

# Telemanagement and Radiology: current structure, opportunities and new horizons

G. Delogu<sup>1</sup>, L. Pellegrini<sup>1</sup>, L. Sorace<sup>1</sup>, G. D'Antonio<sup>1</sup>, F. Spadazzi<sup>1</sup>, I. Naso<sup>1</sup>, P. Frati<sup>1</sup>

<sup>1</sup> Department of Anatomic, Histologic, Medico-Legal Sciences and of Locomotor System, Rome University Sapienza, Italy

## Abstract

**Background.** Telemedicine is a method of providing remote services in compliance with data security, with a significant positive impact on healthcare, in which Teleradiology means the electronic transmission of radiographic images from one geographical area to another. In this context, the term “telemanagement” shows a real remote management of a diagnostic examination, concluded by the production of telereport and telediagnosis.

**Materials and Methods.** On the basis of Italian position papers, National guidelines and current Laws, a careful analysis of multiple aspects was carried out, in order to understand the current obligations and application limits.

**Discussion and Conclusion.** Proper radiotelemedicine requires a shared operating protocol within the structure, which integrates verification and safety procedures, periodic checks and adequate resources. In addition, practical interface between the involved figures must be properly established. Then, guidelines highlight the “standard” radiological procedures that can be performed in the absence of the specialist: in ordinary hospitalization, it is allowed to perform Telemanagement procedures only within “standard” procedures; in emergency setting, the only limit is placed in case of administration of contrast agent. No provisions have been approved for teleradiological work in private settings. Finally, inter-company procedures are only provided for screening programs. In this context; potential negative implications are the risk of substitution of health professionals, as well as ethical issues related to data security, patient’s consent and quality of the doctor-patient relationship. In an effort of optimism aimed at the future, we want to express our propensity towards a universe with lots of potential that, over time, will emerge in its concreteness. *Clin Ter 2024; 175 Suppl. 1(4):84-91 doi: 10.7417/CT.2024.5092*

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## Introduction

Never before has the public debate focused on the practical potential offered by modern technology, especially in view of the fervent promotion and development of artificial

intelligence systems that, although undeniably related to a potential turning point for humanity, seem to carry in themselves an equally unprecedented social, political and economic danger in case of misuse. Progress, in fact, can be metaphorically assimilated to a natural phenomenon: it cannot be stopped, but managed and exploited in its own favor, if not even commanded; however, it is fundamental to consider the littleness that man possesses before him, and the ease with which they can turn against him by annihilation.

For this reason, the purpose of the present paper is to constitute a brief and schematic line of organizational direction in the field of Teleradiology, firstly considering his essence, or the telematic extension of a process (the medical act) based on mutual and fruitful interaction between doctor, health care workers and patient. Then, although the increasing use of technology leads to the debate on numerous issues of an ethical and technical nature, including the protection of personal data, the quality of information transmitted, the organization of the figures on stage, the cost-effectiveness of the new process, it should not be forgotten that everything must never overcome or eclipse the fundamental principle of the appropriateness of the care provided, and that the enthusiasms that accompany this novelty do not cover the fundamental purpose of clinical practice, or the pursuit of the patient’s best interests.

## Telemedicine

Following the definition given within the national policy lines (1), telemedicine can be defined as “*how to provide health care services, through the use of innovative technologies, in particular Information and Communication Technologies (ICT), in situations where the health professional and the patient (or two professionals) are not in the same locality. Telemedicine involves the safe transmission of medical information and data in the form of texts, sounds, images or other forms necessary for the prevention, diagnosis, treatment and subsequent control of patients. Telemedicine services should be assimilated to any diagnostic/ therapeutic health service. However, provision in Telemedicine does not replace traditional healthcare provision in the personal doctor-patient*

Corresponding Author: email: clamp.comitatoscientifico@gmail.com

relationship, but complements it to potentially improve effectiveness, efficiency and appropriateness”.

The relevance and impact of this discipline in the field of society and health is recognized internationally and perceived as a real “cultural revolution” promoted through specific initiatives by numerous bodies including the European Community (2) in order to adapt Member States to new integrated standards within their National Healthcare Systems.

