

Article

# Offshore reporting of radiologic examinations supplementing healthcare delivery worthy of Medicare reimbursement

Arjun Kalyanpur<sup>1</sup>, Neetika Mathur<sup>2,\*</sup><sup>1</sup>Teleradiology Solutions, Bengaluru, Karnataka 560048, India<sup>2</sup>Image Core Lab, Whitefield, Bengaluru, Karnataka 560048, India\* **Corresponding author:** Neetika Mathur, [neetika.mathur@imagecorelab.com](mailto:neetika.mathur@imagecorelab.com)

## CITATION

Kalyanpur A, Mathur N. (2024). Offshore reporting of radiologic examinations supplementing healthcare delivery worthy of Medicare reimbursement. *Imaging and Radiation Research*. 7(1): 6404. <https://doi.org/10.24294/irr6404>

## ARTICLE INFO

Received: 15 May 2024

Accepted: 30 May 2024

Available online: 19 June 2024

## COPYRIGHT



Copyright © 2024 by author(s).

*Imaging and Radiation Research* is published by EnPress Publisher, LLC. This work is licensed under the Creative Commons Attribution (CC BY) license. <https://creativecommons.org/licenses/by/4.0/>

**Abstract:** Medicare, a major healthcare program under the Centers for Medicare & Medicaid Services (CMS) has extended telemedicine services within several states in the US for different specialties for which it reimburses in order to establish a qualitative and accessible healthcare system. In parallel, it has been seen that teleradiology services by American Board Certified radiologists based offshore can significantly supplement healthcare delivery in the US by mitigating the shortage of radiologists and enhance outcomes of patient care especially for after-hours emergency work. Teleradiology can help workflow by improving workload distribution, lowering the cost of reporting, shortening turn-around-time for reports, and improving quality of life for staff. The aim of the article is to provide perspective on Medicare reimbursement of offshore telereporting services. We submit that due to its value proposition and contribution to healthcare, offshore telereporting by American Board Certified Radiologists is worthy of Medicare reimbursement and should be re-evaluated for its credits.

**Keywords:** Medicare; teleradiology; offshore; reimbursement; healthcare

## 1. Introduction

Radiology is a medical specialty that has become a primary contributor to human healthcare [1]. It involves the acquisition and interpretation of images of the human body for the diagnosis of a number of diseases and abnormalities. Technological innovation paved the way for teleradiology, which involves the electronic transmission of diagnostic imaging studies such as X-rays, CTs, and MRIs to remote sites for consultation or interpretation. Teleradiology, a subset of telemedicine, has played a significant role in delivering high quality contemporaneous radiologic interpretations, particularly in areas or during time periods where there is a shortage of radiologists, to facilitate emergency consultations and improve standards of patient care. It has been considered as a front-line driver in making digital imaging achieve its deserved potential.

The benefits of teleradiology for patients have been well documented in several studies [1–5]. In terms of scale of use, in the United States in 2014, more than 50% of all telemedicine services were reported to be performed by teleradiology [6]. The data from the American Medical Association’s 2016 Physician Practice Benchmark Survey reveals that physicians practicing in radiology (39.5%), psychiatry (27.8%), and cardiology (24.1%) frequently use telemedicine to connect with patients. Radiologists (25.5 percent) are in the third position among all specialties, to use telemedicine to connect with other health care professionals (having a specialty consultation and

getting a second opinion) after emergency medicine physicians (38.8 percent) and pathologists (30.4 percent) [7].

For teleradiology utilization, either the images are transmitted from the hospital to the residence of the hospital-based on-call radiologist in the United States after usual working hours or transmitted to a commercial teleradiology service provider that employs American Board Certified radiologists located in other states within US or offshore to carry out preliminary or final interpretations. However, in the latter case, the American Board Certified radiologists located offshore i.e., in countries other than the United States have been permitted to render only preliminary readings and not final radiologic interpretations. In these cases, onsite radiologists overread the images the next day and provide a final interpretation. This model has been previously validated and described in the literature [2,8,9].

