Management of Childhood Solid Tumours in Third World Countries

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Larry Hadley

The concept of the "Third World" is a political construct that through common usage has become synonymous with "developing countries" which is itself a euphemism for "undeveloped countries". The current politically correct, marginally less patronizing, terminology is "resource-poor" countries or "low-income" countries, however they are probably best described as simply "poor".

Within our understanding of these terms there lies a range of economic and social circumstances encompassing the new economic giants of China, Brazil and India as well as the "not-developing" countries of sub-Saharan Africa, but generally these countries are characterized, if not defined, by poverty, a colonial past, poor education standards particularly amongst women, and economic bondage to rich countries [1]. With the exception of Haiti, all not-developing countries are in sub-Saharan Africa (Fig. 33.1).

It can rationally be argued that in such poor countries although the health needs are great childhood solid tumours are not amongst the most pressing. It is undeniable that infectious diseases, poverty and malnutrition are much more important in terms of the numbers of affected children and the morbidity and mortality that they cause [2]. The Millennium Development Goals were established to address these major issues, and although many countries are falling behind their targets, progress is being made [3].

The management of childhood solid tumours however should not be seen in isolation from public health measures to improve the health of populations. Primary Health care initiatives are at least in part designed to identify patients who are suffering from treatable illness that requires more sophisticated management, and to expedite access to the necessary facilities if possible [4]. It must be clearly understood that many, if not most, solid tumours of childhood are treatable and potentially curable diseases, and that energy spent in the management of these children is amply rewarded in terms of quality and length of life and is a cost-effective exercise. Treatment for curable and potentially curable cancers has been described as "a fundamental right of all children in the world" [5]. Cost-effectiveness is maximized by targetting those tumours that occur frequently in a given geographical area, that have a reasonable prognosis and can be treated by regimens that are relatively inexpensive and of low toxicity.

It is difficult to accommodate the wide spectrum of constituencies within the Third World in a single vista and emphasis has been given here, as an exemplar of the Third World, to the most deprived region of the world, sub-Saharan Africa.

Africa is a large continent, larger than United States of America together with the whole of Europe, the Indian subcontinent and Australasia. This vast area is not an homogenous geo-political entity and socio-economic conditions range from the relative wealth of the Arab states in the north and South Africa in the south to include some of the poorest countries on earth. Data relating to Africa are often skewed by inclusion of these relatively wealthy extremes and the true scale of the poverty of sub-Saharan Africa tends to be masked.

Africa is home to 1 billion people with an anticipated increase of 0.5 billion over the next 15 years [6]. It must be remembered that all population increases are children to begin with and already between 40 and 50 % of the total population of sub-Saharan Africa is under 16 years of age [7].

Health Economics

"The African region has 24 % of the burden (of disease) but only 3 % of health workers, commanding less than 1 % of world health expenditure" [8].

The countries of sub-Saharan Africa form part of the "not-developing" world and most are facing their fourth consecutive decade of economic recession [7]. Governments and individ-

L. Hadley, MB, ChB, FRCSEd, FCPaed Surg
Department of Paediatric Surgery,
Inkosi Albert Luthuli Central Hospital, Bellair Road, Cato Manor, Durban, KwaZulu-Natal 4000, South Africa
e-mail: hadley@ukzn.ac.za

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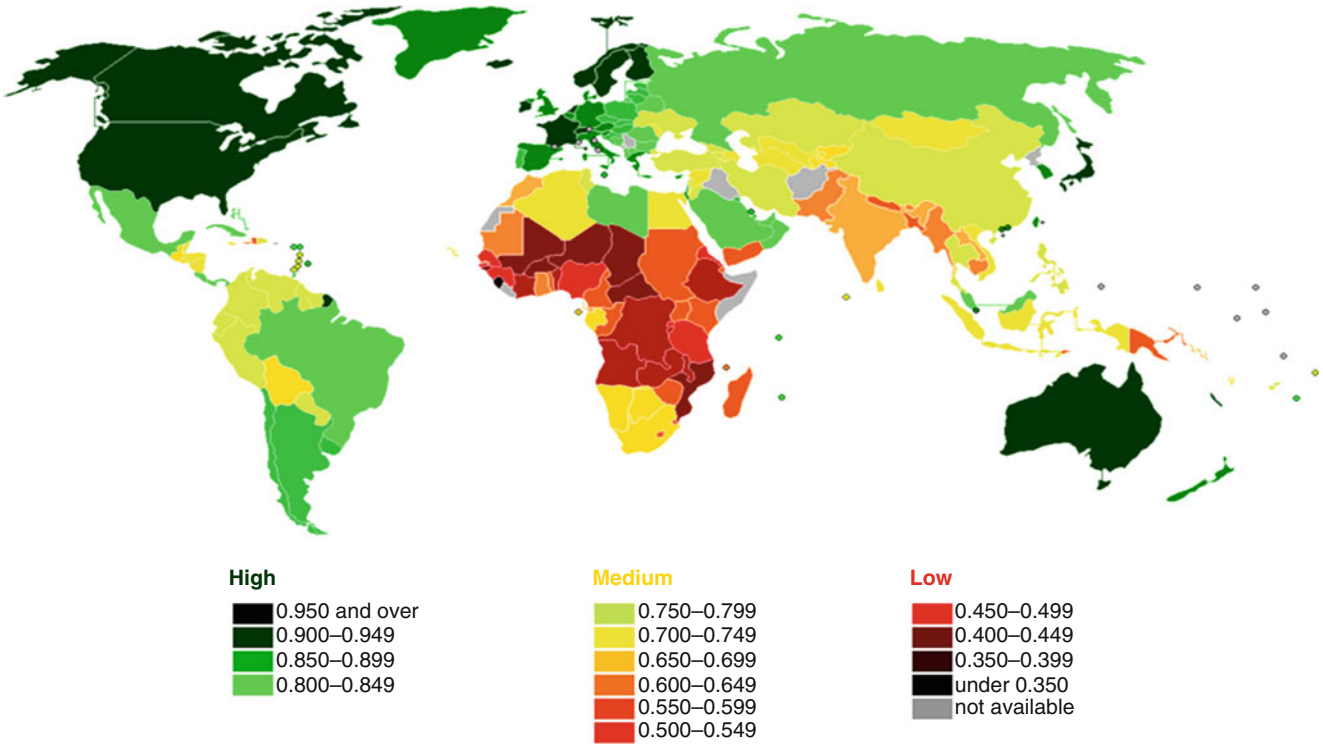

