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paRTner: UK–Africa partnership for radiotherapy

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▲ The paRTner team meet with the Ghana Society for Medical Physics in Accra in May 2012. Professional standards, career progression and development of a national training scheme were discussed in the meeting

paRTner: UK–Africa partnership for radiotherapy

Kate Ricketts and **Gary Royle** reflect on the first year of the paRTner project, a global health partnership for radiotherapy between the UK and Ghana

In the developing countries of Africa cancer is of alarming concern:

- The World Health Organization predicts that by 2017 cancer's death toll in Africa will exceed that of HIV/AIDS, tuberculosis and malaria combined.
- Cancer rates in Africa are expected to double by 2030.
- Most African countries have less than 5 per cent of the total radiotherapy provision necessary.
- Africa has a population 17 times that of the UK yet only has twice as many trained healthcare workers.
- 80 per cent of cancer patients in Africa are diagnosed at such a late stage that only palliative treatment is possible and many die before the treatment is complete. Many receive no treatment.

Over half of all cancer patients require radiation treatment during the course of their disease. Only a few countries in Africa have any facilities for radiation therapy, and in many cases these are grossly ill-equipped and lack adequately trained personnel.

In response to this upcoming crisis, the Department of Medical Physics and Bioengineering at UCL along with the Radiotherapy Departments at the Royal Berkshire Hospital (RBH) and UCL Hospital have formed a global health initiative called paRTner. Our aim is to apply the resources and expertise for cancer treatment that we have in the UK to accelerate the development of radiotherapy services in developing countries. In May 2012 a team supported by UCL Friends visited Ghana to identify both short- and long-term needs in their radiotherapy service.

On this trip we found a small group of radiotherapy staff who were hard working and dedicated but who lacked the necessary level of training to optimise the service or to develop it in the future. A particularly significant area is a shortage of skilled engineers, leading

▲ **[LEFT]** Jerry Hanson, Head of Biomedical Engineering at KBTH. Jerry regularly improvises engineering solutions for the cobalt-60 unit as spare parts are no longer produced let alone stored. The current gantry and couch mechanisms were all made in-house by his department, and he designed and engineered KBTH's laminar flow hood for chemotherapy preparations from scratch

▲ **[TOP RIGHT]** Cancer awareness programmes are currently underway in Ghana, and have started to target school children. This group of schoolgirls is being taught about risk factors and symptoms of breast and cervical cancer

▲ **[BOTTOM RIGHT]** Ghanaian visit to the Royal College of Radiologists to discuss oncology training and exchange schemes

