Cancer Care in Rwanda[^1]

**Rwanda’s Health Care System**

Rwanda has almost 40 district hospitals and 400 health centers serving a population of nearly 10 million people. Two multi-purpose community health workers have been elected in each village of 200-300 people, and there are plans to compensate these workers through a system of cooperatives.

The government of Rwanda (GOR) has attracted international acclaim for its recent achievements in the health sector.[^2] These include a system of performance-based financing and community-health insurance that covers more than 90 percent of the population with minimal co-payment. The GOR raises roughly $4 out of the $24 in annual per capita public health care spending. Donor funding accounts for the remainder, although the GOR hopes to improve this balance over the next 10 years.[^3]

Between 2000 and 2008, under-5 mortality decreased from 196 to 103 per 1000 live births.[^4] Between 2007 and 2010, the percentage of women delivering at a health facility increased from around 40 percent to nearly 80 percent. Increasingly, all health centers can now provide anti-retroviral therapy.

As part of its Health Sector Strategic Plan for 2009-2012, the Rwandan MOH has recognized the need to extend these achievements to non-communicable disease while pushing forward deeper interventions for maternal and child health, as well as nutrition and family planning.

**Brief history of PIH in Rwanda**

*Inshuti Mu Buzima (“Partners In Health” in Kinyarwanda) is the first PIH-supported project in Africa. Launched in the spring of 2005 at the invitation of the Rwandan government and in collaboration with the Clinton HIV/AIDS Initiative, IMB sought to strengthen the existing health system in the process of decentralizing HIV care and treatment to rural areas.*

In April 2005, PIH began working with the Rwandan Ministry of Health (MOH) in two rural health districts in southeastern Rwanda. Between 2005 and 2008, IMB helped rehabilitate the Rwinkwavu district hospital along with six health centers in the region. By 2009, IMB had supervised the construction of a training center for the Southern Kayonza district, as well as an entirely new hospital in Kirehe district. In 2008 IMB expanded its operations to Burera District in northern Rwanda; along with the Rwandan MOH, IMB will formally open the newly constructed Burera District Hospital in June 2010, and currently supports 12 health centers in this district. The catchment area served by IMB-supported sites totals almost 800,000 people. In fiscal year 2009, IMB had an annual budget of nearly $15 million. IMB-supported sites provide the full package of services outlined in Rwanda’s district health system strengthening framework at the community, health center, and district hospital level. Additionally, IMB has helped the MOH innovate in areas where it has sought to expand the package of services available at district level. These innovations include integrated chronic care for non-communicable diseases at district hospitals and health center, electronic medical record development, and community-based chronic care.
In 2009, the Doris Duke Charitable Foundation awarded Rwanda and IMB a 5-year, African Health Initiative grant. This grant will support extension of IMB support to all health centers in the Southern Kayonza and Kirehe districts. The grant also funds enhanced supervision and evaluation of services.

To ensure that the poor are not denied health care or education for lack of an ability to pay, PIH is working with the Ministry of Health to support the cost of insurance and consultation fees for the indigent and is assisting with the costs of school uniforms and supplies. Hundreds of local villagers, many of them HIV patients themselves, were recruited and trained to work as paid community health workers. Social support programs were implemented, including financial support for public health insurance, medical consultation fees, and school fees for the indigent, food packages for HIV or tuberculosis patients, and a carpentry and metalworking shop. As of May 2010, almost 5,000 patients were enrolled on ART at IMB facilities.

**Cancer in Rwanda**

Prior to the 1994 genocide, Rwanda had a cancer registry based at the University hospital at Butare (CHUB). Rwanda does not currently have a national cancer registry, and the capacity for pathology remains limited, so data on cancer incidence and mortality is sparse and incomplete. Estimates of the most common types of cancer within Eastern Africa include: Kaposi’s Sarcoma (14% of total cases), cervical cancer (14%), liver cancer (8%), and esophageal cancer (7%).[5] Smaller studies within Rwanda confirm these estimates. A 1998 report from the Butare registry in Rwanda found that between 1991 and 1994 the distribution of the 454 cancer cases was similar to that in other countries in sub-Saharan Africa. The most frequent cancers were those with possible infectious etiologies (liver (12%), cervical (12%), and stomach (9%)) or associated with HIV infection (Kaposi’s sarcoma (6%) and non-Hodgkin’s lymphoma (3%).[6] A retrospective study of children admitted to the Butare Teaching Hospital between 1999 and 2005 found that the most common pediatric cancers were Burkitt’s lymphoma, non-Hodgkin’s lymphoma, and Hodgkin’s lymphoma.