Fig. 33.1 UN map of human development

uals in the region are therefore worse off today than they were in the 1970s. Despite the region being blessed with considerable mineral and oil reserves, suggesting that it is disingenuous to term the region "resource poor", little of the derived benefit filters down to the common man. The desert North African states, although currently plagued with political upheaval, have larger economies based upon oil and agriculture and in most geographical, social, economic and political aspects are quite distinct from the sub-Saharan region.

Along with a failing economy sub-Saharan Africa lacks basic infrastructure and this is particularly acute in the provision of surgical services [9] but these deficiencies are only one reflection of deficiencies in health care in general and fundamental hospital resources such as running water, electricity and oxygen cannot be taken for granted [10, 11].

All health budgets are finite sums of money; some large, some small, but all finite. Because these sums throughout sub-Saharan Africa are meagre, ranging from US$17.00 per person per year in Democratic Republic of Congo to US$819.00 per person in South Africa [12], there is limited funding for any but the most urgent priorities.

Only seven sub-Saharan African countries can afford more than US$100 per person per year for healthcare and 15 countries spend less than the US$58.00 afforded by Haiti [12]. In the United States comparable expenditure is currently US$7285.00 per person, and in the United Kingdom US$3222 [12].

It is facile to suggest that reorganization of a nation's budget would allow health expenditure to rise to any significant degree as health expenditure relative to Gross Domestic Product is higher in several African countries than it is in North America and Europe [13]. The meagre sums available for health care reflect the real poverty of the region. However, the dated perception that governments in Africa are more corrupt and less efficient than anywhere else in the world has led to major donor funding being channeled through NGO's rather than government departments. Not only may this create a policy mismatch between governments and the narrow goals of NGO's but frequently has knock-on effects including the reduction of medical personnel in the health service as they are sucked into the work of NGO's having been tempted by improved emoluments and working conditions [14].

Where governments are short of money individual wealth is negligible and the people of sub-Saharan African countries are typically subsistence farmers with little or no disposable income [15]. Childhood cancer is not perceived to be a healthcare priority in a region struggling to cope with the ravages of malaria, HIV/AIDS and tuberculosis. What little money there is available for health care, including large donor funding, is diverted into these pressing needs through multinational programmes. Wars and famine continue to blight the region, although this is not something unique to Africa, and add to the considerable risks experienced by children.

Survival from childhood cancer has been shown to relate directly to this government health expenditure but is also critically related to the number of physicians relative to the population served [16].

Patterns of Disease

Throughout the subcontinent patterns of malignant disease vary with an obvious increase in the prevalence of Burkitt Lymphoma in the equatorial belt [17] and recent rises in the incidence of non-Hodgkin's Lymphoma and Kaposi Sarcoma in response to the increased prevalence of HIV disease [18, 19]. There has also been an increase in Epstein-Barr related smooth muscle tumours associated with AIDS in both adults and children [20].

There are few population based studies of malignant disease in African children and nearly all data are derived from hospital based registries or pathology databases. Both of these data collection methods have the potential to underestimate the true prevalence of disease within a community and the number of recorded cancers in children is far fewer than would be expected in European or American populations of similar size. So it seems likely that malignant disease in Africa is more common than reported and many children are either choosing not to present for treatment, are being misdiagnosed or are dying of co-morbidity before their malignant disease has become clinically significant. Hospital registries may also be skewed by regional patterns of referral and other micro-environmental factors.

With these limitations in mind, lymphomas now constitute 44 % of malignancies in a hospital based survey in Nigeria [21], 35 % in Sudan [22]. and 54 % in Ghana [23], although a recent report from a second centre in Ghana puts the incidence at 81 % suggesting considerable variations between districts in the same country [24]. Nephroblastoma constitutes 20 %, 13 % and 10 % respectively but has a surprising incidence of 38.4 % in a hospital-based review from Rwanda (Table 33.1) [25].

Such data, and regional variations demand that each centre develops its own data set, must be used to inform strategies to develop effective management but all suggest that surgical oncologists should be an important part of that development. We have learned from the HIV pandemic that patterns of disease also change with time [19], (Table 33.2) and thus data collection and management must be seen as a continual exercise in order to detect such changes. Sub-Saharan Africa has been disproportionately affected by HIV (Fig. 33.2) and even though antiviral therapy is more widely available, thanks in no small part due to NGO's such as the Bill and Melinda

Table 33.1 Prevalence of Wilms' tumour in Africa

Country	Years	Number of tumours	Number of Wilms' tumour	Percentage
Ghana [23]	2006–2010	554	39	7.0
Nigeria (Zaria) [80]	2006–2010	135	13	9.6
Rwanda [25]	2009–2011	133	51	38.4
Sudan [22]	1999–2007	322	43	13.3
Nigeria (Enugu) [21]	2002–2007	174	35	20.1

Table 33.2 Comparative prevalence of different malignancies between periods 1980 and 1982 and 1990–1992

