Purpose/Objective: Optimal radiotherapy utilization (RTU) rate has been studied for developed countries following an evidence-based, criterion-based method or based on assessment of current practice. In Australia, it has been determined to be 52.3% in 2003 later adjusted to 48.3% in 2012.
For developing countries, current estimates of the proportion of cancer patients who require radiotherapy can be estimated from the distribution of cancer types and stages. The purpose of this project was to assess the optimal RTU rates in 9 middle-income countries, following an evidence based method.
Materials and Methods: Nine middle-income countries were selected to participate in this assessment.
International guidelines were reviewed for external beam radiotherapy indications. Epidemiological data on the proportion of new cases of cancer with indication for radiotherapy specifically for the 9 target countries were identified. Indications and epidemiological data were merged to develop an optimal radiotherapy utilisation tree following the Collaboration for Cancer Outcomes Research and Evaluation (CCORE) method. Univariate and Monte Carlo simulations were used in sensitivity analysis. Globocan-2012 lists 27 tumour types and there is a difference between the total for the individual tumour sites and the total number of cancers reported overall. The database does not report a separate 'unknown' category. The difference between the total cancer cases and the sum of the 27 identified cancer types is a combination of 'other' and 'unknown' cancers. 'Other' and 'unknown' are split roughly 50:50 in Australia where 'other' has an optimal RTU rate of 19% and 'unknown' of 61%. The average is thus 40%. We have assumed this is the same in the 9 target countries. It is probably an underestimate as there are likely to be higher proportions of unknown in middle income countries.
This project also includes a prospective direct assessment of the actual RTU rates in these countries and the results will be reported separately.
Results: The optimal overall RTU rates found for the target countries were: Costa Rica 47%, Ghana 50%, Malaysia 52%, Philippines 52%, Romania 51%, Serbia 53%, Slovenia 48%, Tunisia 54% and Uruguay 51%. The mean value was 51%.
There was a difference of 7% between the lowest optimal RTU in Costa Rica (47%) and the highest in Tunisia (54%). This difference may be due to the incidence of three types of cancers treatable with radiotherapy and which have a lower incidence in Costa Rica than in Tunisia: bladder (1.8% vs. 6.5%), lung (6.6% vs. 20.0%) and nasopharynx (0.8% vs. 3.8%). 27.4% of all cancers in Ghana were cervix ca. with colorectal 1.7%. However, the category 'other and unknown' in Ghana was 11.5% probably reflecting issues with cancer registration.
Conclusions: The optimal RTU rate in this group of 9 middle-income countries did not differ significantly from that found in higher income countries.

OC-0193

Current radiotherapy capacity in post-Soviet countries; an IAEA survey

E. Rosenblatt[1], E. Fidarova[1], O. Utehina[1], S. Tkachev[2], M. Kislyakova[2], N. Semikoz[3], V. Sinaika[4], V. Kim[5], N. Karamyan[6], I. Isayev[7], K. Akbarov[7], Lomidze, D.(8), O. Bondareva[9], P. Tuzlukov[10], M. Zardodkhonova[11], J. Alimov[12], G.W. Jones[13], M. Barton[14], W. Mackillop[15]
[1]IAEA - International Atomic Energy Agency, Nuclear Applications, Vienna, Austria
[2]Blokhin Cancer Research Centre, Radiation Oncology, Moscow, Russian Federation
[3]Donetsk Cancer Centre, Radiation Oncology, Donetsk, Ukraine
[4]Alexandrov Research Institute of Oncology and Medical Radiology, Radiation Oncology, Minsk, Belarus
[5]Kazakhstan Research Institute of Oncology and Radiology, Radiation Oncology, Almaty, Kazakhstan
[6]National Center of Oncology, Radiation Oncology, Yerevan, Armenia
[7]National Center of Oncology, Radiation Oncology, Baku, Azerbaijan
[8]City University Hospital, Radiation Oncology, Tbilisi, Georgia
[9]National Centre of Oncology, Radiation Oncology, Bishkek, Kyrgyzstan
[10]Moldavian Oncological Institute (IMSP), Radiation Oncology, Chisinau, Moldova,
[11]Republic Cancer Centre, Radiation Oncology, Dushanbe, Tajikistan
[12]Institute of Oncology and Radiology, Academy of Sciences of Uzbekistan, Tashkent, Uzbekistan
[13]Credit Valley Hospital and Trillium Health Centre, Radiation Oncology, Mississauga, Canada
[14]Ingham Institute for Applied Medical Research, Radiation Oncology, Sydney, Australia
[15]Queen's University, Division of Cancer Care & Epidemiology, Kingston, Canada

