning through a structured course curriculum with online examinations. After completion of all the modules, candidates embark upon a 2-month clinical observership after which they are subjected to an oral examination before an international panel of examiners. This is an excellent program for young head and neck surgeons as it adds an element of structured academic learning that is lacking in most clinical fellowships in both developed and developing countries. However, programs that include only academic curricula and short-term observation, without practical experience in the unique setting of a developing country, cannot be expected to create a competent head and neck surgeon in the varied clinical approaches and practices required in the developing world.

Access to literature

Many trainees and surgeons in developing countries cannot afford printed journals, pay-for-view journal articles, or textbooks. Furthermore, modern journals and textbooks generally cater only for a developed world practice. Hence, there is a need for free internet-based academic resources that are appropriate to developing world surgical practice. HINARI is a World Health Organisation initiative through which major publishers provide free access for >100 low-income and middle-income countries to one of the world's largest collections of biomedical and health literature (<http://www.who.int/hinari/en/>). The Open Access Atlas of Otolaryngology Head and Neck Operative Surgery is a free surgical atlas that provides step-by-step descriptions of surgical procedures, including procedures that are appropriate only to low-resource surgical settings (www.entdev.uct.ac.za/guides/). Societies, such as the American Head and Neck Society and the American Academy of Otolaryngology Head and Neck Surgery, have some open access resources, including practice guidelines and clinical procedures.

CONCLUDING REMARKS

A sustainable model to improve delivery of cancer care in developing countries requires the establishment of centers of excellence in developing countries that ultimately train their own head and neck surgeons and oncologists. Fellowship training in head and neck surgery comparable to the United States is possible in developing countries, and is more appropriate to a developing world setting. However, to establish such centers requires a range of complementary interventions that focus on teaching and training, and are integrated into existing local services.

In addition, there is a need to encourage open access to journals and textbooks, and to lobby international organizations, governments, and aid organizations to support infrastructure development and research, and for industry to provide appropriate and affordable technology. In this way, the developed world can make a substantial difference to the outcome of the enormous burden of head and neck cancer in the developing world.

REFERENCES

1. Farmer P, Frenk J, Knaul FM, et al. Expansion of cancer care and control in countries of low and middle income: a call to action. *Lancet* 2010;376:1186–1193.
2. Abdel-Wahab M, Bourque JM, Pynda Y, et al. Status of radiotherapy resources in Africa: an International Atomic Energy Agency analysis. *Lancet Oncol* 2013;14:e168–e175.
3. Tatsuzaki H, Levin CV. Quantitative status of resources for radiation therapy in Asia and Pacific region. *Radiother Oncol* 2001;60:81–89.
4. Zubizarreta EH, Poitevin A, Levin CV. Overview of radiotherapy resources in Latin America: a survey by the International Atomic Energy Agency (IAEA). *Radiother Oncol* 2004;73:97–100.
5. Onyango JF, Macharia IM. Delays in diagnosis, referral and management of head and neck cancer presenting at Kenyatta National Hospital, Nairobi. *East Afr Med J* 2006;83:85–91.
6. Rønjom MF, Brink C, Bentzen SM, Hegedüs L, Overgaard J, Johansen J. Hypothyroidism after primary radiotherapy for head and neck squamous cell carcinoma: normal tissue complication probability modeling with latent time correction. *Radiother Oncol* 2013;109:317–322.
7. Fagan JJ, Jacobs M. Survey of ENT services in Africa: need for a comprehensive intervention. *Glob Health Action* 2009;2.
8. Fagan JJ, Lentin R, Quail G. International practice of laryngectomy rehabilitation interventions: a perspective from South Africa. *Curr Opin Otolaryngol Head Neck Surg* 2013;21:199–204.
9. Quail G, Fagan JJ, Raynham O, Krynauw H, John LR, Carrara H. Effect of cloth stoma covers on tracheal climate of laryngectomy patients. *Head Neck* 2016;38 Suppl 1:E480–E487.
10. Vartanian JG, Carrera-de-Angelis E, Kowalski LP. Practice of laryngectomy rehabilitation interventions: a perspective from South America. *Curr Opin Otolaryngol Head Neck Surg* 2013;21:212–217.
11. Lee J, Park JH, Lee CR, Chung WY, Park CS. Long-term outcomes of total thyroidectomy versus thyroid lobectomy for papillary thyroid microcarcinoma: comparative analysis after propensity score matching. *Thyroid* 2013;23:1408–1415.
12. Nixon IJ, Ganly I, Patel SG, et al. Thyroid lobectomy for treatment of well differentiated intrathyroid malignancy. *Surgery* 2012;151:571–579.