SA–CME Information

IMPROVING ACCESS TO RADIATION THERAPY IN INDONESIA

Description

To date, the exponential rates of population growth and cancer incidence often outpace the linear rate of radiation therapy services growth, especially in developing countries such as Indonesia. There are many challenges faced in closing this gap and improving radiation therapy facilities and services. This review article summarizes the challenges and the efforts to overcome them.

Learning Objectives

After completing this activity, participants will be able to:

1. Better comprehend the challenges faced by developing countries such as Indonesia, and the solutions to each problem.
2. Adopt each solution for all countries that have gone through the same issues addressed in this review.

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Improving access to radiation therapy in Indonesia

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Cancer burden is steadily rising globally. For countries in the developing world where most of the global population lives and where most new cancer cases are expected to be diagnosed every year, this is particularly worrying as the exponential rates of population growth and cancer incidence often outpace the linear growth rate of radiation therapy services. The annual cancer incidence in low- and middle-income countries (LMIC) in 2030 is estimated to exceed 14 million new cases per year,[1] a 34% increase over the incidence in 2018.[2]

In Indonesia, 206 megavoltage (MV) machines would have been needed to achieve a 1 MV machine per million population for its 206 million population in 2008, or 176 new machines on top of the 30 machines operational at that time.[3] However, the Indonesian population grew by an additional 60 million by 2018,[4] raising the target goal to 266. Despite nearly doubling the ratio of MV machines per million population from 0.14 to 0.25 through a net increase of 36 machines in 10 years, the deficit of machines barely changed compared to what Indonesia had in 2004. In fact, had the recent burst of radiation therapy investments not occurred between 2012 and 2018, Indonesia would have been in a worse state than it was in 2004 (**Figure 1**).

When evidence-based estimates of optimal radiation therapy utilization rate (RTU) are used to calculate radiation therapy needs for Indonesia, the situation appears even less hopeful. With 348 809 new cancer cases in 2018 and an optimal RTU of 54.3%, 379 MV machines would have been needed, assuming a workload of 500 new patients per machine annually.[2,5] This number would need to grow to 517 to provide optimal access to the 475 502 new cancer patients expected to be diagnosed annually by 2030.[1]

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Whether it is possible or even necessary to achieve this target is up for discussion. However, it has been reported that optimal utilization depends on factors beyond equipment availability and that optimal RTU might even overestimate actual radition therapy need.[6] Consequently, the Indonesian Radiation Oncology Society (IROS) has opted for a progressive target in its advocacy efforts, aiming for 150 MV machines by 2030 (0.5 MV machines per million population) to account for the growth of public awareness and cancer control in general.

Investing in Radiation Therapy

Just like other major economies in Southeast Asia, Indonesia has enjoyed a stable political climate and high rate of economic growth from 1980-1995.[7] In 1982, ahead of other countries in Southeast Asia, Indonesia installed its first linear accelerators and, in the decade that followed, opened several new radiation therapy centers including a national cancer hospital. However, in the absence of a cancer control plan, Indonesia was unable to sustain its growth in radiation therapy access in the decade that followed due to the increasingly low priority given to cancer control. By

the time a major economic crisis hit the region in 1998, Indonesia had less than 20 radiation therapy centers serving its population of 200 million, and radiation therapy was already low on the list of priorities for healthcare investment.

In 2004, to end an extended period of zero growth in radiation therapy services, IROS began directing its main advocacy efforts on increasing public and government awareness of the important role of radiation therapy in cancer care. These efforts started to gain significant traction several years later, after the Indonesian Ministry of Health adopted the 25-year roadmap prepared by the society. The resulting steady investment commitment from the government enabled Indonesia to not only increase the number of machines but also provide radiation therapy services in more provinces. The development came in parallel with improved cancer control in general, following the recommendations from the integrated mission of the Programme of Action for Cancer Therapy (imPACT) in 2010. The mission, coordinated by the International Atomic Energy Agency (IAEA) and conducted with the World Health Organization (WHO) and International Agency for Research on Cancer (IARC), provided the government with a baseline situation analysis and recommendations to prepare and implement a National Cancer Control Plan (NCCP). At the same time, most radiation therapy centers in the country started undergoing a transition from 2-dimensional (2D) to 3-dimensional (3D) conformal radiation therapy techniques. It was also then that the increased number of linear accelerators began outpacing telecobalt machines.