**National cancer care and control efforts**

**Ministry of Health**

As of May 2010, Rwanda’s Ministry of Health did not have a desk devoted specifically to cancer, nor did it have a national cancer plan. In January 2010, IMB and the Rwanda MOH co-hosted on national summit on non-communicable diseases, the first of its kind to focus primarily on the endemic conditions of region. At this meeting, the MOH endorsed the use of the three IMB-supported districts as non-communicable disease training sites for nurses and physicians from the rest of the country. At this summit, the MOH also announced its intention to formulate a strategic plan for non-communicable disease that would include a national cancer plan. The MOH will name a national non-communicable disease policy coordinator who will oversee the consultation process for the policy in this area.

**Prevention and Screening**

Currently, no systematic screening and treatment program exists in Rwanda for cervical cancer (the most common malignancy in Rwandan women).[7] Rwanda does have a national Hepatitis B vaccination program. Merck and Qiagen plan to partner with the Rwandan Ministry of Health to introduce donated HPV vaccines and tests at a national level, but this plan has not yet been fully formulated. Tobacco use remains rare in Rwanda as assessed in the 2005 demographic and health survey, although alcohol is
likely a significant problem. Other interventions that may possibly contribute to cancer prevention include the national malaria control program (malaria is a possible risk factor for Burkitt’s lymphoma), and the national HIV control program (HIV is the primary driver for Kaposi’s sarcoma).

Pathology and Treatment

The current pathology system of Rwanda consists of two pathologists located in Kigali and Butare who service the entire country. Samples processed through the in-country system require an average of 3 weeks for results, with a number of samples often lost in the process of transport and processing.

To date, efforts at cancer treatment have largely been limited to select, ad-hoc administration of chemotherapy and surgical procedures (tumor excision, limb amputation, nephrectomy, eye exenteration, lumpectomy, mastectomy) at the country’s three tertiary hospitals: King Faisal, a private hospital in Kigali; CHUK, the national reference hospital in Kigali; and the Butare Teaching Hospital, the national teaching hospital in the southern city of Butare. Rwanda has no radiation therapy facilities; a commission at the Ministry of Health can elect to send a few cases to Kenya or Uganda for radiation therapy, but in general this intervention is available only to those few patients who can afford to pay for both the travel and treatment themselves. The only oncologist practicing in the country is Lazaro David, a Cuban doctor at King Faisal. Most cancer treatment is provided by internists, pediatricians, and general surgeons. Partly because patients present with advanced disease, outcomes are generally poor at these facilities when compared with other cancer centers with established surgical oncology departments.[8] Palliative therapy at tertiary hospitals includes analgesics, IV fluids, blood transfusion, and nursing.[9]

Palliation

The MOH is currently in the process of finalizing national policies on palliative care. At present, there are several districts that have begun to introduce community-based palliation. The MOH recognizes, however, that too many patients die at home without proper pain management, nursing, or accompaniment.