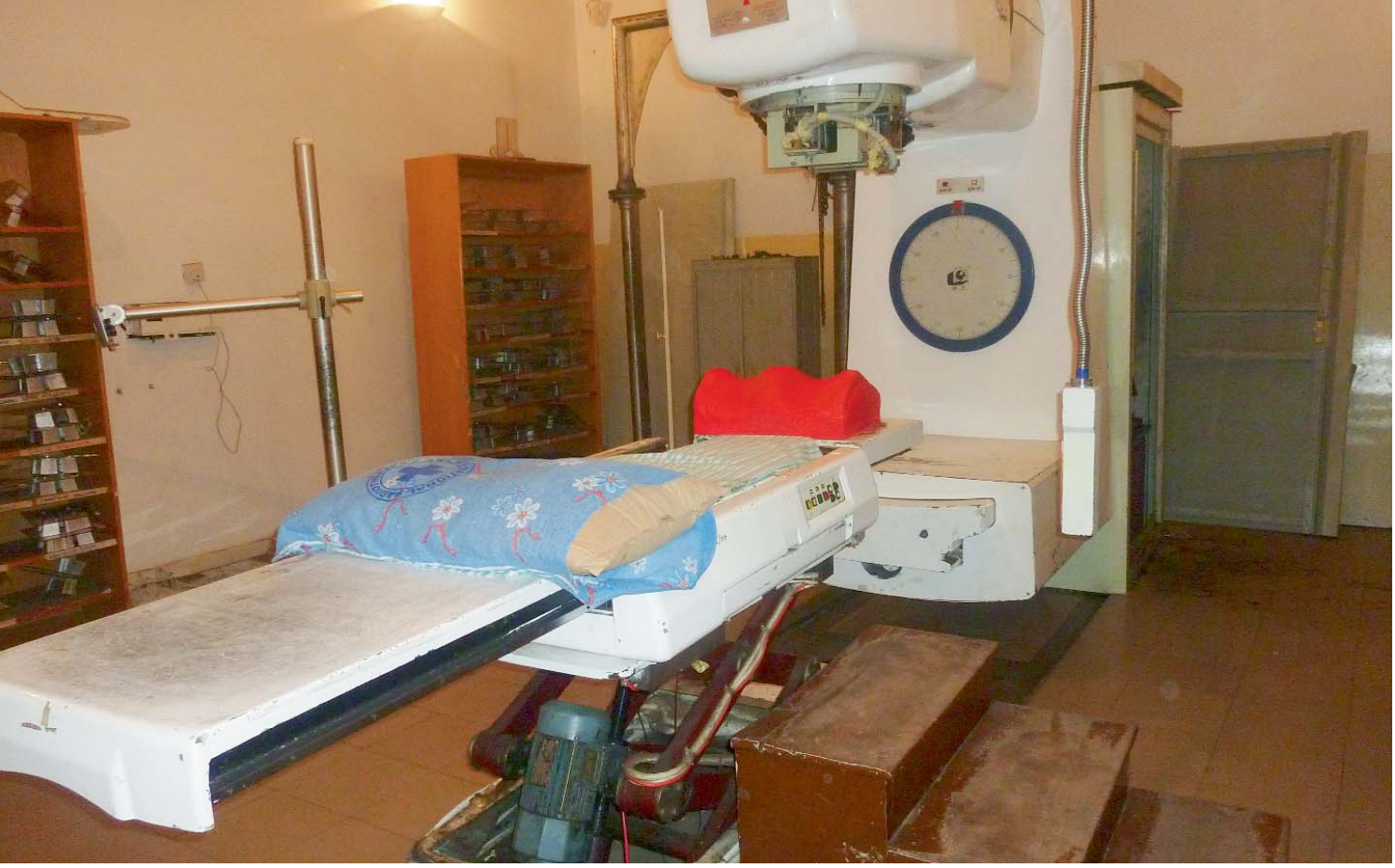
to significant downtime in service provision; a fact strongly expressed by Dr Joel Yarney, the head of Ghana's oncology programme. There is no routine preventative maintenance, meaning that there are frequent breakdowns that take on average 3 weeks to fix. This is largely because departments do not stock spare parts, and need to request funding from management for each repair. At the time of our visit one of the two cancer centres had been unable to treat breast cancer patients for the previous 3 weeks due to a relatively minor equipment fault and insufficient local knowledge to repair it. This will have had a catastrophic impact on the patients about to embark upon or part-way through their treatment regime, estimated to be in the region of 100 patients.

They have dedicated staff who are constantly battling officialdom as well as local beliefs. Meeting with Ghana's two senior medical physicists was a humbling experience and makes me realise what relative luxuries we have in the health service here. The challenges we face pale into insignificance compared to what they see every day. They still have some enormous problems to overcome but their attitude and approach acts as an example to us all. ***Derek D'Souza, Head of Radiotherapy Physics, UCLH***

Cancer landscape in Ghana

Cancer in Ghana is largely diagnosed at a late stage and viewed as a death sentence. Survival rates are estimated to be in the region of 30 per cent for most cancers, compared to 80–90 per cent for the same cancers in the UK. Sixty per cent of Ghanaian women diagnosed with breast cancer are in stage III or IV.[1] This is in great discrepancy to English rates, where a 2012 study found that only around 14 per cent of cases were this advanced.[2] Ghanaian cancer centres also treat cancers not typically seen any more in UK centres. Many of the cancers presented in Ghana are caused by viruses and thus could be prevented with national vaccination programmes. For example, cervical cancer is highly prevalent due to the lack of a cervical screening programme and no nationwide HPV vaccination programme in Ghana. Hepatitis B and C vaccines can protect against the ~80 per cent of liver cancers attributable to the hepatitis virus; the geographical variability of the virus maps precisely to the prevalence of liver cancer globally. There is also a relation between the incidence of Epstein Barr virus (EBV) and the mortality rates of Burkitt lymphoma, the most common childhood cancer in Ghana. Introduction of screening programmes could also impact on early detection rates; advanced screening techniques requiring specialist equipment could be replaced with solutions more suited to the developing world.

