UPDATE IN RADIOLOGY

Toward the appropriate use of teleradiology

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KEYWORDS
Teleradiology; Medico legal; Quality assessment

Abstract Teleradiology involves much more than merely transmitting images and information between two points: teleradiology consists of sharing knowledge and working together in a network. It facilitates rapid access to radiological reports and second opinions, remote consulting among physicians, improved patient care, access to complex tools for postprocessing and computer-aided diagnosis, support for research and training projects, ties between isolated healthcare providers and busier or more experienced providers, 24-h coverage, and competition among radiology departments. A close relation with the radiological services leads to better care. However, teleradiology should not have negative effects on the efficacy of the clinical radiology service that is closest to the patient. This article focuses on the legal requirements of teleradiology services and on the clinical problems that can arise in teleradiology settings, with the ultimate aim of ensuring the appropriate use of teleradiology to improve healthcare.

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PALABRAS CLAVE
Telerradiología; Médico legal; Evaluación de Calidad

Hacia un uso adecuado de la telerradiología

Resumen La telerradiología no consiste en transmitir imágenes e información entre puntos distantes, sino en compartir conocimiento y trabajar en red. Facilita el acceso rápido a informes radiológicos y segунdas opiniones; la teleconsulta entre médicos; la mejora de la asistencia a los pacientes; el acceso a sistemas complejos del posproceso y ayuda al diagnóstico; el apoyo a la investigación y la formación; el acercamiento de los servicios sanitarios aislados a las prestaciones continuadas o de mayor experiencia; la cobertura de 24 horas; y la promoción de


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Introduction

Radiology has been a distinct medical specialty with unique technical challenges from its conception. Radiologists have been greatly involved in all technological developments relating to medical imaging. It is acknowledged that at present the increase in the number of radiological examinations performed is not balanced with the number of radiologists available. Radiologists face this work overload and productivity increase situation by early incorporating digital technology.

Teleradiology is, probably, the most technologically developed form of telemedicine. It can be defined as the electronic transmission of radiologic images from one location to another for the purposes of interpretation or consultation. The appropriate application of teleradiology delivers direct benefits to patient care by providing better services and avoiding unnecessary transfers.

The high quality of images and their rapid transmission as well as reduction of communication and computational costs facilitate the development and implementation of teleradiology as a clinical practice. At the same time, this process is setting out great challenges and generating notable changes in the provision of radiology services. The aspects to be resolved are not purely technological, since in this field almost anything imaginable will be feasible in the midterm, but above all of a professional, economic, organizational, cultural, ethical and legal matter. It would be a great loss if by using teleradiology radiologists were to be considered as mere image readers, isolated with their monitors, and without having a consulting or clinical role. It is therefore critical that the use of teleradiology services do not undermine the effectiveness of a radiology service close to the patient.

From a legal point of view, a major paradox arises between the fast technological development and the slow change and adaptation of regulations, as well as their implementation into appropriate codes of conduct that are socially accepted. The absence of a specific legislation on teleradiology (and on telemedicine) is causing and sustaining various doubts regarding its practical application, along with a certain feeling of insecurity due to the lack of legal certainty.

The most relevant aspects for the correct implementation of teleradiology as a benefit to patients are discussed in this paper by analyzing different application scenarios, the impact in organizations and professionals and their legal and technical aspects, concluding with recommendations for their appropriate use.

Impact in organizations and professionals

Nowadays, it is difficult to imagine a Diagnostic Imaging Central Service or a Clinical Area for Medical Imaging without a technological environment in which information systems (understood not only as producers of radiological reports but also as tools for management and assessment of professional practice) are not implemented and considered by professionals themselves as an indispensable tool to maintain the most accurate level of response to the needs of the referring clinician and the patient’s demands.

The natural evolution of organizations with experience in the use of digital imaging and information systems is toward the use of teleradiology in new networking settings. Without a doubt, an organizational approach including the use of Information and Communication Technologies (ITC) will allow access to great quality services to those areas of population where there is no service availability due to the organization of the healthcare system, distance or costs, improving the efficiency of radiological practice by sharing specialized care. In this setting is where the ‘‘radiology network’’ is developed.