The Centers for Medicare & Medicaid Services (CMS), an agency within the US Department of Health and Human Services (HHS) governs the nation's major healthcare programs including Medicare, Medicaid, the Children's Health Insurance Program (CHIP), and The State and Federal health insurance marketplaces. It evaluates the amassed data and prepares research reports, operates to remove the cases of fraud within the healthcare system, and manages the payments for all radiology services [10]. It decides reimbursement rates for all medical services and equipment covered under Medicare. The services are required to be medically essential, be ordered by physicians, and have documentation to support the submitted claims [11]. Generally, Medicare is available for people age 65 or older and people with disabilities and chronic conditions. Medicare has two parts, Part A (hospital insurance) and Part B (Medicare insurance). Medicare Part B helps cover medical services such as doctors' services, outpatient care, and other medical services including teleradiology services (discussed in Pub. 100-02, Medicare Benefit Policy Manual, chapter 15, section 30). The interpretation of an X-ray, electrocardiogram, electroencephalogram, etc. are enlisted examples [12]. The cost of radiology comprises the technical fees related to the acquisition of images including the fee for operating the devices and paying the radiology technologists as well as the radiologist's fees for reading and interpreting the images. Charges differ depending on the type of modality (e.g., MRI, CT), on whether contrast is used or not, on the body part/organ (e.g., breast, head, leg), and whether there is an interventional procedure or not [1].

### **1.1. Offshore reporting of radiologic examinations supplementing healthcare delivery**

Teleradiology services located within the United States have been working proficiently but face difficulty recruiting radiologists for night-time working hours [13]. Additionally, from an economic perspective the radiologists working nights are inherently unproductive and represents a significant cost burden to the healthcare system given that the current standard/expectation is typically 'one week on one week off' or often 'one week on and two weeks off' to allow for physician recovery from the unphysiological lifestyle and sequelae of night shift work. Furthermore, nightshift work is, for obvious reasons, perceived as being unattractive, rendering recruitment to this cohort especially challenging. Offshore teleradiology has demonstrated the

potential to address this problem and deliver quality and timely radiological interpretations through night-shift teleradiology services delivered by US Board certified radiologists when onsite radiologists are unable to provide immediate coverage [14,15]. Various ‘nighthawk’ teleradiology groups have evolved by leveraging the growing opportunities that teleradiology presents [16,17].

A survey was conducted to determine the effects of international teleradiology attending radiologist coverage (ITARC) of emergency examinations on radiology residents’ perceptions of night call. ITARC is the time gap when a teleradiologist is awake and work for normal daytime hours, at the same time covering the night shift in the US. Most surprisingly, the survey results revealed that ITARC relieved radiology residents’ stress and anxiety related to on-call shifts and promoted accurate afterhours readings and availability of attending radiologists for consultation with referring clinicians, reduced load on daytime attending radiologists and enhanced their educational experience as well. However, ITARC necessitates licensure and credentialing of off-shore teleradiologist in US hospitals, a secure network, redundant internet connections to banish downtime and an expeditious transmission of images for contemporaneous interpretations [18].

The benefits of ‘nighthawk’ services were also revealed by Goelman [19]. The study reported that ‘nighthawk’ services rendered through teleradiology supported by quick and secure internet connections resulted in enhanced night-time radiologist productivity, better quality of life, and most significantly, high quality radiology interpretations.

Furthermore, burnout, a global health problem, is also prevalent among US physicians including radiologists. Numerous studies have reported that burnout is a cluster of symptoms developing from severe work-related stress, apparent as emotional fatigue, depersonalization, despondence, and lethargy [20,21]. It can also lead to reduction in physician productivity, professional effort, gratification, impaired performance and may even result in elevated physician turnover, early retirement contributing to worsening physician shortages, and tragically even physician suicide, thus eventually leading to increasing health care costs. A study by Canon et al. [22] revealed that 54%–72% of diagnostic radiologists and interventional radiologists under study reported aforesaid symptoms of burnout. Thus, the utilization of off-shore teleradiology services addresses burnout, improves workload distribution, reduces the diagnostic error rate, shortens turn-around-time for reports, and enhances the quality of life for radiologists. This has been well documented in various published studies of teleradiology [2,16,23–30].

