

# AMERICAN DIAGNOSTIC RADIOLOGY MOVES OFFSHORE: SURFING THE “INTERNET WAVE” TO WORLDWIDE ACCESS AND QUALITY

ERIC M. NYBERG<sup>+</sup>  
CHARLES F. LANZIERI\*

I. INTRODUCTION .....	253
II. MEDICAL CARE VIA THE INTERNET.....	253
III. REGULATION FOR QUALITY .....	256
IV. HEALTH CARE COST CONTAINMENT .....	258
V. IMPORTANCE OF ON-SITE RADIOLOGY .....	260
VI. OFFSHORING AND OPTIMIZATION .....	262
VII. CONCLUSION.....	264

## I. INTRODUCTION

International reading of medical imaging studies, or offshore teleradiology, has been a successful, though limited, practice benefiting patients and physicians for over a decade. Domestic and international market forces will continue to expand the demand for teleradiology as an important complement to United States based diagnostic radiology, though a full exodus of diagnostic reading to offshore sites is unlikely and inappropriate. Considerable obstacles remain to taking the teleradiology market to scale; however, barriers related to licensure, liability, quality assurance, and reimbursement will likely yield to market forces to be resolved in recognition of the significant benefits teleradiology offers to consumers and providers.

## II. MEDICAL CARE VIA THE INTERNET

As in other aspects of the economy, the world of medicine is becoming flat as the necessity of physical proximity is becoming less essential in the doctor-patient relationship. Telemedicine, which is the use of electronic information and communication technologies to diagnose and manage medical care from a distance, is realistic, successful, and even preferred in several instances.<sup>1</sup> Telemedicine has existed for decades with telephone and fax, but with the Internet and the ability to view large amounts of audio and visual data at increasingly faster and cheaper rates, the practice of telemedicine is rapidly expanding.

---

<sup>+</sup>Resident, Department of Radiology, University Hospitals & Case Medical Center; M.D., 2004, Case Western Reserve University.

\*Interim Chairman and Professor of Radiology and Neuroradiology, Department of Radiology, University Hospitals & Case Medical Center; M.D., New York Medical College.

<sup>1</sup>American College of Radiology, Telemedicine/Teleradiology, [http://www.acr.org/s\\_acr/sec.asp?TRACKID=&SID=1&VID=1&CID=967&DID=14712&RTID=0&CIDQS=&Taxonomy=False&specialSearch=False](http://www.acr.org/s_acr/sec.asp?TRACKID=&SID=1&VID=1&CID=967&DID=14712&RTID=0&CIDQS=&Taxonomy=False&specialSearch=False) (last visited May 15, 2007).

Radiology is not the only specialty affected by telemedicine and, by extension, the possibility of being offshored. Intensive care unit telemedicine is growing, and studies have shown it to achieve profoundly improved clinical and economic outcomes for both pediatric and adult populations.<sup>2</sup> Telepathology, which is the remote interpretation of cytological specimens, has been active for two decades and continues to grow more sophisticated as virtual laboratories are being created.<sup>3</sup> And tele-home care, which is the use of telemedicine in home-based settings, has shown to be successful in enabling community living older adults to maintain independence by providing monitoring of such vitals as blood sugar, blood pressure, heart rate, and mental status.<sup>4</sup> Even the practice of telemedicine in psychiatry has grown with one major study finding that there was no significant difference on patient satisfaction between telepsychiatric care and other specialty care via telemedicine.<sup>5</sup> Some patients, particularly those who were abused or suffered trauma, even show a strong preference for it.<sup>6</sup>

Teleradiology specifically has considerable advantages for both providers and patients. One such benefit is using differences in time zones to alleviate the local burden of overnight calls and the loss of quality that comes with sleep deprivation. This service is generically known as “nighthawking” after the pioneering company NightHawk Radiology Services whose founder coined the term after nighthawk helicopter pilots on night flights in Vietnam.<sup>7</sup> When it is midnight on the east coast, a well-rested radiologist can be reading studies at 2 p.m. in Sydney, Australia. Teleradiology provides economic benefit to many smaller private radiology practices who would need to allocate one of their partners to staff an overnight shift which

---

<sup>2</sup>B. A. Rosenfeld et al., *Intensive Care Unit Telemedicine: Alternate Paradigm for Providing Continuous Intensivist Care*, 28 CRITICAL CARE MED. 3945 (2000), available at [http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list\\_uids=11153637&dopt=Abstract](http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=11153637&dopt=Abstract) (last visited May 15, 2007). See also Karen Blum, *Remote Monitoring of ICU Patients Lowers Mortality Rates, Complications*, THE JOHN HOPKINS UNIV. GAZETTE, Mar. 26, 2006, available at <http://www.jhu.edu/~gazette/2001/mar2601/26remote.html>. See James P. Marcin et al., *Financial Benefits of a Pediatric Intensive Care Unit-based Telemedicine Program to a Rural Adult Intensive Care Unit: Impact of Keeping Acutely Ill and Injured Children in Their Local Community*, 10 TELEMEDICINE J. & E-HEALTH 1 (2004), available at <http://www.liebertonline.com/doi/abs/10.1089/tmj.2004.10.S-1> (last visited Apr. 23, 2007).