Ghana has a population of 25 million people and has a cancer treatment catchment population of nearly 50 million which includes the dependent neighbouring countries of Burkina Faso and Togo. According to international guidelines this population requires >100 radiotherapy treatment units. Currently Ghana can boast of only two cobalt-60 units, one in each of the publicly owned radiotherapy centres: the National Centre for Radiotherapy and Nuclear Medicine, ➤



▲ The cobalt-60 treatment unit at Korle-Bu Teaching Hospital, Accra. This workhorse treats ~50 patients per day and suffers from regular breakdown and source sticking

➤ Korle-Bu Teaching Hospital (KBTH), Accra, and the Oncology Directorate, Komfo Anokye Teaching Hospital (KATH), Kumasi, established in 1997 and 2004, respectively. These centres each employ one qualified radiotherapy physicist, two oncologists and three radiographers. In addition to the two cobalt-60 units, Ghana currently operates two caesium-137 low dose rate brachytherapy units, an orthovoltage unit and a simulator. A third radiotherapy centre called Sweden–Ghana Medical Centre, which is privately owned, is also up and running. The Ghanaian government, under the recommendations of the International Atomic Energy Authority (IAEA), is starting to address the situation and is investing over £10 million to buy a further three treatment machines. Two of these machines will be linear accelerators, although at present there is no linac expertise in the country.

Ghana can expect about 62,500 new cancer patients per annum. According to the International Agency for Research on Cancers, more than 35,000 of these cases would require radiotherapy. The three centres altogether annually treat less than 5,000 new cancer cases, leaving a shortfall of more than 30,000 incidences. There is therefore a huge gap that should be filled by government and stakeholders with support from international bodies and a need to build human capacity in radiation oncology such as oncologists, medical physicists, radiotherapists and therapy radiographers.

In Ghana there is a need for more staff with specialised hands-on training in radiotherapy. Many staff have a theoretical understanding but very little practical knowledge. A training programme will enable Ghanaian professionals to update their skills to the international professional standards in order to confidently handle different areas of radiotherapy. ***James Annkah, paRTner coordinator in Ghana***

Placing cancer services within cultural context

The attitude of the Ghanaian population towards cancer is very different to that in the UK, and high importance should be placed on understanding cancer in its cultural context in order to tackle the root causes of late presentation. Within a populous which subscribes to traditional African religious beliefs where practising 'magic' or 'juju' is commonplace, cancer is perceived as the result of a curse, or a punishment from God, thereby attaching a huge stigma to cancer sufferers and their families. Understandably many people do not want to admit to having cancer as they risk social rejection, and seek treatment too late. Within the local belief system, it is logical to fight 'magic' with 'magic' and many therefore opt to seek help from traditional healers (a cheaper and more discrete alternative to hospital treatment); one study found that herbal medicine or attending prayer camps was the reason for 40 per cent of patients delaying treatment.[1] Some typical responses in a study about the Ghanaian public's view of cancer were:

You get treated and still die.
By saying the word 'cancer' you are 'inviting' or 'bringing' cancer into your life.
Breast cancer is caused by violence, injury and sex.[3]

It is widely believed that cancer is an incurable disease, which has contributed to Ghana's National Health Insurance Scheme (NHIS) not covering cancer treatment. Cancer treatment in Ghana typically costs £300–500, a typical annual income for most of the population; 27 per cent are living on less than £1 per day.

There is a surprising lack of awareness of cancer amongst the population. There is almost no cancer information available and very limited education. A locally run Cancer Awareness Programme is underway to

inform the public about symptoms, but the materials produced only display very late effects of cancer and so early symptoms continue to be missed.