Unfortunately, despite its manifested value proposition, offshore telereporting has still not received the desired credit for its contribution to healthcare. In the United States, Medicare and Medicaid laws prohibit radiologists who are located in countries other than the United States to qualify for reimbursement for final reads. Broadly, Medicare will not pay for health care or supplies that are conducted outside the United States (US). The term “outside the US” means anywhere other than the 50 states of the US, the District of Columbia, Puerto Rico, the US Virgin Islands, Guam, American Samoa, and the Northern Mariana Islands (discussed in Pub. 100-02, chapter 16, section 60, for exceptions to the “outside the US” exclusions) [12]. For this reason, offshore radiology reports are delivered in the preliminary or wet-read model which

necessitates subsequent review by an onshore radiologist (typically at the hospital of origin of the images). This results in duplication of effort and further strains a system that is already overwhelmed and subject to challenges such as reporting delays, reporting errors and radiologist burnout.

Interestingly, the ACR Task Force on International Teleradiology, in 2005, released a white paper with the aim of addressing the legal, regulatory, reimbursement, insurance, quality assurance, and other issues related to international teleradiology. The task force acknowledged that there is no technological variation between intrinsically or offshore generated teleradiology interpretations and reports. In either case, quality and competency should be the priority. Worthy of mentioning, the task force also strongly opined that ABR certified status is the most trustworthy parameter for the quality of an interpreting physician. Moreover, reimbursement for radiologic interpretations and ensuing reports that are furnished by international teleradiology is predicated upon the expectation that the radiologists must be certified by the American Board of Radiology, should have medical licenses in every state and hold privileges, credentialed as a member of the medical staff and have professional liability insurance coverage at the institution or hospital performing the examination and receiving the report [13,31].

The confirmation of professional standing by way of medical licensure and credentialing of radiologists empaneled by teleradiology service providers, as well as stringent quality assurance programs, are pivotal in designing the outcomes of the use of teleradiology to offshore radiology services [32]. Moreover, the advent and integration of PACS (picture archiving and communication system) and RIS (radiology information system) into the teleradiology system, ensued proficient transmission of imaging and findings between teleradiologist and referring clinician [33]. An article reported that hundreds of US hospitals utilize overseas or offshore teleradiology services rendered by the teleradiology service providers such as teleradiology solutions, Bangalore, which strictly follow ACR guidelines regarding licensure, insurance, and hospital privileges. However, Medicare laws prohibit reimbursement to such offshore providers [16]. Besides reading images per se, some international teleradiology firms are also performing 3D image reconstruction for US hospitals [33].

The American College of Radiology [34], together with the American Association of Physicists in Medicine and the Society for Imaging Informatics in Medicine, issued an upgraded ACR technical standard for the electronic practice of medical imaging which clearly described the objectives and adequacy for the utilization of digital image data, along with the electronic transmission of patient examinations from one location to another for interpretation. In 2013, a White Paper of ACR Task Force on International Teleradiology recognized the role of teleradiology in patient care, in ameliorating access to radiologic services and subspecialty expertise in areas in which it is otherwise unavailable. The white paper also recognized the need for designing protocols and software for better connections between physicians, technologists and patients, rules for sharing electronic medical record and peer review system and thus refined the guidelines and standards for teleradiology practice focusing on the specified concerns [35].

In 2019, a survey was carried out by the ACR Commission on Human Resources Workforce to determine the constitution of the radiology workforce and understand the current job market for radiologists. The results indicated that 8% of the workforce is greater than 65 years of age and 22% are between 56 and 65 years [36]. In another study, among 20,970 radiologists involved in active patient care, 82% were of age 45 and over, while 53% were age 55 and over [37]. This indicated that the future workforce needs will depend on retirements of these senior radiologists. In a study presented at RSNA 2021, Khurana et al reported that the increase in the Medicare population surpassed the diagnostic radiology (DR) workforce by about 5% from 2012 to 2019. Further, the pipeline of the incoming radiologist is not commensurate with the need, as from 2010 to 2020, the number of DR trainees entering the workforce increased by 2.5% as compared to a 34% rise in the number of adults over 65. The study by Khurana et al also projected a 4.2 times rise in the number of radiologists per 100,000 Medicare enrollees from 2012 to 2019 in US [38,39]. A salve for these current workforce problems is teleradiology services provided by off-shore radiologists which can add to the capacity of American Board Certified radiologists and help bridge the shortfall.