The use of teleradiology has a great influence in the way radiology professionals, both technicians and radiologists, work thus having an impact not only in the way that work is organized but also in the way digital images are interpreted and reported in workstations. The process of image interpretation in the context of teleradiology is completely based on a digital imaging environment where examinations are read on high resolution monitors; therefore, the radiologist is used to handling various applications to visualize images and information systems in order to adapt to the management of work flows.

The fact that medical imaging examinations are available in digital format and accessible from anywhere at any time allows us to propose new working scenarios through collaboration and cooperation among professionals. Among the options of teleradiology can be highlighted:

- Remote radiology reports of programmed studies.
- No need for the on-call radiologist to be physically present in the examination centers.
- Access to diagnosis by experts.
- Management of shared subspeciality through revision and consult of complex cases.
- Access to complex post processing, imaging biomarkers and computer-aided diagnosis.
- Virtual teaching.
- Cooperative or networking investigation.
The first of the applications of teleradiology is providing remote radiological services for image consultation and interpreting from the location where they were acquired. This situation can be encountered when the center recipient of the service does not have a radiologist or when specialized knowledge is required. Images are delivered long distance along with the patient’s medical history to a radiologist who reads them and assumes the responsibility for diagnosing. In this primary diagnostic scenario based on image interpretation, teleradiology settings require the highest diagnostic services and appropriate personnel in order to have greater control over the agreed report turnaround times and quality.

In this environment of relations between different organizations and companies, it is very important to have written protocols agreed by all parties at our disposal, relating to the local implementation of teleradiology. These documents must include standard procedures regarding acceptance and protocolization of guidelines on various clinical situations, the manner in communicating the recipient the urgency of a given study, who will be responsible for revising the working routines, how are studies going to be reported and, finally, who is going to communicate the results and in what space of time.

If this model were to be extended, it should be considered if teleradiology can be regarded as the only solution for providing services to a community with whom there is not a responsible commitment. The main value to be promoted in radiological practice is our clinical profile, based on the integration of the patient’s information to define the most efficient diagnostic approaches and generate the most complete reports that will help to solve the cause for having to take an imaging test. This can only be carried out on the basis of a fluent interdisciplinary collaboration with other professionals in each center. Given that the physical presence of the clinical radiologists who participate in the local health system is an added value to society, it should not be renounced to, and teleradiology should never be regarded as an isolated service for health care practice. Unfortunately, there are associated dangers to teleradiology such as what might be an uncontrolled development with no regulations, mainly driven by economic encouragement, which is when the clinic profile gets lost.

Teleradiology must be implemented under the agreement of the radiologists working in the various connected centers, who must view the service not as a system aside their activities but as an integrated element of support. It is essential that the various professionals involved in each one of the steps of the system appreciate their usefulness and make it theirs by revising the new situations emerging from the assistance process mapping and thus embodying the best solution to the benefit of the patient.

It is therefore necessary to initiate a discussion regarding the changes to be carried out in these health organizations when this “radiology network” becomes a tangible reality. On this new concept basis, teleradiology focuses more on the management of medical information than on the mere image and diagnostic report transmission from one place to another. Teleradiology must be capable of contributing to the integration of medical information in a digital environment distributed within a hospital and also beyond it, creating added value services to the patients, professionals and institutions, and therefore to the healthcare system on a regional and even international level. In this environment, new professional responsibilities arise for the management of these technologies through organizational changes that preserve confidentiality and patient integrity data. This is the “management of radiology network”.

With the suppression of technical boundaries, teleradiology helps to promote and strengthen relationships between distant center services. It will then be more feasible to open lines of collaboration between their professionals that are destined, among other things, to the evaluation and monitoring of certain diseases thus establishing suitability criteria, continuous training and recycling. It is the concept of “virtual radiology service” that better summarizes this new paradigm.