<sup>3</sup>DORLAND'S ILLUSTRATED MEDICAL DICTIONARY 1795 (29th ed. 2000). “The practice of pathology at a remote location by means of a high-resolution video monitor that displays an image transmitted over telephone lines from a remote-controlled microscope attached to a video camera.” *Id.*

<sup>4</sup>*New Study Finds Home Telehealth to be Promising for Patient Management of Chronic Diseases*, HEALTH IT NEWS, May 10, 2007, available at <http://tie.telemed.org/news/#item1510>.

<sup>5</sup>*The Use of Telemedicine by Academic Psychiatrists*, Medscape General Medicine, [http://www.medscape.com/viewarticle/430544\\_3](http://www.medscape.com/viewarticle/430544_3) (last visited Apr. 23, 2007).

<sup>6</sup>Kirk Johnson, *TV Screen, Note Couch, Is Required For This Session*, N.Y. TIMES, June 8, 2006, at A1.

<sup>7</sup>NightHawk Radiology Services, About NightHawk Radiology Services, <http://www.nighthawkrad.net/> (last visited May 15, 2007).

may only generate a few studies per hour while losing that staff member during the subsequent “post-call,” more productive day time shift. In this case, the teleradiology service can keep its partners productive by servicing enough domestic radiology practices to keep them operating at capacity. Teleradiology also provides critical access to imaging services and timely interpretations for rural areas that cannot attract or afford on-site radiology interpretation, or alternatively in cities where the workload is too great. Similarly, teleradiology offers access to sub-specialists when experts consult or second opinions are needed.

Several companies already successfully provide on-shore (where all radiologists are located domestically) and offshore teleradiology services. This sector has grown remarkably since its inception currently providing on call services to roughly 1000 or almost twenty percent of American hospitals; this number is growing rapidly.<sup>8</sup> One company that has arisen to meet this particular need is NightHawk Radiology Services, as mentioned above, based in Coeur d’Alene, Idaho; it sends locally generated images to American board certified radiologists living overseas, typically in Australia or Switzerland.<sup>9</sup> NightHawk, which currently services over 900 hospitals in the United States, has enjoyed significant growth after going public in early 2006, acquired several smaller teleradiology practices in the last year, and enjoyed a forty-four percent increase in revenues during 2005.<sup>10</sup> Other on call service providers, such as Virtual Radiologic Consultants (VRC), give their radiologists the freedom to live where they choose.<sup>11</sup> While a few of VRC’s radiologists are scattered across the globe, the majority are local and simply adjust their lifestyles to accommodate overnight shifts.<sup>12</sup> At least two Indian based teleradiology organizations, Teleradiology Solutions and TeleDiagnosys, have successfully lured American trained and board certified radiologists and entered the American market.<sup>13</sup>

---

<sup>8</sup>Frank Levy & Kyoung-Hee Yu, *Offshoring Radiology Services to India*, (Massachusetts Institute of Technology Industrial Performance Center, Working Paper No. IPC-06-005, Sept. 2006), available at <http://web.mit.edu/ipc/publications/pdf/06-005.pdf>.

<sup>9</sup>NightHawk Radiology Services, <http://www.nighthawkradiologyservices.net/> (last visited May 21, 2007).

<sup>10</sup>Harry Wessel, *Hospitals’ Night Shift Is Staffed from Abroad: Radiologists Overseas Read Emergency-Room via the Internet*, ORLANDO SENTINEL, Jul. 17, 2006, at 16; *Stock Offerings this Week*, N.Y. TIMES, Oct. 23, 2006, at C2; NightHawk, 2006 Annual Report (10-K), available at <http://ir.nighthawkradiologyservices.net/> (last visited Mar. 5, 2007).

<sup>11</sup>Virtual Radiologic, *Careers, Radiologist Opportunities*, [http://www.virtualrad.com/page/radiologists\\_opportunities.jsp](http://www.virtualrad.com/page/radiologists_opportunities.jsp) (last visited May 21, 2007).

