



INNOVATIONS IN IMAGING AND RADIOTHERAPY

A more connected world

BIR WORLD PARTNER
Network



The British Institute of Radiology (BIR) is an international membership organisation for everyone working in imaging, radiation oncology and the underlying sciences.

We aim to support the work of our members and their colleagues to achieve professional excellence, provide continuing professional development for our multidisciplinary community, publish cutting edge research for our authors and readers across the world and influence and connect with the wider professional sector.



The **BIR World Partner Network** is a community of international societies with the shared goal of advancing the knowledge and understanding of all its individual members. The ultimate aim is to improve the scope and value of imaging and radiation oncology for patients across the world.

For more information, visit bir.org.uk

Thank you to TMC for kindly supporting the printing and distribution of this publication.



Telemedicine Clinic (TMC), a Unilabs company, is Europe's largest provider of teleradiology and telepathology services across Europe. In the UK, TMC is the only provider that adds true additional reporting capacity to the NHS by utilising qualified, sub-specialist and GMC registered radiologists from Europe to report alongside UK-based colleagues.

TMC pioneered the "follow the sun" model for overnight emergency reporting, allowing all our clients' emergency cases to be read in real time during the day from around the globe.

TMC is challenging the traditional outsourced model to provide more than just simple routine and emergency cases. Through TMC Oncology, clinical reports are available for MRI prostate, and CT colon as well as other oncology areas such as female gynaecological/pelvis and MRI breast as well as lung screening and cardiac reporting.

Thanks to TMC's investment in both IT and medical innovation, AI now plays a huge part in providing quality healthcare for all patients.

For more information, please contact info@telemedicineclinic.com

Welcome

This is the second of our joint publications as a worldwide network of imaging and oncology societies.

Together we represent hundreds of thousands of healthcare professionals working in every corner of the globe. We each have opportunities and challenges unique to our countries, but we also have a great deal in common. Among these is a shared determination to keep innovating for the benefit of patients.

The subheading for this publication is ***“a more connected world”***. Due to the COVID-19 pandemic we have not been able to meet in person over the past 12 months but have nevertheless met extensively by video conference, and have discovered that we don’t necessarily have to cross oceans to meet and share ideas; we just need an internet connection and a positive attitude.

As you will see from the contributions, positivity and creativity abound. Radiologists, radiographers, scientists and others are using their ingenuity to bring services to people in hard-to-reach communities, and using technology to allow geographically remote professionals to work together effectively. You will also see that whilst dealing with the COVID-19 crisis has created obstacles and stretched resources, it has also prompted and accelerated a wave of innovation. We are honoured that the contributors to this publication, people helping to shape the development of healthcare professions around the world, have provided so much insight and so much to be inspired by.

Thank you to all involved, and thank you for reading.



Simon Thompson

Chief Executive, British Institute of Radiology



Contents

 <p>Dr J. Daniel Bourland <i>American Association of Physicists in Medicine (AAPM)</i></p>	p.5	 <p>Dr Stephen Chun-Key Law <i>Hong Kong College of Radiologists (HKCR)</i></p>	p.16
 <p>Professor Alexander Norbash <i>American Roentgen Ray Society (ARRS)</i></p>	p.6	 <p>Prof. Dr Amarnath Chellathura <i>Indian Radiological and Imaging Association (IRIA)</i></p>	p.17
 <p>Prof. Dr Alejandro Temptra <i>Argentinian Federation of Radiology (FAARDIT)</i></p>	p.7	 <p>Ms Donna Newman <i>International Society of Radiographers and Radiologic Technologists (ISRRT)</i></p>	p.18
 <p>Dr Daniel Mysler <i>Argentine Society of Radiology (SAR)</i></p>	p.8	 <p>Mr Dean Harper <i>Irish Institute of Radiography and Radiation Therapy (IIRRT)</i></p>	p.19
 <p>Ms Bronwyn Hilder <i>Australian Society of Medical Imaging and Radiation Therapy (ASMIRT)</i></p>	p.9	 <p>Professor Jacob Sosna <i>Israel Radiological Association (ISRA)</i></p>	p.20
 <p>Professor Valdair Muglia <i>Brazilian College of Radiology (CBR)</i></p>	p.10	 <p>Professor Shigeki Aoki <i>Japan Radiological Society (JRS)</i></p>	p.21
 <p>Dr Sridhar Redla <i>British Institute of Radiology (BIR)</i></p>	p.11	 <p>Dr António Madureira <i>Portuguese Society of Radiology and Nuclear Medicine (SPRMN)</i></p>	p.22
 <p>Mr Irving Gold <i>Canadian Association of Medical Radiation Technologists (CAMRT)</i></p>	p.12	 <p>Professor Valentin Sinitsyn <i>Russian Society of Radiology (RSR)</i></p>	p.23
 <p>Professor Zhengyu Jin <i>Chinese Society of Radiology (CSR)</i></p>	p.13	 <p>Dr Milagros Martí de Gracia <i>Spanish Society of Medical Radiology (SERAM)</i></p>	p.24
 <p>Professor Wing P. Chan <i>Chinese Taipei Society of Radiology (CTSR)</i></p>	p.14	 <p>Dr Dharmesh Daya <i>Radiological Society of South Africa (RSSA)</i></p>	p.25
 <p>Professor Dr Gerald Antoch <i>German Röntgen Society (DRG)</i></p>	p.15		

Dr J. Daniel Bourland, PhD

President-Elect, American Association of Physicists in Medicine (AAPM)

*Professor and Medical Physicist, Wake Forest School of Medicine,
Winston-Salem, North Carolina, USA*



American Association of Physicists in Medicine (AAPM)

AAPM is a national professional and scientific society for medical physics in the United States. The mission of AAPM is to advance medicine through excellence in the science, education and professional practice of medical physics. The AAPM has over 9,000 national and international members, including practising physicists and trainees.

How do you make sure that hard-to-reach communities have access to imaging and/or radiotherapy?

Healthcare equity in the US remains a national challenge and is a prominent priority, with past state and national initiatives having moderate success and great potential impact for human health. Hard-to-reach communities may include geographical distance away from a larger medical centre, such as rural areas, as well as population groups that are “remote” with limited access to care due to their socioeconomic status. Imaging technologies have the advantage of a smaller, transportable footprint and can be placed into mobile units to take to underserved communities, perhaps partnering with outreach medical clinics to provide imaging on a scheduled basis. These resources may be staffed by volunteers and funded through non-profit service organizations. Radiotherapy is more challenging because of the requirement for a facility with fixed-in-place equipment. Larger hospitals often choose for their regional radiotherapy practices to be in smaller communities, providing local radiation treatment, with additional resources at the parent hospital, when needed. However, some rural communities continue to face the dilemma of scarce resources for cancer treatment. There is a growing number of Offices of Cancer Equities working to reduce the healthcare disparities for cancer patients, for instance, within nationally recognized cancer centres, and individual states have equity initiatives in cancer care for hard-to-reach communities.

How has the COVID-19 pandemic changed the way imaging and/or radiotherapy professionals work in your country?

Our field required us to emphasize the “medical” part of medical physics, with us still doing the physics part. Universal precautions became mandatory at all times, with and for all patients, colleagues and the general public. Mask, glove and alcohol gel use sky-rocketed and became the norm for all areas. New considerations included extra cleaning of all imaging and radiotherapy equipment and for radiotherapy, scheduling COVID-19 positive patients towards the end of the day. AAPM established a website for COVID-19 updates and an interactive, recorded seminar for the sharing of practices. This era has been a time for medical physicists to practise our public health roles, reminding our communities that the principles of radiation safety all apply to COVID-19: Time: limit exposure; Distance: maintain distance; and Shielding: wear mask/PPE.

In a unique response to the diagnostic challenges of COVID-19, the ACR, RSNA and AAPM jointly established the Medical Imaging and Data Resource Center (www.midrc.org), funded by the NIBIB. MIDRC provides a medical imaging platform “to foster machine learning innovation through data sharing... of imaging and clinical data,” with specific emphasis on anonymized images and data for patients with COVID-19.

How are you ensuring that you have enough capacity to cope with demand for imaging and/or radiotherapy in your country?

Healthcare in the US is organized primarily on a state-by-state basis, with each state annually reporting its needs for services and healthcare providers, most of whom are non-profit entities, establishing their services within the state’s framework. Some states regulate the purchase and implementation of higher cost medical equipment. The national government has a great role in healthcare through determining the reimbursement rates for healthcare services for a larger percentage of the population. This leads healthcare providers to consider the need for imaging and radiotherapy based on state assessments of need, strategic plans for their healthcare institution, and levels of reimbursement from insurance and the government. US spending on healthcare per capita is much higher than in other countries, with imaging contributing greatly in use and costs. In general, US imaging resources are very busy, close to capacity—perhaps over-utilized compared to other countries. Radiotherapy resources, although also busy, have extra capacity per linear accelerator and are perhaps under-utilized, especially compared to regionally-organized facilities in Europe and elsewhere, depending on their urban vs non-urban location.

What role do you think teleradiology will play in your country in the coming years?

Teleradiology and telemedicine will grow immensely in the coming years, and importantly, will change the way healthcare is provided for all patients. Relative to COVID-19, the US government entity overseeing healthcare services (CMS) granted waivers for practitioners to provide certain services via telemedicine approaches. Providers and institutions rapidly ramped up the logistics and technologies needed to provide teleradiology and telemedicine services. This change is significant and will continue. For teleradiology services, the opportunity is huge to incorporate AI into the platforms. Radiotherapy will be more challenging, however the planning and post-treatment evaluations fit well within teleradiology systems. One caveat is that it needs to be recognized that in-person patient interactions cannot always be replaced by tele-tools—every now and then it will be important to see and palpate the patient and walk into the room, literally, to confirm that the patient and procedure are all in order—healthcare is all about people, let us not forget the patient is indeed a person.

Professor Alexander Norbash

President, American Roentgen Ray Society (ARRS)

Chair of Radiology, University of California, San Diego, USA



American Roentgen Ray Society (ARRS)

The American Roentgen Ray Society, founded in 1900, was the first radiology society in the United States. Through educational forums including annual meetings, publications, and AJR, the society has been dedicated to the goal of the advancement of medicine through the science of radiology and its allied sciences.

How do you make sure that hard-to-reach communities have access to imaging and/or radiotherapy?

Images and imaging are in continuous demand by patients and clinicians. They want us to image faster, safer, and more frequently. To succeed in delivering the same, radiology has to therefore become ubiquitous, demanding automation, safety, and low cost. We also have to focus both on migrating closer to where patients are, as part of “point-of-care” considerations, while developing new and inexpensive types of imaging equipment. Such developments rely on our ability to innovate not only in how we image, also how we practice and where we image, including an understanding of how we may need to effectively partner with retail providers. Our patients and non-radiologist clinicians expect disruptive innovation; they are looking for us to parallel with imaging technology what smartphones have done for information technology. We must be smarter, cheaper, and more universal. And perhaps, through applying artificial intelligence, tele-management, and tele-interpretation, we may someday conclude that remarkable and revolutionary advances came out of the terrible COVID-19 pandemic.