The concept of teleradiology, understood as the communication between remote units in the same health department or even between associated departments that allow the functional integration of various radiological services, is behind the various management projects available for medical imaging at regional level. These projects are based on the availability of demographic data of all citizens of a community through their health card, using one only information system created with Internet technology and integrated in a regional based PACS system. This system provides data to the health community with access to digital images along with all information contained, promoting and facilitating all aspects associated with teleradiology. This “management of radiological information” will optimize health care to all the community.

Legal aspects of teleradiology

There are no sectoral and specific regulations to teleradiology, or to telemedicine. This does not mean that we are before a legal void on this issue, since there is a substantial body of legislation that is applied to the different fields affecting this service (healthcare, ionizing radiations, ITC and subcontracting) (Table 1).

The legal principles in which must be based include aspects related to people (professional competence), the radiological process and technology. The main contents will be:

- Respect patients’ rights: right to information; right to informed consent; right to refuse undergoing treatment; right to confidentiality; right to data protection.
- Guarantee a provision of services adjusted to the quality standard in all phases of the radiological process.
- Ensure the identification and genuine identity of all participants.
- Guarantee security and traceability of the service.
- Offer a basis for users to choose the best quality services available with full knowledge.
- Prevent and suppress fraudulent or deceptive practices.

Article 16 of “Directive 2000/31/CE of the European Parliament of 8 of June 2000, on certain legal aspects of information society services” encourages professional and consumer associations the development of these principles.
**Table 1** Regulatory framework in teleradiology.

<table>
<thead>
<tr>
<th>Health legislation</th>
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<tbody>
<tr>
<td>Law 41/2002, of 14 November, regulating the autonomy of the patient.</td>
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<tr>
<td>Law 44/2003, of 21 November on the organization of health professionals.</td>
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<tr>
<td>Royal Decree 1277/2003, of 10 October, on authorization of health centers, services, activities and facilities.</td>
</tr>
</tbody>
</table>

**Legislation on ionizing radiation**

“There are more than 40 regulations. Those of greater practical use are:

- Royal Decree 1976/1999, of 23 December, establishing the criteria for quality in radio diagnosis.
- Royal Decree 815/2001, of 13 July, on justification of the use of ionizing radiation for the radiologic protection of persons in case of medical exposures.

**Information technology and communications regulations**

**On information society**

- Law 34/2002, of 11 July, on information society services.

**On data protection**

- Organic law 15/1999, of 13 December, on the Protection of Personal Data.
- Royal Decree 1720/2007, of 21 December, which approves the Regulation implementing Organic Law 15/1999, of 13 December, on the Protection of Personal Data.
- Instruction 1/2000, of 1 December, issued by the Data Protection Agency on rules governing transfer of international data.

**Subcontracting regulations**

- General legislation on contracts and obligations: Civil and Commercial Code.

and the drawing up of codes of conduct. These codes are of great importance since they will be the basis of the future sector legislations in this matter and will set out the good practices (lex artis) of teleradiological services, especially relevant in the case medical liability lawsuits or other conflicts.

The regulation of responsibilities and legal obligations of teleradiology is funded on the principle of responsibility, which requires that the service providers that are in direct contact with the patient be responsible for the correct complying of the obligations derived from all the radiological process. This responsibility is independent of whether the obligations must be executed by radiologists themselves or by different service providers. Both situations must be differentiated (Table 2):

### Intramural or internal teleradiology

Any radiological process (management of requests; justification of studies; image generation; diagnosis; sending of information and consultation with the clinician) remains under the control of the same service organization or company. In this case there is no difference with regard to the responsibility regime and general obligations applied in traditional radiology, with the only exception regarding data protection regulations.

### Extramural or external teleradiology

The functional unity of the radiological process becomes fragmented. A part of the radiological process (management of requests; justification of the study; image generation) is carried out by the service that has direct contact with the patient, whereas the report preparation and the sending of information is outsourced (subcontracted) to a third party, that specializes in these matters. It is in this case when responsibilities and obligations to each involved party must be clearly specified.

Either when opting for an internal system or for outsourcing, the authorization of the activity, the competence and the identification of the radiologist must be guaranteed based on two fundamental principles, that of the country of origin of the patient and of the freedom to provide services.