<sup>12</sup>*Id.*

<sup>13</sup>John C. Hayes, *Teleradiology: New Players, High Stakes Create Capital Opportunity*, DIAGNOSTIC IMAGING, Nov. 1, 2006, <http://www.diagnosticimaging.com/pacsweb/showArticle.jhtml?articleID=193500276>. TeleDiagnosys pursued a truly multinational model and also services hospitals in the United Kingdom and Canada with radiologists certified by their respective countries.

## III. REGULATION FOR QUALITY

Extensive regulation is justified and necessary in medical care, and teleradiology is no exception. In response to increased demand for teleradiology and in an effort to ensure quality, the American College of Radiology (ACR), which is the principal organization of radiologists, radiation oncologists, and clinical medical physicians in the United States, created Technical Standards for Teleradiology.<sup>14</sup> The ACR's standards define goals, qualifications of personnel, equipment guidelines, licensing, credentialing, liability, communication, quality control, and quality improvement for teleradiology.<sup>15</sup> Accountability and privacy in patient care are likewise essential to a high quality health care system, and the ACR's technical standards further define expectations around these issues. The enforcement of the Health Insurance Portability and Accountability Act (HIPAA), the law that protects patient privacy, as well as governs jurisdiction, poses significant problems in holding individuals responsible outside of the reach of American courts.<sup>16</sup> Issues of liability are of substantial concern for teleradiology providers based outside of the United States that do not use American licensed physicians because jurisdictional loopholes might allow these providers to avoid medical malpractice liability which would likely shift the burden of medical malpractice liability from providers to hospitals.<sup>17</sup>

The ACR also provides guidance regarding requirements for personnel qualifications. While any radiologist with access to an approved workstation and sufficient bandwidth can provide their services from anywhere in the world, ACR standards state that a radiologist performing teleradiology should be American board certified, carry licenses required by the states in which they practice (or from where

---

<sup>14</sup>American College of Radiology, About Us, [http://www.acr.org/s\\_acr/sec.asp?CID=2561&DID=17606](http://www.acr.org/s_acr/sec.asp?CID=2561&DID=17606) (last visited May 15, 2007). See also AMERICAN COLLEGE OF RADIOLOGY, TECHNICAL STANDARD FOR TELERADIOLOGY (2006) [hereinafter TECHNICAL STANDARD FOR TELERADIOLOGY], available at [http://www.acr.org/s\\_acr/bin.asp?TrackID=&SID=1&DID=12292&CID=541&VID=2&DOC=File.PDF](http://www.acr.org/s_acr/bin.asp?TrackID=&SID=1&DID=12292&CID=541&VID=2&DOC=File.PDF) (last visited May 15, 2007).

<sup>15</sup>See TECHNICAL STANDARD FOR TELERADIOLOGY, *supra* note 14.

<sup>16</sup>Health Insurance Portability and Accountability Act, 42 U.S.C. § 1320d (2006); see also, 45 C.F.R. § 164.502 (2007). "A covered entity may not use or disclose protected health information, except as permitted or required. . . ." *Id.* 45 C.F.R. § 164.500(a),(c) (2007).

Except as otherwise provided herein, the standards, requirements, and implementation specifications of this subpart apply to covered entities with respect to protected health information. . . . The standards, requirements, and implementation specifications of this subpart do not apply to the Department of Defense or to any other federal agency, or non-governmental organization acting on its behalf, when providing health care to overseas foreign national beneficiaries.

*Id.* See also, U.S. Department of Health and Human Services, Centers for Medicare & Medicaid Services, Are You a Covered Entity?, [http://www.cms.hhs.gov/HIPAAGenInfo/06\\_AreYouaCoveredEntity.asp](http://www.cms.hhs.gov/HIPAAGenInfo/06_AreYouaCoveredEntity.asp) (last visited May 23, 2007) (stating that the "Administrative Simplification standards adopted by Health and Human Services (HHS) under the Health Insurance Portability and Accountability Act of 1996 (HIPAA) apply to any entity that is a health care provider that conducts certain transactions in electronic form (called here a "covered health care provider").

<sup>17</sup>Thomas R. McLean & Edward P. Richards, *Teleradiology: A Case Study of the Economic and Legal Considerations in International Trade in Telemedicine*, 25 HEALTH AFFAIRS 1378 (2006).

their patients are located), carry malpractice insurance in those states, and be credentialed by the hospitals they service.<sup>18</sup> Current teleradiology service providers state that they comply with ACR's recommendations.<sup>19</sup> One offshore company, the Indian outsourcing giant Wipro which provides dozens of business and technical services to a broad range of companies, attempted to enter the United States market in 2003.<sup>20</sup> Although its radiologists are not American board certified, Wipro argued that it should have been allowed to enter the American market because their radiologists were essentially acting as 'virtual residents' offering preliminary reads only.<sup>21</sup> Because Wipro could not obtain malpractice insurance, it could not establish a foothold in the market.<sup>22</sup> Wipro is currently providing imaging post-processing services, such as 3D reconstructions, and "collaborative interpretations" for four hospitals in the United States; however, the company has not disclosed these organizations, nor have they added additional clients over the past several years.<sup>23</sup>