	1980–1982 (pre-HIV epidemic)			1990–1992 (post-HIV epidemic)			
Malignancy	Total no.	Percentage	Prevalence	Total no.	Percentage	Prevalence	p values
Total	118	100	17.1	200	100	2.1	0.03
All lymphomas	48	42.1	7.2	65	32.5	7.1	NS
Non-Hodgkin's lymphoma	25	21.92	3.7	44	22.0	4.8	NS
Burkitt's lymphoma	18	15.78	2.7	11	5.5	1.2	0.05
Hodgkin's lymphoma	6	5.26	0.9	10	5.0	1.1	NS
Retinoblastoma	7	6.14	1.0	26	13.0	2.8	0.02
Kaposi's sarcoma	3	2.63	0.4	39	19.5	4.2	0.000016
Wilms' tumour	8	7.01	1.2	6	3.0	0.66	NS
Nasopharyngeal carcinoma	2	1.75	0.3	4	2.0	0.44	NS
All sarcomas	15	13.15	2.25	21	10.5	2.32	NS
Rhabdomyosarcoma	3	2.63	0.45	12	6.0	1.32	NS
Osteosarcoma	1	0.87	0.15	2	1.0	0.22	NS
Soft tissue sarcoma	9	7.89	1.35	3	1.5	0.33	NS

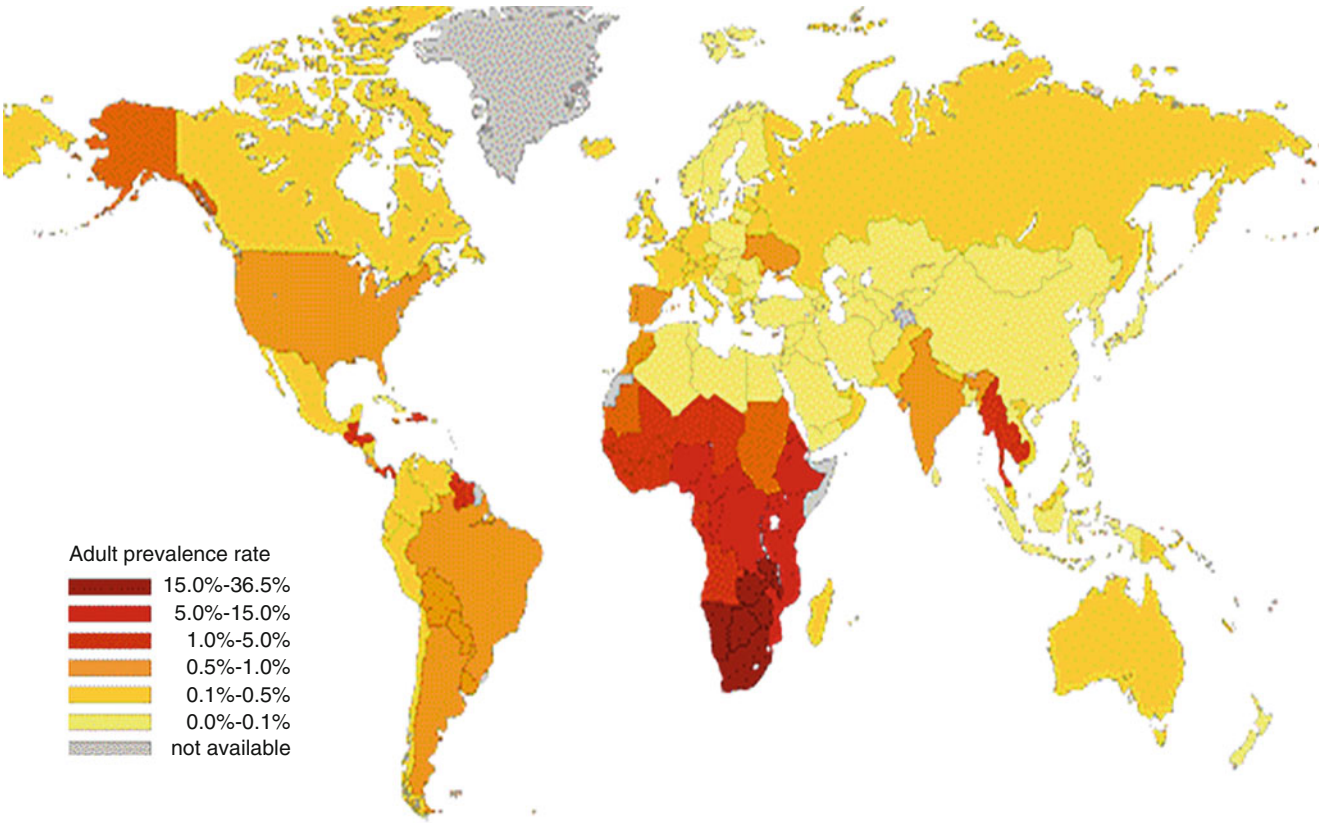

Fig. 33.2 World distribution of HIV

Gates Foundation and the PEPFAR fund, there are still millions of Africans living with the disease untreated. In the KwaZulu-Natal province of South Africa 39.5 % of women attending antenatal clinics were HIV infected in 2010 with an overall prevalence of 15.8 % in the population [26]. Throughout sub-Saharan Africa 35 % of deaths in children under 5 year of age are due to HIV and related diseases and it is estimated that only 10 % of children in need are currently receiving antiviral treatment [27]. Certainly HIV infection dramatically increases the risk of developing certain malignancies, particularly Kaposi Sarcoma [28] but also Burkitt Lymphoma and non-Hodgkin lymphoma [29].

