

UPDATE IN RADIOLOGY

Teleradiology: good practice guide



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Abstract Teleradiology is the electronic transmission of radiological images from one location to another with the main purpose of interpreting or consulting a diagnosis and must be subject to codes of conduct agreed upon by professional societies. The content of fourteen teleradiology best practice guidelines is analyzed. Their guiding principles are: the best interest and benefit of the patient, quality and safety standards homologous to the local radiology service, and use as a complement and support of the same. As legal obligations: guaranteeing rights by applying the principle of the patient's country of origin, establishing requirements in international teleradiology and civil liability insurance. Regarding the radiological process: integration with the local service process, guaranteeing the quality of images and reports, access to previous studies and reports and complying with the principles of radioprotection. Regarding professional requirements: compliance with the required registrations, licenses and qualifications, training and qualification of the radiologist and technician, prevention of fraudulent practices, respect for labor standards and remuneration of the radiologist. Subcontracting must be justified, managing the risk of commoditization. Compliance with the system's technical standards.

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PALABRAS CLAVE

Telerradiología;
Directrices;
Prácticas
profesionales;
Cuestiones
normativas;
Evaluación de
calidad;

Telerradiología: guía de buenas prácticas

Resumen La Telerradiología es la transmisión electrónica de imágenes radiológicas de una localización a otra con el propósito principal de interpretar o consultar un diagnóstico y debe estar sujeta a códigos de conducta consensuados por sociedades profesionales. Se analiza el contenido de catorce guías de buenas prácticas de telerradiología. Sus principios rectores son: el mejor interés y beneficio del paciente, estándares de calidad y seguridad homologables al servicio de radiología local y, utilización como complemento y apoyo del mismo. Como obligaciones legales: garantizar los derechos aplicando el principio de país de origen del paciente,

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Estándares de referencia;
Servicios externalizados;
Comoditización

establecer requisitos en telerradiología internacional y seguro de responsabilidad civil. Con respecto al proceso radiológico: integración con el proceso del servicio local, garantizar la calidad de imágenes e informes, el acceso a los estudios e informes previos y cumplir los principios de radioprotección. En relación a los requisitos profesionales: cumplir con los registros, licencias y cualificaciones exigidas, formación y capacitación del radiólogo y técnico, prevención de prácticas fraudulentas, respeto a las normas laborales y remuneración del radiólogo. La subcontratación debe estar justificada, gestionando el riesgo de comoditización. Cumplimiento de estándares técnicos del sistema.

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Introduction

Since the beginning of the 21st century, radiology has undergone extraordinary advances and expansion thanks to digital radiology, the networking of radiological processes, and teleradiology. Over the last three decades, teleradiology has been brought into general use, and this has led to major technological, professional, economic, organisational, cultural, ethical and legal challenges.

Traditionally, the development of teleradiology has been focused on diagnostic image reporting and the use of information and communication technologies (ICT). However, the task of the radiologist is not simply to generate reports or give their specialised interpretation of medical images. Rather, their role is to solve problems for referring clinicians by providing them with relevant diagnostic information, helping them make clinical decisions, and reducing the level of uncertainty. This is achieved through the interaction of technological, process and professional aspects, all focused on the benefit to, and best interest of, the patient. Good practice guidelines¹ should provide directives on these aspects, determine the fundamental principles of the activity, establish procedures based on ethical and legal norms, and define standards and indicators of quality and safety (Fig. 1).

The aims of this article are to review and analyse the concept of teleradiology developed by radiology societies and public law corporations responsible for healthcare management, and to analyse the regulatory framework in Spain (by consulting legislation published in the BOE [Official State Gazette] and CENDOJ [Judicial Documentation Centre of the General Council of the Judiciary]) and in the European Union (available in the EUR-Lex databases).

Teleradiology: general aspects

Teleradiology: an evolving concept

Over the last three decades, the concept and evolution of teleradiology has been shaped by technological advances, market forces and guidelines issued by radiology societies and health institutions.¹⁻¹⁴ Table 1 lists the bodies that have published good practice guides.

- *Formal conceptual viewpoint.* Teleradiology is a telemedicine service, involving the electronic transmission of radiological images from one location to another for the primary purpose of interpretation or diagnostic consultation.^{15,16}
- *Instrumental viewpoint.* With the universalisation of digital radiology, picture archiving and communication systems (PACS) and the use of IT, 'traditional' radiology is indistinguishable from teleradiology. The quality and safety requirements of both the digital image and the imaging report are the same, and the standardised workflow from the radiologist's perspective is very similar.¹⁷
- *Viewpoint of the facility where the radiologist works.* The relevant issue is not whether or not the radiologist interpreting the images is physically present at the place where the patient's images are generated, but rather whether the radiological process is carried out in an integrated manner within the same service organisation (intramural) or is outsourced (extramural),¹⁸ as the regulations, requirements, obligations and liability regimes are different in the two service models:^{8,15}
 - a *Intramural teleradiology.* In this model, the entire radiology process remains under the control of a single service organisation or company (Fig. 2). This scenario ensures the consolidation, stability and standardisation of both the imaging process and procedures.^{8,15} In this context, there is no distinction between 'normal' radiology and teleradiology.
 - b *Extramural teleradiology.* In this model, the integrated management of the radiology process is fragmented and the responsibility for different parts assigned to different parties (Fig. 3). Part of the process, including the management of referrals, justification of the scan and the generation of images, is carried out by the service that has direct contact with the patient, under the responsibility of a local radiologist. The other part of the diagnostic process (reporting) and the sending of information is outsourced (subcontracted) to a third party. This is where it is important to clearly delimit the responsibilities of each of the parties involved.^{8,15} In this scenario, teleradiology is defined by the tool that enables the electronic transmission of radiology images from the organisation producing the images to the one that is responsible for interpreting them and producing diagnostic reports.