Given the United States' position as the international gold standard of medical training and the current lack of an acceptable alternative international standard, completion of an American Council of Graduate Medical Education approved residency in diagnostic radiology and subsequent passage of the series of exams offered by the American Board of Radiology (ABR) is an absolute requirement if the quality of teleradiology services is to be assured.<sup>24</sup> There are clearly high quality providers of health care in other nations as evidenced by the recent phenomenon of medical tourism; however, widespread and systematic consistency cannot be assured. India is often referred to as the heir apparent for medical imaging due to its vast pool of medical talent and the precedent it sets in business services and software. However, health care services may prove to be less easily transferable and Indian hospitals lack several crucial national standards with regard to quality of care, including a gradation system, standards for discharge details, disease codings, ICD codings, protocols for medical records management, and do not share such critical metrics as mortality and infection rates.<sup>25</sup> American and Indian radiology residencies are also far from interchangeable. Whereas in the United States residents are trained in essentially all current imaging modalities and body systems, in India advanced imaging modalities are not widely available at hospitals; residency education, therefore, often narrows the scope of resident training and emphasizes use of a specific modality.<sup>26</sup> Furthermore, there is no nationally mandated accreditation body

---

<sup>18</sup>See TECHNICAL STANDARD FOR TELERADIOLOGY, *supra* note 14.

<sup>19</sup>Robert M. Wachter, *International Teleradiology*, 354 NEW ENG. J. MED. 662 (2006).

<sup>20</sup>Rob Stein, *Hospital Services Performed Overseas; Training, Licensing Questions Raised*, WASHINGTON POST, Apr. 24, 2005, at A01.

<sup>21</sup>*Id.*

<sup>22</sup>*Id.*

<sup>23</sup>See Hayes, *Teleradiology*, *supra* note 13.

<sup>24</sup>See The American Board of Radiology, <http://www.theabr.org/> (last visited May 21, 2007) (listing the series of exams offered).

<sup>25</sup>See Levy & Yu, *supra* note 8.

<sup>26</sup>*Id.*

and the Medical Council of India does accredit all Indian residencies.<sup>27</sup> Given the differences in regulatory standards between American and Indian hospitals it is understandable that American hospitals would be reluctant to credential radiologists who were not trained in the context of a United States standard of graduate medical education and patient care.

Reimbursement for services is tied closely to credentialing. The Centers for Medicare and Medicaid Services (CMS) requires that the professional providing a medical service have appropriate licensing in the United States and other third party payers follow suit.<sup>28</sup> Furthermore, teleradiology is not a form of telemedicine under Medicare's billing rules, and the location of service of an interpretation is very clearly stated by Medicare to be the location of the interpreting physician, not the location of the purchaser.<sup>29</sup> Also, overseas locations of services are not payable by Medicare.<sup>30</sup> Currently, offshore radiologists are paid directly by the hospital or radiology group they cover for their "initial reads" and the local radiologists, who must offer the "final interpretation," then bill the payer.<sup>31</sup> The CMS also requires that the billing physician attest that their interpretation was made contemporaneously with and has a direct effect upon the clinical question and management decision the imaging study was meant to address.<sup>32</sup> Whether the CMS will find it problematic to reimburse the final interpretation that was provided several hours after an emergent management decision was made, based in part on the imaging study, is unclear.

#### IV. HEALTH CARE COST CONTAINMENT

Health care cost containment is a growing concern, and the primary argument for offshoring any service is to save money. In 2005, total national health expenditures rose 6.9 percent -- over twice the rate of inflation.<sup>33</sup> Total health care spending was two trillion dollars in 2005, or \$6700 per person, and represented sixteen percent of the gross domestic product (GDP).<sup>34</sup> Consumers of health care want the best

---

<sup>27</sup>*Id.*

<sup>28</sup>42 C.F.R. § 485.70(a) (2007).

A facility physician must be a doctor of medicine or osteopathy who -- (1) Is licensed under State law to practice medicine or surgery; and (2) Has had, subsequent to completing a 1-year hospital internship, at least 1 year of training in the medical management of patients requiring rehabilitation services; or (3) Has had at least 1 year of full-time or part-time experience in a rehabilitation setting providing physicians' services similar to those required in this subpart.

*Id.*

<sup>29</sup>NHIC, Corp., (n.d.) Teleradiology – How to Bill Medicare, [http://www.medicarenhic.com/cal\\_prov/articles/teleradiology\\_0107.htm](http://www.medicarenhic.com/cal_prov/articles/teleradiology_0107.htm) (last visited Apr. 27, 2007).

