

Pathology Services in Developing Countries— The West African Experience

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● **Context.**—Histopathology, like other branches of medicine in West Africa, has suffered largely from economic, political, social, and infrastructural problems, becoming a shadow of the top quality that had been obtained in the past. To address the prevailing problems, one needs to attempt defining them.

Objective.—The existing structure of training and practice are discussed, highlighting the author's perception of the problems and suggesting practical ways to address these while identifying potential roles for North American pathology organizations.

Design.—The author's past and ongoing association with pathology practice in Nigeria forms the basis for this review.

Results.—Pathology practice is largely restricted to academic medical centers. The largest of academic centers each accession around 4000 or fewer surgical specimens per year to train 9 to 12 residents. Histopathology largely uses hematoxylin-eosin routine stains, sometimes with his-

tochemistry but rarely immunohistochemistry. Pathologists depend largely on their skills in morphology (with its limitations) to classify and subclassify tumors on routine stains, including soft tissue and hematology malignancies. Immunofluorescence, intraoperative frozen section diagnosis, electronic laboratory system, and gross and microscopic imaging facilities are generally not available for clinical use.

Conclusion.—The existing facilities and infrastructure can be augmented with provision of material and professional assistance from other pathology associations in more developed countries and should, among other things, focus on supplementing residency education. Virtual residency programs, short-visit observerships, development of simple but practical laboratory information systems, and closer ties with pathologists in these countries are some of the suggested steps in achieving this goal.

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Histopathology, like other branches of medicine, faces several challenges in West Africa, a region with high disease burden and limited human and financial resources. This probably reflects the global national problems that include a poor tax administration system, underfunding of social services, and the poor state of health care systems in these countries. The present situation actually represents a decline in standards, as several African institutions operated at levels comparable to the Western world in the past. In the 1950s up to the early and mid 1970s, Africa contributed significantly to increasing medical knowledge. For example, newly recognized diseases such as Burkitt lymphoma were first described in Africa, to be followed by the growth of the first human lymphoma/leukemia cell line, the Raji cell line.¹ Also, *Cancer in Five Continents*, a publication of the International Agency on Cancer Re-

search, used data from Ibadan and Uganda cancer registries in its early years of publication. Unfortunately during the years the countries in these regions have not been able to keep up with technologic advances that have since reshaped the face of health care delivery and research.

It is difficult to determine all the factors that contributed to deterioration in health care delivery in general, and pathology services in particular, in West Africa. However, political mismanagement, civil wars, and repressive military regimes seem to have contributed in large part, resulting in a lack of, or grossly inadequate, funding of basic social services and health care infrastructure. Pathology services, being a highly specialized branch of medicine, are mainly limited to large academic centers and tertiary hospitals. Such hospitals invariably are government funded and hence depend on annual budget votes and government oversight of all funding. The decline in hospital performance in Nigeria, for example, coincides with years of military rule, with its associated corruption, ultimately leading to deterioration in basic social services; as such transportation, potable water, electricity, health care delivery, and communications, among others, were grossly underfunded and left to decay.² The economic downturn of this era is almost unprecedented, virtually eliminating the middle class and destroying the buying power of local currencies. For example, the exchange rate of the Nigerian currency in the late 1970s was either at par with or stronger than the US dollar, but today US \$1 exchanges for approximately 120 Naira, a direct result of a governmental

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Table 1. What Are the Major Challenges?

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| Inadequate volume of surgical pathology specimens |
| Inadequate funding for training and reimbursement of services |
| Inadequate ancillary diagnostic tools |
| Lack of required/helpful technology and raw materials |
| Inadequate access to CME |

Abbreviation: CME, continuing medical education.