In 2012, the society expanded its advocacy efforts to begin three major initiatives. The first advocacy effort was aimed at the National Public Procurement Agency for the inclusion of radiation therapy equipment in the government e-procurement system with the hope that the more efficient and transparent nature of e-procurement would encourage hospital administrators and policymakers to consider investing in radiation therapy. This effort proved especially helpful, as evidenced by e-procurement constituting 58.3% of new radiation therapy machines in the government sector during the past 4 years.

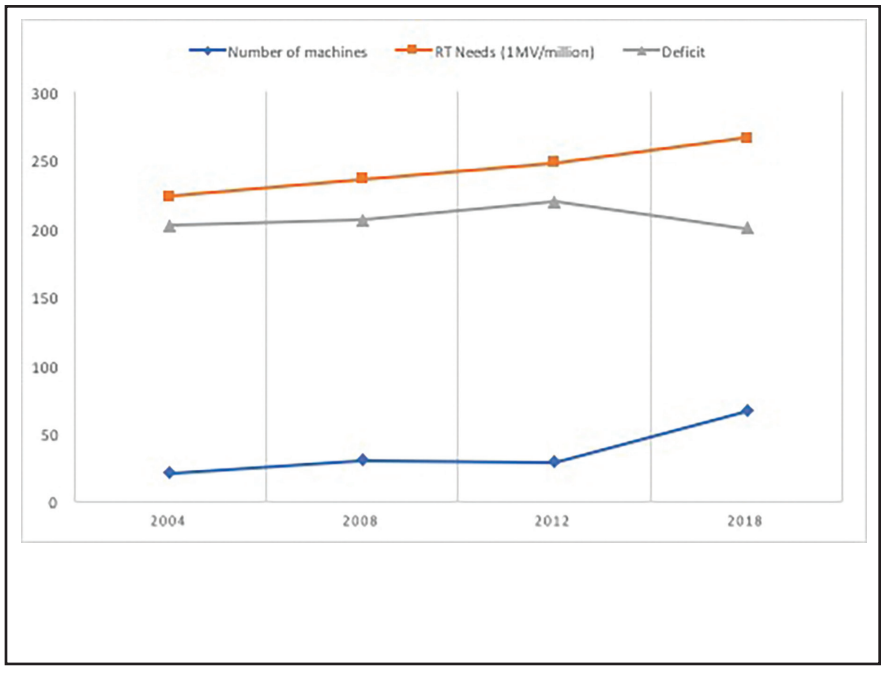

FIGURE 1. *Radiation therapy supply and demand, taking population growth into consideration (data from Indonesian Society of Radiation Oncology annual surveys).*

A second set of advocacy efforts was aimed at the private sector. In contrast to several countries in the region where private sector providers played a major role in the provision of radiation therapy services, all but two radiation therapy centers in Indonesia were government owned in 2012. To assist new centers, the IROS provided consultancy services at no cost to help in needs assessment, planning, commissioning and training. Public-private partnerships were also initiated and have been gaining interest ever since. The society further supported these efforts by developing tools for implementing a public-private partnership program. In 2019, the number of private hospitals providing radiation therapy services or setting up a radiation therapy program increased to 23, providing 40% of the total national radiation therapy capacity.

The third set of advocacy efforts was on ensuring the inclusion of radiation therapy in the Indonesian Universal Health Coverage scheme. This effort brought about a major increase in radiation therapy utilization, but at the same time caused significant prolongation in radiation therapy waiting time all over the country in 2014. The resulting media coverage caught the attention of provincial governments and hospital administrators, prompting them to establish new radiation therapy services. By 2019, the proportion of radiation therapy centers with more than 1 month of waiting time decreased from 66.67% in 2017 to 30% in 2019 through the addition of 27 new MV machines nationwide.