<sup>30</sup>*Id.*

<sup>31</sup>*Id.*

<sup>32</sup>*Id.*

<sup>33</sup>National Conference State Legislatures: The Forum of America's Ideas, Health Finance Issues, <http://www.ncsl.org/programs/health/finance.htm> (last visited May 21, 2007).

<sup>34</sup>National Coalition on Health Care, Health Insurance Cost, <http://www.nchc.org/facts/cost.shtml> (last visited Apr. 22, 2007).

possible care at the lowest possible cost. More often than not, however, they are not willing to sacrifice quality for cost, especially if most of that cost is spread across their insurance pool. Providers of health care want to optimize the resources at their disposal to provide the best possible imaging services to the greatest number of patients. Both consumers and providers, therefore, desire that health care costs be contained. With respect to offshore teleradiology, the question must be asked, is this a potential route to substantial cost savings?

Offshore teleradiology would likely reduce somewhat the cost incurred per imaging study, but it is doubtful that this would have a substantial impact on the cost of imaging services incurred by society. Let us consider the cost of imaging to be the product of the number of studies ordered and the cost per study. Several factors conspire to drive up the number of studies ordered; this includes the increasing size of the target patient population, the increasing morbidity of a population that is living longer and with more chronic illnesses, the increasing scope of proper indications for studies, and the increasing expectation among both physicians and patients that clinical diagnosis and response to treatment be confirmed with imaging.<sup>35</sup> None of these factors would be curbed by offshore teleradiology. With regards to the cost per study, it includes such items as the technical fee that includes the cost of the equipment, contrast agents, support staff, and the professional fee paid to the radiologist. The technical fees rightly increase with the increasing sophistication and cost of equipment; but, the fees decrease as manufacturers reach economies of scale and patents expire. For most imaging modalities, the technical component represents the vast majority of the cost, often over eighty percent.<sup>36</sup> Offshoring could only affect the professional fee component of the cost per study and has no direct bearing on the number of studies ordered. Furthermore, for a deep discount in the total professional fees paid to be realized a substantial number of American trained radiologists would need to forego a lucrative career in the United States in order to make less money abroad. Currently, the small number of American certified radiologists employed by non-American companies, such as Teleradiology Solutions based in Bangalore, India, serve hospitals in the United States and are compensated appropriately as a domestic radiologist.<sup>37</sup> Thus, as long as a United States residency and board certification is the rate limiting step in the growth of offshore teleradiology, this phenomenon is not an economic threat to American radiologists as it does not change the radiologist supply pool.

Therefore, while teleradiology will likely be of substantial economic benefit in selected circumstances, it is unlikely to have the potential to offer society substantial cost savings. Rather, it is more likely that regulators would target the appropriateness of existing imaging ordering patterns, particularly repeat studies or defensive imaging performed to “rule out” pathology for which there is a low clinical suspicion. Or, if the per-study cost is to be targeted, the technical fee component

---

<sup>35</sup> James P. Borgsted, *Specialty or Commodity*, 1 J. AM. COLL. OF RADIOLOGY 369, 369-370 (2004).

<sup>36</sup> Frank Levy & Ari Goelman, *Offshoring and Radiology* (Massachusetts Institute of Technology Industrial Performance Center, Working Paper No. IPC-05-007, Sept. 2005), available at <http://web.mit.edu/ipc/publications/pdf/05-007.pdf>.

<sup>37</sup> Lindsey Tanner, *Medical Tests Add Outsourcing Twist*, NEJM CAREER CENTER, May 16, 2007, <http://www.nejmjobs.org/rpt/medical-test-twist.aspx>. See also Levy & Yu, *supra* note 8.

offers a wider target and would incur the wrath of only those radiologists that own their equipment. This is a scenario that has already come to pass with the Deficit Reduction Act of 2005, which reduced reimbursement of technical fees paid for cross sectional imaging of second or third contiguous body segments in outpatient imaging centers.<sup>38</sup>