Work has started to address late presentation within this cultural context and to remove the social stigma placed on cancer patients; Eric Addison and his co-workers at KATH visit churches on Sundays to educate the congregation about the medical causes of cancer. Pastors are encouraged to help disband erroneous beliefs and attitudes towards cancer and those afflicted with it. Medical physicists have also hosted training sessions aimed at traditional healers to assist them in diagnosing cancer and to set up working partnerships between the traditional and Western medicine techniques to allow for a more holistic, workable solution to cancer treatment. paRTner is also supporting efforts to boost cancer awareness; Mary Neal from UCL has established an educational link with Ghanaian high schools and will tour Ghana this summer to teach 15–17 year olds about the causes and symptoms of cancer.

Hurdles to overcome

There are groups who dispute the introduction of linac technology to developing nations; concerns of unstable power supplies and incapacity to deal with machine breakdowns are but a few reasons that development has been quashed so far. Indeed, access to spare parts and engineers sufficiently trained to deal with day-to-day issues must be addressed (the closest linac support centre to Ghana is a 5-hour flight to South Africa). However, remaining with cobalt-60 units is just not an option. There are severe clinical disadvantages to using such a low x-ray energy; dose cannot be deposited at deep sites such as for cervical and prostate treatments, particularly when considering the larger size of Ghanaian patients, and such units do not provide the skin sparing effect. Staff in the public centres expressed their concern at the quality of treatments and skin reactions resulting from the equipment available at the public hospitals, with staff morale being greatly affected. Providing them with the opportunity to overcome these issues was met with great interest, and they have made a running start to address issues that have so far held them back: climate (extremes of both humidity and dryness), environment (an incredible amount of dust) and power (they now boast a highly stable power generator). We hope that the installation of linacs in Ghana will act as a test case to demonstrate the training, maintenance and protocols required for linac use in a developing radiotherapy department.

In addition, many of the organisations who work in the healthcare sector in developing countries speak out about their desire for medical device manufacturers to develop technology specifically for the developing markets. This can be in the form of low-cost QA tools, cheap, lower specification instrumentation, simple screening technologies, and so on. Encouragingly some of the major manufacturers are making a step in that direction but for the coming years there will be an urgent push for more.

The paRTner programme

We have learnt a lot and forged important individual, hospital and governmental links during the first year of paRTner; we are now in a position to transfer practical support from UK medical physics and engineering to Ghana. paRTner has secured a 2-year medical equipment grant from the Tropical Health and Education Trust (THET) to establish a training and equipment maintenance programme in Ghana, and has secured further funds from UCL Friends to improve African cancer service provision. Following our fact-finding trip we hosted the two senior medical physicists, Eric Addison and Theophilus Sackey at RBH and UCLH, in order to establish the steps needed for the introduction of linac technology to Ghana. This UK visit also enabled our Ghanaian colleagues to gain first-hand experience of linac management and protocols, and to meet with the Royal College of Radiologists to start a dialogue for improvement of oncology services.

Consideration of the most effective method of training is key. The current training method, where suitable candidates have to be sent abroad, has now outlived its objective due to many reasons:

- The cost of training adequate staff in a dedicated centre abroad to support a medium-sized radiotherapy centre is enormous.
- Trainees do not receive the training designed to equip them for work on return to their home countries, in terms of using equipment they will routinely encounter, rather than the sophisticated equipment in developed countries, and focus on the diseases/situations encountered locally.
- Trainees are not successful at the end of their training, due to language and other cultural difficulties.
- Successful trainees are more likely to stay behind or emigrate to other countries where they are likely to obtain better career prospects than they would otherwise obtain in their home countries.

The above can be overcome through organisation of local intensive training programmes, purposely designed to be more relevant to the needs of individual countries. Such an approach will be cheaper to run, provide more training opportunities for many African professionals and be likely to encourage personnel to stay in their countries to develop local services.