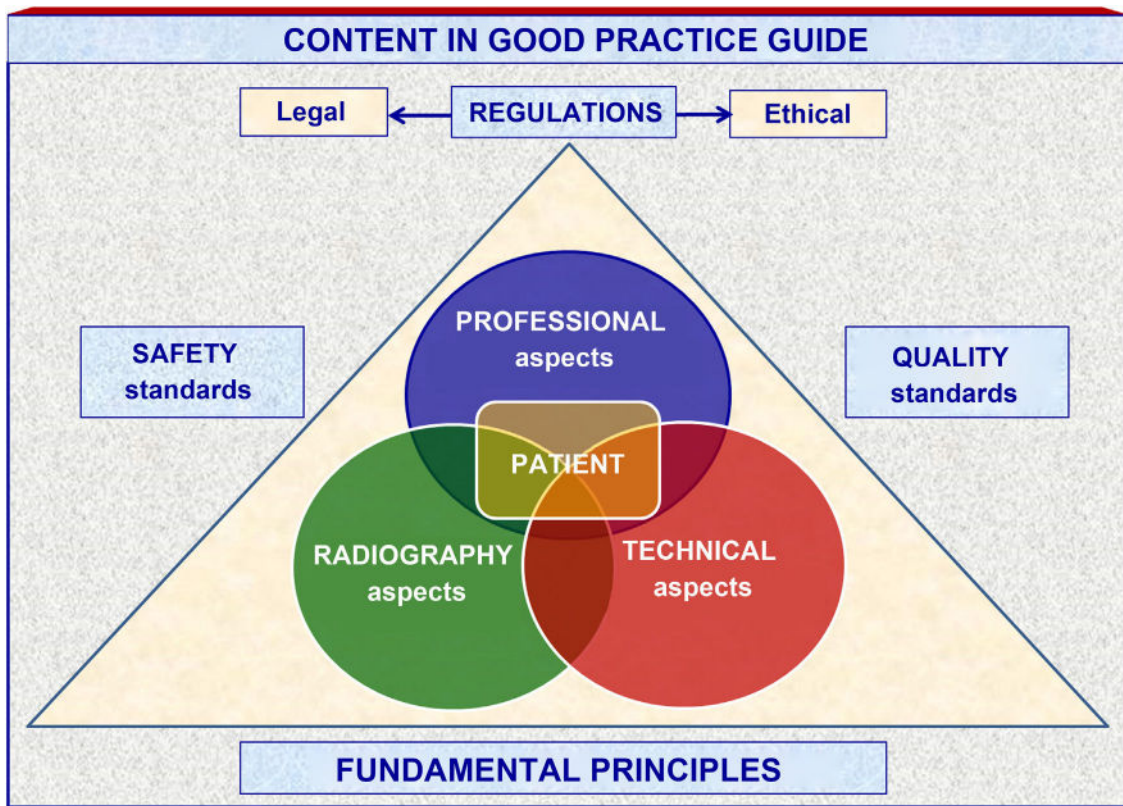


Figure 1 Content in good practice guides.

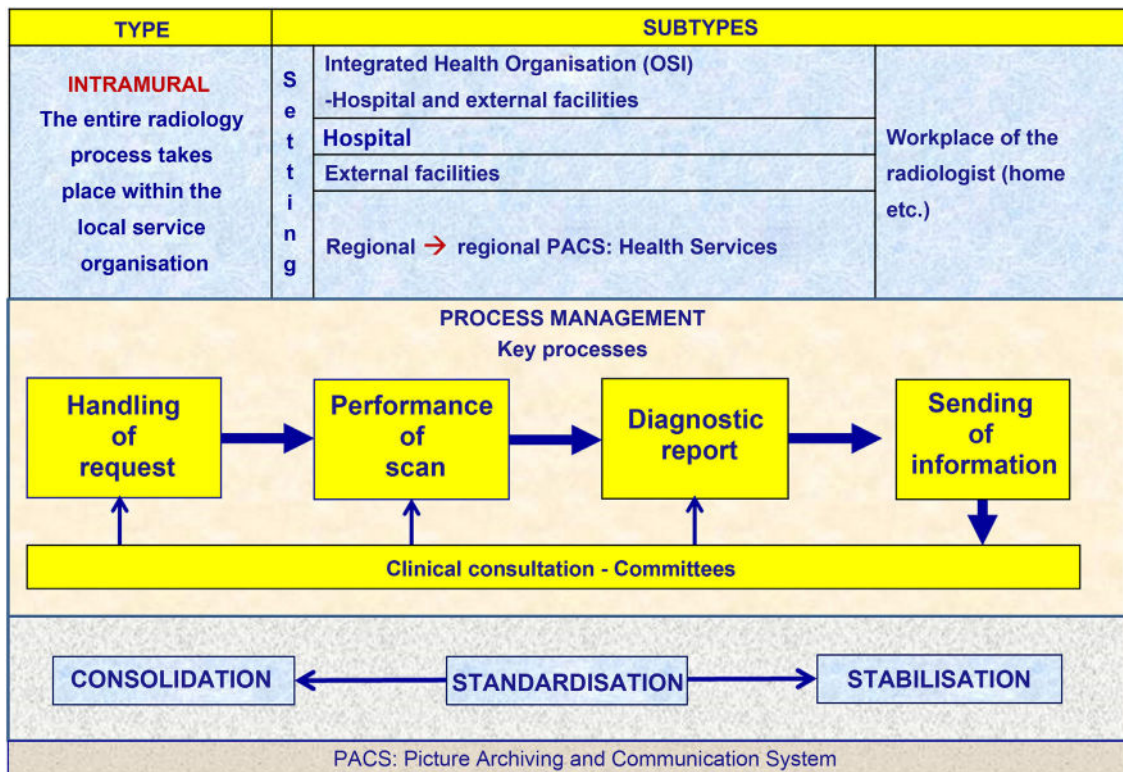


Figure 2 Intramural teleradiology.

Table 1 Good practice guides in teleradiology.

<i>International</i>		
2010	United States	InterAmerican College of Radiology (AMCR). Documents on teleradiology. Policies, standards, guidelines and recommendations for the implementation of teleradiology services in member countries ¹
2014	European Union	European Society of Radiology (ESR). ESR white paper on teleradiology: an update from the teleradiology subgroup ²
2017	Australasia	Royal Australian & New Zealand College of Radiologists (RANZCR). Standards for Teleradiology. 2017 ³
<i>National</i>		
2008	Canada	Canadian Association of Radiologists (CAR). Standards for Teleradiology ⁴
2021	Dubai	Dubai Healthcare City Authority (DHCA). Department: Policy and Regulation-Healthcare Operators & Healthcare Professionals. DHCA Teleradiology Policy ⁵
2013	United States	American College of Radiology (ACR). White Paper on Teleradiology Practice: A Report From the Task Force on Teleradiology Practice ⁶
2016	United States	American College of Radiology (ACR). Report of the ACR task force on international teleradiology ⁷
2015	Spain	Sociedad Española de Radiología Médica (SERAM). Decálogo de buenas prácticas en telerradiología ⁸
2018	France	Conseil National Professionnel de radiologie et imagerie médicale (G4Rad). Charte de Teleradiologie ⁹
2010	Italy	Istituto Superiore di Sanità (ISS). Linee guida per l'assicurazione di qualità in teleradiologia ¹⁰
2008	Malaysia	Ministry of Health Malaysia (KKM). Guidelines On Teleradiology In Malaysia ¹¹
2016	United Kingdom	The Royal College of Radiologists (RCR). Standards for the provision of teleradiology within the United Kingdom Second edition ¹²
2007	Singapore	College Radiologists Singapore (CRS). Teleradiology Guidelines ¹³
2021	Turkey	Turkish Society of Radiology (TSR). Guidelines for the practice of teleradiology: 2021 update ¹⁴

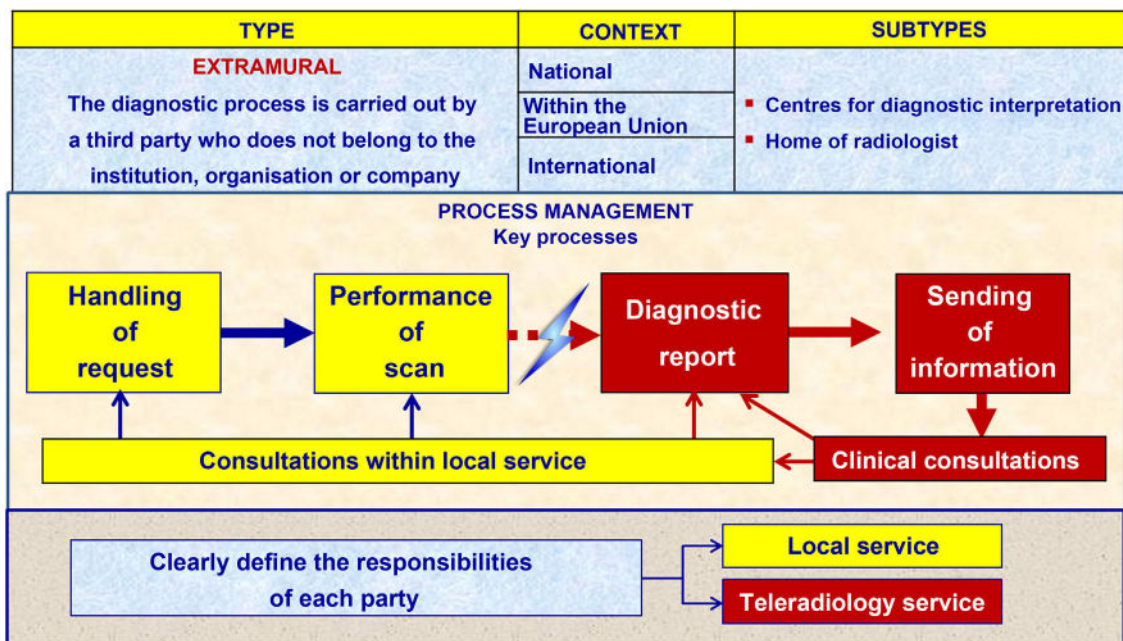


Figure 3 Extramural teleradiology.