Table: opioids on formulary at each level of the health system

<table>
<thead>
<tr>
<th>Codéine</th>
<th>comprimé, 30 mg</th>
<th>RH</th>
<th>DH</th>
<th>HC</th>
<th>Co</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morphine</td>
<td>inj. 10 mg/ml amp de 1ml</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Morphine</td>
<td>comprimé, 10 mg</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fentanyl</td>
<td>inj. 0,1 mg/ml - amp. 2ml</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pentazocine</td>
<td>inj.30mg/ml - amp 1ml</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pétididine</td>
<td>inj. 50mg/ml - amp. 2ml</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tramadol hydrochloride</td>
<td>cp 50 mg ou amp. 50 mg/ml</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Morphine</td>
<td>poudre /solution buvable 5mg/5ml et 50mg/ml et 100mg/5ml.</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* RH = referral hospital; DH = district hospital; HC = health center; C = community

PIH/DFCI initiatives in cancer care and control

1 Rwanda national formulary. August 2009
**Prevention and Screening**

During vaccination campaigns and routine examinations, children are briefly screened by physical exam for orbital, maxillary, lymphatic, or abdominal tumors. Parents are educated to bring children to medical attention if symptoms arise.

As of May 2010, women were not being systematically screened for cervical cancer at IMB facilities. In 2009 IMB began working with the Maternal and Child Health program within the Rwandan MOH to develop a pilot program for cervical cancer screening and treatment, to be implemented in Burera District. The proposed project aimed to demonstrate the feasibility of cervical cancer screening in this setting, and provide a replicable model for national scale-up. Without in-country capacity for pap smears and cytology, the pilot program would be centered around visual inspection of the cervix with acetic acid (VIA) and immediate cryotherapy as needed. The single-visit screening and treatment program be staffed by trained nurses at scheduled clinics in four health centers. Patients with positive results that do not meet the criteria for cryotherapy will be referred to the district hospital for colposcopy and biopsy, hysterectomy, LEEP, or referral to a tertiary or out-of-country facility. Screening would target women 30-45 years of age as well as HIV positive women; both populations would be sensitized and mobilized by community health workers. A module for cervical cancer will be created within the national Open MRS system currently being rolled out across the country. All patient encounters would be entered in a new module for cervical cancer within the national electronic medical records system (currently being implemented nationwide); these records would be used for patient follow-up as well as for monitoring and evaluation. IMB received funding from PATH and coordinated with the JHPIAGOG program in Malawi to commence training in May 2010.

Plans were delayed temporarily in April 2010, however, by the entrance of the Merck and Qiagen donation. IMB was asked to help formulate a clinical algorithm and an operational plan for a national program for HPV vaccination and screening. The new plan will be formulated so that young girls are vaccinated against HPV while women are screened for HPV. Those women who test positive for oncogenic strains of HPV will be sent to district hospitals for VIA and cryotherapy.

IMB has begun to think about how to integrate improved case-finding and early detection of breast cancer into the structure of the existing health system. One possibility include decentralization of a package of women’s health services to district hospital level, including breast clinics and colposcopy. Limitations at present include lack of timely pathologic diagnosis, staging, and limited access to surgery and radiotherapy. Improved case finding will only benefit patients if the upstream referral system has the capacity for diagnosis and treatment.

**Pathology and Treatment**

In 2007 IMB commenced treatment of its first pediatric oncology case in Rwinkwavu. Since PIH began diagnosing, recording, and treating patients, a total of 61 adults and a total of 22 pediatric patients have been logged into an online cancer database and followed. The most common adult cancers encountered include Kaposi’s sarcoma, breast cancer, and CML. The most common pediatric cancers are rhabdomyosarcoma and Burkitt’s lymphoma.

Although normally, only referral hospitals are authorized to administer chemotherapy, the MOH has given IMB-supported facilities permission to undertake these treatments. This is in recognition of the presence of some physicians on-site with internal medicine or pediatric training and their supervision by
oncologic consults. Given that care is provided for free at IMB-supported sites, patients with cancer and other advanced disease come for care from across the country. IMB recognizes the danger of distorting national referral patterns and has increasingly sought to support the public University Hospitals to strengthen their services and ability to train internists and pediatricians in oncologic care. At the same time, chemotherapy for some conditions such as Kaposi’s sarcoma may well be part of an appropriate skill set for generalists physicians working at district hospital level.