#### V. IMPORTANCE OF ON-SITE RADIOLOGY

But even if the technology is available for a radiologist to practice remotely, is it always the best practice? In a large survey published this year by the American Journal of Roentgenology, referring physicians in both medical and surgical specialties strongly prefer local radiologists to a hypothetical international radiologists, even assuming that the latter was equally qualified and could offer a faster turnaround time or offer their patients a thirty dollars of out-of-pocket savings.<sup>39</sup> After spending time in the hospital as a consultant to other physicians and functioning as part of a team that involves radiology nurses and technologists, it is not hard to imagine why. The interpersonal relationships formed between colleagues of varying disciplines cannot be ignored and contributes substantially to providing high quality patient care. These relationships cannot be replicated in the cyber-world of offshored services, and there is no substitution for the on-site presence of the radiologist. Often a radiologist is needed on-site for an imaging guided procedure, such as draining an abscess in a critically ill patient that is not a candidate for surgery or aspirating infected fluid from a septic joint. Even in the non-interventional setting, having a radiologist on-site can be the difference between a non-diagnostic study and one that yields the information appropriate to the clinical question. Ultrasound, for example, is a modality that is commonly used in the emergency setting to diagnose pelvic pathology and is notoriously operator dependent. Although a trained ultrasound technologist may be adept at capturing quality images, the radiologist must either discuss how the images were acquired with the technologist, or in particularly challenging cases, the radiologist should have recourse to verify the findings on his or her own. Usually, daily interaction and review of cases builds each ultrasound technologist into a trusted team member which is requisite if the radiologist is to confidently interpret the technologist's sonographic images.

---

<sup>38</sup>Deficit Reduction Act of 2005, 42 U.S.C. § 1395w-4(c)(4)(A) (2006).

In the case of imaging services . . . furnished on or after January 1, 2007, if-- (i) the technical component (including the technical component portion of a global fee) of the service established for a year under the fee schedule described in paragraph (1) without application of the geographic adjustment factor described in paragraph (1)(C), exceeds (ii) the Medicare OPD fee schedule amount established under the prospective payment system for hospital outpatient department services under paragraph (3)(D) of section 1833(t) [42 USCS § 1395l(t)] for such service for such year, determined without regard to geographic adjustment under paragraph (2)(D) of such section, the Secretary shall substitute the amount described in clause (ii), adjusted by the geographic adjustment factor described in paragraph (1)(C), for the fee schedule amount for such technical component for such year.

*Id.*

<sup>39</sup>Neil Lester et al., *Referring Physicians' Attitudes Toward International Interpretation of Teleradiology Images*, 188 AM. J. ROENTGENOLOGY W1, W1-W8 (2007).

It is important to understand that the practice of radiology is much more than simply the interpretation of images. While the generation of images is often left to the technologist, the radiologist's input is often required. This may pertain to a simple question such as, will the technologist be able to get a diagnostic series of radiographs of the cervical spine with an uncooperative patient or should the order be changed to the more expensive yet more reliable computed tomography (CT) scan? It is apparently a simple question; yet, it requires familiarity and trust between the radiologist and the technologist. The radiologist must also be familiar with the equipment used in image generation, particularly during the 'third shift' overnight hours when the technologists may be less experienced. Consider the following example: Acute stroke is a common clinical challenge involving high morbidity and mortality in which initial triage, often based on CT or magnetic resonance (MR) imaging, is critical and must be made with confidence in a very timely manner. The appropriate imaging protocol, however, can be problematic. This was recently illustrated at our institution by a case in which a woman presented with clinical findings highly suggestive of acute stroke and a CT angiogram would normally have been the appropriate imaging modality. However, our staff had difficulty placing an IV in the patient and her limited venous access meant that the rate of infusion of contrast would not meet the minimum rate per the manufacturer's recommendation. This was potentially exacerbated by the patient's poor cardiac output, which would further delay and dilute the contrast bolus. The radiologist needed to decide, based on past experience with this model CT scanner, whether the images would still be of diagnostic quality and to proceed or to opt for an MR angiogram which is more expensive, more time consuming, and fraught with its own limitations. United States board certification does not guarantee this type of experience-based knowledge. If the radiologist does not have the familiarity with the equipment that often comes with proximity and a sense of ownership in the process, then they are not likely to be prepared to recommend the optimal protocol in such challenging circumstances, and diagnostic yield will suffer.

The type of interpersonal relationships upon which professional trust can be built also cannot be replicated on-line. Where there is less trust between doctors, both parties are compromised, and patient care suffers. When the radiologist is 9000 miles away he or she will be less familiar with both the referring physicians and the patient population than an on-site interpreter. Furthermore, as the physician farthest removed from the patient, he or she is likely to be aware that they are the most likely party to be named in a lawsuit. Thus further removing the radiologist from the clinical setting could have the unintended effect of increasing the radiologist's sense of defensiveness and increasing the ambiguity of their reports. While some caution is warranted in most imaging interpretations, too much caution hampers the clinician's ability to make confident clinical decisions, particularly operative decisions. The ordering clinician then may be more likely to delay critical decisions until a final report is issued the following day which wastes valuable time. For their part, a reasonable clinician may be less likely to opt to take a warranted but potentially high risk therapeutic course of action, such as surgery or intra-cerebral thrombolytics, based on the recommendation of a person whom they have never met, again increasing the temptation to await an official over-read. An appropriately cautious surgeon, for example, given a complex clinical picture may want to be sure that the radiologist was aware of and give appropriate consideration to circumstances that are not apparent by the imaging study alone. This level of assurance often

warrants a phone conversation, if not a face-to-face communication with a trusted colleague. At our institution, such radiologic consultations are commonplace. Even within a potentially global marketplace image interpretation is not a commodity; rather the radiologist is a consultant who functions in a complex environment in which interpersonal relationships, direct experience with the clinical setting, and overall professionalism are relied upon by referring clinicians when critical decisions need to be made.