To ensure sustainable growth in radiation therapy services, a business model must account for capital and operational expenditure, including depreciation. Even for state-owned institutions willing to operate at costs exceeding their revenues, government subsidies are

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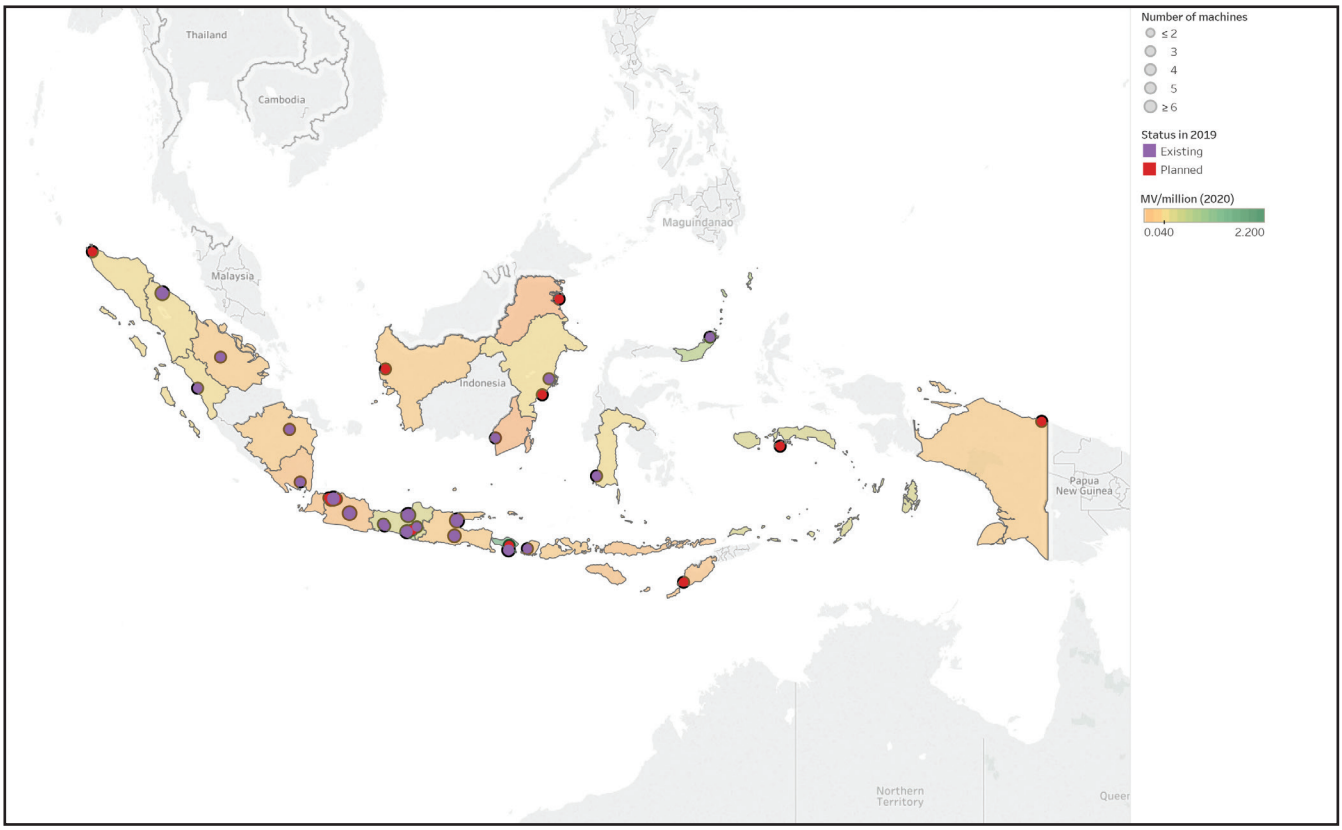

FIGURE 2. *Current radiation therapy status in Indonesia*

not unlimited. In fact, the Indonesian Universal Health Coverage System has encountered several cashflow problems over the past few years and has been continuously trying to optimize expenditures by tightening reimbursement policies for various medical procedures. As a consequence, radiation therapy services in Indonesia are continuously straddling a thin line between affordability and sustainability.

