Radiotherapy one of the treatment modalities in cancer treatment, besides surgery and chemotherapy. According to Delaney G et al., the proportion of patients with cancer in whom external beam radiotherapy is indicated during the whole course of treatment process according to the best available evidence was calculated to be 52.3%. It is confirmed by paper from Rifat Atun, which has mentioned that radiotherapy utilization rate was approximately 50%, in which the most common cancer utilizes radiotherapy was breast cancer (87%). In that paper, it is also mentioned about local control benefit which was range from 2 - 35% and survival benefit was range 1 - 20%. According to GTFRCC, radiotherapy is very effective treatment modality in cancer treatment. Radiotherapy not only saves life but also give economic benefit. In this paper, it mentioned that the availability of radiotherapy will save 26.9 million life-years. The benefit of it, if we translate to nominal cost, it will bring benefit of 278.1 billion US dollars. If we use efficiency method to provide radiotherapy, it will get greater benefit 365,4 billion. This benefit can be earned by low-income country.

Analysis of the gap in radiotherapy has been stated by Zubizarreta et al. in the paper about Analysis of Global Radiotherapy Needs and Costs by Geographic Region and Income Level. If we see from that paper, the total number of demand compared to the number of machines existed, it is already reach the target of 1 MV to 1 million population. However, there is a huge inequity in access to radiotherapy. For example, if we see the situation in Asia and the Pacific, there are many countries still having insufficient radiotherapy capacity to address their cancer burden. We estimate that patients in 12 countries in this region have no access at all to radiotherapy technology, and 25 countries with radiotherapy coverage below 50%. With the highest burden of cancer in the world, patients in Asia face great difficulties in accessing services. Furthermore, in countries where radiotherapy facilities are present, the referral systems are still poorly coordinated; there are insufficient capacity and limited national coverage. Equally important, there is the potential to do more harm than good, if the equipment is inadequate, or health professionals are not properly trained, and a safety regulatory infrastructure is not in place.

How to solve this problem? Proper planning with continuous improvement are the key elements. Starting with the roadmap for radiotherapy development in the country and make it in line with the National Cancer Control Program, followed by continuous effort to convince stakeholder and convince the Government to increase the facilities, provide data to show them the real benefit of it. Private sector is also a good opportunity for a Public Private Partnership (PPP) scheme, whether it is from private hospital or investor in government hospital in the framework of joint cooperation or built operate transfer (BOT). Along with
that process, increase the services by improving the system, including developing the standard guidelines and increase the knowledge and skill of healthcare services is also an important task.

SP-0208 Radiotherapy of Hodgkin Lymphoma: Revolutionary Roots, Challenging Present, Bright Horizons
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Abstract text
The dramatic effect of radiation on Hodgkin lymphoma (HL) was reported shortly after the discovery of x-rays. But limited radiation technology and erroneous treatment concepts resulted in early relapse or incomplete control and thus limited radiotherapy use to palliation only for several decades. In the 1940’s Vera Peters used better penetrating energies and a more extensive field concept to be sure for the first time and to the disbelief of many, in 1950, to demonstrate cure of limited stage HL with radiation alone. Shortly thereafter, Henry Kaplan employed the first medical linear accelerator producing even more penetrating higher doses to extensive fields and propagated the curability of patients with even stages II and III HL with “radical radiotherapy” alone. Indeed, radiation was, (and still is) considered the be the most effective single agent in the treatment of HL. During the two decades to follow, in the absence of effective non-toxic chemotherapy, the radical radiotherapy was the mainstay of treatment for early stages and radiation fields were designed to encompass the entire lymphatic system “total lymphoid irradiation” (TLI). The radiation dose exceeded 40 Gy. To maximize response in unfavorable patients (bulky mediastinum, stage III, B symptoms) the intensive radiation curative approach was even used together with adjuvant chemotherapy. It was relatively well tolerated, cured over 70% of patients with stages I-II but was later found to be associated with significant long-term toxicities, especially the induction of second malignancies and accelerated cardiovascular disease.