Medical Manpower

It has been clearly established that survival from childhood cancer is related to the relative numbers of medical personnel in a country [15]. The African region has a median of 2.3 doctors per 10,000 of the population but this number is skewed by the well endowed countries of north Africa and the economic giants of the region; Nigeria and South Africa. This median however should be viewed in the context of Europe where the median is 33.3 doctors per 10,000 people and the Americas at 22.5 [30].

Thirty–one of 47 sub-Saharan African countries have fewer than 1 physician per 10,000 population [31]. Numbers range from 0.1 physicians per 10,000 people in Liberia, 0.2 physicians per 10,000 people in Tanzania, Ethiopia and Malawi to 7.7 physicians per 10,000 population in South Africa. These figures should be compared to those of affluent nations such as the UK with 23.0 physicians /10,000 population, the USA with 25.6 and the Netherlands with 31.0 [32]. The World Health Organization considers 2 doctors per 10,000 people to be the minimum required to sustain a primary health care programme [33] and clearly much of sub-Saharan Africa currently lacks the human resources to establish paediatric oncology units using the model favoured by European oncology groups [34].

Countries in Africa have difficulty retaining the doctors that they train and both “push” and “pull” factors led to there being 5334 doctors from sub-Saharan Africa working in the United States of America in 2002 [35]. They represented 6 % of African physicians. The situation has not improved [36]. The channeling of aid through non-governmental organizations rather than through ministries of health allows these NGO’s to attract physicians away from the public service leading to further shortages on the ground [13]. The paucity of medical staff has prompted several countries in Africa to train “tecnicos” or “clinical officers”; people who have no

medical training but who can perform standard operations such as Caesarean Section or skin grafting and the emergency management of trauma, or who have been trained to give anaesthesia [37]. Such use of non-medical personnel who cannot easily migrate might yet be a useful and sustainable model for staffing oncology services in many countries.

In defining the millennium development goals the United Nations targetted the high infant mortality and child mortality figures from sub-Saharan Africa [38] however the contribution of childhood malignancy to this attrition is not felt to be significant [39]. Paediatric oncology care once again has slipped under the radar and avoided prioritization.

Paediatric surgery itself was neglected as a specialty until it was recently demonstrated that 80 % of children in parts of the Third World need some surgical procedure before their 16th birthday [40] and that the primary care of many common disorders is simple surgery. However in sub-Saharan Africa there is a paucity of surgeons in general and paediatric surgeons in particular [31]. There were reportedly only 39 paediatric surgeons in sub-Saharan Africa in 2002 and whilst this number will have risen the majority work in either Nigeria or South Africa [41]. There are .001 Neurosurgeons per 10,000 population in the African region making management of brain tumours difficult, if not impossible, in many countries [8]. Most surgery for children throughout Africa is therefore performed by general surgeons. Along with a shortage of surgical specialists there is a paucity of anaesthetic and support staff, particularly those skilled in the care of infants and small children [42].

Paediatric Oncologists are even rarer and their role in nascent oncology services is being filled by general paediatricians or surgeons [43]. There is an increasing awareness of the lack of surgical capacity generally throughout sub-Saharan Africa [44] and efforts to address the unsustainable resource situation in paediatric oncology are underway through the Francophone GFAOP (Groupe Francais-Africain d'Ocologie Pediatrique) and programmes such as the African Paediatric Fellowship Programme (APFP) in Cape Town, however training local oncologists will take time. There are paediatric oncology centres dotted throughout the continent where facilities may mirror Euro-American centres but they are not the rule.

The establishment of treatment facilities, no matter how basic they may be in comparison to the ideal, is an important stimulus to the development of paediatric services in general and paediatric surgery in particular. Surgeons deal with individuals rather than populations and the ability to offer effective treatment is their *raison d'être.* If this involves stretching the definition of surgical care to encompass the administration of chemotherapy, then this is what must be done. It makes no sense to perform difficult surgery yet have the patient relapse because there is no paediatric oncologist available. As personnel costs weigh heavily on limited health budgets and few oncologists are attracted to areas with no resources, the status quo is likely to last into the middle distance at least, with important implications for the training of personnel for practice in these areas.

Access to Health Care

Given the lack of infrastructure and support for oncology the results of treatment of childhood tumours in Africa are unsurprisingly disappointing. Parents of affected children find support and often symptomatic care from traditional healers such as the isangoma and inyanga of southern Africa. These practitioners are both culturally acceptable and available within the community and even in major urban centres are well patronized. Many patients attend hospitals in desperation only after the traditional healer has patently failed in his attempts at cure [45].

Patients may face lengthy and expensive journeys to access appropriate health services and patients from rural areas are especially disadvantaged [46]. Under these circumstances it may be prudent to admit the child to hospital for the duration of treatment rather than risk default. Additionally, in many countries parents are required to pay for all treatment including laboratory tests, imaging studies and chemotherapy. Impecunious parents are then placed in an unenviable dilemma and may have no alternative but to refuse treatment. The economic straits of the patients also preclude regular follow-up in regions where travel is arduous and expensive [47]. Abandonment is a particular problem throughout Africa but is greatest in countries that require the family to fund investigations and treatment. It is hoped that the recent Kenyan initiative in making cancer care free to the patient will set a precedent for the continent [48].