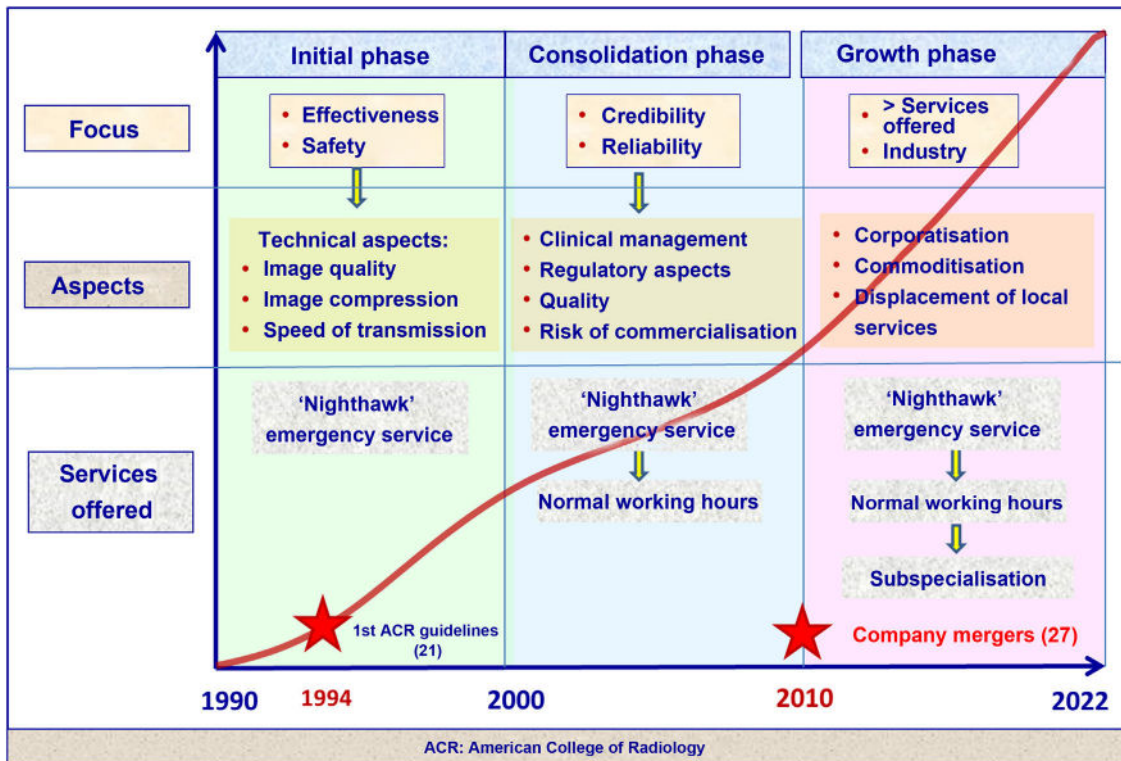


Figure 4 Phases in the development of teleradiology.

Phases in the development of teleradiology

The history of teleradiology is in many ways indistinguishable from that of digital radiology, PACS and visualisation technology.^{19,20} Three phases are outlined below with regard to the focus of each phase, the content of the guides produced during that time and the services provided (Fig. 4).

- *Phase 1: 1994–2000.* De facto teleradiology has existed since 1994 when the American College of Radiology officially recognised the procedure with the publication of its first position statement on the topic.²¹ This decade was dedicated to addressing initial concerns and doubts about its efficacy and safety (speed of transmission, image quality and compression), motivated by the need to provide coverage outside the ordinary working day for urgent radiology studies.^{19,20,22,23} It was during this decade that the first teleradiology companies appeared on the scene, initially providing nighthawk services to cover night-shift emergency reporting for small hospitals.^{22,23}
- *Phase 2: 2000–2010.* The widespread use of PACS and the increase in internet bandwidth made it possible to ensure credibility and increase supply.¹⁹ During this period, debate focused on aspects of clinical management, medico-legal issues, quality assessment and the potential for the commercialisation of the speciality.^{24–26}
- *Phase 3: 2010–2022.* Teleradiology experienced exponential growth and became an industry in its own right. In 2010, two leading US companies merged,²⁷ and teleradiology companies began to expand their services to meet the

demands of their investors, actively seeking hospital contracts (not just after hours), thus prompting a debate on corporatisation, commoditisation and the risk of it replacing local radiology services.²⁸

Review and analysis of the governing principles, standards and good practice guidelines

In the 14 documents reviewed,^{1–14} 26 items have been identified and organised into the following six categories for analysis: guiding principles, legal obligations, process aspects, professional requirements, aspects related to subcontracting and technical requirements (Table 2).

Governing principles

The primary concern of teleradiology must be the best interests and benefit of the patient^{1,2,5–10,12,14}

This principle is universal and fundamental, reflected in international medical ethics declarations²⁹ and codes of conduct³⁰. Its principal objective is that teleradiology is performed for the benefit of patients and society, and never for economic reasons, convenience or opportunism.⁸ The practice should be implemented to improve patient care, not to reduce costs.¹⁵ With patient-centred radiology, respect for the patients' values and preferences is paramount.³¹

Table 2 Revision and analysis of good practice guides.