With this in mind paRTner is offering help in the form of mentoring and hands-on training in conjunction with development of e-learning and distance learning tools. A step-wise transfer of knowledge will help them get to a position where they are self-sufficient and have enough staff to provide a service that is sustainable and successful. We will join our Ghanaian colleagues in commissioning their first linac and introducing their first quality system. For the moment the treatments do not have to be of a complex nature due to the late stages of cancer that are presented but, in time, and with local education for the population, they can develop into departments that can join the international community of sophisticated radiotherapy providers. Further initiatives include: sending a team of skilled UK workers to Ghana for 2–4 weeks in the next 6 months to counter the most ➤

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➤ critical shortcomings in the cancer treatment delivery; partnering Ghanaian radiotherapy medical physics and engineering staff with UK counterparts who will remotely assist with planning complex treatments, advise on quality assurance testing and equipment faults, and advise on procurement of new equipment; and put in practice an engineering programme for preventative maintenance whereby we aim to increase equipment uptime at each centre to 90 per cent within 2 years (it is currently about 60 per cent).

This is an opportunity for experienced UK cancer professionals to take part in something that has the potential to have huge impact on patients and staff and to be exposed to patient numbers and pathologies that are increasingly rare here (e.g. cervical cancer), along with the opportunity to learn the basics of radiotherapy in a challenging environment. ***Dr Matt Williams, Clinical Oncologist, Imperial College Healthcare NHS Trust***

Equipment donation practices

As far as delivering a good radiotherapy service in Ghana, the team require help in the form of equipment. Many UK departments may well have old equipment that they simply do not use any more but which could greatly benefit the Ghanaian departments. paRTner will be regularly touring the UK to collect any donated equipment, big or small.

THET is currently preparing a good practice toolkit for medical equipment donations to low-resource settings. The primary audience for the toolkit is health partnerships and other UK organisations that donate medical equipment as part of their activities. The toolkit includes good practice guidance for each stage of the donation process, from initial discussions between donor and recipient about what is required after donated equipment arrives, is installed and ready for use. It includes in-depth case studies, practical information about shipping and customs logistics, and templates for donations paperwork. Most importantly, it highlights what both donors and recipients need to do to ensure that a donation will be appropriate and useful for the recipient, as opposed to burdensome. The toolkit will be formally launched in the autumn of 2013. For more information visit **http://www.thet.org/hps/resources/ articles**.

The Ghana Society for Medical Physics

As Dr Francis Hasford, Assistant Secretary of the society explain, Medical physics training started locally in Ghana in 2004. The programme has since produced 25 medical physicists who are serving in the country's radiotherapy, nuclear medicine and diagnostic radiology, research and tertiary institutions. The programme includes two semesters of didactic education followed by 1 year of research and clinical training. This is followed by a 1-year internship covering radiation oncology, diagnostic radiology and nuclear medicine at KBTH and/or KATH for local graduates. The Medical Physics Department of the Graduate School of Nuclear and Allied Sciences in the University of Ghana is gradually becoming the hub of medical physics training in the sub-region, attracting a number of foreigners from some African countries. The department currently hosts five IAEA fellows for academic and radiotherapy clinical training.

An infrastructure is in place at the Ghana Atomic Energy Commission (GAEC) campus for academic training of the medical physics students. In addition to the research programmes of the individual lecturers, GAEC's Radiological and Medical Sciences Research Institute (RAMSRI) has an active research programme in place and students benefit from the Institute's programme with the research team leaders as supervisors to deal with the research component of the academic programme. RAMSRI is being nurtured into a complex, composed of a hospital with a radiation emergency medical facility and research centres promoting indigeneous research with the main research activities in medical diagnostic imaging and cancer treatment. This project, when completed, would immensly contribute to the training of medical physicist students since the facility, which is to be cited very close to the medical physics department, would serve as the official training facility for students. Currently, some of the lecturers in the department double as clinical medical physicists in the oncology and nuclear medicine centres in the country. This arrangement promotes good structure in conducting clinical training with the lecturers having access to facilities for training.

> "It highlights what both donors and recipients need to do to ensure that a donation will be appropriate and useful"

The Medical Physics Department has been an indispensable and strategic stakeholder in educational and training programmes in the radiation sciences in the country. Resource persons from the department have been the backbone of the training programmes for radiologists, radiographers, oncologists, dentists, nuclear scientists and health physicists in addition to their core business of providing training for medical physicists. The faculty is staffed with competent, qualified and highly motivated lecturers. There is a culture of continuing education and skills upgrading in place, including refresher courses and long-term training leading to PhD degrees to promote research and clinical skills to offer the best services.