Table 2. Demographics for One of the Largest Pathology Programs in Nigeria for 2007

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| Total surgical accession | 3501 |
| Number of residents in training | 12 |
| Total number of cases examined with immunohistochemistry | 10 |
| Total number of autopsies performed (hospital + coroner's) | 298 |
| Total (Gyn and non-Gyn) cytology accession | 1000 |

Abbreviation: Gyn, gynecologic.

devaluation program made necessary by years of economic mismanagement. Tertiary hospitals in Nigeria not surprisingly have remained relatively stagnant compared with the rest of the world, such that new facilities could not be procured to match the growth in technology of the 1980s and the 1990s. The individual patient's inability to afford health care has not helped matters, because health insurance is practically nonexistent, thereby hampering hospitals' ability in cost recovery for services rendered. All these factors have affected the provision of pathology practice. Coinciding with this period was a period of formidable medical challenges such as malaria, AIDS, and increasing incidence of cancer-related deaths.³ Some of the problems facing health care delivery are not unique to West Africa but also shared by other sub-Saharan African countries.⁴ Further compounding these problems is the spate of brain drain of qualified medical professionals out of the region to the more affluent Western countries partly to escape repressive juntas but largely to pursue greener pastures in countries where facilities to practice are more readily available. In the year 2000 it was estimated that 20% of all African-born physicians practiced in a developed country outside Africa.⁵ However, in spite of seemingly insurmountable odds, the caliber of personnel on the ground deserves commendation: resident education continues albeit with great difficulties; diagnoses are being rendered in critical ways that have kept the specialty alive and functional in spite of these odds. The current review aims at defining my perception of the West African situation using Nigeria as an example, highlighting the prevailing circumstances, and proffering suggestions toward improving these circumstances. Some practical ways in which pathology organizations in the Western world could assist in strengthening the existing system are also suggested.

METHODS

The discussion is based on my experience from prior training, work, and continuing visits to Nigeria.

FINDINGS

A summary of existing problems in Nigeria is listed in Table 1. These are discussed further.

Pathologists, Population and Training

There is a gross shortage of trained personnel, both pathologists and technical staff. Currently, there are approximately 50 Nigerian anatomic pathologists serving a population of about 140 million people, meaning there is 1 anatomic pathologist for every 3 million Nigerians. It is therefore imperative that the issue of producing more pathologists with appropriate training be addressed immediately. Also, African pathologists in diaspora should be encouraged to explore possibilities of returning, even if only on a visitation basis, to supplement the depleted manpower.

Pathology Residency Training

This is an area with great potential for intervention. To improve training there must be availability of material. Currently many hospitals are recording decreasing numbers of patients because of the increasing cost of health care. Associated with this is marked reduction in laboratory specimens, resulting in an inadequate volume of material available for training per resident (Table 2).

In addition to the limited volume, most of the specimens are evaluated largely with routine hematoxylin-eosin stains with only limited histochemical stains. Most centers do not use ancillary techniques to aid diagnosis as funds, resources, and materials are not available and patients cannot afford to pay for these additional techniques.

Residents therefore become proficient at morphologic diagnosis but are handicapped in disease subclassification, which often is predictive of prognosis, appropriate followup therapy, and, of course, research. Also other ancillary methods that are easily available elsewhere (eg, in situ hybridization, flow cytometry, molecular testing, cytogenetics) have not yet been incorporated as part of residency training. Current training would therefore need to address these limitations.

Quality Control and Assurance

Several quality control measures are in place but largely not formalized. These may need to be better organized into an auditable format. Residency training should also emphasize quality control in the preanalytic, analytic, and postanalytic phases and encourage accurate documentation of processes. Some institutions have been enrolled in peer-reviewed proficiency programs in the past, such as the Australian slide club. However, many other potentially useful programs, such as the Performance Improvement Program of the College of American Pathologists, are simply too exorbitant for practicing pathologists in this region to participate in, especially in view of the high exchange rate from local currency to the US dollar.

