СЕВЕРО-АМЕРИКАНСКИЙ ВЗГЛЯД НА ОБУЧЕНИЕ МЕДИЦИНСКИХ ФИЗИКОВ В РОССИИ

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От редакции. В ноябре прошлого года для чтения лекций на курсах повышения квалификации медицинских физиков, проводимых АМФР на базе НМИЦ онкологии им. Н.Н. Блохина, были приглашены медицинские физики из США и Канады. Вернувшись домой, они написали о своих впечатлениях в свои журналы, а также прислали статью для публикации нашем журнале. Мы публикуем перевод на русский язык этой статьи и приводим фото статей, опубликованных в Канаде и в США, считая, что это будет интересно для наших читателей.

В ноябре 2017 г. нам представилась возможность преподавать на курсе “ЛТМИ и другие конформные методы” при поддержке ААМФ/АМФР в РОНЦ им. Н.Н. Блохина. В то время как д-р Эмили Соасон уже бывала в России в 2015 г. в качестве преподавателя на курсе, для д-ра Эмили Хиф это был первый визит в Россию. Наши доклады включали дозиметрию малых полей, радиобиологию, качество и безопасность, гарантию качества ЛТМИ, вторичные расчеты мониторных единиц, адаптированное планирование, отступы, IGRT и терапию протонами и тяжелыми ионами. Лекции читались на английском языке с переводом на русский в режиме реального времени. Перевод был обеспечен группой медицинских физиков из центра Н.Н. Блохина.

В этой статье мы хотим поделиться нашими впечатлениями о медицинской физике в России с нашей северо-американской точки зрения. Первое, что мы поняли – это то, что московская клиника очень похожа на нашу клинику в Северной Америке с точки зрения размера, состава и количества персонала и оборудования. Мы отметили, что все современные методы ЛТ, используемые у нас дома, также доступны и в центре Н.Н. Блохина. Местный персонал хорошо разбирается в современной ЛТ, и мы узнали некоторые новые вещи во время экскурсии по отделению и при прослушивании лекций.

Мы обнаружили, что Россия столкнулась с той же проблемой в разнице качества оказываемых услуг среди различных регионов, что и многие области Соединенных Штатов и Канады. Нас впечатлили усилия АМФР, направленные на агрессивное решение данной проблемы. АМФР, без сомнения, проделала большую работу в этом направлении, и напрямую принимает участие в различных обучающих программах.

Так как обучающие ресурсы для клинических физиков в России представляются менее доступными, по сравнению с США и Канадой, АМФР обращается за помощью к другим орга-

низациям (МАГАТЭ, ЭСТРО, ААМФ, и др.) для повышения квалификации преподавателей в соответствии с общепринятой практикой в радиационной онкологии. Как результат, настоящие курсы продолжают обеспечивать обучение медицинских физиков из России и стран СНГ на очень высоком уровне.

Нас удивили несколько моментов, касающиеся практики проведения лучевой терапии в России. Первый момент – это использование кобальтовых аппаратов и существование рынка для новых кобальтовых аппаратов в России. В то время как в Северной Америке кобальтовые аппараты для лечения людей используются крайне ограниченно, в Москве они остаются основным элементом лучевой терапии. Многие российские физики отметили надежность этих аппаратов, и мы не можем поспорить с философией “если они не сломаны, то зачем их демонтировать!”. Несомненно, кобальтовые аппараты продолжают использоваться в России, и мы согласились с этой практической логикой.

С другой стороны, мы были удивлены открытием протонного центра в Санкт-Петербурге. Несмотря на то, что в американской системе здравоохранения было проведено масштабное инвестирование в протонную терапию, этот метод лечения до сих пор недоступен в канадской государственной системе здравоохранения (кроме ограниченного числа облучений в Ванкувере). Дебаты по поводу обоснованности использования протонной терапии с точки зрения клинической выгоды и стоимости лечения до сих пор ведутся в наших странах. Несмотря на то, что протонная терапия в Канаде уже не за горизонтом, страна до сих пор отправляет потенциальных “протонных” пациентов на лечение в США, что является обоснованной финансовой моделью для канадского правительства.