Good practice ITEM	IACR (1)	ESR (2)	RANZCR (3)	CAR (4)	DUB (5)	ACR (6.7)	SERAM (8)	G4Rad (9)	ISS (10)	KKM (11)	RCR (12)	CRS (13)	TSR (14)
1. Primary concern is the best interest and benefit of the patient	Yes	Yes	-	-	Yes	Yes	Yes	Yes	Yes	-	Yes	-	Yes
2. Quality and safety: never inferior to that provided by local radiology services	Yes	Yes	Yes	Yes	-	Yes	Yes	Yes	Yes	-	Yes	-	Yes
3. Pre-eminent position of local services: teleradiology is a complement and support to local imaging services	-	-	Yes	Yes	-	Yes	Yes	Yes	-	-	Yes	-	Yes
4. Adherence to legal requirements: Principle of the country of origin of the patient	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	-	-	Yes	Yes
5. Patient rights	Yes	-	Yes	Yes	-	-	Yes	Yes	Yes	-	-	-	-
6. Data protection and confidentiality	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
7. Consent	Yes	Yes	-	-	Yes	-	Yes	Yes	Yes	Yes	-	-	Yes
8. International teleradiology: requirements	Yes	Yes	-	-	-	Yes	Yes	-	-	-	-	-	-
9. Liability insurance	Yes	Yes	Yes	Yes	-	Yes	Yes	Yes	-	-	Yes	Yes	-
10. Contract	Yes	Yes	-	-	Yes	Yes	Yes	Yes	-	-	Yes	-	Yes
11. Incorporation into the local radiology service	Yes	-	Yes	-	Yes	Yes	Yes	Yes	Yes	-	Yes	Yes	Yes
12. Image quality: shared responsibility	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	-	-	Yes
13. Quality of diagnostic report	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
14. Access to previous studies and reports	-	Yes	-	-	-	Yes	Yes	Yes	Yes	-	Yes	-	Yes
15. Background and additional clinical information	Yes	-	-	-	-	Yes	Yes	Yes	Yes	-	Yes	Yes	Yes
16. Ensure communication with referring clinician	Yes	-	Yes	-	Yes	Yes	Yes	Yes	Yes	-	Yes	-	Yes
17. Radiation safety: radiation protection aspects	Yes	Yes	Yes	Yes	-	Yes	Yes	Yes	-	Yes	-	Yes	Yes
18. Accreditation, licensing, registration: teleradiologists	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	-	Yes	Yes
19. Competence of the radiologist: education and training	Yes	Yes	Yes	Yes	-	Yes	-	Yes	Yes	Yes	-	Yes	Yes
20. Ensuring the real identity of all involved parties: preventing ghost reporting	Yes	-	Yes	-	Yes	Yes	Yes	Yes	Yes	Yes	-	-	Yes
21. Requisites: radiographer (qualifications, training, under local radiologist)	Yes	Yes	Yes	Yes	-	Yes	-	Yes	Yes	Yes	-	Yes	-
22. Workplace: working environment, ergonomics	-	Yes	-	-	-	Yes	-	-	-	-	-	-	Yes
23. Remuneration of radiologists	-	Yes	-	-	-	Yes	-	Yes	-	-	-	-	Yes
24. Justified subcontracting: principle of necessity	-	Yes	-	Yes	-	-	Yes	Yes	Yes	-	-	-	Yes
25. Risk of commoditisation	Yes	Yes	-	-	-	Yes	Yes	-	-	-	-	-	-
26. Technical requirements: acquisition, transmission, visualisation, archiving	Yes	Yes	Yes	-	Yes	Yes	-	Yes	Yes	Yes	-	Yes	Yes

ACR: American College of Radiology; CAR: Canadian Association of Radiologists; IACR: InterAmerican College of Radiologists; CRS: College of Radiologists Singapore; DUB: Dubai Healthcare City Authority; ESR: European Society of Radiology; G4-Rad: Conseil National Professionnel de radiologie et imagerie médicale; ISS: Istituto Superiore di Sanità; KKM: Ministry of Health Malaysia; RANZCR: Royal Australian & New Zealand College of Radiologists; RCR: The UK Royal College of Radiologists; SERAM: Sociedad Española de Radiología Médica; TSR: Turkish Society of Radiology.

The quality and safety of teleradiology should never be inferior to that provided by local radiology services^{1-4,6-10,12,14}

For any given aspect of the radiological process,⁷ the standards used in teleradiology should be the same as those of local radiology services both in terms of quality^{32,33} and health care safety.^{34,35}

The pre-eminent position of local services: teleradiology should be used to complement and support local imaging services^{3,4,6-9,12,14}

Seven guidelines emphasize the preeminence of local radiology services, expressing in different ways the preference for local teleradiology services over their outsourced equivalents.⁸ Local radiologists provide the optimal clinical environment for patients and the referring clinician, as they are able to provide greater interaction and availability.⁴ The on-site radiologist is the preferred model of service delivery and teleradiology is supplementary to clinical radiology.³ The contribution of radiologists to the health care team goes beyond simply providing interpretative reports;³⁶ it is important for radiologists to maintain patient contact, and the services they provide in terms of teleradiology should be a complement to—and not a replacement for—their on-site practice. Under no circumstances should teleradiology become the exclusive practice of a radiologist, as this is

likely to deprive them of certain professional skills in the long term.⁹

Legal aspects

Spain does not have a universal healthcare regulation covering teleradiology (nor telemedicine). However, there is a body of regulations that applies to this topic, with which professionals must comply in order to guarantee an adequate and lawful service,^{8,15,37} as presented in Table 3.

It should be emphasised that responsibility for the report lies with the signatory radiologist. In this sense, and in the event of errors in the diagnosis, negligent actions or lack of diligence, this individual is responsible for any claim made by the patient or their legal representatives.

Adherence to legal requirements: Principle of the country of origin of the patient^{1-10,13,14}

The link between imaging activity in the patient’s country of origin and in the recipient country must not be broken. The capacity of teleradiology to cross territorial boundaries in no way impedes full compliance with the legal regulations of the place (region, country) where the patient resides. The service must be supervised at the point of origin of the activity and the competent authorities must ensure that this protection is in place. This means that the facility generating

Table 3 Legislation applicable to teleradiology.**Health legislation***On patient rights*

General Health Law 14/1986, of 25 April

Law 41/2002, of 14 November on the autonomy of the patient

Directive 2011/24/EU, on the application of patient rights in cross-border healthcare. Transposition:

Royal Decree 81/2014, of 7 February on the establishment of rules to ensure cross-border healthcare

On clinical documentation

Royal Decree 1093/2010, of 3 September, on the approval of the minimum data set for clinical reports in the national health system

On academic training and qualifications

Directive 2005/36, of 7 September 2005 on the recognition of professional qualifications

Law 44/2003 of 21 November 2003 on the organisation of the health professions

Royal Decree 183/2008, of 8 February, on the determination and classification of specialities in health sciences and the development of certain aspects of the specialised health training system

Ministerial Order SCO/634/2008, of 15 February 2008, on the approval and publication of the training programme for the speciality of diagnostic imaging

On the authorisation of health centres, services and establishments

Royal Decree 1277/2003, of 10 October, on the establishment of the general conditions for the authorisation of health centres, services and establishments

Legislation on ionising radiation

There are more than 40 regulations. The following are those of greatest practical use:

Royal Decree 1976/1999, of 23 December, on the establishment of quality criteria in diagnostic imaging

Royal Decree 601/2019, of 18 October, on the use and optimisation of radiotherapy and radiological protection for medical exposure to ionising radiation

Legislation on electronic services and commerce

Directive 2000/31/EC, on electronic commerce. Transposition: Law 34/2002, of 11 July, on information society services and electronic commerce

Directive 98/34/EC, on information society services (LSSI)

Legislation on data protection

Organic Law 3/2018, of 5 December, on the protection of personal data and the guarantee of digital rights

Regulation (EU) 2016/679 of the European Parliament and of the Council on the protection of individuals with regard to the processing of personal data (GDPR)

Directive (EU) 2016/1148 of the European Parliament and of the Council of 6 July on measures to ensure a high common level of security of network and information systems in the Union

Legislation on subcontracting

Directive 97/7/EC of 20 May 1997 on the protection of consumers in respect of distance contracts

General legislation on contracts and obligations

Civil Code

Commercial Code

Law 9/2017, of 8 November on public sector contracts

Legislation on remote work

Law 10/2021, of 9 July, on remote working

the images must ensure good practice at every step of the imaging process, including any reporting carried out by third parties.^{8,15,37}

Patient rights^{1,3,4,8–10}

The following two types of rights are applicable:

- *Rights related to autonomy and self-determination:* right to information, right to informed consent and right to refuse the procedure.³⁸
- *Rights related to the protection of privacy:* right to confidentiality of health records³⁸ and the right to the protection of personal data.^{39,40}

Data protection and confidentiality^{1–14}

This aspect has been included in all the reviewed guidelines. The guide published by the European Society of Radiology deserves special attention⁴¹ as it sets out the obligations and basic notions of confidentiality, secrecy and security measures that are relevant to radiologists in this area.