Comprehensive radiotherapy remained the dominant approach to treatment of early disease until clinical trials demonstrated that a combination strategy with chemotherapy could produce superior cure rates with much less irradiation, leading to a reduction of the irradiated field size to only the involved anatomical area and was called the “involved field” (IF). The radiation field reduction was based on a series of studies aimed at minimizing the toxicity of radiation therapy treatment while maintaining its efficacy. The developments in functional imaging, treatment planning, intensity-modulated and image-guided radiation therapy have made it possible to better define and further decrease the radiation fields. Thus, IFRT, that was based on arbitrary anatomic landmarks and encompassed adjacent uninvolved nodal stations, was further minimized. Based on the facts that occur in the original nodal sites, involved node irradiation therapy (INRT) was suggested; the field, in this case, is confined to the macroscopically involved nodes on imaging studies at diagnosis. It requires accurate information on the pre-chemotherapy or pre-biopsy extent of the node and often necessitates some margins for uncertainties. Yet, even with the same clinical presentation, it is still markedly smaller than IFRT and thus results in significantly lower exposure to adjacent critical structures. Using INRT requires acquiring images at diagnosis in treatment positions and prior to the start of chemotherapy to minimize anatomic position variations between diagnostic and radiation treatment planning imaging. Because this information is often unavailable, new guidelines defining involved site radiation therapy (ISR) has been introduced by the International Lymphoma Radiation Oncology Group (ILROG). The new ISRT approach allows clinical judgement based on the quality of imaging and response to modify the field based on INRT principles. It results in a significant reduction in the volume included in the previously used IFRT and markedly limits the amount of normal tissue being irradiated. A radiation technique of discharging radiation only during a monitored deep inspiration phase called DIBH (deep inspiration breath hold) has recently been introduced to the treatment of patients with mediastinal involvement. DIBH markedly reduces the exposure of heart and lungs by better separating them from the treated mediastinal nodes and reducing motion uncertainties. In early stages, favorable and unfavorable, combined modality using ISRT of only 20 or 30 Gy provides the best disease control and in comparison to chemotherapy alone, allows less chemotherapy, reduces the need for intensive and toxic salvage and even improves overall survival. The argument of radiation toxicity has become mostly irrelevant, but is still overplayed by some oncologists. Even in advanced-stage HL, there is a selective role for RT and unfortunately, RT forced retirement was not based on sound data and will be discussed. Newly approved systemic agents have not fulfilled the initial expectations and are associated with serious financial toxicity. Yet, possible synergistic effects of RT with immune check point inhibitors is currently being explored in new programs of HL and other lymphomas and may expand the role of RT in lymphoma beyond salvage and classical limited stage indications.

SP-0209 Should proton therapy clinical practice move away from a constant RBE of 1.1?

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Abstract text
The proton RBE varies among cell lines, tissues, endpoints, as well as with beam-quality. Experimental data do show a trend towards an increase in RBE as α/β of the linear-quadratic model decreases. Furthermore, one would also expect the RBE to increase as dose decreases. The RBE also increases with increasing linear energy transfer (LET). Yet, due to experimental uncertainties and because of the fact that the majority of data is obtained in vitro, there has been no clinical implementation of a variable RBE in treatment planning. Thus, proton therapy uses a generic RBE of 1.1. Phenomenological models are capable of predicting the RBE as a function of the parameters mentioned above. Uncertainties, especially in vivo, are preventing the clinical application. Input parameters for these models are solely based on cell survival data obtained in vitro. It is unclear if in vitro relationships can be translated to in vivo endpoints even for tumor control. Furthermore, to define normal tissue complications, the endpoint of cell survival may not be appropriate at all. Most importantly, patient specific radiosensitivity is poorly understood and clinical evidence that RBE variations indeed matter in patients is scarce.

RBE variations are currently not considered quantitatively in proton therapy. However, some qualitative consideration is given towards variable RBE values by, for instance, avoiding specific beam angles or reducing the