Reducing capital expenditure goes a long way toward accelerating the growth of radiation therapy services, and can be achieved through bulk purchasing. In a recent report, Moraes et al[8] described the experience with the Brazilian RT Expansion Project (EXPANDE), notably how it included the bulk procurement of 140 linear accelerators supporting 15 national federations at a significantly lower total cost than expected from individual procurements. This approach is under consideration by the Indonesian Ministry of Health but will require extensive planning and risk management considering the substantial investment required. The current expansion plan is still focused on ensuring availability of radiation therapy in all provinces (**Figure 2**).

Education and Training

A safe and effective radiation therapy program requires qualified, trained professionals. Therefore, it is important to align the growth of human resources and equipment to ensure enough qualified radiation therapy professionals are available to provide services once machines are installed and commissioned. Unfortunately for Indonesia, this was much harder than it sounded. Achieving a proportional rate of growth between human resources and equipment has required consideration of various factors and often necessitated compromises.

Until 2004, the slow rate of human resources growth had been another factor in addition to lack of government awareness in halting growth in radiation therapy services. This was substantiated by findings during a Quality Assurance Team in Radiation Oncology (QUATRO) audit by the IAEA in 2006. Several factors contributed to the slow rate of human resources growth, including long training periods, a short interval between starting practice and entering retirement, lack of interest in the specialty, and lack of recognition. Most of these factors were related to radiation oncology training being a 2- to 3-year fellowship program for consultant radiologists. Trainees entered the program after 10-15 years of clinical practice in diagnostic radiology at a rate of 1 new trainee per year, and held dual certifications of radiology and radiation oncology upon completion. This format resulted in slow growth of new radiation oncologists,

barely keeping pace with those exiting clinical practice.

In 2008, a radiation oncology residency program was launched at the University of Indonesia. The entry point for radiation oncology training was shifted to an earlier point, and a curriculum revision was based on an IAEA syllabus.[9] The Indonesian College of Radiation Oncology was founded, and radiation oncology training transitioned from a consultant fellowship to residency training, doubling expected retention by allowing new radiation oncology trainees to enter the profession at a maximum age of 35 years vs 45 years with the previous plan.

Collaborations of the South East Asian Radiation Oncology Group (SEAROG) with the European Society for Therapeutic Radiology and Oncology (ESTRO) started at this time with the first of the SEAROG/ESTRO course series organized in 2009 in Manila, Philippines, providing access to affordable, high-quality educational events for trainees. Compromises, however, were needed. The shift from being a subspecialty discipline to a primary specialty affected the recognition and career path of existing radiation oncologists. Existing IROS members had to choose between letting go of either their radiology or radiation oncology practice as it was not feasible to practice multiple specialty disciplines under the Indonesian Medical Council regulations. Between 2008-2010, IROS membership declined as several members chose their radiology practice instead of radiation oncology. However, this brief drop was soon offset by the increased number of new radiation oncologists entering clinical practice, at a rate of 6-8 per year.