### The principle of the country of origin of the patient

The ability of teleradiology for trespassing territorial boundaries does not prevent it from fully complying with the local legal regulations (community, state) of the patients’ place of residence. It is not acceptable to dissociate an activity from both the communities of origin and destiny of the images. Control of services must be carried out at the origin of the activity and the competent authority must guarantee this protection. This means that the service that generated the images must guarantee the good practices on all steps of the radiological process, including reports performed by third parties.

### The principle of freedom to provide services

Within the European Union exists the free movement of goods, capital and people; being the freedom to provide services one of the most important features of the European citizenship. Any European radiologist can freely carry out their profession in any state of the EU, with the right to the entire application of EU regulations regarding the mutual recognition of professional qualifications. However, medicine and radiology are professional activities subject to the strictest regulations and submitted to previous administrative authorization. This requires the rigorous compliance of a number of conditions and requirements by the service provider organization and by the radiologist (Table 3).

In case of malpractice, patients have the right to sue the radiologist and/or the company that offers these services in another country or autonomous community. The claim will
be substantiated at the place of residence of the patient. The applicable law and its jurisdiction (place of the trial) is that of the state or community of residence of the patient. There cannot be any difficulties in determining the applicable law and competent judge because this will result in infringement of the essential content of the Right to Effective Judicial Protection.

The radiologist is required to subscribe to a liability insurance. This insurance protects radiologists from economic loss if they are sued or sentenced in relation to their professional activities. In the case of teleradiology, it is necessary to subscribe an insurance covering this type of activity and guaranteeing coverage in all countries where it is carried out.

The teleradiology service must always guarantee patient confidentiality and must comply with the data protection law of the countries of origin and destiny. As in any medical treatment, there are some fundamental premises concerning the rights of intimacy-confidentiality and personal data protection:

- The right to intimacy-confidentiality is a passive right (not to do), specified under the duty to preserve confidences or secrets.
- The right to data protection is an active right (to do), specified under the duty to establish a set of security measures and diligence when collecting, handling, controlling and preserving data.

- Data belong to people, not organizations.
- Citizens have the power of disposition or control on their personal data specified under the right to consent (regarding the collection and use of their personal data), right to know (regarding the destiny and use of those data) and the right to opposition (regarding accessing, correcting and deleting data).
- Data must be compulsorily legalized through notification and registration of the personal data files before the data protection agencies.
- Data must be legitimized to ensure complying with the principle of information and explicit consent. There is an exception regarding intramural teleradiology, where there is no need to gather consent.
- Personal data referring to health matters are especially protected. Data protected in radiology are personal data (name and surname, physical and e-mail address and telephone), financial data, reports and images.
- Regarding health data, it is compulsory to establish high-level security measures. Among them, it is worth mentioning, given its importance, the requirement of encoding telecommunications.
- When the service is outsourced (extramural teleradiology), it is considered a “third party data access” and must be regulated by a contract. Radiological data, given their

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**Table 2** Types of teleradiology.