Purpose/Objective: The IAEA is assessing the current capacity and quality of radiotherapy (RT) services in post-Soviet countries. We can now report on the current infrastructure in 12 countries in terms of number of facilities, equipment and staffing. The countries are: Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russian Federation, Tajikistan, Turkmenistan, Ukraine and Uzbekistan.
Materials and Methods: In June 2012, Country Coordinators (CC) were identified. The CC had to provide: [1] infrastructure and quality indicators (QI) on their respective country, [2] infrastructure and QI on their own RT centre and [3] infrastructure and QI on other RT centres in their country. The survey questionnaire was adapted from two validated sets of QI for RT.
The third and final phase of the Project consists of collection and analysis of QI on most RT centres in these 12 countries and this will be reported separately.
Results: The overall data on RT infrastructure of 12 countries as reported by the CCs is presented in Table 1.
The total number of RT centres is 250 with the Russian Federation having 144 centres, and Ukraine 52.
The calculated number of TT machines/1M inhabitants was 2.1 but varied widely from 0.1 in Tajikistan to 2.8 in the Russian Federation. The calculated number of TT machines per 1000 new cases/year was 0.8 but varied from 0.14 in TAJ to 1 in Turkmenistan, 0.77 in RUS and 0.75 in UKR.
The organization of RT services usually includes a leading cancer centre with research capacity, large RT centres in large cities and smaller provincial centres. The group presents heterogeneity in that some metropolitan centres operate with modern equipment, while the majority rely on stand-alone Cobalt-60 machines.
Assessment of staff levels was challenging since countries use professional designations and tasks which do not correspond to those in the west. In some countries, a 'radiologist' is licensed to read imaging studies, deliver radiotherapy and practice nuclear medicine. The profession of radiation therapist (RTT) is not well defined and the training path is minimal. The operation of treatment machines is done by

nurses who train on-the-job. Most countries do not have focused education programmes for RTTs.

Table 1: Current radiotherapy resources in post-Soviet countries, relative to cancer incidence (Globocan-2012)

Country	Population million (2012)	Number of new cancer cases (x1000) in 2012	No. RT centres	LINACs	Co-60 units	Teletherapy machines/ million	Teletherapy machines/1000 new cancer patients/year	Conventional simulators	CT-sim	TPS	BT systems	RO	MP	RTT
ARMENIA	3.1	10.9	2	2 (1 n.o)	3	1.2	0.4	1	1	4	2	15	4	9
AZERBAIJAN	9.4	13.9	3	5	3	0.85	0.8	0	3	5	2	20	6	20
BELARUS	9.5	32.4	13	10	15	2.6	0.77	6	6	16	18	117	62	55
GEORGIA	4.3	12.4	4	5	1	1.3	0.5	1	3	3	2	18	12	21
KAZAKHSTAN	16.4	40.4	19	8	26	2.0	0.8	16	4	39	17	98	39	110
KYRGYSTAN	5.4	5.8	1	0	2 (1 n.o.)	0.3	0.3	0	1	1	0	14	5	6
MOLDOVA	3.5	9.9	1	1	2	0.85	0.3	1	1	3	1	21	4	12
RUSSIAN FED.	142.7	458.4	144	183	221	2.8	0.77	29	16	170	152	1251	487	1193
TAJIKISTAN	7.1	5.5	1	0	1	0.1	0.14	1	0	2	1	5	2	0
TURKMENISTAN	5.2	6.0	5	2	4	1.1	1	0	1	0	4	No data		
UKRAINE	44.5	141.0	52	21	86	2.4	0.75	6	28	60	49	460	188	59
UZBEKISTAN	28.1	22.6	5	1 (n.o.)	5	0.2	0.2	1	0	-	1 (n.o.)	20	4	25
All countries combined	279.2 (sum)	759.2 (sum)	250 (sum)	238 (sum)	369 (sum)	1.3 (mean) 2.1 (calculated)	0.56 (mean) 0.8 (calculated)	62 (sum)	64 (sum)	303 (sum)	249 (sum)	2039 (sum)	813 (sum)	1510 (sum)

TPS = tr. planning systems, BT = brachytherapy, RO = radiation oncologists, MP = medical physicists, RTT = radiation therapists, n.o.: not operational. Turkmenistan data: subject to confirmation from official sources.

Conclusions: The results indicate heterogeneity with regards to appropriate levels of infrastructure. Some countries reach (Turkmenistan) or approach (Azerbaijan, Russia, Belarus and Ukraine) 1 TT machine/1000 cancer patients/year relative to 2012 cancer statistics.

These indicators represent an approximate estimate of resource availability, but do not reflect patient access or quality of the radiotherapy services.

