International Skeletal Society outreach in Sub-Saharan West Africa

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A review of the state of radiology and musculoskeletal radiology in West Africa and presentation of data collected during an ISS Outreach Program conducted by the authors (JM, SO, and MS) in Accra, Ghana, in July 2010.

The Association of Radiologists of West Africa (ARAWA) met in Accra, Ghana, from July 19 to 23, 2010. Membership of ARAWA is drawn from all the countries in Sub-Saharan West Africa (Table 1). The ISS outreach was conducted in collaboration with ARAWA. Members of the ISS outreach included Dr. Johnny Monu from Rochester, NY, Dr. Simon Ostlere from Oxford, England, and Dr. Murali Sundaram from Cleveland, OH. The meeting was attended almost entirely by the English-speaking members in the sub-region and most of the attendees came from Nigeria. There was only one attendee from a French-speaking West African country (Senegal). This may be attributed in part to language difficulties. Data collection has always been difficult in this part of the world for many reasons, not enumerated here. Some of the data presented here were collected during the ARAWA meeting and also with the collaboration with officers of ARAWA.

Most of the data presented will reflect the state of radiology in Ghana but since over 80% of the participants were from Nigeria, it will be appropriate to also look at the state of radiology in Nigeria.

Ghana is a country of 24 million people. It is bordered to the south by the Atlantic Ocean, to the north by Burkina-Faso, to the west by Ivory Coast, and to the east by Togoland. It is populated by many tribes including but not limited to the Akans (Ashantis, Akyems, Akwapims, etc), the Ewes, the Fantis, the Ga's, and the Dagombas. The lingua franca is English. Accra is the capital city of Ghana. The life expectancy at birth is about 59 years for males and 62 years for females. About 50% of the population live in urban centers. The health care system in Ghana is subsidized by the government. About 10% of the budget allocation goes to health services.

There is a fledgling National Health Insurance scheme that is mainly owned by the government. To what extent it is subscribed to by the population is unclear.

Most of the time, however, the individual has to pay for his/her health needs. In the rural areas, the government is depended upon to provide health services almost entirely. It is easy to appreciate that sophisticated health facilities like radiology services are located in the urban centers. Plain radiographic equipment is, however, located in every district hospital. Four of the ten regional hospitals, including Tamale Teaching Hospital, a teaching hospital in northern Ghana, have no radiologists.

Ghana has a total of about 25 radiologists, nearly all of whom are indigenous. These radiologists have had either part or all of their training in Europe or America. Most radiologists do engage in private practice both to make a comfortable living and to fulfill a much-needed demand. With only 25 radiologists in the country, this gives a ratio of about one radiologist per 973,600 persons. In Ghana

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Table 1 Countries of West Africa (Sub-Saharan W. Africa). Estimated population and radiologists distribution

S/N	Country	Language for business	Population in millions	% of population in urban areas	Life expectancy male/female	# radiologists	Accredited rad. training centers
1	Benin	French	9.05	41	58/61	-	-
2	Burkina Faso	French	16.24	20	51/55	-	-
3	Cameroon	French/English	19.29	57	53/55	-	-
4	Cape Verde	Portuguese	0.51	60	68/72	-	-
5	Chad	French/Arabic	10.54	27	47/49	-	-
6	Cote d'Ivoire	French	21.06	49	55/57	60	-
7	Gambia	English	1.82	57	52/56	-	-
8	Ghana	English	24.34	50	59/62	25	3
9	Guinea	French	10.32	34	56/59	-	-
10	Guinea-Bissau	Portuguese	1.57	30	46/50	-	-
11	Liberia	English	3.69	60	55/58	-	-
12	Mali	French	13.8	32	51/54	-	-
13	Niger	French	15.89	16	53/54	-	-
14	Nigeria	English	152.21	48	46/48	220	>17
15	Senegal	French	14.09	42	57/61	-	-
16	Sierra Leone	English	5.25	38	53/58	-	-
17	Togoland	French	6.20	42	58/62	-	-

Blanks indicate information is not immediately available

there is an active association of radiologists and is affiliated to the Ghana Medical Association. Most radiologists also belong to the regional association – Association of Radiologist of West Africa (ARAWA). The radiologists regularly attend the meetings of these organizations. The radiologists also attend other international meetings in Europe and North America. However, since the radiologists often have to fund their travels from their personal resources, only the reasonably affluent attend these international meetings with some regularity.

Nigeria, with a population of 152 million, is the most populous black African country. Nigeria is bordered to the south by the Atlantic Ocean, to the north by Niger, to the northeast by Chad, and to the east by Cameroon. The western neighbor of Nigeria is Benin. Nigeria has over 300 tribes and as many spoken languages. However, the lingua franca is English. Only about 48% of the population live in urban centers. The life expectancy at birth is about 46 years for males and 48 years for females [1].

Health services are provided through government hospitals and numerous private clinics and hospitals. Some employers pay for the health care of their employees but for the rest of the population, individuals have to pay for their own health care needs. As of 2006, total expenditure on health as a fraction of gross domestic product was 4.1% [2].

Nigeria has 36 states and a Federal Capital Territory. Each capital city for these states has a specialist and/or teaching

hospital. Currently, Nigeria has about 220 radiologists. This gives a ratio of one radiologist for 692,000 persons. Virtually all the radiologists are located in the urban centers. A few of the older-generation radiologists in Nigeria were trained in Europe and North America, whereas the younger radiologists were trained in Nigeria. Nearly all the teaching hospitals have a radiology resident training program.