How has the COVID-19 pandemic changed the way imaging and/or radiotherapy professionals work in your country?

The pandemic has encouraged and demanded our adaptability and our willingness to innovate. Teleradiology and telecommuting have flourished within a remarkably short period of time. Similarly, academic practices have learned how to provide distance education to trainees, and how to organise and conduct educational seminars and national meetings fully remotely. Without a crisis such as the pandemic, this would have been a much more gradual and prolonged process. Many of us have also incorporated AI tools into the diagnosis and assessment of COVID-19 patients, thereby accelerating implementation of AI tools much more expediently than ever could have been imagined. There has been a wave of innovation and creativity demanded by COVID-19 that has accelerated our already rapid innovation cycles.

How are you ensuring that you have enough capacity to cope with demand for imaging and/or radiotherapy in your country?

We must become experts at operations management. We may find in each institution individuals committed to assessing and improving radiology operations management, although the current levels of experience are highly valuable with each institution often reinventing the wheel. Roundtables, dialogues, and Key Performance Index registries are starting to come into being, realizing we do not always know who is best in class, and what it is that they are doing right. We must move towards streamlining imaging protocols to provide the care needed in the shortest time possible. Perhaps we should focus on delivering routine spine and unenhanced brain MRI examinations performed in 15 minutes of patient block time. Perhaps utilizing AI and operations management we can streamline our operations, and simultaneously accelerate the development arm for practical and capacity-adding imaging innovation. Our entire specialty is built on our pipeline of brilliant innovations, and now we have an opportunity to utilize the breadth of our budding imaging and operations management AI tools to maximize capacity.

What role do you think teleradiology will play in your country in the coming years?

We want to find the effective balance between telepresence, and live presence. We know we can now function at a remarkably high-level remotely; we also recognise that there is a cost to being remote and out of sight. As our interventional and breast imaging colleagues have been physically ever-present, we also run the risk of creating a schism between those who physically show up and those who telecommute. We now have to understand how much of our live presence is beneficial, effective, favourable, and essential. Teleradiology will increase the brilliance of our educational and consultational offerings as we collaborate globally on creating unparalleled forums and discussion sessions that otherwise would have been impossible. We can pull the most brilliant of minds into a single space with the click of a button. We were inadvertently pushed into a space that will allow us to innovate into an exceptionally brilliant future.

“Teleradiology will increase the brilliance of our educational and consultational offerings.”

Professor Dr Alejandro Tempra

President-Elect, Argentinian Federation of Radiology (FAARDIT)

Universidad de Mendoza, Mendoza, Argentina.



Argentinian Federation of Radiology (FAARDIT)

Our federation gathers 20 radiology associations in Argentina and it groups all certified radiologists in the country. It has its own headquarters in the city of Córdoba.

How do you make sure that hard-to-reach communities have access to imaging and/or radiotherapy?

Principally, ensuring accessibility from the technological point of view. This includes installing internet repeaters and providing adequate reception equipment with state-of-the-art notebooks to reach remote communities, reducing the distance barrier but maintaining the quality of the image.

As for radiotherapy centres, we know that they are located in larger towns and big cities. In order to access these centres from a distant town, the patient is transferred in an ambulance and, depending on the extent of the treatment, travels for the day or remains hospitalized throughout the process.

All these developments increase healthcare costs, so it is essential to optimize the quality of the results' transmission and acquisition. The variables of time and speed of data processing and transmission help to reduce costs. Above all else, the close relationship with the patient and the attending physician should not be missed and the patient should always be informed of the methodology used so he can give informed consent.

How has the COVID-19 pandemic changed the way imaging and/or radiotherapy professionals work in your country?

Since the mandatory quarantine was declared in our country due to the SARS-CoV-2 pandemic, studies have been reported from the radiologist's locations by teleimaging and teleradiology. This decision was taken in order not to expose the professional to the virus, leaving this potential danger to technologists and sonographers, who could not do their job in any other way but who used their personal protective equipment for protection.

We tried to carry out only those studies that were essential for the patient's health, complying with all the measures of the protection protocol, which included limited and controlled entry of health personnel and patients, hand hygiene, use of masks, and use of gloves and aprons. In addition to those measures within the protocol, the patient was informed about viral prevention methods against COVID-19.

How are you ensuring that you have enough capacity to cope with demand for imaging and/or radiotherapy in your country?

The major responsibility is on the national government, sometimes it is on the provincial government and a few times on the municipality. They are the ones who must ensure equal opportunities as regards radiologic studies and oncology radiation treatments for the entire population, taking into account the adequate time to treat a given pathology and the appropriate method. To this end, policies to install low and high complexity diagnostic equipment and radiotherapy equipment are implemented in strategic places to assist as many people as possible.

These decisions should involve the radiologist and/or the radiotherapist, who are the ones who are familiar with the technology, in order to ensure image quality and the equipment that best suits the needs of the place. Besides, they should be accompanied by the appropriate technical personnel who must be trained and certified in teleradiology and who are always under the supervision of the radiologist in charge.

What role do you think teleradiology will play in your country in the coming years?

In the next few years, teleradiology will demonstrate its full usefulness and potential. We believe that its growth will increase exponentially because, in addition to its usefulness in improving the distance/time equation, it demonstrates that it is possible to maintain the quality in the transmission of images and comply with the legal standards that are already regulated in the systems. Also, because radiologists are already getting used to these technologies.

As we all know, the protection of patient data must be granted and the acquired images must be safeguarded, as well as the confidentiality of the whole process. All this is already a reality due to the technical support and the technology.

We believe that the radiologist will always be needed throughout this technology chain, evaluating clinical information, choosing the most appropriate diagnostic modality for the patient's pathology, monitoring the study and evaluating the results obtained.

"In the next few years, teleradiology will demonstrate its full usefulness and potential."

Dr Daniel Mysler

President, Argentine Society of Radiology (SAR)

Chief of Imaging Department in Alexander Fleming Institute, Buenos Aires, Argentina



Argentine Society of Radiology (SAR)

The Argentine Society of Radiology (SAR) is composed of about 2,000 members. It offers an academic framework in which members can train as specialists, maintain their continuing medical education, and obtain professional certificates. It also organizes congresses, conferences, and courses, and publishes the *Argentine Journal of Radiology* (RAR).

How do you make sure that hard-to-reach communities have access to imaging and/or radiotherapy?

“Access” includes availability, accessibility, appropriateness, affordability and quality. Diagnostic imaging and radiotherapy plays an important role identifying a pathology and following its progression but also it plays a major role preventing a possible disease due to screening. Therefore, we believe that access to imaging and radiotherapy care for people living in our country is a moral imperative, and the ultimate goal is to guarantee universal and equitable access for everyone.

There are challenges such as the lack of awareness of screening services, the perception that treatment or screening is unnecessary or the belief that seeking time for care or treatment includes taking time off work.

In Argentina, there is a disparity in access to medical imaging technology. Larger cities have access to state-of-the-art technology and human resources. However, this is not the same for rural areas. There are also socioeconomic, sociocultural, infrastructural and academic disparities.

Our society has been involved in campaigns with academic and government organizations in efforts to expand delivery of healthcare. These raised awareness of breast, lung and liver screening, allowing us to reach rural populations and raise awareness especially in low-income groups.

How has the COVID-19 pandemic changed the way imaging and/or radiotherapy professionals work in your country?

Imaging departments underwent some important changes in daily activities to optimize the healthcare of both COVID-19 and non-COVID-19 patients, as well as the safety of health workers. Screening tests and non-urgent exams were reduced to separate patients in waiting rooms. In addition, every exam was given extra time to allow workers to properly disinfect equipment between examinations.

We suggested that imaging departments should implement a system by which radiology staff rotated every 15 days, to prevent staff shortages if any of them became infected with the virus. Videoconferences were established for boards to allow participation of all members of staff.

In addition, no students or external observers were allowed to rotate so as to reduce the number of people working during each shift. To provide this advice we worked with an infection committee. Collaboration of every member of the radiology department is needed to achieve the needed safety measures.

How are you ensuring that you have enough capacity to cope with demand for imaging and/or radiotherapy in your country?

Even before the coronavirus pandemic began, demand for imaging had been increasing year on year. In our country, we have limited resources, especially when talking about the public health service. This leads to increased internal delays, pressure on radiologists and potentially a poorer experience for patients.

In our case, we recommend imaging departments should:

- Review time objectives: Identify and promote exams that are required quickly.
- Increase productivity: Use report templates for exams and reduce interruptions during informing.
- Continuous academic training for radiologists.
- Integrate an electronic patient database.
- Include new technology: During the COVID-19 pandemic we brought together several chest radiology experts to design a web page which, thanks to telemedicine, allowed the double-reading of chest X-rays and CT scans.

We believe there will be a constant increasing demand on radiology departments and that good organization, continuous academic training and the use of technology are the best ways to increase productivity and optimize patient care.

What role do you think teleradiology will play in your country in the coming years?

Teleradiology is likely to continue to grow over the coming years in Argentina. However, successfully implementing it will be a challenge. Teleradiology offers access to radiology exams in rural areas; the possibility of having a second opinion from an expert, reduces workload and improves delays in scan interpretations, as well as decreasing imaging departments' costs. What's more, it allows further educational opportunities.

Nevertheless, several challenges need to be faced such as the lack of control over reports, the lack of information a radiologist may have about a patient's clinical history or the lack of suitable equipment. In addition, and very important to take into account, the legal aspect regarding the jurisdiction of a teleradiology system, the medical licence needed and the proper certifications needed for practitioners. I believe that we should act together among all scientific societies to actively create an accreditation scheme for teleradiology services.

Ms Bronwyn Hilder

President, Australian Society of Medical Imaging and Radiation Therapy (ASMIRT)

Chief Radiation Therapist/Manager, WP Holman Clinic, Royal Hobart Hospital, Tasmania, Australia



Australian Society of Medical Imaging and Radiation Therapy (ASMIRT)

ASMIRT is the peak body representing medical radiation practitioners in Australia. Our aims are to promote, encourage, cultivate and maintain the highest principles of practice and proficiency of medical radiation science, always mindful that the welfare of the patient should be at the centre of everything we do.

How do you make sure that hard-to-reach communities have access to imaging and/or radiotherapy?

Equitable access for patients has always been a significant issue for the profession. Limited funding is available to attract suitably qualified health professionals to remote locations. The largest obstacle is the provision of suitably qualified professionals to operate and run the equipment.

In Australia, given the extensive distances required to travel from one rural community to another, Licensed X-ray Operators (LXOs) play a crucial role in delivering basic imaging services to rural and remote communities where it is not economically feasible or sustainable to employ a qualified radiographer. This type of operator does not exist in the radiation therapy sector.