Following presentation, patients with findings highly suspicious for malignancy must receive a formal diagnosis before treatment can proceed. Most biopsies are processed in-country, but complicated cases or those that require immediate interpretation are prepared and stained by trained technicians at IMB sites to be processed and reviewed on a volunteer basis by the Division of Pathology at Brigham and Women’s Hospital. In some cases treatment is initiated without a pathologic diagnosis if the diagnosis is clinically evident or if the patient is ill and empiric therapy can be given safely.

Treatment plans are developed in consultation with specialists at the Dana Farber Cancer Institute. Once a new diagnosis is confirmed by pathology, the oncologists from the Dana Farber provide advice via an online forum within the Global Health Delivery Online system designed to provide education and collaboration between Rwandan and US physicians. Through this collaboration, treatment plans are created and oncologists are able to follow consultations along with the Rwandan physicians located at the three primary IMB-backed district hospital.

Treatment options for oncology cases include surgery, chemotherapy, radiation, or palliation. Due to the lack of cancer screening and prevention within Rwanda, many patients present in advanced stages of their disease. While some cancer types may be cured even in advanced stages, the majority of patients qualify for palliation chemotherapy and radiation only. Patients are generally referred for surgery to a referral center unless there is a visiting surgeon on-site. Several specialty surgeons located in Kigali, trained in HEENT, thoracic, gynecological, or abdominal operations, assist with tumor removal and debulking procedures in oncology patients.

On-site physician and nurse teams at the PIH district hospitals administer chemotherapy. Oncologists from Dana-Farber Cancer Institute advise in the selection of the chemotherapy protocol and supportive medications. Pharmacists are trained to prepare the drugs, with oversight from the treating physicians. Instructions detail how to obtain, prepare, administer, and monitor chemotherapy and response to treatment. Chemotherapy was initially purchased by PIH on a case-by-case basis. With the increasing number of patients being treated, several district hospital sites now contain reserve supplies of commonly used chemotherapy regimens, including taxanes, tamoxifen, and Gleevec. The Dana-Farber Cancer Institute provides many of the chemotherapy regimens, specifically those medications that would otherwise be unobtainable through the public sector procurement system or from King Faisal Hospital. Gleevec is obtained via a donation from its manufacturer. Regimens and outcomes for specific malignancies are described in the accompanying appendix.

A select number of patients are sent, at significant cost to IMB, to Uganda or Tanzania for Radiation Therapy. The patients often spend several weeks in foreign countries where they have no family support and typically do not speak the language amidst ongoing illness. Visa requirements and transportation needs often lead to delayed treatment times.

Paid community health workers, called accompagnateurs, are provided to each patient in the cancer program. Accompagnateurs come to all clinic appointments and visit patients daily to ensure that they
are not experiencing serious adverse effects from chemotherapy or developing fevers, and to assess psychosocial needs. If complications develop, *accompagnateurs* bring patients to hospitals or health centers. In the case of social problems, *accompagnateurs* notify clinic-based social workers. *Accompagnateurs* also maintain supplies of antiemetic medications, rehydration salts, and antibiotics for urgent administration.

At the district hospital, follow-up of oncologic patients is integrated into a chronic care clinic for advanced non-communicable disease. This clinic is staffed by trained two nurses, a data officer, and supervised by a physician.

**Table: chemotherapy agents on national formulary in Rwanda[10]**

<table>
<thead>
<tr>
<th>Drug</th>
<th>Formulation</th>
<th>RH</th>
<th>DH</th>
<th>HC</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acide folinique</td>
<td>comprimé 15 mg</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bléomycine</td>
<td>inj. 15 mg en flacon</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cyclophosphamide</td>
<td>comprimé, 25 mg;</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cyclophosphamide</td>
<td>inj., 500 mg</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Doxorubicine</td>
<td>inj. Poudre10,50 mg fl</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Méthotrexate</td>
<td>comprimé, 2,5 mg</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Méthotrexate</td>
<td>inj. 50 mg</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vincristine</td>
<td>Inj 1mg/ml</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mercaptopurine</td>
<td>Comprimé 50mg</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hydroxyurea</td>
<td>Capsule</td>
<td>X</td>
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</tbody>
</table>

* RH = referral hospital; DH = district hospital; HC = health center; C = community

**Barriers to implementation and scale-up**

Without nationwide national control plan, cancer control efforts within the public sector and among NGOs remain geographically fragmented and programmatically uncoordinated. In recognition of this problem, the MOH has initiated a non-communicable disease policy coordination and strategic planning process. Training models and cost estimates from the process will drive future budgets and human resource strategies in this area. Marginal increases in public health spending will have to be supported by external donors until such a time as national revenues increase in line with Rwanda’s vision 2020.