Radiology training: Radiology training across the sub-region is accredited by the West African College of Surgeons and the training is a 4-year program divided into two parts. Part I of the exam comprises a written and oral component. The written part includes radiologic physics, radiologic anatomy and techniques, clinical medicine, and clinical radiology questions. The oral exam includes a steeple chase-type image interpretation examination and image interpretation skills evaluated by a panel of examiners.

After part I of the examination, the candidate is encouraged to seek a 1-year apprenticeship in the developed countries to supplement their training before part II of the exam, which should take place no earlier than 2 years after successful completion of part I exam. Most radiology trainees after their training aspire to work in their environment albeit in the urban areas. The Teaching Hospital at Korle-Bu in Accra is currently training radiology residents at a rate of three a year. Ghana now has a program to encourage newly qualified post-graduate doctors to go to rural areas.

In some teaching hospitals, e.g., at Korle-Bu - Ghana, in National Hospital, Abuja – Nigeria, and Ahmadu Bello University Teaching Hospital, Zaria – Nigeria, the radiologists are thinking of areas of interest, such that the individual radiologist will sub-specialize in several organ systems. This apparently is still a thought process and the thinking has not made it up the ladder to the training or exam levels.

Nearly every state in Nigeria has a teaching hospital and many of these have some form of radiology training program. The training program is similar to that of Ghana except that the Nigerian trainee radiologists have a choice of two examining bodies, The West African College of Surgeons and the Nigerian Postgraduate Medical College. The curriculum of the two examining bodies is nearly identical. The Nigerian trainee radiologist may opt to take the exam of the National Postgraduate Medical College or that of the West African College of Surgeons.

It would appear that Nigeria embarked on a program of mass production of radiologists as a sampling of some randomly selected training programs showed faculty:trainee ratio of 1:2–1:7 (Table 2). Although some basic equipment is available (in most state capitals at least), the patient volume does not reflect the need, as a large fraction of the population cannot pay for the radiologic services.

Imaging equipment

There is an abundance of ultrasound scanners that are being used for all modes of investigation but predominantly abdominal and pelvic imaging (including obstetrics and gynecologic imaging). Ultrasound of the MSK system has yet to evolve.

In Ghana, CT scanners are mostly located in the teaching hospitals. In Korle-Bu Teaching Hospital, there is dual-slice CT scanner and a 1.5-T MRI Scanner. In Accra there is one 64-slice multi-slice CT scanner in a private imaging facility. The cost of the equipment is prohibitive to most organ-

izations, governments included, across the region. There is also the additional issue of maintenance as the personnel have to be flown in from the Europe or America to fix the equipment when it breaks down.

In Nigeria, on the other hand, virtually all generations of CT equipment can be found (Table 2). It would seem that the majority of MRI scanners are 0.3 T, and these have been installed in numerous specialist/teaching institutions (by government fiat). There is no high-field MRI unit in Nigeria, as the basic support infra-structure like a steady electricity power supply is not available.

No gamma cameras or PET scanners exist in the whole sub-region. The capital outlay necessary for an atomic reactor or a cyclotron is well beyond the means of most African governments.

In 1991, Fuchs (3) observed that nearly 90% of all x-ray procedures in the developing world were essentially simple procedures. With this in mind, training at two levels was advocated, one for the general practitioner and the other for the radiologist [3]. As occurs in even the developed world, the non-radiologists often tries to interpret (or practice) radiology with or without additional training. Still very valid, however, is the assertion of Rabinowitz and Pretorius that between 25 and 30% of all decisions to perform medical procedures derive from imaging findings, and Africa's needs are no different from the rest of the world [4]. Participating at the ARAWA showed the level of the conference to be quite sophisticated and that the radiologists are as well informed as their colleagues in other parts of the world.

In conclusion, there is a dearth of sophisticated equipment across the region and, when available, is located in the urban centers. Maintenance of the equipment remain a persistent and vexing problem. The radiologists are very aware and informed about innovations in the developed world, but there remains an overwhelming shortage of radiologists. There is a lot the developed world can do to ameliorate this situation. Aid can and should be directed

Table 2 Summary of equipment and personnel data in Nigeria

	Mammo units	Fluoro units	US units	Angio units	CT scanners	MRI scanners	Residents	Attendings
UTH-1	1	(1)	2	0	1 (dual slice)	0	30	10
UTH-2	1	1 (1)	1 (4)	(1)	1 (4 slice)	Unavailable	24	7
UTH-3	1	1	2	0	1 (dual-slice)	0.3 T	15	6
UTH-4	1	0	2	0	1 (4 slice)	0.2 T	14	3
UTH-5	1	0	2	0	1 (dual-slice)	0.2 T	30	5
UTH-6	1	1	2	0	1 (dual-slice)	0.2 T	20	7
UTH-7	0	0	2	0	2 multislice 1 spiral	0.2 T	9	4

UTH University teaching hospital

Number of non-functional equipment in *parenthesis*

towards resident training as the attached Table 2 shows a worrying faculty-to-resident ratio. The world wide web can be used as a learning tool where residents can log into ongoing conferences at established academic centers, meetings, etc. Training positions should be created for the residents to visit for 6 months to 1 year for the residents who have completed the first part of their training. Electronic access to the international journals should be made available to the training centers. Web access to conferences can be made available to training institutions in West Africa so that trainees will be able to participate in resident conferences in institutions that have such facilities. The problems are numerous and multi-factorial and should be tackled from all possible fronts. It is our observation, however, that in spite of the many difficulties, the

radiologists we interacted with were quite well informed about innovations in the developed world.

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