Laboratory Information System

Central to issues such as quality control (including turnaround time), quality assurance, followup of patients with previous biopsies, and correlation with patients' electronic medical record is an integrated laboratory information system. None of the hospitals with a major pathology department has an operational laboratory information system. As such pathology requisitions and final reports are still performed strictly on a paper-based format. Hand in hand with this is the absence of a centralized hospital electronic medical record system. Residents often have to complete a thesis for their final pathology board certification, collecting data manually by going through written paper reports one at a time for as many years as the study

Table 3. Suggested Assistance to Pathologists in the West African Subregion

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| Training |
| Supplement residency training program |
| Creation of virtual residency program |
| Short-stay observerships in North American/European programs |
| Symposia, seminars, and other visits in the region to promote interaction among surgery-pathology departments |
| Cooperate with USCAP's <i>Friends of Africa</i> initiative sponsoring local pathologists to attend IAP meetings |
| Develop local proficiency program for histotechnologists |
| Material Resources |
| Improvement in existing facilities, especially immunohistochemistry laboratory |
| Development of simple laboratory information system |
| Involve pathologists in CAP's proficiency testing such as PIP, DSP, etc |
| Funded attendance to international pathology conferences |

Abbreviations: CAP, College of American Pathologists; DSP, Digital Slide Program in Surgical Pathology; IAP, International Academy of Pathology; PIP, Performance Improvement Program in Surgical Pathology; USCAP, United States and Canadian Academy of Pathology.

is to cover, which is both slow and tedious. However, in this regard, high-speed Internet access is fairly easily available and provided by the medical schools at reasonable costs in many of the big centers. This will become an important tool as deliberations ensue on ways to assist our pathology colleagues in West Africa.

THE WAY FORWARD

Though the commonly provided assistance, such as books and shipping off old equipment, are welcome and useful for literature update and continuing education, more lasting intervention is needed. I believe there is an urgent need to assist in trainee mentorship and residency training to augment the available resources and ensure appropriate training to meet rapidly increasing challenges and advancement of pathology practice. One vital question to ask therefore is "How do we assist in residency training in West Africa?" The other aspect is that of provision of material resources to aid in delivery of pathology services. Discussion of how this could be approached follows and is summarized in Table 3.

Training

No doubt, there has to be an increase in the specimen volume and exposure to advancing technology and ancillary techniques to adequately train. This could be done in 2 ways, preferably concurrently—virtual microscopy using Web-based technology and real time:

1. Virtual microscopic pathology: Internet access is probably one of the most exciting bright spots in many pathology departments. Pathology imaging software that supports digital virtual microscopy comes in various sizes and shapes these days, most uniformly exciting and user-friendly. International organizations such as the Canadian Association of Pathologists, the College of American Pathologists, and the United States and Canadian Academy of Pathology (through its *Friends of Africa* initiatives), among others, could fund a virtual residency program. For example, during the next couple of months a volunteering big academic pathology department in North America would digitally scan as much of the gastrointes-

tinal (or genitourinary, or lung, or breast, etc) case material passing through as possible and make it available as a virtual resource to be accessed by West African residents. This would be the same volume a North American resident undergoing a gastrointestinal rotation would have seen in a 2- to 3-month period. Participating residents would register for these "residency programs" and with the provided password access the posted material in a systematic (rotation-like) manner. Residents would preview the cases, form an opinion, and later "sit down" for "signout" with the attending after the independent preview. The virtual signout would entail reading a brief synopsis the attending would have posted (accessed via a separate sign-in) corresponding to each reviewed case. Because these synopses would have been written as a signout time instruction, the resident would virtually be receiving expert teaching on real cases, only without the glass slides and microscope. These activities would mirror as much as possible what residents do all over the world during their rotation, and the participating resident would have access to the high volume we all agree is vital to adequate training. With every subspecialty so covered, these virtual rotations would significantly bridge a major gap and at the same time complement the real (though very few) cases available at their primary training institutions. At the end of each rotation, the resident would be evaluated (maybe even have to pass a quiz) and, with satisfactory performance, be deemed to have completed this rotation. As many countries in the subregion still lack access to a wireless Internet connection, the same program could be adapted and presented in a DVD format for systematic mailing to registered programs, although follow-up for evaluation purpose would present additional challenge when this option is applied. To ensure that clinical materials unique to West Africa are included (eg, infections), the virtual residency program should actively engage the pathologists from across the subregion to participate in case submissions. This would not only ensure that "North American pathology" is being taught but also (albeit in a limited way) encourage exchange of interesting cases between participating programs.