По впечатлению от наших лекций на курсе, нам показалось, что студенты были более всего заинтересованы в следующих направлениях: протонная терапия, адаптированное планирование, радиобиология, качество и безопасность. Слушатели продемонстрировали живой интерес к изучению новой информации, а также к прикладным советам, которые можно стазу же применить на практике. Нас очень обрадовало большое количество вопросов после каждой лекции. Во многих случаях нам приходилось переосмысливать свой собственный практический опыт и информацию, лежащую в основе наших рекомендаций.

В дополнение к сильной академической составляющей, сотрудники АМФР включили в нашу неделю и активную социальную программу. Несмотря на холодную и облачную погоду, мы прекрасно провели время. Осматривать Москву нам помогали несколько студентов из нашей группы. Это было прекрасно узнать людей вне лекционного зала, и мы им очень благодарны за помощь. Перед началом курса в воскресение после обеда Эмили Хиф присоединилась к студентам для экскурсии по Кремлю и Красной площади. Позднее на неделе Сергей Тимошенко из Твери организовал для нас прекрасный тур по музею космонавтики. Мы также побывали на выступлении танцевальной группы “Тодес”. Наш свободный день – пятницу, мы использовали для посещения Красной площади, музея “Гараж” и парка Горького. Мы зашли в магазин сувениров и приобрели матрешки и русскую водку, чтобы взять с собой на память в Северную Америку.

Мы глубоко признательны ААМФ и АМФР за то, что дали нам такую возможность посетить Москву и Онкологический центр им. Н.Н. Блохина. Мы будем призывать ААМФ к продолжению поддержки этого курса и надеемся на сотрудничество в будущем.

EDUCATION AND TRAINING OF MEDICAL PHYSICISTS IN RUSSIA

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and
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We recently had the opportunity to join the faculty of a joint AAPM/AMPR sponsored training course at the N.N. Blokhin National Medical Research Centre of oncology in Moscow, Russia on the topic of "IMRT and Other Conformal Techniques in Radiation Therapy". The course was organized, on behalf of the AAPM, by Joanna Cygler of the Ottawa Hospital Cancer Centre. The course was held during one week of a four week course where students from all over Russia and the Commonwealth of Independent States (CIS region) travelled to Moscow for training on modern techniques in radiation oncology.

During our stay in Moscow, we learned about the education and training model in this region, and we thought we would share what we learned with the COMP membership.

Due to a severe shortage of trained medical physicists, formal training is not necessarily a condition of employment for medical physicists in Russia. Many of the physicists that we met had entered the field from other areas of science and had received their medical physics training on the job. Some, such as those enrolled in our course, are sent to Moscow to receive didactic and hands on training at the International Training Centre (ITC) of the Association of Medical Physicists in Russia, which is based in the predominant teaching hospital in Russia. The ITC provides education and training in medical physics for medical physicists, radiation oncologists, radiotherapy administrators and healthcare managers throughout Russia and the CIS region. There are two universities (Lomonosov Moscow State University and National Research Nuclear University MEPhI) in Moscow and several others universities in other big cities (Saint-Petersburg, Belgorod, Kazan, Saratov, Tomsk, etc.) offering graduate education programs in medical physics (two year master's degree programs in medical physics).

Blokhin is the home base for Russia's medical physics professional organization, the Association of Medical Physicists in Russia (AMPR/ AOMP), including their international training center (ITC). The AMPR was founded in 1993 with a mission of "building competence in medical physics through education and training". As techniques have become more complicated, the need for formal training has increased. The organization now has more than 600 members. Its founding president, Dr. Valerie Kostylev, who is known worldwide for his leadership in medical physics, unfortunately passed away last year, leaving a new generation of young physicists to take over the organization.

This organization has worked hard to improve access to high quality radiotherapy in Russia and the CIS region by offering a variety of training options in Moscow. In addition to offering their own courses, they are very proud to partner with AAPM, IAEA, and ESTRO in offering jointly sponsored Russian language educational programs. In addition, they publish a Russian medical physics journal, (Meditsinskaya Fizika) and coordinate the WHO TLD audit program throughout the region. The AMPR keeps records of staffing and equipment in radiotherapy centers of the Russian Federation. In projects they performed in the early 2000s, they showed that Russia was lagging behind the rest of the developed world due to significant shortages in qualified medical physicists and equipment, and have since been working hard to advocate for increased investment in equipment and training. In addition, they suffer from a problem of a self-described "brain drain", where they lose trained medical physicists from throughout the CIS region to urban areas or the private system, resulting in a continued shortage of trained professionals outside urban centers.