It should be noted that, due to the sensitivity of the health data being processed, robust organisational and technical measures must be implemented by the professionals working in this service. Information should be kept confidential, accessible and complete.^{39,40} The following should be highlighted:

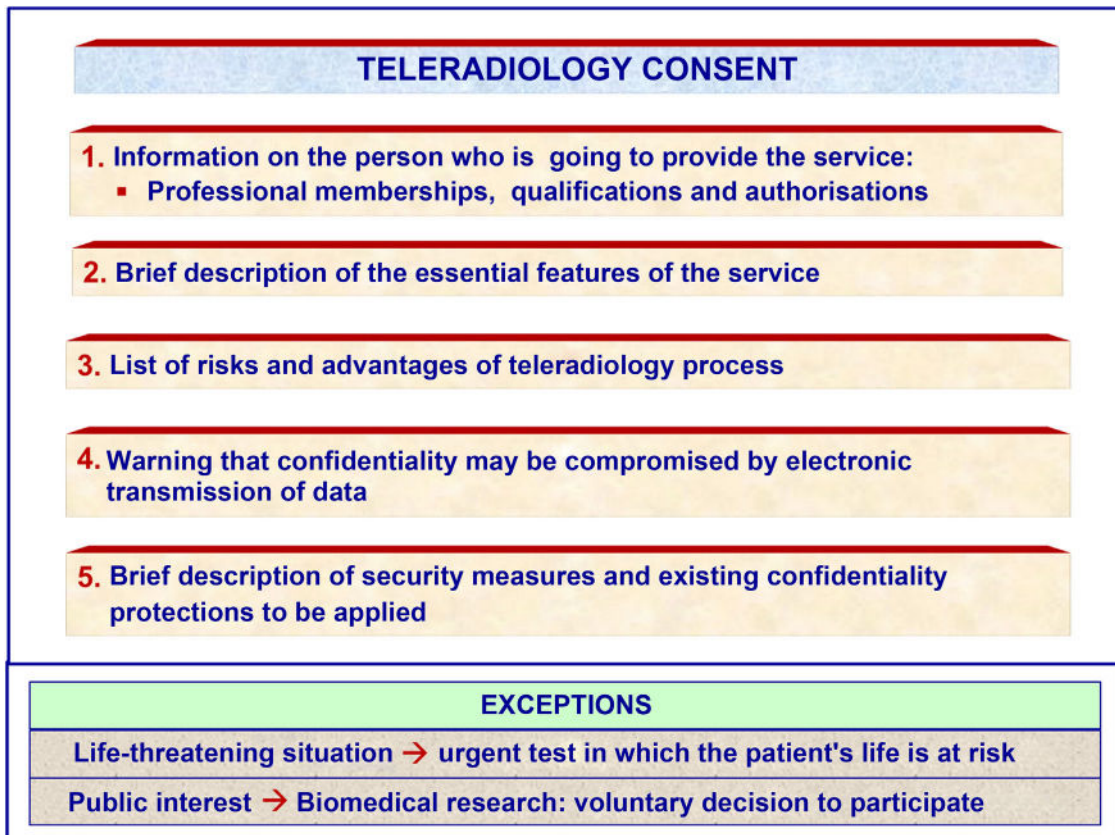


Figure 5 Content included in consent documentation.

- Data may only be accessed by authorised personnel. Authorisations and restrictions on access and permissions must be tightly controlled (for example, whether a user is only granted access to the data or permission to edit it).
- Encryption of data must be ensured at all times, both when communicating data and when storing information.

Consent^{1,2,5,8-11,14}

It is necessary to differentiate between ‘informed consent’ for a health care intervention, which is governed by health-care legislation,³⁸ and ‘consent for processing of personal (healthcare) data’, for which the data protection regulations apply.^{39,40}

Written consent must be sought from patients whenever images from their scans are transferred outside the health-care organisation where the scan is performed, regardless of geographic location.⁸ The European guidelines state that patients should be fully informed when teleradiology is used.^{2,41} It must be carried out in accordance with legal requirements.^{39,40} Fig. 5 presents the content that is recommended for inclusion in the wording of this consent and exemptions.

International teleradiology: requirements^{1,2,6-8}

As teleradiology has become globalised, geographical borders are no longer a barrier, and concern at the lack of regulation is expressed in some guidelines, most notably that of the American College of Radiology (ACR),⁷ which states

the need to set out requirements and limits governing the new international outsourcing models.

Furthermore, it is important to be aware that in the event that personal data leaves the European Economic Area, it is considered to be an international data transfer, which must be standardised in order to comply with the applicable regulations.⁴⁰ These requirements and conditions are illustrated in Fig. 6.

Liability insurance^{1-4,6-9,12,13}

An insurance policy that covers this teleradiology activity and guarantees coverage in every country where it is carried out must be in place.^{8,15,37}

Contract^{1,2,5-9,12,14}

The following must be formalised in the case of extramural teleradiology:

- A ‘service provision contract’ that sets out the medico-legal responsibilities and obligations of each of the parties: both the local radiology service and the reporting teleradiology service providers.¹⁵
- A ‘data processing agreement’ which sets out the obligations of the centre as the data controller on the one hand and of the teleradiologist as the processor of personal data on the other.⁴⁰

In the public sector, public procurement processes are governed by the Public Sector Contracts Act.⁴²