Teaching Lecture: Lung SCLC-How can we improve survival further with radiotherapy?

SP-0194

Lung SCLC-How can we improve survival further with radiotherapy?

L. Kepka[1]

[1]*SP ZOZ MSW Warmia & Mazury Oncology Centre, Radiotherapy, Olsztyn, Poland*

Radiotherapy (RT) has always been kept, one way or another, as a part of the multidisciplinary management of small-cell lung cancer (SCLC). In 1957, a clear distinction between two categories of SCLC – limited-disease (LD) and extensive-disease (ED) – depending on the possibility of inclusion of all possible disease sites into a single radiation portal – was made. This reflects a historically recognized value of RT for treatment outcome of SCLC. Nowadays, in the era of the use of modern technologies for imaging and RT planning, the distinction between LD and ED is made on the basis of the presence of distant metastases. But still we weigh up a value and the extent of improvement of outcome with RT use separately for LD and ED.

Thoracic RT in combination with chemotherapy and prophylactic cranial irradiation (PCI) increase 3-year survival by approximately 5% each, as shown in the meta-analyses. One randomized phase III trial demonstrated also a survival advantage by PCI of 13.5% at one year for ED-SCLC. Recently, it was demonstrated in a randomized trial that the addition of thoracic RT (30 Gy in ten fractions) after any response to chemotherapy in ED-SCLC improved 2-year survival. Although all of these improvements per se are relatively small there is a wide consensus among oncologists that these treatments should be offered to SCLC patients. Additionally, these advancements in the therapy of SCLC are worth of consideration in the context of poor survival unchanged with the use of chemotherapy over the past thirty years.

What next? Could we improve survival further with radiotherapy?

Certainly, it is a room for improvement in some areas which are still under investigation as an issue of radiotherapy dose, timing, fractionation and target volumes. Current recommendation for LD-SCLC is the use of radio-chemotherapy with early accelerated hyper-fractionated RT. However, such an approach may not be convenient and its toxicity makes it unfeasible for fragile and/or elderly patients. The use of newer RT technologies and proper selection of patients for aggressive radio-chemotherapy schedules are expected to improve treatment tolerance.

A small improvement of survival obtained with PCI may be compromised by worse quality-adjusted life expectancy in long term survivors, as the pronounced effect of neurotoxicity (NT) becomes apparent after several years. What factors should be considered for an individual patient to find a balance between benefits of prolongation of survival by the reduction in the incidence of brain metastases and the risks of short-term and long-term toxicity? Over the past fifteen years, since an influence of PCI on survival was first demonstrated, magnetic resonance imaging (MRI) has become the imaging technique of choice in patients suspected of brain metastases. This change may decrease the number of patients eligible for PCI, as MRI is more sensitive than computerized tomography in detecting brain metastases. For better understanding of the extent and severity of late NT, long-term follow-up of patients included in prospective studies is needed. Also, some attempts have been made to prevent the development of neurocognitive decline attributed to brain irradiation. Long-term outcome of such approach is awaited.

Thoracic RT and PCI obviously do not decrease the progression rate outside the thorax and brain, thus the addition of RT to sites of extrathoracic and extracerebral metastases might also merit investigation. It is in line with growing interest and increasing data that accumulate evidence on the value of RT in the treatment of oligometastatic disease for other cancers. Such an approach is being investigated in the randomized trial by the Radiation Therapy Oncology Group.

Advancements in RT technologies proved to increase survival rates in population-based studies for Non-SCLC patients. It is reasonable to expect that it is also valid for SCLC patients; better radiation volume definition prevents from geographical misses and reduces unnecessary healthy tissues irradiation.

All these issues will be discussed in detail during the lecture.

Teaching Lecture: On the need of Population-based studies of arbitrary cancer management in the elderly

SP-0195

On the need of Population-based studies of arbitrary cancer management in the elderly

J.W. Coebergh[1], H.A. Maas[2], M. Aarts[3]

[1]*Erasmus University MC, Public Health, Rotterdam, The Netherlands*

[2]*Tilburg Hospital Tweesteden, Geriatrics, Tilburg, The Netherlands*

[3]*Netherlands Cancer Registry, Research (section Quality of Care), Eindhoven, The Netherlands*

Much has been said already on the complexities and unknowns in management of cancer in the elderly, by 2020 more than 50% of all newly diagnosed patients with cancer older than 65 years, >30% when >75 years and about 10% over 85 years in most European countries. Above age 65 and rising with age, about 10% of newly diagnosed cancers is a second cancer, excluding those in the same organ site [skin - basal cell carcinoma (BCC) and large bowel as well as