Tertiary facilities need to be strengthened to provide dependable access to pathologic diagnosis, staging, chemotherapy, and surgical intervention. Patients with cancers and other advanced conditions may require more substantial transportation and social support as part of effective referral care for the poor. These centers could benefit from direct partnerships with global centers of excellence in cancer care such as DFCI. The role of a national radiation oncology program remains to be clarified.

District hospital must be prepared to provide preliminary, diagnosis, staging, and follow-up of patients with suspected oncologic disease.

Health center nurses and community health workers may be an important part of a strategy to improve case finding and early detection.
Comprehensive palliative care requires multidisciplinary and complex care delivery, involving pain management protocols and medications, intensive nursing, social supports, and physical therapy. The MOH has recognized that many of these services remain relatively undeveloped even in the most resourced health centers and hospitals in Kigali, let alone in resource-poor rural districts.

**Cancer and health systems strengthening**

The use of online forums for clinicians has proven central to the implementation of case-specific treatment protocol for cancer patients in Rwanda. The frequent use of these forums, which provide a direct link between oncologic specialists abroad and the clinicians administering therapy, might help to explain why the Rwanda program has been able to treat a higher number of patients with complex chemotherapeutic regimens than other PIH country programs. Once clinicians in resource-poor settings (especially generalist physicians) are accustomed to utilizing these forums to connect to a broader community of specialists, possibilities expand for more advanced treatment of complex cases in other disease areas.

IMB hopes bring Rwandan oncologic specialists into this network and to integrate clinicians at Rwandan referral centers into the online forum. As with cardiology and other kinds of specialty care, effective cancer programs require excellent collaboration between specialists and generalists.

**Key lessons learned**

One critical issue for oncologic care at district hospital level is how to identify candidates for curative chemotherapy or surgical treatment. Although many patients present at a late stage and need primarily palliative care, it is difficult to exclude treatable disease without more access to diagnostics. There is a great need for simplified approaches to diagnosis and staging at district hospital level and increased access to pathologic diagnosis and imaging. This situation is parallel to that encountered in cardiology where possible surgical candidates with rheumatic heart disease are difficult to identify from the general heart failure population without access to basic echocardiography.

At the same time, good outcomes for chemotherapeutic regimens may be achieved even without physical oversight by an oncologist. What services should be delivered by internists and pediatrics versus generalist physicians is unclear.

While IMB is currently able to offer treatment at the district hospital for many cancers, development of a national referral hospital will provide not only more advanced treatment options like radiotherapy, but also improved monitoring and management of toxicity (especially for chemotherapeutic regimens such as liquid tumors).

More work needs to be done on estimating the unit and total costs of cancer screening, regimens and care in Rwanda as part of development of a national strategic plan.
Appendix: Regimens and outcomes for specific malignancies

Adult

Nine patients have been diagnosed with Kaposi’s sarcoma (5 low-risk, 4 high-risk). All 9 patients received infusions of paxitaxel. Most are managed as outpatients, returning to the inpatient wards for each infusion. Those patients whose oral lesions severely limit nutritional intake remain in the inpatient ward between chemotherapy cycles. All nine remain on active paclitaxel treatment.

Six patients have been diagnosed with breast cancer. Most presented with advanced Stage III or IV disease, and thus are not surgical candidates. Three received systemic therapy and then were subsequently placed on Tamoxifen.[11]

Six patients have been diagnosed with cervical cancer. Due to the absence of HPV vaccination and early screening for cervical cancer in Rwanda, most women present with advanced cervical cancer at the time of their initial diagnosis. Two patients were sent abroad for radiation therapy, and one received a hysterectomy. Three patients died from their disease.