Healthcare professionals (HCPs) who choose to become LXOs, such as doctors, nurses, paramedics, administration and support staff, are provided a Basic Radiography Training programme through select universities and education providers. The programme consists of pre-reading and a 2–4-day face-to-face workshop which incorporates an assessment process. Successful completion of the assessment results in a certificate used for application for a limited radiation licence (basic) to use X-ray equipment in areas where a qualified radiographer is not present.

The HCPs are under direct supervision of qualified radiographers. Any X-rays taken are sent via teleradiology to the supervising radiographer at a distant location for approval.

How has the COVID-19 pandemic changed the way imaging and/or radiotherapy professionals work in your country'?

Imaging and radiation therapy professionals have always kept current with new technology and the use of new technology. The COVID-19 pandemic has been a reminder that infection control is significantly important in a healthcare environment. This has exposed challenges in systems around cleaning and disinfecting surfaces, education of staff as well as highlighting the strain on limited resources and tight budgets. Clinicians are now more aware of clinical hygiene, the correct use of PPE, COVID-19 safety training compliance and managing students and patients.

The COVID-19 pandemic has also resulted in re-assessment of how quickly technology can be rolled out, how structured teams can work together over different shifts and how remote planning can occur effectively in radiation therapy. The use of communication platforms such as Teams and Zoom has enabled continued communication and operations in an effective manner.

How are you ensuring that you have enough capacity to cope with demand for imaging and/or radiotherapy in your country?

Educational institutions providing medical imaging and radiation therapy qualifications are increasing the intake of students into their programmes to ensure workforce capacity. The main challenge is to ensure there are enough clinical placement spots for training for the increased intake. To mitigate the limited clinical positions, universities are engaging with equipment vendors. They are utilising both physical hardware and virtual software for teaching fundamentals in both equipment and patient positioning as well as in radiation therapy planning. Online theoretical teaching through various portals has supplemented the physical and virtual software to ensure students are supported with theoretical knowledge, clinical expertise and research capabilities. Clinical placements through various types of institutions have been key to maintaining students' interest in the profession.

Expansion of current imaging services to include some health services at low to no cost are essential to support increased workload demands. Introduction of new technology has also seen an increase in cross hybridization of the workforce.

Continuous advocacy by the professional body with external stakeholders seeks to ensure that there are planned FTE increases for a sustainable workforce to support the full operation of these services.

What role do you think teleradiology will play in your country in the coming years?

Teleradiology and outsourced after hours radiology reporting services will continue to play a significant role in ensuring remote and rural communities receive timely reports and diagnostic services. With infrastructure and further opportunities increasing, it is anticipated that teleradiology will only become a larger part of medicine in the future both locally and internationally.

The combination of teleradiology and the electronic health record (My Health Record) is improving healthcare services and service delivery for both patients and healthcare professionals.

Answers provided by the ASMIRT Artificial Intelligence Reference Group.

Professor Valdair Muglia

President, *Colegio Brasileiro de Radiologia (CBR), Brazilian College of Radiology*

Associate Professor of Radiology, *Ribeirao Preto School of Medicine, University of Sao Paulo, Brazil*



Colegio Brasileiro de Radiologia (CBR), Brazilian College of Radiology

The Brazilian College of Radiology is a federation, encompassing 27 radiological societies from all Brazilian States. The CBR is in charge of certification of Brazilian radiologists and represents radiology (we have more than 12,000 radiologists in Brazil) on all levels, including government regulatory agencies, the Medicine Council and others.

How do you make sure that hard-to-reach communities have access to imaging and/or radiotherapy?

Brazil is the fifth largest country in the world. Considering that hard-to-reach communities, in our case, include even remote locations in the rainforest, it is virtually impossible to deliver high-quality imaging information in person. Over the last decade, the Brazilian College of Radiology has invested in human resources and information technology to ensure the development of online tools to make digital education a reality for all members. A dedicated sector was created and developed to design a plan, including an assorted mix of digital learning tools to be gradually implemented until 2022. One major limitation of this ambitious plan is that not all variables are under our control. For instance, some online interactions will require a dedicated link to the internet, however the Brazilian internet infrastructure is variable; it can be very fast in some states but can be troublesome in others.

In spite of this and other limitations we're moving on with our project.

How has the COVID-19 pandemic changed the way imaging and/or radiotherapy professionals work in your country?

The effects of the pandemic on radiology practice can be detected all over the world, and, to a certain degree, are the same.

One major change was in the speed of migration to teleradiology, which was already on its way before but has been accelerated by the COVID-19 pandemic, even in small and medium sized cities. The implementation of teleradiology was, initially, a protective measure against the spread of the infection. However, due to its facility and efficiency, a great proportion of radiologists have migrated to this form of work. A survey conducted by CBR in July 2020 estimated about 50% of radiologists were working, predominantly, remotely. Besides, the restriction on the available personnel in many radiological facilities at the peak of the pandemic, forced the development of more efficient workflows, which were subsequently incorporated into routine practice.

However, the true impact that COVID-19 has had on radiology practice still remains to be determined.

How are you ensuring that you have enough capacity to cope with demand for imaging and/or radiotherapy in your country?

In our country, the Brazilian College of Radiology has many roles in respect to our specialty. The CBR is responsible for providing the minimum requirements for radiology residency training programmes; it is the institution officially designated to certify radiologists; it represents the specialty in the Brazilian Association of Medicine and government health agencies and; it is also a scientific society, aimed at providing reliable sources of information for its members. Considering the multitude of purposes in its by-law, the CBR has recently reassessed its administrative design. New departments, in accordance with the new demands of medicine and our specialty were implemented, along with the incorporation of new skilled professionals, with previous experience in each of the four aforementioned tasks. The national nature of our institution is one of the major strengths of the CBR. The human resources, the radiologists, members of the Board of Directors, and all committees are composed of dedicated, high-quality professionals from all over the country, ensuring the continuity of all this planned work.

What role do you think teleradiology will play in your country in the coming years?

The Brazilian Council of Medicine has authorized tele-interconsultation (second opinions between the radiologist and general practitioner) and telediagnosis (remote reporting) since 2009, having already updated the Teleradiology Resolution in 2014, when it expanded the radiologist's performance without, however, authorizing tele-ultrasonography. In 2020, teleconsultation (doctor-patient) was authorized by federal law, opening an opportunity in the coming years for the radiologist to act in patient care. In parallel, Brazil has strict federal laws in place for the protection of personal data and electronic medical records to ensure quality and security for teleworking, which is also recognised by another federal law. The current scenario is one of high investment in internet infrastructure by the market stakeholders and in the training of people by the Brazilian College of Radiology with the support of medical schools. This combination ensures, in the medium term, the increase of teleradiology in Brazil, a country with cultural and socioeconomic diversities and inequalities to be faced and ameliorated.

"The speed of migration to teleradiology has been accelerated by the COVID-19 pandemic."

Dr Sridhar Redla

President, British Institute of Radiology (BIR)

Consultant Radiologist, The Princess Alexandra Hospital NHS Trust, Harlow, United Kingdom



British Institute of Radiology (BIR)

The BIR is the international membership organisation for everyone working in imaging, radiation oncology and the underlying sciences. We aim to support the work of our members and their colleagues to achieve professional excellence, provide continuing professional development, publish cutting edge research and influence and connect with the wider professional sector.

How do you make sure that hard-to-reach communities have access to imaging and/or radiotherapy?

As part of the National Health Service (NHS) long-term plan, there will be a radical overhaul of the way imaging and other diagnostic services are delivered to patients. It has been recommended that community diagnostic hubs or “one-stop shops” should be created across the country and away from main hospitals, so that patients can access these life-saving services closer to their homes wherever they live. These centres can then be connected through technology and networking to enable access to specialists and sub-specialists. This will also even out geographic variations when it comes to reporting backlogs and workforce shortages.

Within radiotherapy, specialist cancer clinics have always been conducted across cancer networks, bringing clinical expert consultation to patients closer to where they live. Radiotherapy capacity has expanded through the development of extra cancer centres and (where appropriate) devolved/satellite radiotherapy units improving patient access, whilst maintaining high standards of service through agreed clinical management guidelines and network services. National clinical services, like high-energy proton beam therapy, are specialised NHS services, with high degrees of support for patients to access the services during treatment, and specialised support after treatment in cancer centres/clinics closer to their local communities.

How has the COVID-19 pandemic changed the way imaging and/or radiotherapy professionals work in your country?

The COVID-19 pandemic has certainly altered the way we work and hastened certain changes which would have taken much longer to implement. Technology has been thrust to the forefront with remote working or working from home becoming the norm wherever possible. Employers and imaging professionals, who were previously averse to this idea or had reservations, have now embraced this partly as a reaction to the Government’s social distancing and stay at home message and partly due to the flexibility it brings to our lives. This has been backed up by NHS initiatives and easy access to these technological advances.

Within radiotherapy, new ways of working were quickly implemented. More work was conducted remotely/online for areas like treatment planning. Collective advice was published nationally through professional bodies, and different (shorter) fractionation regimes were implemented safely. Practices established as safe and secure will likely continue in some form in a post-COVID-19 environment.

How are you ensuring that you have enough capacity to cope with demand for imaging and/or radiotherapy in your country?

This can be achieved through a three-pronged approach for Imaging:

1. Creation of imaging networks is now a focus of NHS England’s long-term plan, which is set to create 18 radiology networks across the country. This will enable images to be accessed by clinicians “regardless of geography”, thereby helping departments stretched for resources and allow faster access to specialist opinion.
2. Embracing technology like AI which can be used for prioritizing workflow, as a “first or second reader” thereby reducing errors and reporting times.
3. Promoting radiology as an attractive speciality for junior doctors and increasing radiology training posts to address current and future workforce needs.

For radiotherapy, the increasing needs and capacity, and the optimum sites for expansion, are developed in discussion with commissioners of specialized services against a national service specification. Additional capacity is considered by specific cancer networks, recognising the needs for patient access to radiotherapy through specific satellite units organized around cancer centre hubs and/or capacity-increasing working practices within cancer centres. Service needs and locations are key strategic drivers.

What role do you think teleradiology will play in your country in the coming years?

Teleradiology is already playing a major role in the UK. Currently, the various teleradiology companies offer their services to institutions with workforce shortages to help with their reporting backlogs. They also play an important role in providing out-of-hours reporting services for a major proportion of hospitals in the country. Moving forwards, teleradiology will play a crucial role in the various imaging networks being set-up across the country for easy and seamless transfer of images and faster access to specialist opinion. It will provide a solution to short-staffed departments, particularly in times of leave and sickness. The other major benefit is sub-specialist opinion and input for multi-disciplinary clinical meetings.

Remote/online working and IT links connecting oncology information systems play an increasing role in modern radiotherapy; enabling faster access for clinicians and healthcare professionals to outline, plan and authorise radiotherapy and offer advice and support for complex radiotherapy issues.