## **1.2. Medicare reimbursement**

Medicare has implemented strict guidelines through which it will reimburse telemedicine practices. The eligibility for Medicare reimbursement for a telemedicine service depends upon the patient's location. The patient must be in a rural geographical location either a health professional shortage area or a county outside of a metropolitan statistical area with exceptions for patients getting treatment for end-stage renal disease, stroke, and substance use disorder [40]. Medicare makes payments under the physician fee schedule (PFS) for the services of more than 10,000 physician services and other billing professionals (i.e., payment of assistant at surgery, nurse practitioners, nurse midwives, physician assistant, clinical psychologists and social workers, registered dietitians or nutrition professionals etc.), since 1992. The Medicare PFS pricing amounts are adjusted to display the difference in practice costs from area to area. Under the PFS, the payment for the physicians' services is conferred under a variety of settings, including physician offices, hospitals, critical access hospitals, skilled nursing facilities and other post-acute care settings, outpatient dialysis facilities, clinical laboratories, and beneficiaries' homes [41].

A national private payer reimbursement online survey conducted by the American Telemedicine Association interpreted that there was no standard protocol for billing for telemedicine services in the hospitals because neither government nor private payers were willing to pay for them. Moreover, insurance companies followed the guidelines of their individual states. Administrative rules varied for in-person and telemedicine care which put impediments to reimbursement. It was postulated that the setting up of universal coverage policies by regulatory bodies would remove these barriers [42]. This approach is likely to be of greater benefit given that the challenges of radiologist shortages are neither local nor regional but rather national. The increasing utilization of telemedicine has resulted in raising interest among various

payers, be it insurance companies, or certain government-funded programs, to expand their policies to accommodate for teleservices.

In 2018, Medicaid widened the scope of telehealth and telemedicine services in several states within the US for which they reimburse, thus lowering impediments to their use. Despite support from lawmakers, administrators, and clinicians in favour of continued utilization of telehealth after the COVID-19 pandemic, there is ongoing debate as to whether telehealth will continue to be reimbursed in parity with in-person care [43]. There is however no dearth of legislation related to potentially improving healthcare reimbursement practices. For example, CMS had decided on its regulations to show required changes in telehealth reimbursements made by the Bipartisan Budget Act of 2018, specifically related to end-stage renal disease (ESRD) services and the treatment of acute stroke, with effect from January 2019 [44]. According to a report by American Society of Radiologic Technologists, on 1 June 2021, the Medicare Access to Radiology Care Act [45] was introduced by US Reps. Mike Doyle of Pennsylvania and John Curtis of Utah as House Resolution 3657 with companion legislation, Senate Bill 2641, introduced on 5 August by Sen. John Boozman and cosponsors Sen. Bob Casey of Pennsylvania and Sen. Steven Daines of Montana. These bills propose a law that revises Medicare reimbursement policy for radiologist assistants to bring it at par with state radiologist assistant licensure laws essentially recognizing that innovative approaches are needed to address these critical radiologist shortages. Additionally certain coverage restrictions around PET imaging outside of oncology were lifted by CMS in July 2021 [46]. However, the 2024 MPFS puts forth new difficulties for radiologists through reimbursement reductions and the pause of the appropriate-use criteria (AUC program) for advanced diagnostic imaging services initiated in 2014 [47–49].

In summary, a number of ground-breaking legislations have been passed in recent days to support telemedicine reimbursement that will positively impact on healthcare budgets and spending. However, off-shore teleradiology still awaits its legitimate credit for the value it provides.

## **2. Conclusion**

Medicare has expanded the reach of telehealth and telemedicine services in several states within the US for different specialties for which they reimburse, to create a qualitatively superior healthcare system that is more accessible, affordable, and empowered. Our submission is that despite this, and despite the multiple obvious stated benefits of the offshore model, offshore teleradiology delivered by American Board Certified Radiologists still does not receive its due credit. We would submit that the night-to-day international teleradiology model, two decades on from its inception, represents a successful model that deserves commensurate attention from the standpoint of reimbursement. Essentially this is an idea whose time has come.