The Internet

Support structures such as "twinning" with centres in Europe and America are frequently unavailable to African centres, although there are nascent programmes of information exchange within the continent, and some early excursions into training of both doctors and nurses [49]. Throughout Africa internet access is 11.4 % compared to 33.5 % for the rest of the world. Again penetration is uneven with figures of less than 1.0 % in countries such as the Democratic Republic of Congo, Ethiopia, Guinea, Niger, Liberia and Sierra Leone. Data for Africa are skewed by the inclusion of the Mediterranean countries where internet penetration is high (34 % in Tunisia and 41 % in Morocco). Africa as a whole has 15 % of the world's population but only 5.7 % of the world's internet users [6]. Broadband internet penetration is around 0.6 %. These access difficulties, in addition to high

internet service costs make "twinning" most difficult in those areas of arguably the greatest need. Low bandwidth programmes have been used in Paediatric Surgical education within Africa [50] and interactive educational and management meetings are regularly arranged by those countries blessed with broadband access, but there is untold potential for use of the internet for consultation, support and education. The use of mobile phone technology in support of patients on HIV medication or malarial treatment programmes suggest a model for improving patient follow-up at oncology clinics [51].

Co-Morbidity

Centres in Africa are overwhelmed by the numbers of children presenting with advanced disease and significant co-morbidity [52]. Of particular concern is the number of children who are malnourished at presentation either because of a marginal pre-morbid diet or because of the effects of late presentation [53], or both (Fig. 33.3). Malnutrition has a direct effect on the toxicity of treatment, and mortality, requiring that neoadjuvant chemotherapy doses must be reduced [54]. There is some evidence to suggest that in malnourished children with alteration of body composition there are altered pharmacokinetics of chemotherapy drugs that might in part explain this increased toxicity [55]. However chemotherapy in this group of patients is difficult and requires careful monitoring.

It must be clear that malnutrition also increases surgical risk and that pre-operative feeding must be given in conjunction with cytoreductive treatment if peri-operative morbidity is to be minimized. It may be necessary to increase the caloric intake by overnight nasogastric feeds in children who are unable to take adequate amounts orally [56].

Having a solid tumour does not protect a child from his environment and children with tumours, in addition to nutritional support, also need treatment for their malaria, tuberculosis, intestinal parasites, HIV/AIDS and other associated diseases [57]. Associated diseases may make primary assessment more difficult (Fig. 33.4) as well as requiring specific treatment. These features conspire to make biopsy of suspected primary and metastatic lesions more frequently necessary.

Tuberculosis presents particular difficulties in that clinical presentation can mimic malignant disease, the pathologies frequently co-exist and radiology can be confusing. Under these circumstances it may be necessary to biopsy pulmonary or intra-abdominal lesions to correctly stage the disease (Fig. 33.5) [57].

Many patients present with advanced local disease (Fig. 33.6) with displacement of normal anatomy that can be recognized when computerized tomography is available but which might ensnare the surgeon who does not have access

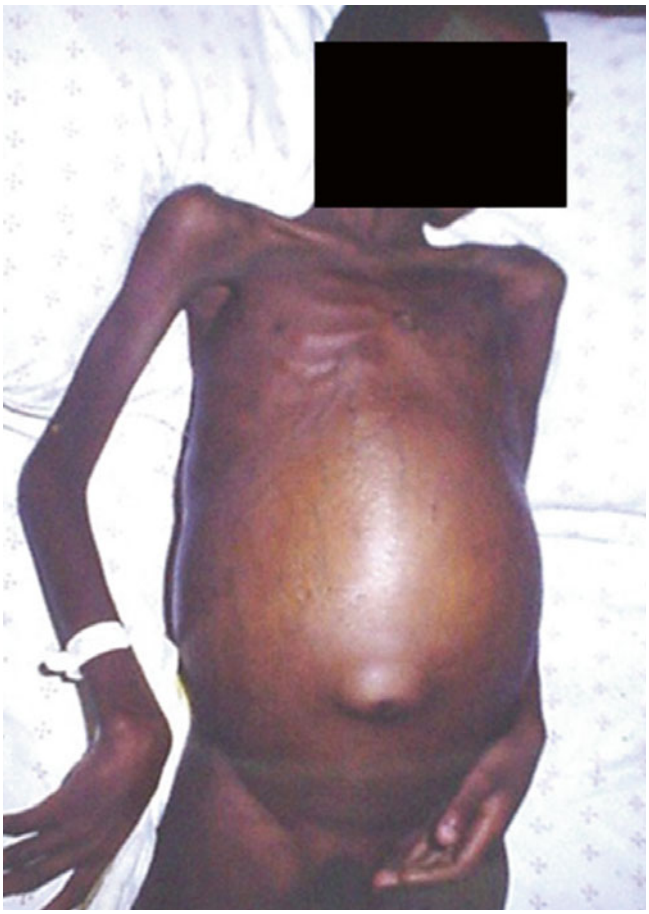

Fig. 33.3 Patient with Wilms' tumour at presentation showing abdominal tumour and signs of malnutrition

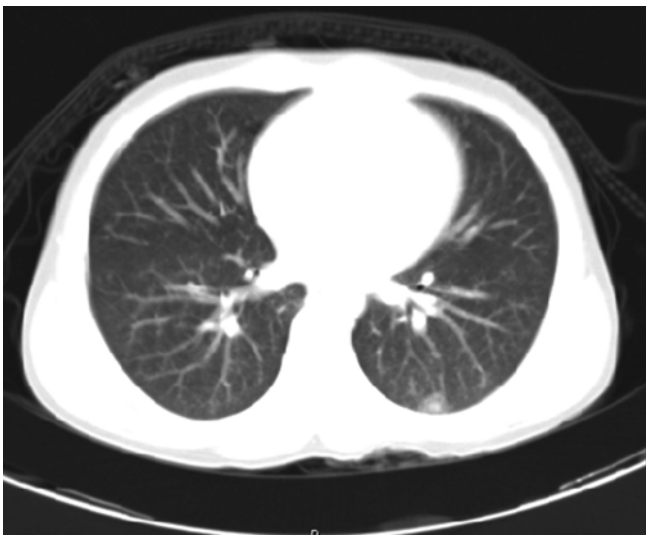

Fig. 33.4 Chest CT image of an HIV infected child with nephroblastoma. Thoracoscopic biopsy confirmed the pulmonary lesion to be schizosomiasis

to this investigation. Advanced local disease may also result in intestinal obstruction (Figs. 33.7 and 33.8) with challenging consequences. These large abdominal masses also alter the mechanics of breathing with frequent basal atelectasis and infection. Metastatic disease is common and often extensive (Fig. 33.9). It would appear that the site of metastatic disease in Wilms' tumour in Africa does not impact on survival [59].