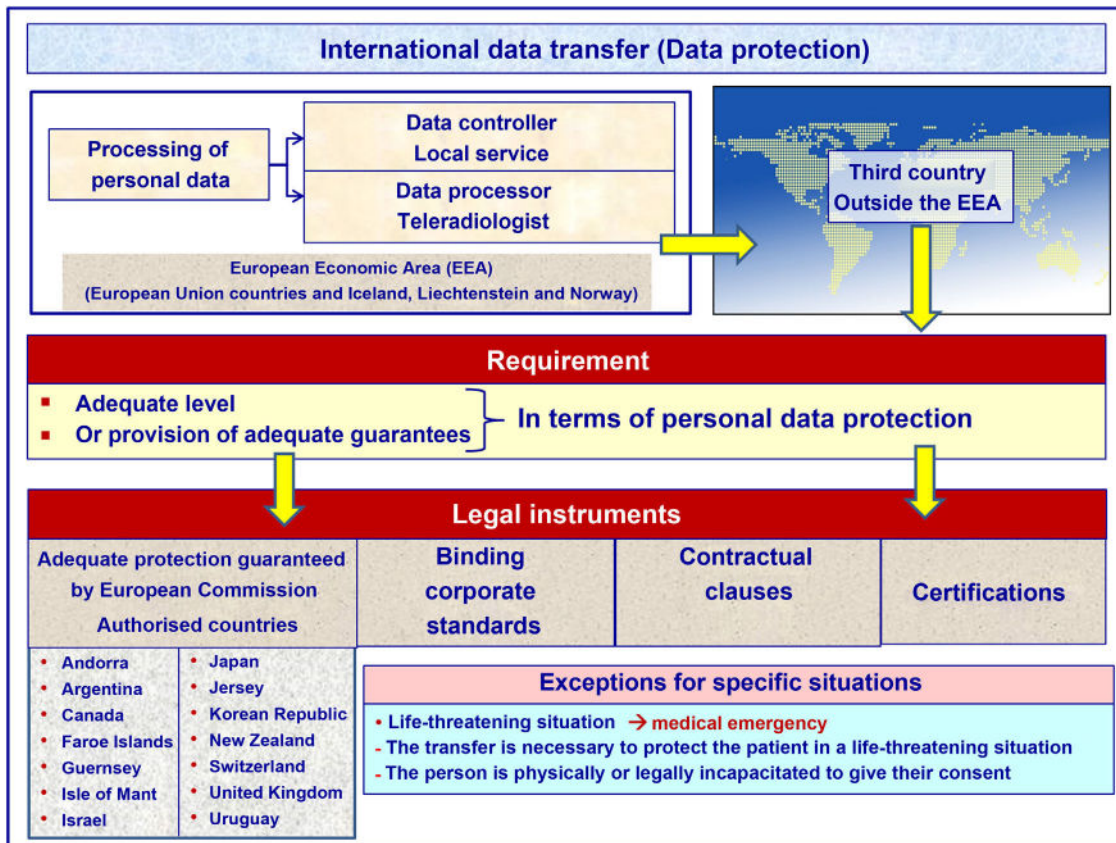


Figure 6 International data transfer.

Aspects of the imaging process

Incorporation into the local radiology service^{1,3,5–10,12–14}

Teleradiology cannot be regarded as a completely separate service to local radiology and its procedures. Teleradiologists must be involved in the following activities, either directly or in a manner established by protocols signed prior to the study: justification of the scan; selection of the most appropriate imaging process (related to the clinical information provided); supervision of the imaging protocol; prescription of contrasts; patient risk management and healthcare safety. Its object is to prevent variability in quality and in scanning protocols.⁴³

Image quality: principle of shared responsibility^{1–11,14}

The principle of shared responsibility between the local radiologist and the teleradiologist applies. The reporting teleradiologist is responsible for the quality of the images sent, without detracting from the management and supervisory responsibilities of the local service in this respect.

Quality of reports^{1–14}

This requirement is unanimously recognised in all the guidelines reviewed. The benefits of teleradiology are only fully realised when clinically useful reports are produced.¹² The form of quality control that is most strongly recommended is formal peer review.^{44–46} Only one guideline recommends that the radiologist should have to produce a minimum number of reports per month to ensure quality and competence

are maintained.¹¹ Regarding the standard of communication, most guidelines recommend those of the American College of Radiology.⁴⁷ In relation to structure, style and content, a recent publication has analysed the requirements of an organised, predefined and structured report.⁴⁸

Access to previous reports and studies^{2,6–10,12,14}

Teleradiologists must have the same standard of access to patient information regardless of whether they are working intramurally or extramurally. Access to previous studies, reports and clinical information are essential for ensuring the quality and safety of the radiology report.^{8,49} The inability to access and consult previous imaging scans and reports is a major cause of malpractice⁵⁰ and a frequent source of cognitive misdiagnosis.⁵¹

Background and additional clinical information^{1,6–10,12–14}

Apart from the obligatory clinical information, it is important that the teleradiologist is able to request any additional information. This requires open channels of communication and for the referring clinician to be accessible. This access is essential in emergency teleradiology.

Ensure communication with referring clinician^{1,3,5–10,12,14}

Timely and efficient communication of diagnostic findings to clinicians is essential.⁴⁷ In concrete terms, an absence or delay in reporting critical, urgent or significant findings can have particularly serious consequences for patients, and protocols for communicating such findings must be

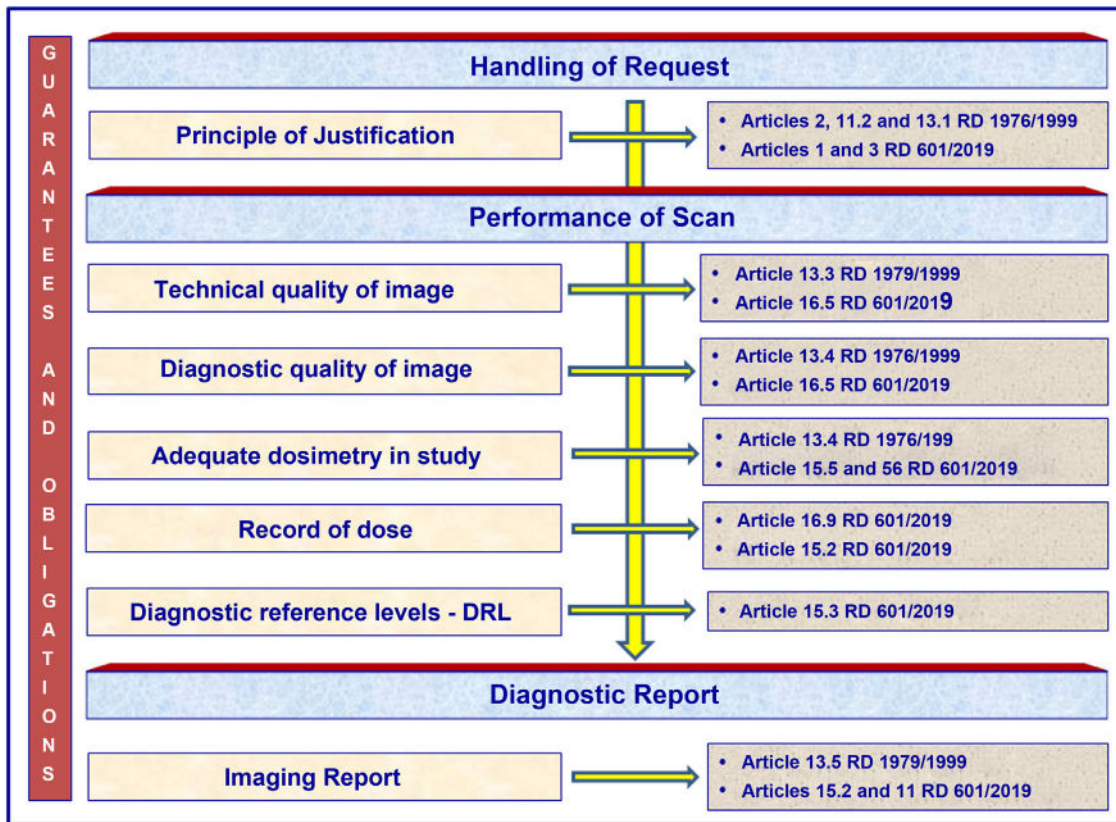


Figure 7 Radiation safety guarantees and obligations.

formalised in advance.⁵² With regard to the form of communication, it is recommended that verbal feedback provided during consultations is documented in the patient's medical records.⁵

Radiation safety: radiation protection aspects^{1-4,6-9,11,13,14}

Radiation safety and radiation protection legislation is still applicable to teleradiology⁵³⁻⁵⁵ given that it involves regulated activities and tasks (Fig. 7). Legal responsibility lies with the head of the facility, the head of the radiology department (a local radiologist must always be assigned to the scan) and the head of the radiophysics and radiation protection department.

Professional requisites

The professional figures involved are the radiologist and the radiographer; their credential requirements, roles and responsibilities must be clearly defined.

Accreditation, qualification, licensing, registration: teleradiologists^{2-11,13,14}

Guarantees must be provided that the reporting radiologist complies with the required registrations, licences and qualifications in both the country of origin where the images are produced and the country where the reporting takes place.^{8,15} The requirements in Spain are listed in Fig. 8.