Mr Irving Gold

Chief Executive Officer, Canadian Association of Medical Radiation Technologists (CAMRT)



Canadian Association of Medical Radiation Technologists (CAMRT)

The CAMRT is the national professional association and certifying body for radiological, nuclear medicine and magnetic resonance imaging technologists and radiation therapists in Canada. Established in 1942, the CAMRT today represents over 12,000 members.

How do you make sure that hard-to-reach communities have access to imaging and/or radiotherapy?

Canada is a very large and diverse country. Providing medical imaging and radiation therapy services to the rural and remote communities can be very challenging. Nuclear medicine, magnetic resonance imaging and radiation therapy, are generally only available in larger urban centres. Many smaller communities have access to X-ray, and some to CT through community-based health services. That said, there are still many very isolated communities with little to no access to medical imaging and radiation therapy services at all. Typically, the residents of these communities are flown to a larger centre to receive their care.

Currently, the CAMRT is working closely with Health Canada and a number of partner organizations to address imaging needs in our First Nations, and rural and remote communities. We are discussing many potential solutions to begin to address the lack of access to technology, as well as the shortage of professionals required to perform imaging examinations so that more Canadians can access imaging and radiation therapy services in the future.

How has the COVID-19 pandemic changed the way imaging and/or radiotherapy professionals work in your country?

COVID-19 has had a massive effect on both medical imaging and radiation therapy services. It has affected all aspects of our practice and continues to be a significant source of stress for MRTs. The initial wave was marked by adjustments to infection control, patient flow and shutdowns to certain services in medical imaging (e.g., breast screening). The months since the first wave passed have revealed enormous backlogs created by the shutdowns and the slowdowns caused by distancing and sanitization. We have conducted three studies on the effects of COVID-19 and its impact on the practice environments for both medical imaging and radiation therapy.

The CAMRT has played an important role in advocating for MRTs. Early in the pandemic the association focused on ensuring MRTs were recognized as frontline healthcare workers and had access to PPE. In 2021, we have been working to ensure MRTs are getting access to the COVID-19 vaccine. Additionally, we are studying violence in the workplace and the mental health status of our community.

How are you ensuring that you have enough capacity to cope with demand for imaging and/or radiotherapy in your country?

The CAMRT constantly monitors the state of medical imaging and radiation therapy within Canada. On a biennial basis, the CAMRT conducts a Health Human Resources Survey of all Canadian medical imaging and radiation therapy facilities. We ask managers to disclose current vacancies, projected vacancies, and projected workload volumes to get a sense of the health of our professions.

Secondly, we support the Canadian Agency for Drugs and Technology in Health (CADTH) in the development of a Canadian Medical Imaging Inventory to monitor advanced medical imaging equipment across the country. This inventory, now in its third iteration, helps to determine access to medical imaging at the present time, and forecast future needs.

Finally, we work with other partner organizations. The Canadian Association of Radiologists (CAR) reports, *The Lifecycle Guidance for Medical Imaging Equipment in Canada* and *Radiology Resilience Now and Beyond* discuss issues related to our practice and envision a future beyond our dealings with COVID-19. In radiation therapy we work closely with the Canadian Association of Radiation Oncology (CARO) and the Canadian Organization for Medical Physics (COMP) to support the efforts of the Canadian Partnership Against Cancer.

What role do you think teleradiology will play in your country in the coming years?

Due to Canada's sparse population, and the isolation of many of our First Nation, rural and Northern communities, teleradiology already plays an integral role in the Canadian healthcare system ensuring that images are read by a radiologist. In fact, during COVID-19, many radiologists have been splitting their time between the hospital and their home offices.

Unfortunately, there are still numerous barriers to teleradiology for the most remote communities. Stable internet is not always available across the country. And, though this is currently being addressed by the federal government, it is a long-term project.

As networks, internet infrastructure and technology improve, we believe that teleradiology will grow, playing an even more significant role in the Canadian healthcare system. We also believe that additional technologies such as AI will play an important role in helping radiologists triage examinations.

Professor Zhengyu Jin

President, Chinese Society of Radiology (CSR)

Peking Union Medical College Hospital, Beijing, P.R. China



Chinese Society of Radiology (CSR)

The largest radiology society in China, CSR is a non-profit national community dedicated to radiology research and clinical treatment, founded in 1937 in Shanghai. As a subordinate of the Chinese Medical Association (CMA), CSR set its purpose for uniting all radiologists as well as radiologic technologists nationwide, and actively promotes the development of Chinese radiology.

How do you make sure that hard-to-reach communities have access to imaging and/or radiotherapy?

Residents of remote communities in China have relatively inadequate access to high-quality primary health care. Poverty due to illness is one of the root causes of rural poverty in China. Poverty alleviation is the focus of the government's policy support, emphasizing the improvement of healthcare.

China has its unique social security system, under related laws and regulations, through the redistribution of national income, to safeguard citizens' basic living needs. The social security system is mainly constituted by endowment insurance, medical insurance and unemployment insurance.

The development of internet-based digital health technology also assists in relocating medical resources to hard-to-reach communities. Recent research projects have integrated AI into clinical workflow. AI programs can help radiologists prioritize worklists by identifying suspicious or positive cases for early review. AI can be used to extract "radiomic" information, thus going beyond human visual ability, potentially increasing the diagnostic and prognostic value derived from image data sets.

Last but not least, the application of advanced technology should go hand in hand with a good training programme, as a way to improve the professional knowledge and technical skills of health workers in comparatively remote regions.

How has the COVID-19 pandemic changed the way imaging and/or radiotherapy professionals work in your country?

CT was recommended as the first-line imaging modality for the screening and severity evaluation of patients suspected of COVID-19 infection in China. Subsequently, the pressure for medical workers in radiology departments increased dramatically during this pandemic.

On the other hand, critical importance has focused on infection control and prevention practices to reduce cross-infection of both medical workers and patients.

This pandemic has also accelerated digital innovations, shifting workflow in the medical industry from offline to online. Patients can check their medical results through personal cell phone devices. Remote reading has been more widely chosen among radiologists.

How are you ensuring that you have enough capacity to cope with demand for imaging and/or radiotherapy in your country?

There is a mismatch between the growing medical needs of citizens and the current medical capacity available. Balancing the situation is a challenge faced by the health sector around the globe.

Fortunately, research programmes have begun exploring the underlying factors of workforce distribution from different perspectives. From the individual perspective, studies of job satisfaction, burnout, and motivation can help understand how personal choices contribute to maldistribution. To think creatively, AI programs designed to increase single individual productivity are encouraged to mitigate this problem.

The theory of supply and demand has served as an essential basis for understanding labour market dynamics but has rarely been applied to the health field. We call for high-quality research to provide evidence and insight to support formulating more effective policies. Establishing a long-term dynamic balanced medical workforce system is a primary concern for the healthcare sector.

"Teleradiology is a possible way to mitigate geographic discrepancies in imaging care."

What role do you think teleradiology will play in your country in the coming years?

With rapid progress in the translation of digital technology in the medical field, teleradiology has developed rapidly in recent years. We believe teleradiology will become the mainstream working style shortly, and it will also play an essential role in enhancing medical image efficiency.

Teleradiology is a possible way to mitigate geographic discrepancies in imaging care. High-quality imaging diagnosis can be transferred to remote regions to improve healthcare access through online platforms, and the overload situation of doctors working in tertiary hospitals in the metropolis can also be mitigated through internet-based teleradiology.

Professor Wing P. Chan

President, Chinese Taipei Society of Radiology (CTSR)

Professor and Chief, Department of Radiology, Wan Fang Hospital, Taipei Medical University, Taipei, Chinese Taipei.



Chinese Taipei Society of Radiology (CTSR)

Founded in 1951, the Chinese Taipei Society of Radiology is devoted to improving healthcare in Chinese Taipei. We administer the Diagnostic Radiology Board Examination, regulate and accredit residency training programmes, provide policy advice to the government, organize an annual meeting and various educational courses, and publish *Journal of Radiological Science*.

How do you make sure that hard-to-reach communities have access to imaging and/or radiotherapy?

It is strongly believed that the government should support policies that promote equal access to healthcare, whether in rural or urban areas. This includes not only adequate infrastructure (manpower and facilities) but also quality of care. To ensure this, it is important that governments loosen regulations regarding remote care.

Telemedicine and teleradiology offer lots of potential at a relatively low cost. Networks should be established and maintained to ensure that medical images can be easily transmitted to the appropriate urban/regional hospital or medical centre via PACS.

To allow for timely communication of critical diagnoses between radiologists and clinicians, a videoconferencing platform is required. For radiologic studies and procedures that are not amenable to telemedicine, the government can provide incentives to encourage radiologists and technologists to serve in remote areas. Transportation routes and systems should be designed to ensure that patients in rural hospitals are able to be transferred to urban hospitals rapidly within 40 minutes and efficiently should an upgrade in care level be required. This also applies to cancer patients receiving radiotherapy treatment.

Finally, mobile clinics can be a useful means of allowing access to digital radiography, screening mammography, and CT scanning for patients in rural communities.

How has the COVID-19 pandemic changed the way imaging and/or radiotherapy professionals work in your country'?

Chinese Taipei responded quickly to the COVID-19 outbreak. Early intervention, strict border controls, and community measures effectively halted the spread of the virus. Public health officials employed certain technologies to identify and trace suspected patients and high-risk individuals.

As of March 12, 2021, Chinese Taipei has only 978 confirmed cases and 10 deaths due to the virus. Hospitals established COVID-19 infection control teams. In radiology departments, patients with confirmed or suspected COVID-19 were triaged appropriately, and dedicated equipment was reserved for these patients. Disinfection of equipment, staff scheduling, and environmental protection measures were employed to prevent transmission of the virus in the radiology department. Frontline healthcare workers were provided with sufficient PPE.

In addition, trainees adopted online learning methodologies, and attending physicians resorted to virtual conferences.

How are you ensuring that you have enough capacity to cope with demand for imaging and/or radiotherapy in your country?

Chinese Taipei has a rural population of approximately 5 million people, or 22%, which is similar to the percentage of people living in rural areas in the US.

Also as compared to the US, our rural population has somewhat limited access to radiologic studies, particularly CT scans. The number of CT scans performed is 18 per million population, which is only about two fifths of the US.

Our government has prioritized access to imaging, particularly for those living in rural areas. In November 1999, an Integrated Delivery System was initiated, which covers all of the 48 mountainous and island districts, thereby serving over 400,000 people. Hospitals located on outlying islands and in mountainous regions were equipped with telemedicine capabilities.

Collaboration with radiologists at certain urban hospitals was subsequently started, to ensure that films were read in a timely manner. The government also began offering certain incentives to entice retired healthcare workers to rejoin the workforce in rural hospitals.

What role do you think teleradiology will play in your country in the coming years?

Teleradiology in Chinese Taipei is relatively less developed compared to many western countries. The population density and relatively small size have made on-site readings more sustainable and have reduced the need for teleradiology.