Hypertension is reported in Africa with a far greater frequency than from Europe and America and the sequelae of hypertension; intracranial and cardiac add to the difficulties of treatment (Fig. 33.10) [60].

Other Resource Constraints

Perversely, whilst the expense of newer pharmacological treatments is high, availability of commonly used drugs may be limited because they are *not* expensive and therefore there is little profit to be made by drug manufacturers [61]. There

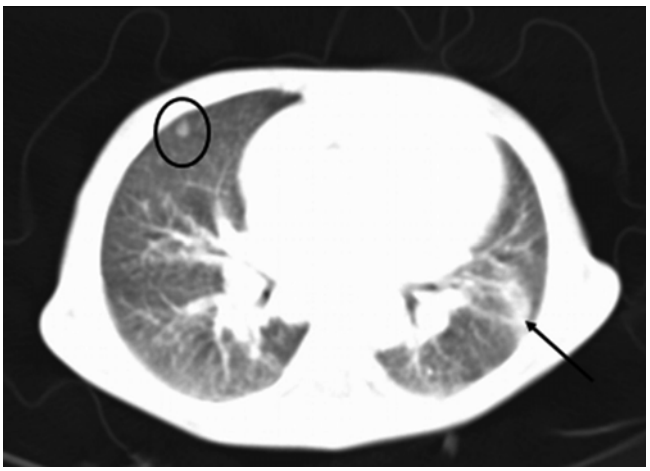

Fig. 33.5 Transverse CT image of patient with nephroblastoma and HIV infection. Note tuberculosis (*arrow*) and intra-pulmonary lymph node (*circled*) showing HIV lymphadenitis on biopsy

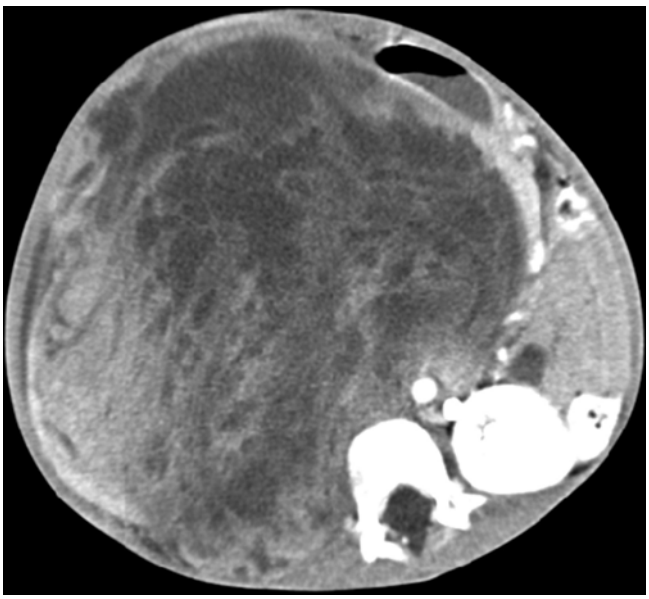

Fig. 33.7 Axial CT image of patient presenting with right sided Wilms' tumour causing duodenal obstruction

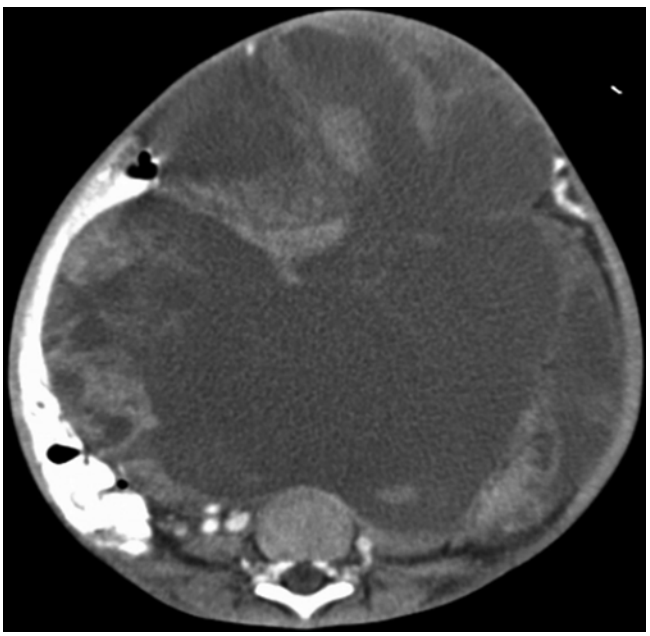

Fig. 33.6 Transverse CT image of patient with typical triphasic Wilms' tumour. The displacement of the common iliac vessels to the right of the lumbar spine can be clearly seen