### 3. Take home points

- 1) The Medicare regulation restricting reimbursement for healthcare services delivered overseas dates back to a time when it was intended to deter individuals from travelling overseas for procedures performed by international physicians and then submitting claims for reimbursement. The regulation did not take into account telemedicine services, which were not available at the time.
- 2) Today, given severe radiologist shortages in the US, and resultant radiologist overwork and burnout, American Board Certified radiologists located offshore can significantly support and supplement the healthcare delivered by the local radiologists in the US, especially for after-hours work, which can be more physiologically performed in a daylight time zone.
- 3) The virtual pool of radiologists available through teleradiology increases the doctor-patient ratio compensating for radiologist shortage especially at the time of emergency situations.
- 4) Given these benefits, and given that Medicare has been making innovative changes within the billing framework overall, it seems relevant that the issue of Medicare reimbursement for radiology reporting services delivered from offshore by American Board Certified Radiologists should be re-evaluated at this time, as this has the potential to address the challenges of shortages of radiologists which are being acutely perceived at this time.

**Author contributions:** Conceptualization, AK and NM; writing—original draft preparation, NM; writing—review and editing, AK; visualization, AK; supervision, AK; project administration, AK. All authors have read and agreed to the published version of the manuscript.

**Conflict of interest:** The authors declare no conflict of interest.

### References

1. Bashshur RL, Krupinski EA, Thrall JH, Bashshur N. The Empirical Foundations of Teleradiology and Related Applications: A Review of the Evidence. *Telemedicine and E-Health*. 2016; 22(11): 868-898. doi: 10.1089/tmj.2016.0149
2. Kalyanpur A, Neklesa VP, Pham DT, et al. Implementation of an international teleradiology staffing model. *Radiology*. 2004; 232(2): 415-419. doi: 10.1148/radiol.2322021555
3. Kalyanpur A, Meka S, Joshi K, et al. Teleradiology in Tripura: Effectiveness of a Telehealth Model for the Rural Health Sector. *International Journal of Health Technology and Innovation*. 2022; 1: 7-12.
4. Bogner P, Chadaide Z, Lenzsér G, et al. Teleradiology-based stroke network in Western and Southern Transdanubia in Hungary. *Orvosi Hetilap*. 2021; 162(17): 668-675. doi: 10.1556/650.2021.32097
5. Kiuru MJ, Paakkala TA, Kallio TT, et al. Effect of teleradiology on the diagnosis, treatment and prognosis of patients in a primary care centre. *Journal of Telemedicine and Telecare*. 2002; 8(1): 25-31. doi: 10.1258/1357633021937424
6. Weinstein RS, Lopez AM, Joseph BA, et al. Telemedicine, Telehealth, and Mobile Health Applications That Work: Opportunities and Barriers. *The American Journal of Medicine*. 2014; 127(3): 183-187. doi: 10.1016/j.amjmed.2013.09.032
7. Kane CK, Gillis K. The Use of Telemedicine by Physicians: Still the Exception Rather Than the Rule. *Health Affairs*. 2018; 37(12): 1923-1930. doi: 10.1377/hlthaff.2018.05077
8. Kalyanpur A, Weinberg J, Neklesa V, et al. Emergency radiology coverage: Technical and clinical feasibility of an international teleradiology model. *Emergency Radiology*. 2003; 10(3): 115-118. doi: 10.1007/s10140-003-0284-5