Ten patients have been diagnosed with CML.[12] Laboratory technicians at the district hospital typically perform the peripheral blood smear, while chromosomal analysis is performed at BWH. All ten patients received Gleevac for control of their disease. Two patients died from unclear etiologies, but likely due to complications from their malignancy. Eight patients continue on treatment, and are actively followed by monthly visits at each district hospital.

Patients presenting with liquid tumors have included lymphoblastic lymphoma, acute myelogenous leukemia, large cell lymphoma, and chronic myelomonocytic leukemia. Among pediatric patients, Hodgkin’s lymphoma has been the most common type. While the liquid tumors are often some of the most responsive malignancies to systemic therapy, the complications of treatment prechallenges to the current district hospital system. Patients often become severely myelosuppressed from aggressive chemotherapy regimens, placing them at risk for infection and in need of multiple transfusions. Aggressive B-cell lymphomas can be cured with chemotherapy alone. Patients with non-Hodgkin’s lymphoma receive CHOP (cyclophosphamide, doxorubicin, vincristine, prednisone) at standard doses, with occasional dose reductions for baseline severe cytopenias.[13] Patients have also undergone chemotherapy for lymphoblastic lymphoma and acute myelogenous leukemia.

Pediatric

Three patients have been treated for rhabdomyosarcoma (2 alveolar, 1 embryonal). The patient with embryonal rhabdomyosarcoma was treated with chemotherapy and surgery, and has been in remission for three years. Of the 2 alveolar type rhabdomyosarcoma patients, 1 patient became resistant and died, one patient continues on treatment.

Two patients completed treatment for Burkitt’s lymphoma, with one patient in remission for 2 years and one patient who developed resistance and died. A new patient has just been diagnosed and is due to start treatment this month. Current treatment involves combinations of
cyclophosphamide 40-60 mg/kg, vincristine 1 mg/m², and intrathecal methotrexate at 14 day intervals.

Two patients have been diagnosed with Hodgkin’s lymphoma, and received ABVD. One patient successfully achieved remission, but developed cardiomyopathy from the doxorubicin and died 2 months post treatment. The other patient completed an initial round of chemotherapy, relapsed after 8 months, underwent a second course of chemotherapy + radiation, and has currently been in remission for 3 months.

One patient presented with ALL and one patient with AML. The patient with ALL was sent to the US for induction of chemotherapy, which he is now completing near his home in western Rwanda. The AML patient presented late, was referred to King Faisal for treatment, and subsequently passed away.

Two patients presented with advanced osteosarcoma. If metastases are not suspected, patients receive an amputation above the involved site plus vincristine, cyclophosphamide and doxorubicin. Each patient had received amputations. One patient had extensive metastases, and received palliative care only. One patient received chemotherapy but failed to respond and passed away.

Two patients were diagnosed with retinoblastoma and subsequently referred to the national ophthalmology hospital for further evaluation and care.
[1] Thanks to Amy Sievers, Gene Bukhman, Corrado Cancedda, Anne Sosin, Christiane Haeffele, Sara Stulac, and Jacklin St. Fleur for the data and information they provided on the PIH/DFCI cancer program in Rwanda.


[11] Nonmetastatic patients receive doxorubicin + cyclophosphamide + surgery +/- tamoxifen (often empiric as hormone receptor testing is not reliably available). Metastatic breast cancer patients receive empiric tamoxifen and palliative care. IMB is not currently testing for or treating Her-2-Neu positive cancers with trastuzumab. IMB plan to incorporate Her-2-Neu directed therapy in future phases of the program.

[12] PIH is the de facto referral center for CML for Rwanda, because it is the recipient of donated Gleevec. So the disproportionate share of CML patients relative to other cancers is a reflection of these referrals.

[13] Future plans include the use of rituximab, which has been shown increase cure rates by 12%. Current costs and infusion requirements have limited the use of rituximab to date.