While teleradiology services do currently exist, the coverage will likely expand greatly in the future. Teleradiology will increase the efficiency and add to the convenience of both radiologists and other physicians who wish to view images remotely. The establishment of networks between hospitals and remote sites as well as of communication tools to permit efficient relay of urgent findings are the remaining hurdles to widespread adoption of teleradiology.

However, these hurdles are small, as the templates already exist in many other countries, and should not be difficult to implement, particularly for a technologically savvy nation like Chinese Taipei. The future of teleradiology here is therefore indeed very bright.

Professor Dr Gerald Antoch

President, German Röntgen Society (DRG)

Director of the Department of Diagnostic and Interventional Radiology,
Düsseldorf University Hospital, Germany



German Röntgen Society (DRG)

The German Röntgen Society is a medical society that supports and promotes radiology in its medical applications, its qualifying teaching and in its further scientific development. The society makes an active contribution to the quality-assured, scientifically-based application of all imaging procedures and minimally invasive techniques, with particular emphasis on radiation protection.

How do you make sure that hard-to-reach communities have access to imaging and/or radiotherapy?

In Germany, compulsory health insurance applies to all people. Around 90 percent of the population in Germany has statutory health insurance, all others have private health insurance. All insured persons receive the same comprehensive care and are generally free to choose the doctors who treat them (principle of free choice of doctor).

Since 2019, appointment service centres have also been expanded as central points of contact for patients, 24 hours a day, 7 days a week, so that everyone can receive medical and, if necessary, radiological care without long waiting times.

More than 700 hospitals that have a radiology department and around 4,000 working radiologists in the outpatient sector ensure radiological care in Germany. Teleradiology applications help to ensure that this care is nationwide, fast and high quality.

“Teleradiology applications help to ensure that this care is nationwide, fast and high quality.”

How has the COVID-19 pandemic changed the way imaging and/or radiotherapy professionals work in your country?

Radiology has a central role in the diagnosis and follow-up of patients with COVID-19. Radiology departments therefore had to prepare for the care of COVID-19 patients. In particular, this involved protecting the health of patients and staff through extensive hygiene regulations. In particular, to protect staff within the department as well as to ensure the operation of facilities, it was necessary to avoid spreading the virus among staff in case one or more staff members became infected (possibly asymptotically). During the pandemic, radiology departments were also required to forgo elective examinations and therapies of all non-COVID-19 patients.

At a very early stage of the pandemic and further on, the German Röntgen Society filed recommendations on how to handle the pandemic in an in-patient and out-patient setting. On the other hand, the pandemic has also promoted networking of radiology in Germany. One example is RACOON (“Radiological Cooperative Network”), a multi-centre research network for the reporting, analysing, and pooling of CT data sets of suspected or proven SARS-CoV-2 cases for statistical epidemiological evaluation.

How are you ensuring that you have enough capacity to cope with demand for imaging and/or radiotherapy in your country?

The demographic development of increasing life expectancy goes hand in hand with changing family structures, a rural exodus, and a growing proportion of people with multiple comorbidities, chronic illness and increasing age. However, the increasing demand for health-related services is matched by a differentiated and high-quality range of outpatient and inpatient care. In the outpatient sector, target values for different physician groups per inhabitant have been defined for demand planning. The planning of inpatient care is the responsibility of the federal states, which enable and ensure the operation of hospitals in a way that meets demand. Hospital plans define the capacity of hospitals required for this purpose, measured in established beds.

In order to ensure high-quality radiological service provision, continuing education is part of everyday professional life, even after board certification as a specialist in radiology.

The German Röntgen Society makes an active contribution to the quality-assured, scientifically-based application of all imaging procedures and minimally invasive therapies, with particular emphasis on radiation protection, especially through the development and implementation of continuing and advanced training programmes for physicians, students, and technical staff. These programmes are quality-assured and participation is documented, e.g. through certificates.

What role do you think teleradiology will play in your country in the coming years?

Teleradiology helps to ensure nationwide, rapid and high-quality care. Radiological image data can be transmitted in the shortest possible time, both for emergency referrals and for obtaining a second opinion via teleconsultations, for referrals or initial consultations. Patient transfers or duplicate examinations can thus be avoided, second opinions can be obtained more quickly, or treatment plans can be drawn up early, even before the patient arrives, in the event of an emergency transfer. Particularly in territorial states, teleradiology can save lives.

Area-wide digitization has enabled radiology to effectively serve the needs of modern telemedicine applications early and ahead of other medical disciplines. Teleconsultation, teleconferencing and teleradiological examinations are the key applications that have emerged on the basis of this successful digitization process. The requirements and rules for the use of teleradiology are listed in the German Radiation Protection Act (StrlSchG). These include specifications on equipment or on the availability and professional qualifications of the persons involved.

Dr Stephen Chun-Key Law

President, Hong Kong College of Radiologists (HKCR)

Hong Kong Sanatorium & Hospital, The University of Hong Kong and the Chinese University of Hong Kong



Hong Kong College of Radiologists (HKCR)

Hong Kong College of Radiologists was incorporated in September 1991. The College was established with the objectives to encourage the study and advancement of the science and practice of radiology, as well as to maintain the good practice of radiology by ensuring the highest professional standards of competence and ethical integrity.

How do you make sure that hard-to-reach communities have access to imaging and/or radiotherapy?

Hong Kong's healthcare system runs on a dual-track basis encompassing the public and private sectors. All the public hospitals and out-patient clinics are governed and managed by the Hospital Authority, which is totally funded by government. The rest is provided by the private healthcare sector with more personalized choices and more accessible services.

Hard-to-reach refers to those sections of the community that are difficult to involve in public participation. The barriers are commonly multifactorial with complex socio-economic and cultural contexts. Some of these groups may not be visually apparent and easily identified. For example, single working parents or people with poor social support are more likely to miss appointments either because they forget or cannot make time for it.

Some government funded radiotherapy centres in Hong Kong are exploring the feasibility of extended working hours. Likewise almost all the public hospitals in Hong Kong provide imaging services in extended hours and weekends. Medium-sized hospitals were built to deliver care closer to home. These increase the availability of radiotherapy or imaging to groups of patients who otherwise may not be able to access them because of other competing priorities. As Paul Vittles puts it, "no-one is hard to reach, just more expensive to reach. It is important to put more effort and creativity in reaching these groups."

How has the COVID-19 pandemic changed the way imaging and/or radiotherapy professionals work in your country?

In order to minimize unnecessary hospital visits, hypofractionated radiotherapy is increasingly used, following international consensus guidelines. This minimizes the risk of transmission of COVID-19 in hospital settings. Patients who need to remove their surgical masks during radiotherapy, for instance those having radiotherapy for head and neck cancer or breast cancer using active breath control, are regularly screened for COVID-19 using deep throat saliva. Radiotherapists regularly check the results of these patients before their radiotherapy treatment.

For imaging, appointments of non-urgent cases have been rescheduled according to their clinical indications and the overall situation of COVID-19 disease control in Hong Kong. The purpose is to ensure adequate capacity is available to support urgent imaging services at all times, and to reserve adequate capacity to cope with the increase of elective demand during the recovery phase of the disease outbreak.

How are you ensuring that you have enough capacity to cope with demand for imaging and/or radiotherapy in your country?

The public hospitals in Hong Kong, which provide the majority of imaging and radiotherapy services, are under increasing strain because of rising service demand and manpower shortage. Several measures have been or will be implemented to increase the service capacity.

The Hospital Authority manages all public hospitals in Hong Kong. It has launched several public-private partnership initiatives to divert some unmet needs to the private sector. For example, some patients who need early CT, MRI or palliative radiotherapy could receive a substantial subsidy to have these done in selected private imaging centres or hospitals. This can harness the reserve capacity of the private healthcare sector to ensure timely delivery of imaging or radiotherapy services.

Use of AI is being actively explored to expand service capacity. By employing AI in image interpretation or radiotherapy contouring, more patients can receive timely diagnosis or treatment without a significant increase in the supply of doctors.

What role do you think teleradiology will play in your country in the coming years?

In Hong Kong, secured IT networks are available in hospitals under the Hospital Authority and cross-hospital teleradiology is actively practised. It is used mainly for handling demand surges such as an increased need for radiological services in the flu season. In the COVID-19 outbreak, this has also been adopted in centralized reporting of suspected/confirmed cases that are admitted into designated Treatment Centres.

Home-based teleradiology is being explored and is anticipated to be ready for service provision very soon. Its implementation will further ensure timely interpretation of images in non-office hours and maintain radiology services during possible future lockdowns in relation to COVID-19.

With an expansion of radiology service provided by satellite hospitals in the coming years, teleradiology could also allow trainees to stay in accredited training centres where direct supervision or mentoring is more readily available, while they participate in image-interpretation of radiological examinations performed in the satellite hospitals.

Prof. Dr Amarnath Chellathurai

President, Indian Radiological and Imaging Association (IRIA)

Professor and Head of Radiodiagnosis, Government Stanley Medical College, Chennai, India



Indian Radiological and Imaging Association (IRIA)

IRIA is the largest radiology association of Indian radiologists in Asia with a member strength of more than 18,000. IRIA strives for excellence in radiology, continued medical education for members and empowers them academically and socially. IRIA also engages in social work like empowering the marginalized women of the country.

How do you make sure that hard-to-reach communities have access to imaging and/or radiotherapy?

The government of India has started subsidizing CT/MRI machines for tier 2 and tier 3 cities. The high-speed internet availability in the last few years in India is a revolutionary story, with penetration in the remotest of areas and the cheapest across the world. These things have fuelled the entrepreneurial spirit of many Indians to open imaging centres in the remotest places. In most places, reporting is done by a radiologist based in a city. This is done by either remote access software like TeamViewer or by online teleradiology software like Osirix cloud. The typical turnaround time is about one hour.

The central government of India has introduced free health insurance working on a public-private partnership model called "Aayushman Yojna". Here a marginalized person can get treated at a private corporate hospital for free. The biggest success story of this scheme is oncology treatment. More than a year into this scheme, it has become a very viable project for private hospitals in terms of sheer volume, with government funding the treatment of patients. This has encouraged many hospitals in most cities to start new radiotherapy centres. With good road and rail connectivity, patients regularly come for radiotherapy in such centres.

How has the COVID-19 pandemic changed the way imaging and/or radiotherapy professionals work in your country?

According to a survey, radiologists were amongst the least infected medical professionals with COVID-19 as compared to doctors of other specialities in India. The Indian mentality is always to have a flexible approach to solve a problem that uses limited resources in an innovative way. We as radiologists have been taught the principle of Time-Distance-Shielding to counter the ill effects of radiation. Following the same for COVID-19, radiologists have started to work from home as much as possible. With the advent of "cloud computing" readily available in Osirix and Horos, reporting can be done from home. Many centres have started using AI based algorithms to report COVID-19 scans. These AI based algorithms proved a boon especially in the second wave when a typical tier 2 city has a load of about 2,000 CT scans in a day.

How are you ensuring that you have enough capacity to cope with demand for imaging and/or radiotherapy in your country?