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<tr>
<th>Type</th>
<th>Characteristics</th>
<th>Legal regime</th>
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</thead>
<tbody>
<tr>
<td>Intramural</td>
<td>Integrated within the hospital. Hospital-Radiologist’s workplace. Various hospitals (same level or different levels). Regional (regional health PACS services).</td>
<td>- Responsibility regime: similar.</td>
<td>- Responsibility</td>
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<td></td>
<td>State European Union</td>
<td>- Obligations regime: similar.</td>
<td>regime: principle of</td>
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<tr>
<td></td>
<td>Outside the European Union</td>
<td>- On data protection regulations: communication encryption.</td>
<td>the origin of country</td>
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<td></td>
<td></td>
<td>- Responsibility regime: principle of the origin of country of the patient.</td>
<td>of the patient.</td>
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<td></td>
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<td>- Obligations regime: on legal regulations regarding authority, activity</td>
<td>- Obligations regime:</td>
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<td></td>
<td>and radiologist’s qualifications.</td>
<td>on legal regulations</td>
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<td></td>
<td></td>
<td>- Data Protection: third party data access agreement.</td>
<td>regarding authority,</td>
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<td></td>
<td></td>
<td>- Contract: contract for provision of services.</td>
<td>activity and</td>
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<td></td>
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<td>- Responsibility regime: principle of the origin of country of the patient.</td>
<td>radiologist’s</td>
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<td></td>
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<td>- Obligations regime: on legal regulations regarding authority, activity</td>
<td>qualifications.</td>
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<td></td>
<td></td>
<td>and radiologist’s qualifications.</td>
<td>- Data Protection:</td>
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<td></td>
<td></td>
<td>- Data Protection: third party data access agreement and authorization</td>
<td>third party data</td>
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<td></td>
<td>of the Director of the Data Protection Agency in case of transfers to states</td>
<td>access agreement and</td>
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<td>that do NOT grant an appropriate level of protection equivalent to the</td>
<td>authorization of the</td>
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<td>Spanish LOPD.</td>
<td>Director of the Data</td>
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<td></td>
<td>- Contract: contract for provision of services.</td>
<td>Protection Agency in</td>
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<td>case of transfers to</td>
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<td>Spanish LOPD.</td>
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<tr>
<td>Extramural</td>
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</table>
Table 3  Conditions and requirements of the radiologist and/or service provider.

<table>
<thead>
<tr>
<th>Requirements of the radiologist and/or service provider</th>
<th>Regulations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Previous administrative authorization.</td>
<td>Royal Decree 1277/2003, of 10 October, establishing the general bases for authorization of health centers, services and establishments of Regional Legislation.</td>
</tr>
<tr>
<td>Nationality test.</td>
<td>Law 44/2003 on Health Profession Management (Art. 46)</td>
</tr>
<tr>
<td>Medicine and Radio diagnostics.</td>
<td>Law 51/2002 of 27 December</td>
</tr>
<tr>
<td>Certificate of non-suspension.</td>
<td>Registration for Spanish tax on economic activities, when required by law.</td>
</tr>
<tr>
<td>Linguistic tests.</td>
<td>Registration for Spanish self-employed workers regime, when required by law.</td>
</tr>
</tbody>
</table>

confidential value, cannot be accessed or shared by a third party without the explicit consent of their owner or, failing that, without being regulated by a contract. Legally, the most secure way is setting up a "third party data access agreement". In this document the terms of treatment and especially the duty to confidentiality, secrecy, security measures and prohibition to new subcontracting of the service must be specifically established.

- International data transfers are only legally secure within the European Union or in countries with an appropriate level of protection equivalent to the Spanish Data Protection Act (Ley Orgánica de Protección de Datos, LOPD). International data transfers that do not grant an appropriate level of protection equivalent to that of the LOPD are not legally secure. In these cases, the authorization of the Director of the Data Protection Agency will be necessary, which will require a series of additional warranties from the service provider.

Out of respect for the principle of transparency, in extramural radiology (with the exception of emergency), patients must be asked for their explicit consent when their imaging studies are transferred to another service organization, independent of whether it is located in Spain or any other European country. The recommended content of this information should include:

- Clear information as to who is going to provide the service (affiliation, qualification and authorizations).
- Brief description of the essential characteristics of the service.
- Description of the risks and advantages of the teleradiological process.
- Warning that confidentiality might be compromised due to the electronic transmission of information.
- Brief description of the security and existing confidentiality protection measures applied.

In extramural teleradiology, independent of the obligation of having a "third party data access agreement", it is also required to sign a "contract for the provision of services" that identifies medico-legal responsibilities and obligations of the reference hospital and those of the teleradiology report services (Table 4).

The main legal obstacles in teleradiology relate to the ubiquity of images, the globalization of the radiological reading and its apparent anonymity. So there are three main fraudulent and criminal practices punishable according to the Spanish Criminal Code:

- Unauthorized practice of the profession (Art. 403 CC): use of specialists without recognized qualifications within the European Union.
- Falsification of documents (Arts. 390–396 of CC): use of "ghost reading" or "ghost reporting", understood as when a second radiologist writes a report (at a cheaper price) and another qualified radiologist signs it (usually without revising it or following low quality control).