Another compromise was in programmatic standards compliance. To support a rapid growth of radiation therapy services along with technological transition from 2D to 3D conformal and intensity-modulated radiation therapy, the capacity of the only training program in Indonesia needed adjusting several times over the last decade. Instead of the ratio of 1-2 staff members per resident as is common in affluent countries,[10,11] the Indonesian College of Radiation Oncology had to allow the program to train 3-4 residents per staff members instead. Tutorials and lectures outside of office hours as well as distance- and blended-learning initiatives were needed to compensate for this. The IAEA's Distance Learning Course on Applied Sciences of Oncology (ASO)[12] had been helpful in ensuring trainees receive a good foundation for their training within the limited availability of resources. Despite all that, the residency program was barely able to meet the needs of new and expanding radiation oncology centers all over the country even with the expanded capacity. In 2019, Indonesia had only 93 board-certified radiation oncologists and 65 residents in training. Indeed, it was impossible for a single center to train radiation oncologists for the whole country with a 260 million population, but the way residency education was structured as a master's program within the national public education system made it challenging to develop additional residency training programs despite calls from several medical specialty colleges to shift toward hospital-based residency training. This is worrying considering that just to cover the 2018 deficit of 200 machines by 2030, 300 new radiation oncologists would need to be trained in that period.

As a stopgap solution around this limitation, elective rotations to affiliate hospitals have been introduced, allowing residents to gain more experience with a wider variety of clinical cases and practice settings while allowing staffs in affiliate hospitals to gain experience in organizing training for residents. The hope with this plan is that more practicing radiation oncologists could contribute toward education and training, and more residency programs would open in the future. IROS believes that an exponential growth in the number of radiation oncologists is only possible when a fixed proportion vs a fixed number of practicing radiation oncologists are involved in residency education. This means having as many good quality residency training centers as possible.

At a similar pace with radiation oncology, medical physics education and training also underwent a rapid transformation. Within the last decade, Indonesia saw the recognition of the medical physics profession in 2014 and the establishment of the first medical physics residency training program with the support of the IAEA.[13] In 2019, two radiation therapy centers were part of an integrated national medical physics program with an additional three centers in the pipeline.

Unfortunately, the education and training of radiation therapy technologists (RTTs) had been lagging compared with the other two professions. The lack of career development and professional/academic recognition means that it is not uncommon for RTTs to switch careers to medical physics despite the availability of a graduate diploma program. Even in 2019, most RTTs working in radiation therapy centers entered the profession after completing a basic diploma program in radiography followed by brief on-the-job programs organized by the centers where they work.

While the possibility of novel technology in the future such as artificial intelligence will not completely replace the function of professional medical staff, it may help reduce human resource workloads. In particular, it may benefit the radiation oncologist to have more time with patients and help MPs reduce treatment planning time, hence increasing patient throughput.[14] However, it remains to be seen whether this would impact staff requirements.

Discussion

At several points in the past, Indonesia encountered opportunities to improve radiation therapy access, but was unable to translate them into a sustainable growth due to the lack of a well-defined target. It was only after defining indicators that the IROS maintained proper advocacy efforts supported by clear action plans. However, due to the continuously rising cancer incidence, it is important to periodically evaluate the projections of needs to make adjustments accordingly.

In the case of Indonesia, significant investment would be necessary just to maintain the current level of access to radiation therapy, which becomes even more substantial when considering machine lifetime. In fact, machine lifetime silently but progressively threatens the sustainability of radiation therapy services, as machines (or sources) installed today need replacing in 10-15 years, with budgets determined in advance. Failure to account for these factors can seriously threaten the sustainability of national radiation therapy services, especially in developing countries such as Indonesia where various developmental goals compete for priority in the government budget. Close collaboration between national professional societies, health authorities and private healthcare providers is very important as it provides opportunities to develop and utilize innovative and out-of-the-box strategies to promote and sustain investment in cancer care.

In addition to capital investments, education of radiation therapy professionals is a key area that determines the growth rate of radiation therapy access. Planning for future staffing should take into account the expected growth in radiation therapy utilization to tightly maintain a balance between supply and demand. Experiences in developed countries have shown us that maintaining this balance is challenging even with proper planning.[15,16]

Conclusion

The Indonesian experience of expanding its radiation therapy services has demonstrated the challenges in achieving sustainable access to radiation therapy services. Learning from experience and adapting to challenges has enabled Indonesia to stay on its path toward better access to radiation therapy.

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