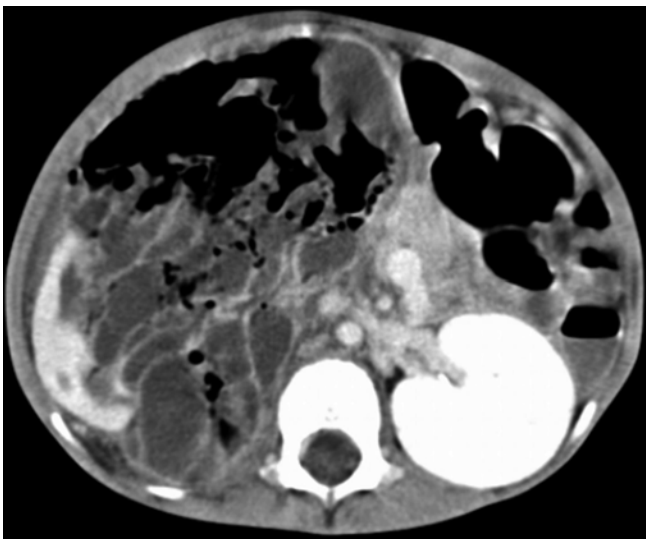

Fig. 33.8 "Pneumo-nephroblastoma" caused by fistulation into the duodenum during neoadjuvant chemotherapy in the patient also illustrated in Fig. 33.7

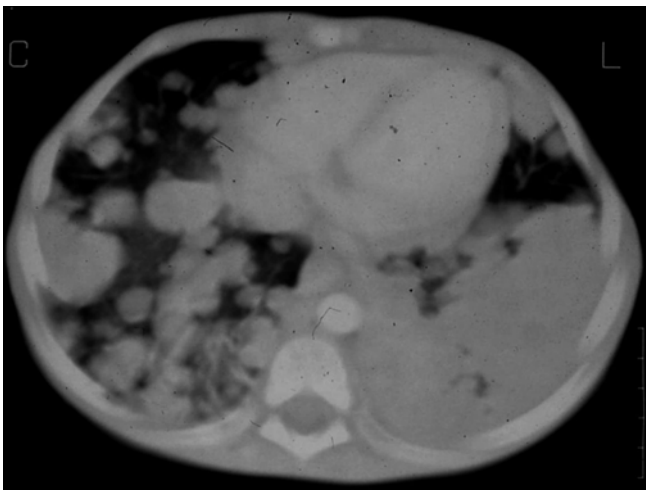

Fig. 33.9 Axial CT image of a patient presenting with Wilms' tumour

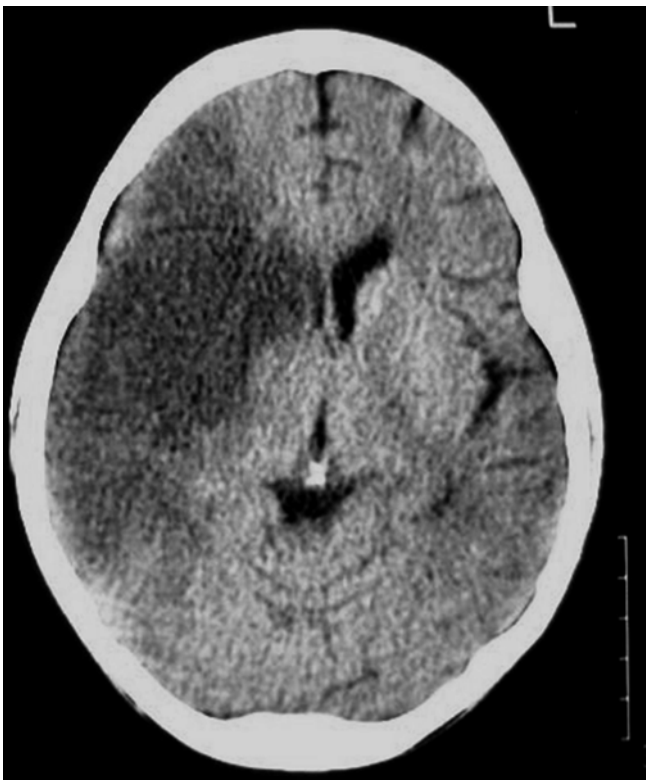

Fig. 33.10 Transverse cranial CT scan of 4-year old patient with Wilms' tumour presenting with hypertension and stroke (Previously published image) [60]

are also difficulties with the regularity of drug supply, storage, affordability and dispensing [62].

Paediatric surgical services are stretched by the conflicting interests of trauma victims, congenital abnormalities, surgical infections, and routine surgical pathology [40]. Cytology and histopathology services are patchy and lengthy reporting times frequently delay the introduction of effective treatment [63].

Blood and blood products, where available, may be unsafe and expensive [64] and oncology surgery can be difficult and time-consuming.

Despite the efforts of the International Atomic Energy Agency through their PACT programme (Programme of Action for Cancer Therapy) radiotherapy is effectively not available in the region [65] and the European norm of one megavoltage machine per 250,000 population is far from being attained [66]. This lack of resource is possibly most keenly felt in attempting to treat children with brain tumours.

So it may be thought that the problems and pressures on surgeons confronting children with malignant disease could hardly be greater but they pale into insignificance compared to the pressures on parents and the patients themselves. In countries in which patients are required to pay for investigation and management or appeal for charity to assist them there may be irresistible financial pressures to refuse treatment. Where distances are vast it may be impossible for a parent to accompany a child to the treatment centre, particularly when there are siblings at home requiring attention. Distance is also a major disincentive to regular follow-up attendance and in Malawi this has been obviated by using GPS technology to locate each patient's dwelling and having a staff member on a motorcycle make rounds and record the survival status of treated children.

What all this means

In an environment characterized by a lack of human and material resources, late presentation of patients, multiple life-limiting co-morbidities and an inability of the patient to comply with treatment and follow-up protocols, some tumours are simply untreatable and therapeutic efforts should be directed at those common tumours that we know have a reasonable prognosis and for which the treatment is manageable within the resources available.