The AMPR has had particularly close collaborations with the IAEA on three technical cooperation projects to address these shortages. During the period of 2012 – 2017, 406 Russian speaking medical physicists from 19 countries were trained at IAEA/ AMPR courses held at the ITC. In addition to the 20 courses given by AMPR faculty at the clinical base of

Blokhin Centre, modern dosimetry equipment was distributed to seven countries (Armenia, Belarus, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan, and Uzbekistan) and five IAEA documents were translated into Russian and distributed among the participants of the courses. Funding from these projects was also used to upgrade physics equipment at the training center in Moscow.

The ITC at Blokhin has all the modern equipment that you would see in a typical clinic in Canada. They have four Varian iX machines equipped with full IMRT and IGRT capability, two Varian low energy linacs (600x and 6EX), one Cobalt machine, and most of the physics equipment you would see in your own clinic's storage area, including PTW dosimetry equipment, diode arrays, QA phantoms, etc. They have a private Cyberknife facility housed on the same campus. In addition, they have a virtual training environment (VERT) that they purchased as a part of the aforementioned training project.

We found the Russian faculty at the ITC was up on recent developments in radiation therapy and, as a whole, quite young. They have solid foundations in physics and are doing their best to offer care that is comparable to Europe and North America, despite not having the same regulatory environment. They have maintained efforts to keep their faculty up to date on the latest techniques, which often requires sending them out of the country for additional training. In addition, as was the case in this course, they invite faculty from North America and Europe to teach in local courses, which does not just serve to teaching the students, but also to provide new information for their local trainers.

There were 16 participants in the course from all areas of Russia, with a few from the Republic of Kyrgyzstan. Most of them were coming from centers with a few physicists (2 – 5) and a wide variety of equipment. While 60Co teletherapy machines are still standard in Russia, and continue to be purchased, many centers can also now offer IMRT and IGRT on modern state-of-the-art linacs. Russia has a public/private healthcare system, and within the private system you can find robotic radiosurgery and even proton therapy.

While there was some use of Eclipse, Pinnacle, and Monaco, many were using a Russian treatment planning system called Amphora, ROCS. All participants have HDR (MultiSource or GammaMed) and Cobalt (mainly Terabalt or Theratron), and most had at least one accelerator, with models ranging from the 600C and SL20 to Truebeam and Synergy. When we polled them on use of the equipment, we found that they were not necessarily using it to full capacity. For example, while many had CBCT, several were not actually using it clinically. Their hope in completing the course was that they would obtain the knowledge they need to properly implement IGRT and IMRT capabilities.

The program in which we were teaching was the third joint AAPM/AMPR course at the ITC. In addition to the lectures that we gave on more modern concepts in radiotherapy, the other weeks of the course covered more fundamentals of commissioning and QA for new techniques. For example, there were many lectures and hands-on training on IMRT and IGRT implementation and quality assurance. Our topics were assigned to us based on the interests of the course coordinators. Emily Heath taught the more academic topics of dose calculation algorithms, radiation biology, proton and heavy ion therapy, and the IAEA's small field dosimetry protocol, while Emilie Soisson covered the more clinical topics of IMRT PSQA, independent MU calculations, adaptive planning, autoplanning, margins and IGRT, and quality and safety. We found determining the right level was sometimes difficult. For example, Emilie Soisson had the topic of independent MU calculations. We assumed they were doing independent MU calculations and that they were interested in new methods, when in fact, they were interested because they do not do independent MU calculations and were wondering on a more basic level why we do secondary MU calculations at all. Some of the topics were also quite broad, for example Emily Heath's topic of "Radiobiology", so it was a bit tricky to ensure we were teaching the most relevant material. In addition, we had to learn how to communicate the material with the constraint of having everything we said translated to Russian by a live translator.