Technical aspects

The working scenario of a radiologist, when acting as a teleradiology service provider, must not be different from the requirements in a radiology service, as far as image quality, visualization systems, monitors and related information is concerned. In fact, technology related to teleradiology has been sufficiently proved and is accessible especially thanks to the existing open standards for software. Among them are the DICOM (medical imaging), HL7 (healthcare informatics systems), XLM (messages between information systems), TCP-IP (Internet communications) and especially the IHE initiative that in different scenarios develops specific interoperability demonstrators among all involved agents.

Telecommunications infrastructure is the weakest link and one of the main obstacles for the expansion of remote services. The progress regarding speed and reduction of
**Table 4** Advisable content in a teleradiology contract.

<table>
<thead>
<tr>
<th>Parties involved</th>
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</thead>
<tbody>
<tr>
<td>- Principle of genuine identity of the participants.</td>
</tr>
<tr>
<td>- Identification and professional situation of the radiologist.</td>
</tr>
<tr>
<td>- Respect legal authority regulations, activity and qualifications to exercise the sub-specialty within the state or community of habitual residence of the patient.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Subject matter of the contract</th>
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<tbody>
<tr>
<td>- Issuing of diagnostic reports: primary or diagnostic consult, final report, urgent or ordinary report.</td>
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<tr>
<td>- Information made available (time, way).</td>
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<tr>
<td>- Consultation availability.</td>
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<table>
<thead>
<tr>
<th>Location</th>
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<tr>
<td>- Activity’s address.</td>
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<tr>
<td>- Must allow surveillance, inspection and control by competent administrative bodies.</td>
</tr>
<tr>
<td>- Duration and contract termination.</td>
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<tr>
<td>- Fixed period of time.</td>
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<table>
<thead>
<tr>
<th>Price and form of payment</th>
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</thead>
<tbody>
<tr>
<td>- Inclusion of expenses and taxes.</td>
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</table>

<table>
<thead>
<tr>
<th>Obligations of the parties. Clauses</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Infrastructure, physical facilities, budget and maintenance (equipment, maintenance manager, information transmission format, hours of coverage, permanent supply of electric power, communication systems, emergency planning).</td>
</tr>
<tr>
<td>- People: type of relationship (working or service contract relationship).</td>
</tr>
<tr>
<td>- Management of radiological quality process (indicators).</td>
</tr>
<tr>
<td>- Prohibition of subcontracting.</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Confidentiality and protection of personal data</th>
</tr>
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<tbody>
<tr>
<td>- Third party data access agreement: Content- Arts. 12 and 9 of the Spanish Data Protection Act.</td>
</tr>
<tr>
<td>- Authorization from the Director of the Data Protection Agency in case of international transfers to states that do not meet the appropriate level of protection equivalent to the Spanish LOPD.</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Applicable law and competent jurisdiction</th>
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<tbody>
<tr>
<td>- Country of origin of the patient.</td>
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costs related to information transmission is essential in order to establish efficient work scenarios in teleradiology. The possibility of using radiologic image compression might facilitate access to information in remote environments with limited bandwidth. Recently, the European Society of Radiology published a document about the use of irreversible compression of medical images. In this document the concept “irreversible compression acceptable for diagnosis” is introduced and may vary according to the type of study, the area studied and the technique used, and would allow the use of “lossy compression” in diagnostic environments.

Given that network data transmission net implies an integrity and confidentiality risk, it is necessary to establish the required measures to ensure that the information transmitted is secure, complete and reliable. Equipment connection as well as archive and information systems add great complexity to data protection policies. The most serious security dangers include the possibility of easily obtaining vast databases, software viruses and the possibility of altering the content of health care information. Security systems based on user identification and data encryption are similar to the ones used in other sensible fields, such as economic transactions.