The paRTner project is important to Ghana in the sense that it would aid in improving radiotherapy services by training of personnel, development of techniques and protocols, and increasing capacity of equipment. This objective would be achieved through (a) provision of resources in terms of training, teaching, personnel and provision of equipment, (b) location of funding for training support and assistance to help Ghanaian radiotherapy departments secure funding internally, (c) practical training courses tailored to local needs, (d) collaborations between Ghanaian universities and hospital departments, and between UK and Ghana universities. ***Ghana Society for Medical Physics***

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The journey ahead

The road ahead for Ghana's developing radiotherapy service is a challenging one. To reach the ultimate goal of three to four treatment machines per million of population requires not only huge investment but a huge growth in qualified personnel and expansion of the necessary infrastructure and nationwide organisation. Those currently in the profession face an intensive period of lobbying for further investment to meet future demand, at the same time as increasing the number of referrals through cancer awareness campaigns and referral networks in order to create that future demand; it's a fine balance. But it is one that the UK and many other countries have faced before, and look how far we've come; so the road ahead need not be quite so challenging because the template for development has been set. Solutions to most of the future issues already exist and this is where we see the potential benefits of a UK–Ghana partnership, or a UK–any developing nation partnership for that matter.

In the short term we can assist with the expansion of the service through the arrival of the first linacs in the public sector. In the medium term we can assist with cancer awareness and education, training of future workers to expand provision even further to meet the predicted growth in demand, the integration of IMRT, IGRT and other state-of-the-art methodologies into the clinic, career development, and so on. And in the long term we can assist with lobbying for further investment to expand the service even further. There are large parts of the country without any cancer service and only a very small minority live within 1 hour of an oncology department. Imagine if we could help to plant a radiotherapy centre in the north of the country, with its catchment population in excess of 10 million. The north is a deprived region with no access at present to cancer treatment, and it will also offer provision to Burkina Faso.

The scope for a partnership of this type is vast because of the multidisciplinary nature of the field, and so, given the breadth and depth of UK expertise around this area, we should be ambitious and aim high. For a fledgling service with limited numbers of qualified personnel the road ahead is challenging, as indeed it was for the pioneers of the UK radiotherapy service. But, in partnership with experienced, enthusiastic, UK colleagues, who all have the benefit of hindsight, the journey can become quicker and smoother.

The paRTner project has proven to be a great success and is a superb example of developing professional links to hospitals and organisations beyond our traditional spheres of operation. I am fully in support of any mechanism that permits an extension of our competencies to those who could build upon our success either in terms of clinical guidance or the creation of professional standards. Perhaps of greater relevance, though, is the improvement of healthcare for the population of Ghana who was not only able to identify immediate benefits of the exchange but also is enthusiastic to maintain an ongoing relationship. Such an exchange of staff or ideas can only provide benefits to all concerned including the Royal Berkshire Hospital Cancer Centre and Medical Physics, and as Departmental Director I am extremely enthusiastic for my staff to reach out nationally and internationally to assist with improvements in patient outcome. ***Professor Malcolm Sperrin, Director of Medical Physics, RBH*** ■

→ FOR FURTHER INFORMATION
For more on the paRTner programme please contact **k.ricketts@royalberkshire.nhs.uk** or visit **http://www.ucl.ac.uk/medphys/international/homepage**

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→ THE PARTNER TEAM
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9 Department of Radiotherapy, Imperial College Healthcare NHS Trust, London

▼ **TABLE 1.** Top ten cancers at Korle-Bu Teaching Hospital in 2009, provided by Dr Joel Yarney, Clinical Director

TABLE 1

Cases	Number of patients	%
Breast	288	25.8
Cervix	207	18.5
Head and neck	165	14.8
Prostate	117	10.5
Sarcoma	43	3.8
Ovary	42	3.8
Colorectal	35	3.1
Lung	18	1.6
Endometrium	16	1.4
Wilms	8	0.7
Others	179	16
Total	1,118	100