Competence of the teleradiologist: training and education^{1-4,7,9-11,13,14}

Radiologists involved in teleradiology services should be specifically trained in this field. Training should include information on technical requirements, patient rights, legal regulations governing the protection of personal data, ethical norms, and the unintended consequences that may result from malpractice.

Ensuring the real identity of all parties involved: preventing ghost readers^{1,3,5-11,14}

This is critical for the prevention of ghost readers and ghost reporting—the terms used when a second radiologist produces a report (usually at a lower price) and the contracted radiologist signs it (usually after a poor or non-existent quality check). To prevent this fraudulent practice, electronic signature systems must be used and traceability in the ICT system ensured in order to guarantee that the radiologist who signs the report is the same individual who has interpreted the images.^{8,15} These fraudulent and dishonest practices must be effectively prevented and curbed; in the United States, a radiologist was imprisoned for such practices.⁵⁶ In Spain, it can constitute grounds for three criminal offences¹⁵ (Fig. 9).

Requisites: radiographer^{1-4,7,9-11,13}

The radiographer must meet all legal requirements in the country where the images are acquired. In Spain, this

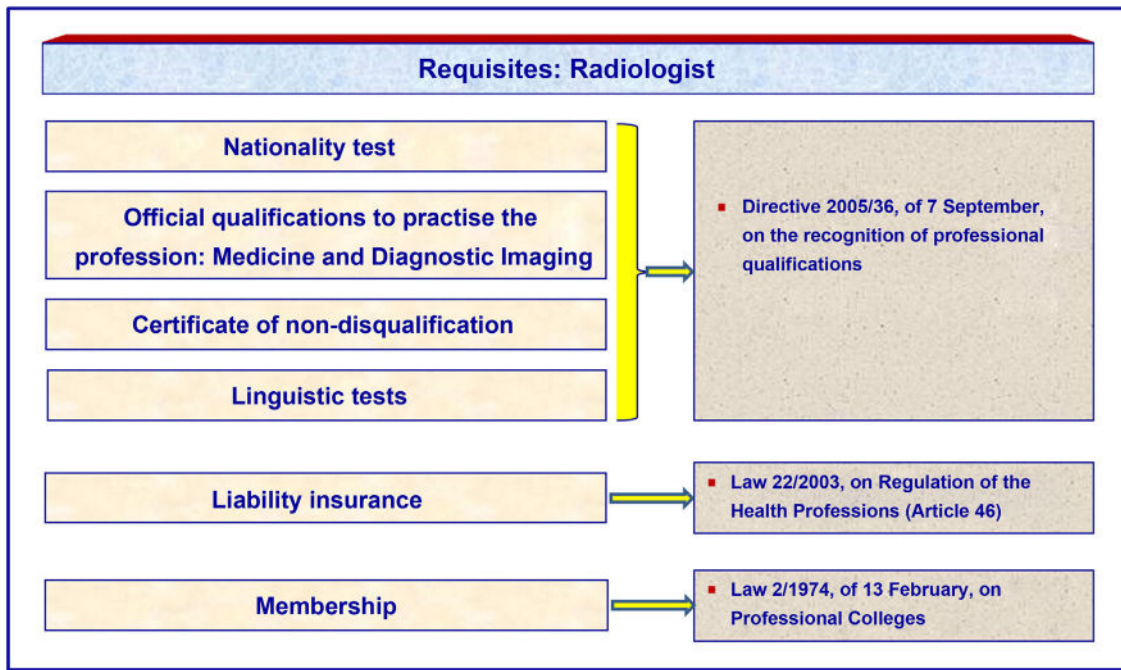


Figure 8 Legal requirements of the radiologist.

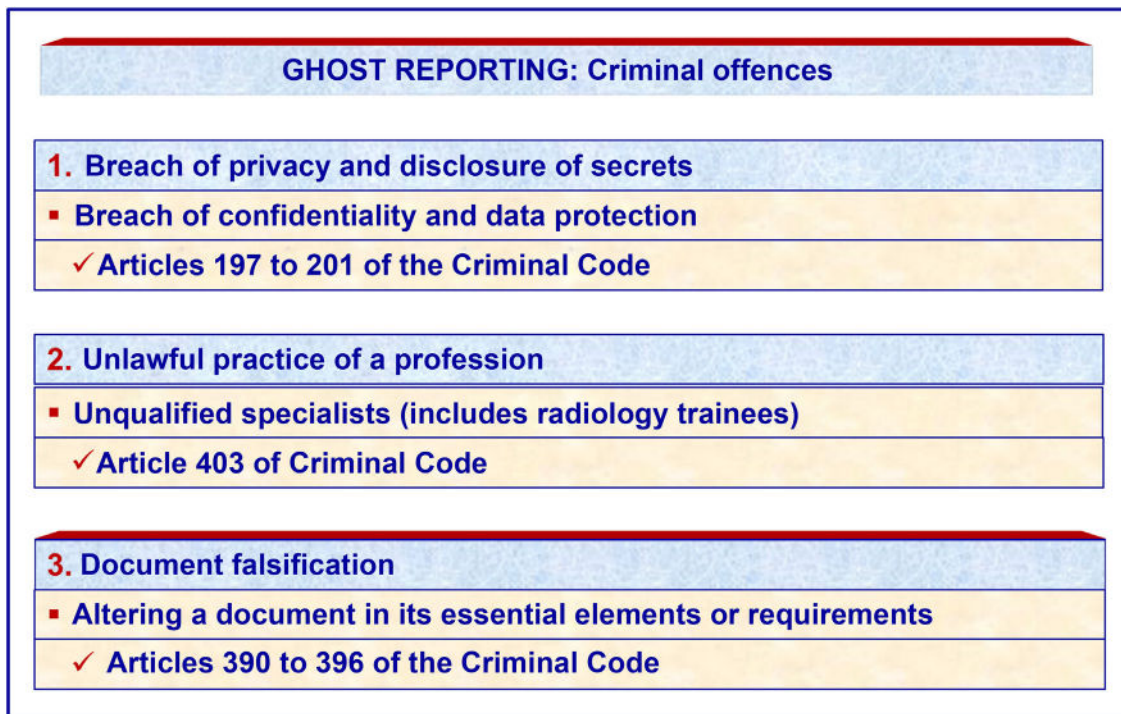


Figure 9 Criminal legal repercussions of ghost reporting.

means providing appropriate qualifications and an operator's licence from the Spanish Nuclear Safety Council. Radiographers must be trained and experienced in teleradiology (equipment/software used) and work under the general supervision of a local radiologist.