#### VI. OFFSHORING AND OPTIMIZATION

With their on-site role firmly established, it is nevertheless important for radiologists in the United States to also accept the specter of globalization and adapt to it in ways that promote the field and benefit patient care. If completion of a United States residency were no longer a requirement to sit for United States board certification or some world equivalent, the market forces would change dramatically. So how robust is this limitation? Each year approximately twenty to twenty-five percent of residency foreign medical graduates fill positions in the United States.<sup>40</sup> The American College of Graduate Medical Education and United States residency directors alike have therefore concluded that although medical schools in the United States may be more desirable, they are by no means unique. Currently, gaps between the quality and interchangeability of graduate medical education in the United States and those of other countries are formidable; United States residency and credentialing are the gold standard. As long as they are perceived as categorically superior to their international counterparts, the restriction will remain as Americans are unlikely to be willing to compromise the quality of their care. Referring clinicians would likewise be reluctant to defend their decision to compromise their patient's imaging needs to save their hospital money. However, restricting the supply of radiologists in the United States may be more difficult to justify if this perception changes.

The pace of economic development and modernization of countries like India and China must be acknowledged, and the face of medical education and technology in these countries a decade or two hence is impossible to predict. There are many experts in the field that see some form of global certification process as inevitable.<sup>41</sup> These experts predict that:

[A] global virtual radiology service based on workload sharing and reallocation. More applications of teleradiology can be expected due to the continuing shortages and uneven distribution of radiologists, and the increasing use of radiological imaging for diagnosis . . . Eventually the distinction between picture archiving and communication systems and teleradiology will be blurred and radiology will be provided by virtual organizations with distributed capabilities.<sup>42</sup>

---

<sup>40</sup>James A. Hallock, Stephen S. Seeling & John J. Norcini, *The International Medical Graduate Pipeline*, 22 HEALTH AFFAIRS 94 (2003).

<sup>41</sup>Seong K. Mun et al., *Teleradiology and Emerging Business Models*, 11 J. TELEMEDICINE & TELE CARE 271 (2005).

<sup>42</sup>*Id.*

Dr. William G. Bradley, who is the chairman of the Department of Radiology at the University of California at San Diego and an academic advisor of NightHawk Radiology Services, was a spokesman at the World Congress on Radiology.<sup>43</sup> He said, “[i]t’s becoming a single world. We’re just a couple of steps away from [certification] reciprocity. At some point there will be a common Board and world standards.”<sup>44</sup> The process of international cooperation to create a commonly recognized medical profession certification may already be in its early stage. In 2000, the International Association of Medical Regulatory Authorities (IAMRA) was formed, of which the United States National Board of Medical Examiners is a member.<sup>45</sup> In 2002, IAMRA initiated a taskforce to look at creating an internationally recognized “medical passport” to be given to highly qualified medical practitioners which was modified to a “Fast Track Credentials System.”<sup>46</sup> However, this international credentialing is still in the planning process.<sup>47</sup>

One potential way to embrace globalization would be to leverage the current advantage the United States has in high tech imaging, thus, solidifying its position in this important sector, while ceding some of the lower tech, high volume business that continues to occupy a very significant proportion of most American radiologists’ time. Mammography, for example, is a loss leader at many hospitals which displaces potentially more profitable work but is needed to maintain status as a full service provider. It may be advantageous then for American firms to send mammograms for offshore interpretation while maintaining the technical fees. A variation on this theme would be to use computer assisted diagnosis (CAD) to screen for mammographic abnormalities and then triage the presumably normal mammograms for offshore interpretation while flagging the potentially abnormal study for the American radiologists who would then likely follow up with more advanced imaging, such as breast magnetic resonance.<sup>48</sup> Indeed, one expert who has published extensively on the role of offshoring in radiology noted that American radiologists face more of a threat from advances in computer aided diagnosis than from foreign radiologists who perform interpretations at reduced rates.<sup>49</sup> Normand Laberge, the CEO of the Canadian Association of Radiologists, recently suggested

---

<sup>43</sup>George Wiley, *Teleradiology 2005: Cracks in the Nighthawk Egg*, IMAGING ECONOMICS, Feb. 2005, available at [http://www.imagingeconomics.com/issues/articles/2005-02\\_02.asp](http://www.imagingeconomics.com/issues/articles/2005-02_02.asp).