9. Abujudeh HH. Malpractice and Radiology: A Hapless Relationship. *Radiology Noninterpretive Skills: The Requisites*. 2018; 27: 256-266.
10. Kagan J. Centers for Medicare & Medicaid Services (CMS): Definition, How It Works. Available online: <https://www.investopedia.com/terms/u/us-centers-medicare-and-medicaid-services-cms.asp> (accessed on 3 March 2024).
11. Ghoshal M. Understanding Medicare Reimbursement & Claims. Available online: <https://www.healthline.com/health/medicare/medicare-reimbursement#:~:text=Medicare%20pays%20for%2080%20percent,some%20of%20the%2020%20percent> (accessed on 3 March 2024).
12. Rachele B. Navigating Medicare Coverage Outside the US and Foreign Travel. Available online: <https://policyscout.com/medicare/learn/medicare-outside-the-us> (accessed on 3 March 2024).
13. Bradley WG. Offshore Teleradiology. *Journal of the American College of Radiology*. 2004; 1(4): 244-248. doi: 10.1016/j.jacr.2003.12.043
14. Kalyanpur A. Commentary: Teleradiology: The Indian Perspective. *Indian Journal of Radiology and Imaging*. 2009; 19(01): 19-20. doi: 10.4103/0971-3026.45338
15. Kalyanpur A. The Role of Teleradiology in Emergency Radiology Provision. *Health management*. 2014; 14(1).
16. Wachter RM. International Teleradiology. *New England Journal of Medicine*. 2006; 354(7): 662-663. doi: 10.1056/NEJMp058286
17. Burute N, Jankharia B. Teleradiology: The Indian perspective. *Indian Journal of Radiology and Imaging*. 2009; 19(01): 16-18. doi: 10.4103/0971-3026.45337
18. Joffe SA, Burak JS, Rackson M, et al. The Effect of International Teleradiology Attending Radiologist Coverage on Radiology Residents' Perceptions of Night Call. *Journal of the American College of Radiology*. 2006; 3(11): 872-878. doi: 10.1016/j.jacr.2006.02.014
19. Goelman A. Telework That Works: Teleradiology and the Emergence of Nighthawk Radiology Firms. In: *Proceedings of the Sloan Foundation Industry Studies Annual Conference; 2007; Cambridge, Massachusetts*.
20. Shanafelt TD, Hasan O, Dyrbye LN, et al. Changes in Burnout and Satisfaction with Work-Life Balance in Physicians and the General US Working Population Between 2011 and 2014. *Mayo Clinic Proceedings*. 2015; 90(12): 1600-1613. doi: 10.1016/j.mayocp.2015.08.023
21. Chetlen AL, Chan TL, Ballard DH, et al. Addressing Burnout in Radiologists. *Academic Radiology*. 2019; 26(4): 526-533. doi: 10.1016/j.acra.2018.07.001
22. Canon CL, Chick JFB, DeQuesada I, et al. Physician Burnout in Radiology: Perspectives from the Field. *American Journal of Roentgenology*. 2022; 218(2): 370-374. doi: 10.2214/AJR.21.26756
23. Zafar SR. Teleradiology 2.0: How AI is changing the game in radiology platforms. Available online: <https://www.linkedin.com/pulse/teleradiology-20-how-ai-changing-game-radiology-platforms-zafar/> (accessed on 3 March 2024).
24. Horn B, Chang D, Bendelstein J, Hiatt JC. Implementation of a teleradiology system to improve after-hours radiology services in Kaiser Permanente Southern California. *The Permanente Journal*. 2006; 10(1): 47-50. doi: 10.7812/TPP/05-119
25. Matsumoto M, Koike S, Kashima S, Awai K. Geographic Distribution of Radiologists and Utilization of Teleradiology in Japan: A Longitudinal Analysis Based on National Census Data. *PLOS ONE*. 2015; 10(9): e0139723. doi: 10.1371/journal.pone.0139723
26. Lester N, Durazzo T, Kaye A, et al. Referring Physicians' Attitudes Toward International Interpretation of Teleradiology Images. *American Journal of Roentgenology*. 2007; 188(1): W1-W8. doi: 10.2214/AJR.05.1303
27. Zabel AOJ, Leschka S, Wildermuth S, et al. Subspecialized radiological reporting reduces radiology report turnaround time. *Insights into Imaging*. 2020; 11(1): 114. doi: 10.1186/s13244-020-00917-z
28. Kaye AH, Forman HP, Kapoor R, Sunshine JH. A Survey of Radiology Practices' Use of After-Hours Radiology Services. *Journal of the American College of Radiology*. 2008; 5(6): 748-758. doi: 10.1016/j.jacr.2008.01.009
29. DeCorato DR, Kagetsu NJ, Ablow RC. Off-hours interpretation of radiologic images of patients admitted to the emergency department: Efficacy of teleradiology. *AJR. American Journal of Roentgenology*. 1995; 165(5): 1293-1296. doi: 10.2214/ajr.165.5.7572522