**Recommendations**

In addition to these provisions and contracts, the appropriate use of teleradiology systems must take into account problems associated to the clinical and healthcare environment that might arise from its implementation. Among them, the following situations can be highlighted:

- Loss of communication between technicians, clinicians and patients with the consequent decrease in the quality of the health process.
- Difficulty to work in a multidisciplinary team.
- Difficulty for clinicians and patients to understand and assess the radiologic report.
- Difficulty for the radiologist to access the medical history of the patient.
- Increase in costs if the number of examinations escalates due to insecurity and the lack of communication by the radiologist as well as economic interests of the organizations.
- Difficulty to control quality (error control, test adaptation).
- Increase in legal problems (qualifications, excessive workload, responsibilities and insurance).
- Real possibility of deconstructing the paradigm of health care.

In order to minimize these problems and optimize the possibilities of a “radiology network”, “management of radiology network” and “management of radiologic information”, guidelines and codes of conduct must be adhered to. The Appropriate Use Guidelines proposed in this paper are:

- Teleradiology must be controlled and organized by radiologists, in collaboration with other physicians and health professionals, and must be part of the local radiology service where patients are taken care of. In rural or neglected areas, teleradiology must be established with the closest radiology service available.
- Teleradiology is a medical treatment subject to professional ethics. It includes validation and justification of the study, radiological protection of patients and workers, correct acquisition of images by the technician under supervision, by the radiologist, analysis and interpretation of images as well as communication with the patient and the referring clinician.
- The use of teleradiology must be integrated within the health service provisions to the benefit of the patients’ interests. It is well known that patients are better cared for when there is a close relationship between the clinician and the radiologist at the clinical radiology service.
Radiologists who provide a teleradiology service must communicate directly and often with the referring clinicians and the patients, offering them immediate diagnostic information that, due to its importance, might affect the correct treatment of the patient.

- Radiologists’ workload must neither exceed levels that might compromise diagnostic precision nor quality of service.

- Teleradiology must enable the exchange of knowledge among radiologists in an environment of discussion of cases. Discussing cases with a subspecialist is established for the benefit of a second opinion or to immediately transfer the patient to a specialized centre. Centralization of specific specialized reports outside the clinical environment of general hospitals must not be accepted.

- Teleradiology must not be a substitute for hiring radiologists that manage locally radiological services. The service of teleradiology must be established to improve patient care and not for lack of radiologists or cost reduction that compromise quality standards in health care assistance.

- Teleradiology must enable the development of regionally based networks that promote better communication between institutions aiming to have a better medical knowledge on the patient.

- Teleradiology must be validated by the local radiology service. Audits must be carried out to control the quality of processes, reliability of radiological reports and the diagnostic and therapeutic impact these services have on patients.

- Teleradiology contracts must include all action protocols in the clinical environment and the description of the technical characteristics of the facilities that ensure the quality and security of procedures, thus guaranteeing compliance of imaging quality standards at any time. The form of payment per service must be also specified in the contract.

- In order to avoid fraudulent subcontracting, the use of digital signature systems and traceability of information within the system is recommended to ensure that the radiologist signing the report is the one who has read the radiological study.

- Patients must be informed and accept the teleradiological procedure. Security in patient identification, confidentiality and identification of the professionals involved (referring clinicians and radiologists) must comply with the standards of medical ethics and the existing legislation.

Conclusions

To be beneficial, teleradiology must be associated with an increase in efficiency and improvement in networks and information transfer tools of the health care service. Teleradiology is an excellent radiological tool that, under the appropriate conditions, will provide:

- Telecommunication and teleconsultation among clinicians.
- Second opinions.
- Improved assistance and patient care.
- Access to complex post processes and computed help to diagnosis.
- Open new lines of research and training.
- Bring closer isolated or less attended health care services.
- Provide 24-h coverage (on-call with or without physical presence of the radiologist).
- Facilitate the competence among radiology services.

Authorship

1. Responsible for the integrity of the study: LMB, LIDB, AM.
2. Conception of the study: LMB.
3. Design: LMB, LIDB, AM.
4. Acquisition of data: N/A.
5. Analysis and interpretation of data: N/A.
6. Statistical analysis: N/A.
7. Bibliographic search: LMB, LIDB.
8. Drafting the paper: LMB, LIDB, AM.
9. Critical review with intellectually relevant contributions: LMB, LIDB, AM.
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Conflict of interest

The authors declare not having any conflict of interests.

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