<sup>44</sup>*Id.*

<sup>45</sup>International Association of Medical Regulatory Authorities, IAMRA History, <http://www.iamra.com/history.html> (last visited May 16, 2007). See also International Association of Medical Regulatory Authorities, IAMRA Membership List, <http://www.iamra.com/memberlist.html> (last visited May 16, 2007).

<sup>46</sup>International Association of Medical Regulatory Authorities, IAMRA News August 2002, <http://www.iamra.com/2002-August.html> (last visited May 16, 2007). See also International Association of Medical Regulatory Authorities, IAMRA News November 2005, <http://www.iamra.com/2005-November.html> (last visited May 16, 2007).

<sup>47</sup>*Id.*

<sup>48</sup>Levy & Goelman, *supra* note 36.

<sup>49</sup>John C. Hayes, *CAD Could Pose Bigger Threat Than Offshoring*, DIAGNOSTIC IMAGING, Jan. 1, 2007, <http://www.diagnosticimaging.com/pacsweb/showArticle.jhtml?articleID=196801218>.

sending mammography offshore in an attempt to address Canada's shortage of radiologists and growing wait of time for diagnostic services.<sup>50</sup> The backlash that resulted was his colleagues threatened his job, but the reaction would have been different if offshoring less profitable studies were viewed less as a surrender and more as a favorable term of engagement.<sup>51</sup>

A healthy, open market response to international competition could stimulate a shift in how American radiologists are trained and buttress the United States' position as a global leader in advanced medical care. If today's bread and butter studies are viewed as endangered, more American radiology residents might be prompted to seek fellowship positions enabling them to increase their marketability as sub-specialists fluent in advanced imaging modalities, such as magnetic resonance spectroscopy, diffusion tensor imaging, or cardiac perfusion. They would then be poised to export their interpretation expertise to other developed nations such as Canada, the United Kingdom, Australia, and New Zealand (as soon as imaging equipment vendors could provide the equipment within those countries) which are also frustrated by chronic radiologist shortages.<sup>52</sup> Developing nations, therefore, should clearly recognize that the United States is poised to capitalize on a significant market advantage if nations come to compete for medical services on the basis of quality as a global leader in the provision of high end imaging interpretation.

## VII. CONCLUSION

International teleradiology is a positive development for both patients and physicians. The market for American radiology is operating at capacity and is inevitably leading to the use of international teleradiology solutions. When robust quality assurance provisions are built into the system, timely and high quality interpretations can be provided to meet global imaging needs while allowing American radiologists to have adequate sleep and manageable workloads, and perhaps better able to focus on more advanced imaging modalities and further specialization. But, teleradiology has its limits. It cannot replace the role of the on-site radiologist for quality assurance and consultation with referring physicians. Furthermore, quality assurance provisions should guard against the temptation on the part of interpreters to skim exam codes to select those with higher reimbursement rates as this would be detrimental not only to patient care but also to education and research and development in the neglected lower margin modalities. Nor is offshoring a panacea for the runaway cost containment in a litigious medical environment with an increasingly aging population, advancing technology, and growing indications for imaging. The exporting and importing of interpretation services has the potential to be advantageous to the medical market, but substantial

---

<sup>50</sup>Press Release, Canadian Association of Radiologists, One Billion Dollars Diagnostic Imaging Fund to Better Serve Canadians (Jan. 29, 2000), available at <http://car.ca/en/news-pubs/media/press/000129.asp>.

<sup>51</sup>Brad Mackay, *Furor over Proposed Offshore Teleradiology*, 176 CAN. MED. ASS'N J. 21 (2007), available at <http://www.cmaj.ca/cgi/content/full/176/1/21> (last visited May 21, 2007).

<sup>52</sup>The Royal Australian and New Zealand College of Radiologists, 2000 Royal Australian and New Zealand College of Radiologists Workforce Survey Diagnostic Radiologists Report, available at [http://www.ranzcr.edu.au/documents/download.cfm/2000\\_WF\\_Survey\\_Report.pdf?txtLibraryID=rancr&txtFileName=ACFC3BD.pdf](http://www.ranzcr.edu.au/documents/download.cfm/2000_WF_Survey_Report.pdf?txtLibraryID=rancr&txtFileName=ACFC3BD.pdf) (last visited Apr. 22, 2007).

reengineering of the infrastructure for credentialing, licensing, privacy assurance, and reimbursement is necessary before this will come to pass and be of benefit to the United States, and perhaps global, health care.