There are currently 25,000 practising radiologists in India; every year around 2,500 new radiologists start practising. Right from the radiology training days, residents are trained to work for typically 8-10 hours a day with about two emergency duties per week. In the last decade, with the boom of internet connectivity, hundreds of Indian teleradiology companies have flourished. With such a seamless synchrony amongst imaging centres and radiologists, the output of diagnostic imaging is near perfect. The remuneration by these teleradiology companies is usually market equivalent. These opportunities especially become a boon for female radiologists who might be nursing mothers or retired radiologists. Many radiologists who have got international qualifications like RANZCR or FRCR, do regular reporting of foreign countries' diagnostic scans over and above their routine Indian radiology work.

As for radiotherapy centres, with a growing demand of oncotherapy, the centres are operational for 18-20 hours a day.

What role do you think teleradiology will play in your country in the coming years?

The year 2020 has become a watershed moment in the history of mankind wherein medical science has become a torchbearer to lead the way. Radiology has always been pioneering in technology acceptability amongst other specialities. The coming years will test the resilience of mankind against many deadly diseases and teleradiology will be the tool to fight such menace. Teleradiology combined with state of the art algorithms will change the way humans are diagnosed/prognosticated of a particular disease. Teleradiology will also aid in multi-speciality treatment of patients without being physically present. It will pave the way for better treatment of each and every citizen of the world without any discrimination of race or region. Just as video calling has brought far flung families closer, teleradiology will help us treat and bring the world much closer, as cherished in a Sanskrit phrase "Vasudhaiva Kutumbakam"—The whole world is a family.

"Teleradiology will pave the way for better treatment of each and every citizen of the world."

Ms Donna Newman

President, International Society of Radiographers and Radiologic Technologists (ISRTT)

Lead Nuclear Medicine and PET-CT, Sanford Health, Fargo, North Dakota, USA



International Society of Radiographers and Radiologic Technologists

ISRTT represents over 500,000 radiographers worldwide with a mission to improve the standards of delivery and practice of medical imaging and radiation therapy throughout the world by acting as the international liaison organisation for medical radiation technology and by promoting Quality Patient Care, Education and Research in the radiation medicine sciences.

How do you make sure that hard-to-reach communities have access to imaging and/or radiotherapy?

ISRTT has been working to ensure that hard-to-reach communities gain access to imaging and radiotherapy medical equipment by contributing to the WHO's Global Action Plan which includes increasing availability of affordable basic technologies by 80% by 2025.

ISRTT represents the global voice for radiographers/radiological technologists around the world as the official non-governmental organization in official relations with the WHO. ISRTT experts contributed to the WHO's Priority Medical Device project convened to improve global access to medical devices in low- and middle-income countries.

The project was developed to create a list of priority medical devices needed for management of high-burden diseases at a given healthcare level in a country. These documents are used by governments to budget for appropriate healthcare.

ISRTT expertise helps to ensure access to priority radiology equipment which can be used in the management of healthcare within countries around the world.

How has the COVID-19 pandemic changed the way imaging and/or radiotherapy professionals work in your country'?

Suspension of many screening programmes and some non-essential procedures, during the acute phase of the pandemic, caused radiography departments to reorganize schedules, often increasing daily workloads. Patients, who were uncomfortable coming to the hospital cancelled their appointments and were often more ill when they did present, increasing staffing needs.

New social distancing protocols and new PPE standards were incorporated into daily practice. Special considerations for some practices, such as facemasks without metal for patients receiving MRIs, were implemented to avoid patient burns.

New practices, incorporated to allow negative air exchange and appropriate cleaning were added. Scheduling to incorporate these universal precautions also impacts daily schedules.

Radiographers have shown their resilience and rapid adaption to changing protocols, as well as their dedication to patient care, ensuring the continued human touch in delivery of patient care.

How are you ensuring that you have enough capacity to cope with demand for imaging and/or radiotherapy in your country?

ISRTT is contributing by representing the radiography global voice and developing strategies for the WHO's Health Employment and Economic growth committee's call for action campaign "Addressing the 18 million Health Worker Shortfall projected by 2030".

ISRTT has developed a collaborative plan that invests in the health and social workforce to create the right skills while meeting a country's needs. ISRTT strategies includes promotion of a reformed service model in countries worldwide for the radiology profession. This includes a four-tier educated radiographer profession with a basic to advanced career path. Another collaborative plan is elevation to professional status at the International Standard Classification of Occupation and the final path is investment in baseline education in maths in science for all genders.

Many of ISRTT member societies meet every 3-5 years with governments to evaluate supply needs verses the number of technologists available and adjust students in training programmes accordingly. The ISRTT believes these strategies will promote sustained, inclusive and sustainable economic growth for our future workforce in the radiography profession.

What role do you think teleradiology will play in your country in the coming years?

Teleradiology might help meet the shortage of radiologists around the world and may benefit departments with radiographer/radiological technologists but are lacking a radiologist. Availability for immediate results of a radiology procedure such as in trauma, stroke or emergent situations, teleradiology may also be of benefit. Globally it varies from country to country depending on their economic status, the practice of the radiology group, government laws of that country, insurance laws, and patients' privacy data laws. Also factoring the success of teleradiology is the availability of reliable internet, telephone lines, and wide area network availability.

Relating to radiographers some countries may mandate by law that a physician (sometimes a radiologist) has to be in the building in order to perform certain radiology procedures. While this looks like a bright future for our profession many details need to be worked out before there will be success of telemedicine in all countries.

Mr Dean Harper

President, Irish Institute of Radiography and Radiation Therapy (IIRRT)

Radiation Therapy Services Manager, St Luke's Hospital, Dublin, Ireland



Irish Institute of Radiography and Radiation Therapy (IIRRT)

The IIRRT was founded in 1996 and is the professional body representing radiographers and radiation therapists in Ireland. Our mission is to promote and advocate for the professions of radiography and radiation therapy and to improve the care received by our patients within healthcare settings through the continued development of our professions.

How do you make sure that hard-to-reach communities have access to imaging and/or radiotherapy?

Despite having one of the lowest population densities in Europe, almost two thirds of the Irish population is considered urban. As a result, the majority of the population is located within a 30-minute travel time or 15 km of an acute hospital.

Despite a network of hospital facilities and enhanced connectivity through improved infrastructure, a reconfiguration of services since the economic downturn has increased the travel time from many rural locations. As a result, it is estimated that 2.8% of the Irish adult population forewent medical care due to distance, waiting lists and other factors in 2017.

The recently published "Sláintecare" report outlines a roadmap to reform the Irish healthcare system which envisages a reorientation towards integrated primary and community care including community-based diagnostics to improve access to services across the country.

In the interim, key services such as "BreastCheck" (national breast screening programme), have established tele-radiology solutions to ensure this vital service is available to women in locations convenient to where they live. Mobile units move around the country and stay at locations depending on the demand for screening in that area and images taken are sent via link to a central unit where they are reported on by two consultant radiologists.

How has the COVID-19 pandemic changed the way imaging and/or radiotherapy professionals work in your country?

As a result of public health measures implemented in response to the COVID-19 pandemic, there was a need to reduce the time spent at, and the overall footfall within, healthcare facilities to curb the spread of infection while simultaneously maintaining frontline services.

The NCCP published a number of guidelines on the management of patients undergoing radiotherapy treatment during the COVID-19 crisis which offered a number of innovative solutions to the challenges faced.

One of the key recommendations was to reduce the number of face to face encounters by using technology to move towards virtual consultations and most review appointments with the patient are now carried out by phone or video-phone. Additionally, the use of this technology has expanded to facilitate remote attendance of the radiation oncologist at the treatment unit for image sign-off during more complicated techniques such as SABR or SRS.

How are you ensuring that you have enough capacity to cope with demand for imaging and/or radiotherapy in your country?

The number of cancer cases in Ireland is increasing at a rate of 3% per annum and expected to double by the year 2040. The number of patients requiring radiotherapy is expected to grow accordingly with up to 60% of patients requiring radiotherapy as part of their course of treatment.

The National Cancer Control Programme (NCCP) is responsible for the configuration and co-ordination of cancer services as outlined in the current National Cancer Strategy. One of the main goals of the strategy is to reduce the burden of cancer through prevention, screening and early diagnosis through rapid access diagnostic clinics.

The strategy acknowledges that pressure on current services is set to increase and that a rolling plan of capital investment will be required to ensure that system capacity and access is adequate to meet future demands. It is envisaged that public facilities will be expanded and an equipment replacement programme will be established. Additionally, workforce planning initiatives such as using advanced practice roles in radiography and radiation therapy will be needed to meet the demand and developments in technology.

What role do you think teleradiology will play in your country in the coming years?

I think with the roll out of the "Sláintecare" reform programme we will see a greater shift towards community-based diagnostics in the coming years with a significant programme of investment in community-based diagnostics facilities. It is likely that some of these facilities will be supported through links to acute hospitals through the National Integrated Medical Image System (NIMIS) which will facilitate remote reporting by experts located in other areas of the country.

In relation to radiotherapy services, I think that we will witness a greater emphasis on virtual consultations even in the post COVID-19 era and particularly for follow-up appointments. As public radiotherapy services are currently only available in seven locations, this will greatly reduce the burden on patients having to travel long distances for routine specialist services.

Professor Jacob Sosna

President, Israel Radiological Association (ISRA)

Hadassah Hebrew University Medical Center and
Chancellor, Israel Academy of Medical Sciences, Jerusalem, Israel



Israel Radiological Association (ISRA)

ISRA was established in 1927 and has 450 members. It is the oldest medical society in Israel. It has two roles: the first is academic and deals with setting the standards for radiology practice and education; the second is professional aimed at setting the requirements for a sound profession with strong position within the medical field.

How do you make sure that hard-to-reach communities have access to imaging and/or radiotherapy?

Israel is a small country with a population of about nine million. However, there are discrepancies in imaging equipment and staffing between central and peripheral regions. For instance the northern region of the Galilee with over one million inhabitants has only one centre equipped for radiotherapy in comparison to Tel Aviv. This is the same for PET-CT and MRI scanners. The planning of imaging equipment is centralized with a demand for a certificate of need in order to purchase advanced scanners. The means for providing better treatment for the periphery is a constant battle to ensure equal numbers of scanners and trained personnel. The campaign by our society was successful; five years ago we established a government-funded fellowship training in which radiologists are sent to more centrally located hospitals for one year for training in accredited fellowships such as neuroradiology, abdominal imaging or breast imaging. The government pays the salary of the trainee and the trainee is intended to go back to his/her original smaller hospital for a period of at least three years. We are proud that over 50 trainees have completed this programme and in this way we promoted the professional level of radiologists nationwide.

How has the COVID-19 pandemic changed the way imaging and/or radiotherapy professionals work in your country?