Workplace: working environment, ergonomics^{2,6,7,14}

The occupational well-being of the radiologist is an important factor in determining the success of teleradiology services. The work schedule and responsibilities of the individuals involved in this activity should be planned in

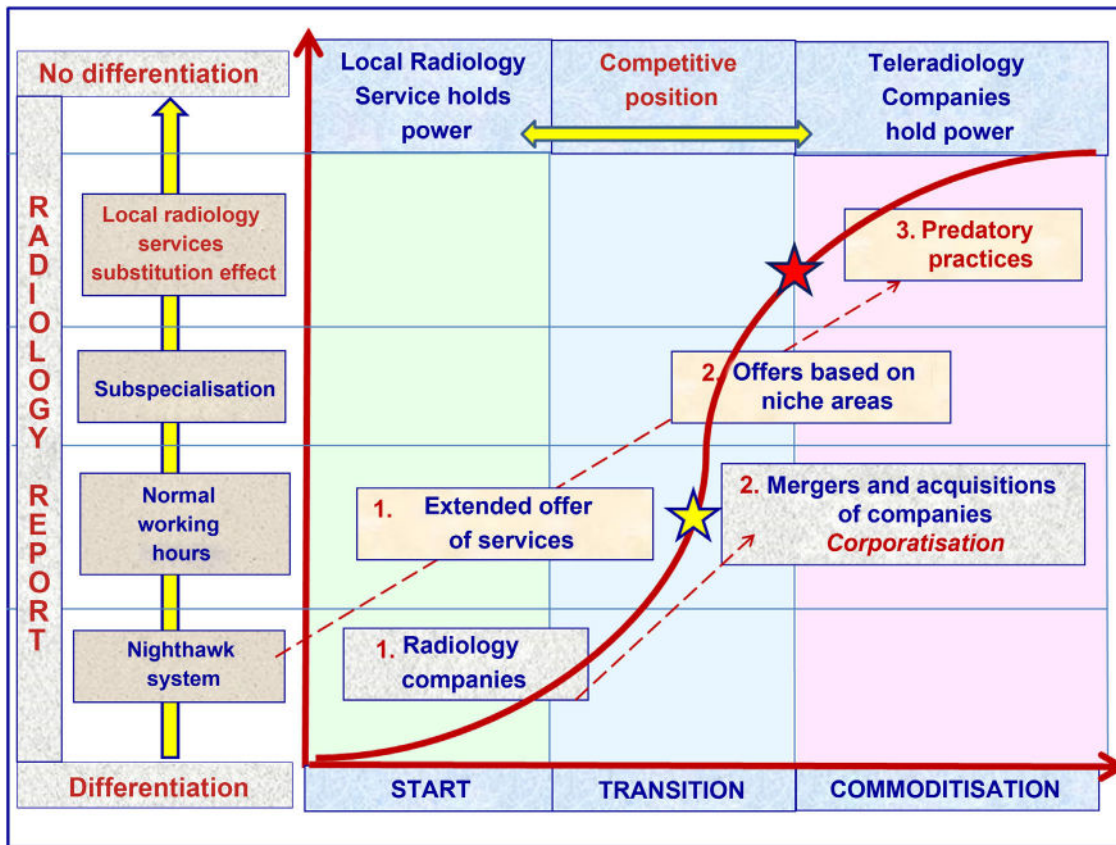


Figure 10 Phases in the development of commoditisation.

a way that does not infringe on working hours or other legal entitlements.⁵⁷ Ergonomics and comfort should also be addressed.⁵⁸

Remuneration of radiologists^{2,6,7,9,14}

A system should be in place to ensure that radiologists are properly reimbursed for the teleradiology services they provide.

Aspects related to subcontracting

Justified subcontracting and the principle of necessity^{2,4,8-10,14}

These guidelines stipulate the principle of necessity as a precondition. Without a valid reason, the on-site service provided by local radiologists should not be replaced. To this end:

- A sufficient number of on-site radiologists should be employed to cover the expected workload.¹⁴
- Teleradiology should not be used to justify the acquisition or renovation of imaging facilities unless the required number of on-site radiologists is available to supervise them in accordance with the medical indications of the project.⁹

- The French guidelines⁹ stipulate the principle of territorial priority when subcontracting: local territory in the first instance, then neighbouring territories, then provinces or even regions (before considering any outsourcing to a national commercial company).

Outsourcing has always been subject to debate^{24,26,59} with a focus on the following two types of conduct:

- *Predatory commercial practices*: Some teleradiology companies seek to replace local radiology services; the end result of this approach would be a radiology service with a minimal number of radiologists.⁵⁹
- *Disintermediation practices*: This process eliminates intermediaries from transactions. In this case, the local radiology service is excluded from negotiations which take place between hospital managers and teleradiology companies. This may even include the signing of direct contracts with no consultation with the local service providers.⁶⁰

In summary:

- The decision to contract teleradiology services is within the scope of local radiology services, as long as it contributes to improving patient care or provides services that

local radiologists are unable to offer.

- Teleradiology should not replace or preclude the employment of radiologists and should be implemented to improve patient care, not to reduce costs.¹⁵
- Teleradiology projects should involve local radiologists in the decision-making processes and conditions of outsourcing.⁸

Risk of commoditisation^{1,2,6–8}

Commoditisation is an economic neologism that comes from 'commodities', defined as 'raw materials' or 'basic products'. Commoditisation describes the process of converting products or services into homogeneous products or services that are indistinguishable in every way except their price.

This process has always occurred, and any sufficiently mature sector is susceptible to commoditisation, including the radiology sector.⁶¹ This trend has been accelerated by teleradiology⁶² which can turn reporting into an indistinguishable marketable commodity that can be outsourced anywhere, and in which radiologists also become interchangeable productive resources. As they are converted into commodities, differentiation disappears and the market value and bargaining power of the radiologist diminishes (Fig. 10).

Some authors argue that the commoditisation of teleradiology can offer advantages that include increased market transparency, mechanisms to guarantee medical quality and a means of attracting capital to the healthcare sector.⁶²

The following three approaches are recommended in decommoditisation strategies:

- Establish specific indicators and standards to differentiate imaging services on the basis of quality and clinical outcomes.⁶³
- Enhance the consultative role of the radiologist.⁶¹
- Contribute to the principle of efficiency.⁸ This implies that in the European Union context—consisting of free market welfare states—, the primary objective of private business is to make money and the primary objective of public business is to ensure the sustainability of the system.

Technical requirements^{1–3,5–7,9–11,13,14}

Technical standards of quality and safety for the proper functioning of the teleradiology system, both at the transmitting and receiving sites, must fulfil minimum technological requirements. The following guides detail the principal requirements:

- The 2022 revised technical standard⁶⁴ for the electronic practice of medical imaging by the American College of Radiology (ACR), the American Association of Physicists in Medicine (AAPM) and the Society for Imaging Informatics in Medicine (SIIM).
- The Royal College of Radiologist's (RCR) guidelines on PACS and diagnostic display devices.⁶⁵
- The ACR reference guide in information technology for the practising radiologist.⁶⁶

Conclusions

- Teleradiology is about much more than just reporting a scan from afar or transmitting images and information between distant points; it is also about sharing knowledge.
- It must be subject to codes of good practice agreed by scientific societies that determine its fundamental principles, establish guidelines for action based on ethical and legal norms, and define standards and indicators of quality and safety for the activity.
- When respected, codes of practice are an excellent tool that allows telecommunication and teleconsultation between referring clinicians and radiologists. Its benefits are well known, including the provision of diagnostic imaging consultation and interpretation services in areas where there is a proven need for radiologists, thus bridging the gap between specialists in one location and clinicians and patients in another. Other benefits are the provision of reports for urgent procedures and during out-of-hours periods to provide 24-h coverage; an enhanced diagnostic capability resulting from the possibility of requesting a second opinion; access to complex post-processing systems and computer-aided diagnosis; and the development of new possibilities in biomedical research and training.
- The threats it poses include risks related to outsourcing; delocalisation; cross-borderisation; commoditisation; corporatisation; its use as a service isolated from clinical practice that fractures the radiology care process; breaches of confidentiality and data protection rights; its uncontrolled and unregulated growth driven solely by commercial incentives; and the use of fraudulent and criminal practices, such as the employment of specialists without EU-recognised qualifications and the use of ghost readers.

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None.

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