30. Wong WS, Roubal I, Jackson DB, et al. Outsourced teleradiology imaging services: An analysis of discordant interpretation in 124,870 cases. *Journal of the American College of Radiology: JACR*. 2005; 2(6): 478-484. doi: 10.1016/j.jacr.2004.10.013
31. Van Moore A, Allen B, Campbell SC, et al. Report of the ACR task force on international teleradiology. *Journal of the American College of Radiology*. 2005; 2(2): 121-125. doi: 10.1016/j.jacr.2004.08.003
32. Levy FS. The International Teleradiology Industry: Successes and Failures. In: *Proceedings of the IHEA 2007 6th World Congress: Explorations in Health Economics Paper*; 2007.
33. Levy F, Yu KH. Offshoring Radiology Services to India. Available online: [http://isapapers.pitt.edu/148/1/2007-33\\_Yu.pdf](http://isapapers.pitt.edu/148/1/2007-33_Yu.pdf) (accessed on 3 March 2024).
34. American College of Radiology. ACR-AAPM-SIIM Technical Standard for Electronic Practice of Medical Imaging. Available online: <https://www.acr-/media/ACR/Files/Practice-Parameters/Elec-Practice-MedImag.pdf> (accessed on 3 March 2024).
35. Silva E, Breslau J, Barr RM, et al. ACR White Paper on Teleradiology Practice: A Report from the Task Force on Teleradiology Practice. *Journal of the American College of Radiology*. 2013; 10(8): 575-585. doi: 10.1016/j.jacr.2013.03.018
36. Bender CE, Bansal S, Wolfman D, Parikh JR. 2019 ACR Commission on Human Resources Workforce Survey. *Journal of the American College of Radiology*. 2020; 17(5): 673-675. doi: 10.1016/j.jacr.2020.01.012
37. Montecalvo R. Radiologist Staffing Trends. Available online: <https://blog.vrad.com/radiologist-staffing-trends-2021> (accessed on 3 March 2024).
38. Khurana A, Patel B, Sharpe R. Geographic Variations in Growth of Radiologists and Medicare Enrollees From 2012 to 2019. *Journal of the American College of Radiology*. 2022; 19(9): 1006-1014. doi: 10.1016/j.jacr.2022.06.009
39. Henderson M. Radiology Facing a Global Shortage. Available online: <https://www.rsna.com/news/2022/may/global-radiologist-shortage> (accessed on 3 March 2024).
40. Hyder MA, Razzak J. Telemedicine in the United States: An Introduction for Students and Residents. *Journal of Medical Internet Research*. 2020; 22(11), e20839. doi: 10.2196/20839
41. Medical Billers and Coders. Available online: <https://www.medicalbillersandcoders.com/articles/best-billing-and-coding-practices/Understanding-Basics-of-Physician-Fee-Schedule-PFS.html> (accessed on 24 March 2024).
42. Antoniotti NM, Drude KP, Rowe N. Private Payer Telehealth Reimbursement in the United States. *Telemedicine and E-Health*. 2014; 20(6): 539-543. doi: 10.1089/tmj.2013.0256
43. Ellimoottil C. Understanding the Case for Telehealth Payment Parity. Available online: <http://www.healthaffairsdo/10.1377/forefront.20210503.625394/full/> (accessed on 3 March 2024).
44. Telehealth Policy 101—CCHP. Available online: <https://www.cchpcapolicy-101/> (accessed on 3 March 2024).
45. The Medicare Access to Radiology Care Act (MARCA). American Society of Radiologic Technologists. Available online: <https://www.asrtmain/standards-and-regulations/legislation-regulations-and-advocacy/marca> (accessed on 3 March 2024).
46. Stempniak M. CMS dropping coverage restrictions around PET imaging outside of oncology care. Available online: <https://radiologybusiness.com/topics/healthcare-policy/cms-coverage-restrictions-pet-imaging-oncology> (accessed on 20 June 2021).
47. 2024 MPFS Final Rule: Impact on Radiologists. Available online: <https://apsmedbill.com/whitepapers/2024-mpfs-final-rule-impact-radiologists> (accessed on 4 March 2024).
48. 2024 Medicare Physician Fee Schedule Final Rule Includes Payment Reductions for Radiology. Available online: <https://info.hapusa.com/blog-0/medicare-fee-schedule-2024-final-rule-includes-payment-reductions-for-radiology> (accessed on 4 March 2024).
49. Schartz E, Manganaro M, Schartz D. Declining Medicare Reimbursement for Diagnostic Radiology: A 10-Year Analysis Across 50 Imaging Studies. *Curr Probl Diagn Radiol*. 2022; 51(5): 693-698. doi: 10.1067/j.cpradiol.2022.01.007