The COVID-19 pandemic has impacted Israel as it impacted the entire world. In radiology it impacted mainly our radiographers who work at the front line performing mobile chest X-rays in emergency departments as well as in COVID-19 ICUs. Our radiologists also had to comply to work with patients suspected of being COVID-positive mainly in US and in IR. The ability to work from a distance enabled them to read studies from home with rapid deployment of working stations in homes. Multi-disciplinary conferences have turned virtual instead of face-to-face. Teaching also changed. Our medical students were forbidden to physically come to the hospital in the first few months and teaching was mainly via on-line resources.

How are you ensuring that you have enough capacity to cope with demand for imaging and/or radiotherapy in your country?

Israel has a very advanced modern medical system that is provided by four HMOs and over 20 hospitals. Only 7.3% of the GDP is allocated to health which is one of the lowest in the EOCD. However, this necessitates a very efficient system. The number of MRI scanners as well as linear accelerators is set by the government but due to around-the-clock operation of imaging machines, the service provided to our citizens is at a high level. In my institution for instance, we operate the MRI scanners 24 hours a day and it is not unusual to have a knee MRI at 3 am. Another way to control the need is by setting guidelines for imaging studies. Recently the Ministry of Health decided to initiate a pilot project intended to use appropriateness criteria to avoid over-utilization of advanced imaging. ACR-based criteria will be used in CT and MRI in leading centres to evaluate the impact on the number of unnecessary studies performed.

What role do you think teleradiology will play in your country in the coming years?

Teleradiology has existed in Israel for a few years. It enables radiologists to read from a distance for their own hospital especially in the COVID-19 era. It also allows radiologists from larger hospitals to cover regions with smaller hospitals that are lacking radiologists in specific sub-specialities. Moonlighting is also enabled this way. The use of teleradiology has limitations however: the lack of interaction with clinicians undermines the value of radiologists and of our profession and might turn us into a commodity. The ability to work from home is more attractive to some radiologists that have left their positions at leading hospitals though; the struggle to find radiologists is becoming more difficult. Teleradiology is thus a tool that should be used selectively in order to maintain our profession as visible and attractive.

“The lack of interaction with clinicians undermines the value of radiologists and of our profession and might turn us into a commodity.”

Professor Shigeki Aoki

President, Japan Radiological Society (JRS)

Professor, Juntendo University, Tokyo, Japan



Japan Radiological Society (JRS)

JRS is one of the oldest and largest radiological societies in Asia, founded in 1950, with nearly 10,000 members in good standing. The society includes medical personnel from two major fields, i.e. diagnostic/interventional radiology and radiation oncology.

How do you make sure that hard-to-reach communities have access to imaging and/or radiotherapy?

In Japan, we have more than 8,000 hospitals, which translates to 6.7 hospitals per million. This is much higher than the global standard, and for instance, in the USA, there are only 1.8 per million. This means that we have a 3.7 times higher number of hospitals here in Japan. Most of them are equipped with some forms of imaging modalities and thus the access to imaging studies is not a big problem. The same applies to radiation oncology: there are about 900 hospitals with their own linear accelerators and thus, most citizens have access to those as well. On the other hand, the human resource to run these machines is lacking. For instance, there are only 6,000 diagnostic radiologists and 1,300 radiation oncologists in the country. Thus, the quality control of the studies and treatments is a big challenge. Some of the machines are run by part-time radiologists/oncologists, which is not an ideal way of practising global standards in medicine.

How has the COVID-19 pandemic changed the way imaging and/or radiotherapy professionals work in your country?

Some hospitals tried to divide up the team into two, so that they would not get quarantined all at once. This was not easy, as there was a shortage of physicians to begin with. Neither did we have an option to work from home, as there are very strict privacy rules here in Japan. There were, however, some changes at the latter half of 2020, as many of the hospital administrators realized that radiologists are one of the most suitable professions to work remotely and there is no reason to hold this plan back until the pandemic is over. This movement has led to allowing some of us to work from home, and this trend is slowly beginning to spread across the country.

How are you ensuring that you have enough capacity to cope with demand for imaging and/or radiotherapy in your country?

We are facing a substantial shortage of radiologists/radiation oncologists, and thus we are trying to reach out to the Ministry of Health Labour and Welfare to increase the number in this speciality. However, their mainstay agenda is to cut the budget of welfare to balance the growing increase in demand for medicine, due to a quickly aging population. At the same time, the government is trying to shorten the working hours of physicians in Japan, which is to ensure gender equity in the workplace. This will lead to a further shortage in workforce in the near future. We are trying to cope with this situation by task-shifting to nurses and technologists but we are afraid that this may not be enough to secure the required workforce.

What role do you think teleradiology will play in your country in the coming years?

This pandemic has led us to work remotely using teleradiology systems and now the hurdles are much lower than before. We believe teleradiology will be a mandatory part of our way of life. There are a few conceivable downsides to this movement. Firstly, we have to deal with the new legal issues related to data security. Secondly, we have to establish quality control processes to ensure that we are able to maintain the levels of interpretations/treatments. Last but not least, there is a risk for us to become more invisible if we distance ourselves too much from the hospital. We believe that the coming years will be a big experiment for us.

“We believe teleradiology will be a mandatory part of our way of life.”

Dr António Madureira

President, Portuguese Society of Radiology and Nuclear Medicine (SPRMN)

Chairman Radiology Department Centro Hospitalar Universitário S. João, Porto, Portugal



Portuguese Society of Radiology and Nuclear Medicine (SPRMN)

The Portuguese Society of Radiology was founded in 1931, following the success of the Portuguese School of Angiography, whose most prominent member was Egas Moniz (recipient of the Nobel Prize in Medicine in 1949). The Society publishes the journal, *Acta Radiológica Portuguesa*, and currently has around 800 members.

How do you make sure that hard-to-reach communities have access to imaging and/or radiotherapy?

Access to imaging services is a very important problem. In Portugal there is a dual system, based on public hospital facilities and private practices, certified by the government, which provides radiologic services to patients referred from primary care physicians and reimbursed by the Health Ministry. This system covers all imaging modalities except MR. The primary care physicians refer their patients to local hospitals which, if unable to address the problem, can refer the patient to another hospital. The “end of the line” hospitals are the “central hospitals”, of which there are five in the country. There are also three specialized “cancer hospitals” (Instituto Português de Oncologia) in Porto, Coimbra and Lisbon. The referral process has some specific problems as the majority of hospitals are unable to cope with the large number of referrals, leading to considerable waiting lists. A programme to recuperate these lists has been put into practice, with some success.

How are you ensuring that you have enough capacity to cope with demand for imaging and/or radiotherapy in your country?

The number of radiology and radiotherapy training positions is determined yearly by the Ministry of Health, after having received from the Portuguese Medical Association (“Ordem dos Médicos”) a list of the hospital facilities considered qualified to train Interns, along with their maximal training capacity. Some years ago, this resulted in a bottleneck as the government did not open all the available training positions, resulting in a shortage of radiologists. This situation has now been reversed. The private medicine sector is also quite important and in the last couple of years the number of private hospitals has exceeded the number of public hospitals for the first time in history. As they are able to offer better compensation packages than public hospitals, we experienced a considerable exodus of radiologists from public hospitals to the private sector, with a peak about five years ago. The public hospitals reacted by allowing radiologists to work overtime and getting a “fee-for-service” payment, reading CT or MR scans or performing ultrasound examinations. Nowadays the situation is more stable.

How has the COVID-19 pandemic changed the way imaging and/or radiotherapy professionals work in your country?

The COVID-19 pandemic has caused quite important changes in the way professionals work and in the design and workflows of imaging departments. During the peak pandemic waves, some professionals were asked to work longer shifts, resulting in less travel to the hospital, to work in “mirror teams”, and a significant number of radiologists worked from home, using teleradiology. The departments also had to change their layout and workflow. Some installed dedicated CT scanners and ultrasound units adjacent to COVID-19 areas. All had to define new circulation routes for COVID-19 positive patients so as to separate them from the regular patients. The emphasis on hygiene measures was also re-addressed.

What role do you think teleradiology will play in your country in the coming years?

Teleradiology will definitely play an increasing role in Portugal in the coming years. It already has a very important position, as a significant number of hospitals use teleradiology services for reading CT scans performed during night shifts in emergency departments. The importance of regulation should not be overlooked as problems are due to appear. Although from an individual perspective it is undoubtedly more comfortable to read CT or MR scans from home, we should not ignore the importance of being perceived as clinical partners to our referring physicians. We must therefore remain “visible” and available in hospitals, to discuss cases and interact with one another.

“We should not ignore the importance of being perceived as clinical partners to our referring physicians.”

Professor Valentin Sinitsyn

President, Russian Society of Radiology (RSR)

Chair of Radiology, Head of Radiology Department, University Hospital of Lomonosov Moscow State University, Moscow, Russia



Russian Society of Radiology (RSR)

Founded in 1916, the Russian Society of Radiology is the oldest and only national society of Russian radiologists, nuclear medicine specialists, medical physics, radiographers, technicians and other specialists related to radiology, diagnostic and interventional imaging. It unites local organizations of radiologists and nuclear medicine specialists from all regions of Russian Federation

How do you make sure that hard-to-reach communities have access to imaging and/or radiotherapy?

It is one of the critical medical problems in our country. Russia has a vast territory. There are many hard-to-reach regions where the population still has limited access to modern imaging and radiation therapy technologies. During the last decade, Russian Public Healthcare invested a lot into purchasing and installing modern radiological equipment in distant hospitals, especially ones in Siberia and the Far East.

The Ministry of Health renewed guidelines and standards of diagnosis and treatment for most important diseases, and every hospital and clinic should work to these. Another problem is a shortage of qualified radiological personnel in remote areas. Many highly qualified specialists move to large cities and towns located in the central and southern parts of Russia. The Government is trying to keep specialists in remote regions by increasing their salaries and offering certain additional social benefits, but so far, this problem has not been solved. The development of teleradiology could be a solution to some extent. The training of radiologists in distant areas is another important issue. The Russian Society of Radiology launched a system of regional schools targeted at radiologist education and training in hard-to-reach regions.

How has the COVID-19 pandemic changed the way imaging and/or radiotherapy professionals work in your country?

The COVID-19 pandemic severely impacted radiology and radiotherapy practices in Russia. There was a considerable increase in chest X-ray and CT examinations and a decrease in other types of imaging or radiotherapy procedures. In 2020 many general hospitals were converted into COVID-clinics. Patients with cancer and other severe diseases had limited medical service access. It is interesting to note that in Russia, chest CT has become a primary imaging modality for patients with suspected COVID-19; the role of chest X-ray was negligible. But COVID-19 contributed to the accelerated development of some new diagnostic imaging fields like telemedicine and teleradiology, distant training, and AI. We are now coming out of the second wave of the COVID-19 pandemic and most of our hospitals and radiological departments have resumed their usual work. The National vaccination programme is working, and we hope that the third wave of infection will not arrive. This pandemic provided a bitter but valuable experience to all medical doctors, including radiologists.

How are you ensuring that you have enough capacity to cope with demand for imaging and/or radiotherapy in your country?