Burkitt's lymphoma is the most frequent malignancy seen in children in equatorial Africa and there have been many studies showing the efficacy of low toxicity regimens that result in an increased overall survival without increasing the risks of treatment related mortality [67]. As endemic Burkitt's lymphoma has no parallel in Europe and America these regimens have had to be designed regionally and the exercise represents a successful collaboration between funders, clinical researchers and patients in need. By demonstrating that collaboration improves results such programmes have stimulated interest in children's cancer that has been traditionally thought to be an insoluble problem.

Nephroblastoma is a tumour that has an excellent survival in patients treated in the developed world with cure rates reportedly between 85 and 95 % on both sides of the Atlantic irrespective of the nature of the primary intervention [68]. In

sub-Saharan Africa survival data, where available, suggest that the outlook for afflicted patients remains dire. In Sudan only 11 % of the inception cohort completed treatment and 27 % received no treatment at all [69]. In Malawi, one of the few sub-Saharan African centres with a Paediatric Oncology Unit, albeit under the guidance of a general paediatrician rather than an oncologist, there has been a measurable increase in survival from the start of the programme [70] and although current Wilms' tumour survival in Malawi is not comparable to European or American data, the fact that progress has been made is encouraging [54]. However the difficulties experienced by the surgeon are exemplified by their report of anaesthetic related death, irresectability and intra-operative tumour rupture. These experiences are by no means unique and are mirrored in reports from Nairobi, Kenya [71] and Nigeria [72]. In western Kenya 2 year overall survival is 33 % [73] as it is in Dar es Salaam, Tanzania [74].

Such experiences inform the decision of many African centres to align themselves with the SIOP philosophy of neo-adjuvant chemotherapy [75]. Such a policy has the potential to make primary tumours smaller thereby improving the operative risk profile, it affords a window of opportunity to detect and manage co-morbidities, and offers an in vivo trial of the efficacy of the selected chemotherapy protocol [76]. With tumours that are large at presentation secondary intestinal obstruction is not unusual and dramatic chemotherapy-related complications such as entero-tumoral fistula may tax the attending surgeon (Figs. 33.6 and 33.7).

Whilst certainly true of nephroblastoma the principle of neoadjuvant treatment has been applied to nearly all solid tumours.

Pursuant upon this broad policy, and influenced by the prevalence of second primary pathology such as tuberculosis, pretreatment diagnosis becomes desirable. In some regions where histopathology services are rudimentary or non-existent diagnosis is based on clinical findings and perhaps ultrasound. Of course there will be errors but the frequency of these errors is immeasurable. Where histopathology services are readily available percutaneous needle biopsy is advisable, not in an attempt to define subtleties within a diagnostic group but to exclude non-malignant conditions such as TB [57]. The Collaborative Wilms Tumour Africa Project involving centres in an increasing number of countries demonstrates the ability to cooperate across national borders and language barriers in an attempt to develop regionally relevant policies and protocols [58].

Summary

Sub-Saharan Africa is disadvantaged in terms of both human and material resources and faces multiple pressing health challenges. In resolving these challenges, whilst Africa has no need to reinvent the wheel, importation of European and American models of health care may not be appropriate and culturally and socially acceptable, as well as affordable, models need to be developed.

It is fantasy to think that management and research strategies of the developed world can be applied directly to patients in Africa and it is unlikely that the standards of histopathological diagnosis, of radiology, of laboratory evaluation that are required by European and American protocols are going to be attained in sub-Saharan Africa in the near, or even the distant future.

It is important to adopt a pragmatic approach. Pragmatism dictates that patients with potentially favourable outcomes should be treated as aggressively as circumstances allow and resources should not be expended on patients for whom the outlook in any event is grim [77]. There is little to be gained by offering chemotherapy to patients where there are no laboratory facilities to monitor toxicity, or where blood transfusion is not available should it become necessary. It is unwise to attempt major surgery in the absence of adequate anaesthetic support.

Data acquisition is an important first step in redressing the situation. Regional variation in the prevalence of childhood tumours is great and the impact of HIV on these patterns of disease requires continuous regional study. Diagnosis very often must be made on clinical or simple radiological grounds such as ultrasound scanning performed by the treating physician [68]. This does not devalue the information. The results of such data collection must be published and used to formulate policy and define needs.

Massaging data, by for example excluding from analysis children who die before, or soon after treatment starts, or who abandon treatment or refuse surgery, will increase the apparent overall survival and is always a temptation. However such manipulations mask the true state of affairs. We know how to treat tumours such as Wilms' tumour, the developed world has shown us this. The tragedy of Africa is that children are still dying of the disease. The answers to the problem of late presentation, abandonment and co-morbidity might lie more in the domain of politics rather than oncology but it is important that the oncology community generate data that reflect the true situation so that health administrators can base their decisions on fact.

Treatment options are limited by the drugs available, the general condition of the patient and the clinical skills and facilities available. To insist that chemotherapy administration requires the skill of a paediatric oncologist is not a sensible contribution to progress in Africa where there are few paediatric oncologists and it seems unlikely that there will be an adequate number in the foreseeable future [43]. Just as untrained "tecnicos" can perform skin grafts without medical training so a surgeon or paediatrician can inject chemotherapy and monitor toxicity without being an oncologist.

The current heightened awareness of the inequity of global healthcare resources in general [78], and surgical services in particular [79], augurs well for the future development of appropriate surgical services in Africa. Sharpening the needle-point of surgical expertise will, of itself, not compensate for the major infrastructural deficiencies, but must proceed in tandem with resource development and allow health planners to realize that paediatric surgical oncology is a cost-effective service that can uplift regional services generally.

It is the responsibility of interested parties, whatever their primary field of expertise, to ensure that paediatric surgical oncology remains on the agenda.

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