Of course, in addition to classes, there was a busy social program, which enabled us to go out and enjoy being in Moscow. We were treated to trips to Red Square, museums, a night out at the theater, and many meals of Russian staples, like borscht and pelmeni (Russian dumplings). Of particular memory was our guided tour of the Russian space museum by Sergey Timoshenko, a medical physicist from Tver, Russia, who had never visited the museum before, but was a space enthusiast with his own encyclopedic knowledge of the Russian space program. When asked what his favorite thing in the museum was, he said it was the authentic space suit of American astronaut Michael Collins. Sergey told us it was special because it was the original (not a replica) and was given to the Russians as a gift. In addition to guided activities, we were given a day off to do our own exploring, quite the treat for a couple of working moms with a total of seven kids left behind.

In summary, we were happy to be invited to participate in this Russian training course. We were impressed with the AMPR, the Blokhin radiotherapy clinic, and ITC, as well as the faculty and staff of the program. While we both underestimated the time it would take to prepare the combined 15 hours of lecturing to a group of students with very different clinical practices and academic background, we found the experience rewarding and were happy that we had the opportunity to participate. We also look forward to continuing to support this important collaboration in the future.

With the students in our classroom at the Blokhin Centre.

Emilie in the waiting area outside the Cyberknife 'Oncostop' centre.

Sightseeing during out day off.

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AMERICAN ASSOCIATION of PHYSICISTS IN MEDICINE

Improving Health Through Medical Physics

A Report on the 3rd AAPM/AMPR Training Course in Moscow, Russia

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The purpose of this article is to report on the most recent joint training course on "IMRT and Other Conformal Techniques in Radiation Therapy" organized between the Association of Medical Physicists in Russia (AMPR) and AAPM, that was held in Moscow, Russia this past November. AAPM's participation in the course is organized by the International Training and Research Coordination subcommittee, currently chaired by **Dr. Joanna Cygler**, whose charge is to facilitate medical physics training and research opportunities for international medical physicists.

This course was the third such collaborative teaching course with the AMPR over the past five years. As in previous years, the course covered topics in modern radiation therapy with the goal of providing international perspective on a variety of topics. Lectures were given by faculty from both AAPM and AMPR in Russian. (AAPM lectures were given in English with live translation to Russian.) The students, who come from all over Russia and the Commonwealth of Independent States (CIS) region, stay in Moscow for a total of 4 weeks of training at the AMPR's International Training Center (ITC) that is housed in the N.N. Blokhin National Medical Research Centre of Oncology in Moscow, Russia, home of the AMPR and Russia's predominant teaching hospital.

As in previous years, AAPM sent two members to join the faculty, **Dr. Emilie Soisson** from the University of Vermont Medical Center and **Dr. Emily Heath** from Carleton University. This year's topic included the subjects of radiation biology, proton and heavy ion therapy, IMRT QA, Auto-planning, secondary MU calculations, along with several others. The clinic at Blokhin is equipped with all that you might find in a typical North American academic teaching hospital including modern linacs with full IGRT capabilities and a full arsenal of dosimetry equipment.

As we have noted in previous years, this region has gone through a somewhat rapid modernization, from mainly cobalt-dominated therapy to incorporating modern linacs, and even proton therapy, in a relatively short amount of time. Equipment varies widely from region to region and center to center.

Most of this year's students told us that they were working in a center with a mix of cobalt and modern accelerators. However, many reported that they felt they were not capitalizing on all of the clinical potential of newer technologies. We were interested to find that many clinics continue to support cobalt therapy, purchasing new cobalt units when theirs approach end of use, due to the ease of use and continued value in some clinical settings.

One thing that AAPM members might not recognize is that international organizations such at the AMPR see AAPM as a great resource. The medical physics faculty in the AMPR's ITC look not only to AAPM, but also the IAEA and ESTRO to "train the trainers" in Russia. They fly abroad for meetings and are aware of international recommendations, including those made by AAPM. One difficulty the faculty have is finding Russian language training materials for medical physicists so, to that end, they have translated many AAPM task group reports into Russian for use in their country. In addition, as in this course, they make an effort to involve medical physicists from other parts of the world directly into their educational programs.

In summary, this course was once again a rewarding and educational experience for everybody involved, including us. We hope that AAPM will continue to support this collaboration with the AMPR, and other international educational efforts, in the future.

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