2. Real-time increase in surgical pathology volume: The North American professional bodies (eg, the Canadian Association of Pathologists, the College of American Pathologists, the United States and Canadian Academy of Pathology) should consider actively matching residents with training programs in North America, for short-term fully funded observerships to last up to 3 months (the United States and Canadian Academy of Pathology's *Friends of Africa* is already pursuing such a similar program and collaboration should be encouraged). In these months the observing resident would actively interact with the host program's residents and participate in signouts, conferences, tumor boards, grossing (as much as regulatory bodies would allow), journal clubs, and so forth. These 3 months would be of particular benefit to a resident who had successfully rotated in the virtual residency program modules. Subspecialty experience could also be encouraged during these visits.

3. A long-term approach to real-time increase in surgical pathology volume would involve individual and institutional programs that promote actual visitation to these countries. This would on the one hand bridge inter-collegial gap and aid in better understanding other ways to meaningfully help but also enable exchange of ideas

with pathologists and surgeons on ways to increase the volume of surgical specimens reaching pathology for diagnostic and prognostic examination. One such idea could explore the possibility of billing patients upfront for surgery and pathology, thereby ensuring all resected/excised specimens make it to pathology in a timely manner for appropriate evaluation. This also has the immediate advantage of improving patient care. Unfortunately this would still not address the poverty issues patients have to deal with, which remains one of several social factors local health and political authorities need to address. Local factors that can improve specimen volume include

1. Improved health care funding: Currently patients pay out of pocket for surgical and pathology services, which reduces the number of specimens that get to the laboratories.
2. Improved transportation of specimens to the laboratories: Many surgical procedures are performed outside of the tertiary centers, especially in private hospitals, outside of centers with pathology laboratories. An improved transportation network would enhance specimen delivery and volume for training.

Improvement of Existing Resources

I am aware of individual efforts by pathologists and histotechnologists from Canada, the United States, and the United Kingdom who have established and are maintaining personal links with colleagues in Nigeria. These links have so far resulted in the ability to apply immunohistochemistry, but their efforts still suffer from the lack of sustainable material resources (primary and secondary antibodies especially), accounting for why immunohistochemistry is applied only to a minority of cases. These individual efforts would have a more far-reaching impact on patient care and residency training if funded and supported by large professional organizations such as the 2 Canadian and American pathologists' associations. As such a program commences, personnel training of additional support/technical staff should be included. Lastly with a drive from the Canadian Association of Pathologists, the College of American Pathologists, and other similar organizations, involvement by the laboratory-related industry could be actualized, such that immunohistochemistry products could be made available at affordable prices to encourage surgeons and patients to follow through with evaluation of resected specimens.

Development of the Laboratory Information System

Many pathologists now have access to the Internet and personal computers. Simple software that would serve the needs of small pathology departments could be developed, without necessarily investing in more robust and expensive systems used in Europe and North America. As an extension, hospitals should be encouraged toward elec-

tronic systems for patient records. For economic reasons, however, such efforts will have to begin with the use of simple programs written and designed to be operable at these sites, which could be improved upon to address increasing complexity in subsequent years.

Continuing Medical Education

Consideration could be given to free or highly discounted subscriptions for practicing pathologists to proficiency programs such as the College of American Pathologists' Digital Slide Program in Surgical Pathology and the Performance Improvement Program in Surgical Pathology. Also proficiency programs for histotechnologists and cytotechnologists should be developed. Lastly, continuation of funded attendance at international meetings of the International Academy of Pathology by pathologists and pathology trainees from the developing countries should be encouraged.

CONCLUSION

Unfortunately, largely due to social, economic, and political factors, pathology practice in Nigeria, like in other West African countries, has suffered from underfunding making it difficult for pathologists to develop and apply recent technologic advances in their everyday practice. This has adversely affected residency training, and assistance efforts should be focused on this group of trainees, who have the zeal, ability, and desires to match the best anywhere in the world. Provision of material and professional and educational resources to improve existing infrastructure and targeted at optimizing training are suggested as areas for potential involvement by pathology organizations in Western countries. Having addressed these issues, the brain drain phenomenon that encourages well-trained professionals to migrate to more affluent nations should be addressed as a priority both by the foreign nations and the regional authorities, as previously suggested.^{6,7}

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