This problem's solution consists of several essential parts: the radiological staff, equipment, radiological service organization, and funding. Russia has a national system of healthcare. Demand for radiologists and nuclear medicine specialists is estimated and projected for 3–5 years ahead. Using these numbers, dozens of medical universities and university hospitals across the country offer residency positions for young doctors. But still, we experience the lack of radiologists. There are programmes of re-certification. Medical doctors from other specialties could get a radiologist's certificate after completing a second residency. Central and local authorities try to renew radiological equipment. The organization and function of radiological services on all levels is essential for optimal productivity. The radiologists' workload is increasing, and more regulations and reforms are needed to optimize diagnostic imaging workflow. Reimbursement of radiological services is another legal problem. The Russian Society of Radiology is a member of the National Medical Chamber. We try to influence different decrees, laws, and regulations prepared by the Chamber and the Ministry to benefit radiologists and our patients. The share of private medicine is increasing and can compensate for the deficit of imaging and radiation therapy in some regions of the country.

What role do you think teleradiology will play in your country in the coming years?

Teleradiology is one of the most popular topics in healthcare. For many years teleradiology worked well in the networks of private hospitals and imaging centres. They have a lot of part-time radiologists, and teleradiology helps them to work more efficiently. The COVID-19 pandemic has accelerated the growth and implementation in different regions of the country. Some cities and areas have connected all hospitals and outpatient centres with radiological equipment into the regional networks with PACS systems and gates to the internet. The benefits of teleradiology for modern medicine are multiple. One important feature of teleradiology in Russia is the creation of consultation centres for distant primary readings, "second-opinions" or audit programmes. Launching such networks needs substantial financial investment. Most regions just have plans to create a regional teleradiological network. Again, there is a problem with experts. The number of top-qualified radiologists is limited. Many of them have been working already beyond their capacity. We should use teleradiology for the benefit of doctors, avoiding further increase in workload.

Dr Milagros Martí de Gracia

President, Spanish Society of Medical Radiology (SERAM)

Chief of Emergency Radiology Unit, La Paz University Hospital, Madrid, Spain



Spanish Society of Medical Radiology (SERAM)

SERAM is a medical-scientific organization encompassing more than 6,000 Spanish radiologists. SERAM's main objectives are to promote, lead, and spread education and research in radiology and image-guided therapy, as well as to make its activities known to the public. SERAM also represents and defends the interests of radiology before institutions.

How do you make sure that hard-to-reach communities have access to imaging and/or radiotherapy?

In Spain, different solutions, adapted to the diverse geographical characteristics of each region have been sought. In large cities there are usually no difficulties in accessing radiological resources, but this is not always the case in communities where the population lives in small, isolated or dispersed villages. Portable mammography equipment has been installed on traveling buses to screen women in these hard-to-reach populations. Likewise, MRI units have also been installed in trucks that travel to small towns and cities where there are no MRI facilities (or which are insufficient to meet the needs). The exams are performed by the technicians who travel with the travelling buses or trucks; the reports are usually carried out in the referral hospital.

With the current COVID-19 pandemic, portable X-ray equipment has also been installed in trucks in order to reach small towns to perform chest radiographs. All these "mobile" options centralize the examinations in a single place, avoiding the displacement of patients and, above all, offering feasible solutions to the needs of radiological assistance where fixed equipment would be underused.

How has the COVID-19 pandemic changed the way imaging and/or radiotherapy professionals work in your country?

The COVID-19 pandemic has transformed the way radiology departments work. The most fortunate hospitals have two independent circuits with different equipment depending on the patient's COVID-19 status. In departments with insufficient equipment, infected patients are clustered for imaging and then a thorough cleaning of both the rooms and the radiological equipment is carried out. In any case, it is always necessary to clean the equipment after each non-suspected patient, to avoid unwanted infections. This has required modified schedules to adapt to the new pace of work and a reduction in the capacity of waiting rooms, among other measures. Obviously, these measures have significantly slowed down the workflow. On the other hand, after many months of almost exclusive dedication to COVID-19, there have been notable delays in the care of patients with other conditions. This has forced us to review the requests to prioritize the most urgent examinations.

How are you ensuring that you have enough capacity to cope with demand for imaging and/or radiotherapy in your country?

SERAM itself tries to act as an advisor to public bodies in terms of equipment whenever our opinion is requested. On the other hand, different documents and position papers are periodically published (together with supplier companies, with the radiological protection society, or independently) urging the renewal of older equipment in an attempt to reduce technological obsolescence. Also regularly, and in collaboration with local officials, documents are drawn up indicating the convenience of increasing technological resources to adapt them to healthcare needs and to guarantee homogeneous medical assistance in the different regions of our country. SERAM sometimes participates in the drafting of criteria to select the most appropriate radiological equipment. SERAM also supports the heads of radiology departments of different hospitals to justify the acquisition of new radiological equipment. The advent of COVID-19 has led to the direct purchase of new equipment by many hospitals, especially portable radiology and ultrasound equipment, minimizing bureaucracy but with the advice of experts.

What role do you think teleradiology will play in your country in the coming years?

In Spain, teleradiology is used for both scheduled and urgent examinations, to centralize reports of studies performed in remote centres where there are no on-site radiologists.

The number of radiology centres where they often work remotely, operating 24/7, is increasing. Consequently, the number of studies that new equipment can generate exceeds the work capacity of a radiologist during a single shift. The current trend is that a single radiologist supervises the acquisition of the studies, which are distributed to be read by several radiologists, who do not necessarily need to be present in the clinic/hospital. This allows flexibility in schedules and better family-work balancing. But we cannot forget that radiologists are not just "report-makers" and that we are responsible for the entire radiological process and must ensure that our clinical impression is accurately understood. Teleradiology can also help reduce the burden of work and waiting lists on already over-stretched hospitals, but it cannot replace the absolutely essential relationship between radiologists and clinicians, the involvement of radiologists in multidisciplinary committees, interventional and vascular procedures, or many ultrasound studies, to mention just a few.

Dr Dharmesh Daya

President, Radiological Society of South Africa (RSSA)

Director and Consultant Radiologist, VRP Radiology, Johannesburg, South Africa



Radiological Society of South Africa (RSSA)

The RSSA is the professional association of radiologists in both the public and private sectors in South Africa. We also have members from Zimbabwe, Namibia and Botswana.

How do you make sure that hard-to-reach communities have access to imaging and/or radiotherapy?

Due to historical and political circumstances, healthcare in South Africa consists of two tiers. A state sector and a private sector. The rural areas are almost completely served by the state and consist of often poorly funded hospitals. The private sector in these areas usually consists of GPs and small non-hospital-based radiology practices. The rural hospitals are usually staffed by a single radiologist. The onset of digital imaging has made it easier for these rural departments to access teleradiology assistance from state hospitals for difficult cases. This is a step in the right direction, although far from adequate as the state hospitals in urban areas are often themselves overwhelmed. Our goal is for the rural departments to move to fully digital PACS systems so that the better resourced private sector can assist. This would ideally be provided as an outreach programme free of cost. There is a willingness amongst many private radiologists to provide this service, however medicolegal and bureaucratic hurdles have delayed this. As a society we are still actively pursuing various options and I am confident that a solution will be reached in future to provide access to expert radiological opinion for all members of our society.

How has the COVID-19 pandemic changed the way imaging and/or radiotherapy professionals work in your country'?

The COVID-19 pandemic and the impact of lockdowns has made us, like many other professions, reconsider our working environment.

The initial goal to reduce the risk of exposure led to many departments limiting the number of radiologists on site with backup cover being provided by radiologists working from home. In many instances this has proved to be a more efficient system. We've also made use of ultraviolet-C (UVC) lamps in CT scanners for disinfection. This has sped up the disinfection process and limited scanner down time. Using dedicated portable and sonar machines for COVID-19 wards has also helped limit exposure. Waiting room capacity has been reduced to ensure social distancing. Despite initial difficulties in performing elective procedures due to hard lockdowns, radiology has adapted and we are slowly returning to our full service.

How are you ensuring that you have enough capacity to cope with demand for imaging and/or radiotherapy in your country?

As witnessed in other parts of the world, the demand for medical imaging has risen exponentially in recent years. South Africa has approximately 900 radiologists corresponding to a ratio of 1.5 per million population. The UK and Germany by comparison have 48 and 92 respectively. This is painfully inadequate for our needs, however the training of radiologists is completely dependent on the Department of Health and the RSSA is unable to influence the number of radiology training posts. Our priority therefore has been to maximise the potential of our scarce resource.

We've had a highly successful CME program and prior to the COVID-19 pandemic had organised congresses with internationally renowned faculty. This has increased our knowledge and skills base to better cope with our increasing workload. We've also co-ordinated interaction between state and private radiologists to share our resources. Increasing use of PACS and digital imaging has increased our efficiency for more rapid reporting. Adversity has brought out the best in our radiologists and I am confident that we will continue to maximise our limited resources.

What role do you think teleradiology will play in your country in the coming years?

Teleradiology provides a perfect opportunity for us to reach the more rural areas of our country as well as provide assistance to overloaded state institutions. It also allows access to super specialist knowledge which may only exist at major academic centres. The increasing use of the PACS system in both state and private radiology has helped expedite this process. Teleradiology has also increased the efficiency of radiology practices with radiologists at quieter branches having the ability to assist the busier branches thereby sharing the workload. The establishment of the national health insurance and the move to managed health care will lead to increased co-operation between the state hospitals and the private sector. Teleradiology will provide the ideal mechanism to integrate these resources.

“As witnessed in other parts of the world, the demand for medical imaging has risen exponentially in recent years.”



Join our radiology community

The British Institute of Radiology welcomes everyone working in imaging and radiation oncology.

If you work in radiology, whatever your profession, or you would like your company to join the BIR, please contact **membership@bir.org.uk**



The World Partner Network is a growing international community.

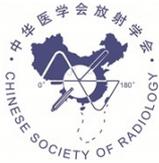
We share information, occasionally meet in person and online, and sometimes work together on projects such as this publication.

Members of World Partner Network societies are currently entitled to special membership rates to join the BIR, giving them access to BJR and other publications, as well as online education and reduced rates to virtual events and video courses.

If you would like your society to be part of the network please contact **communications@bir.org.uk**

BIR WORLD PARTNER

Network



If you would like your society to be part of the network
please contact communications@bir.org.uk



The British
Institute of
Radiology

Registered charity number 215869

visit bir.org.uk

admin@bir.org.uk

+44 (0)20 3668 2220

48–50 St John Street, London, EC1M 4DG

 [/BritishInstituteOfRadiology](https://www.facebook.com/BritishInstituteOfRadiology)

 [The British Institute of Radiology](https://www.linkedin.com/company/the-british-institute-of-radiology)

 [@BIR_News](https://twitter.com/BIR_News) [@BJR_Radiology](https://twitter.com/BJR_Radiology) [@BIR_YPAT](https://twitter.com/BIR_YPAT)