Italy has welcomed this revolution through numerous initiatives, including the establishment of the e-care National Observatory (3) by the Ministry of Health on the initiative of the Emilia Romagna for the purpose of encouraging exchange of good practices and technologies to the benefit of accessibility and effectiveness of the means offered to Italian citizens. However, it was the recent pandemic period from SARS-cov-2 that provided a major boost to the spread of Telemedicine, culminating in the promulgation on 17 December 2020 of the recent guidelines “National indications for the provision of telemedicine services” (4), which, on the basis of the needs dictated by the management of the health emergency caused by the Covid-19 pandemic (5), have provided uniform indications for the provision of Telemedicine services to be adopted at national level, by means of a different processes organisation, which can be complemented or replaced by existing traditional procedures in the field of prevention measures, diagnosis, or therapy, in the monitoring of physical parameters and to facilitate multidisciplinary collaboration and the exchange of information between professionals. It is precisely this document that recalls some further concepts necessary to illustrate, in particular the undoubted opportunity that this method provides in terms of improving access to prevention, diagnosis, therapy and monitoring of acute and chronic diseases as well as facilitating multidisciplinary collaboration between health professionals.

Specifically, the benefits offered are:

- equity of access to health care, through the implementation of tools that facilitate or even allow the citizen to benefit from qualified health care in remote areas or in prison institutions;
- improved quality of care, ensuring continuity of care through the possibility of bringing the doctor’s service directly into the patient’s home, to the benefit of the follow-up of chronic diseases as a priority area;
- improved effectiveness, efficiency and appropriateness in terms of the use of economic resources in the face of a phenomenon of progressive and inexorable ageing of the population, as well as the availability of timely and synchronous information from which the construction of specific process and outcome indicators can be derived; implicitly a:
  - containing public health expenditure in terms of rationalising and reducing the social cost of diseases;
  - contribution to the economy, in consideration of the very high rate of innovation linked to the specific field of technologies applied to medicine, an industrial sector whose worldwide potential value is estimated at EUR 60 billion in 2014. Therefore,

it is incorrect to consider only containing health expenditure in light of a positive and concrete contribution (1).

In order for these advantages to emerge, everything must be aimed at obtaining the maximum appropriateness of payment, bearing in mind that Telemedicine services can NOT (at least currently) replace traditional healthcare services, whereas the establishment of a comprehensive doctor-patient relationship cannot be separated from that physical and human contact precluded to the telematic activity which nevertheless represents a valuable support to the clinical activity in presence, integrating and dynamizing it.

#### *Brief introduction to logistics*

The telematic medical act may take place in different situations and its scope includes: teleteaching, teleconferencing, teledistribution, teleconsultation, teleadvice and remote management (6).

As for the first, “teledidactics”, this is a neologism used to indicate every form of distance learning through telecommunications systems; the term “teleconferencing” indicates instead the exchange and distribution of medical data between multidisciplinary teams and between two or more structures. Therefore, these elements form the basis for the existence of a telematic health infrastructure, given the need for an exchange of clinical information and notions for educational and professional purposes between individuals in the health sector (7). As already mentioned, it is necessary that such interchange respects at least the confidentiality of the transmitted data, from which the mandatory use of hardware and related software compliant with IHE profiles (8) such as Patient Information Reconciliation (ensures alignment between the patient’s master data in the sending and receiving system), Basic security (which makes it possible to verify that the characteristics of confidentiality and data integrity are respected in network transmissions and allows the monitoring of the operations carried out by the various users, such as knowing the names of users who have access to reading or writing confidential patient’s data).

The telematic transmission of health data and diagnostic images entails numerous risks regarding the integrity and confidentiality of the data transmitted. These risks are significantly limited if the system used uses dedicated transmission networks installed for this purpose, but they are much higher in systems linked to public networks, which are more numerous than the former and rapidly increasing, in relation to the spread of the Internet and broadband networks that guarantee very high data transmission speeds at significantly reduced costs. Therefore, the implementation of a telemedicine system must provide firstly a proper security management policy, if possible in consultation with the company management. The objectives can be summarised as follows:

- control of physical (isolated and controlled premises input) and logical (use of identification codes and passwords, or nominal chips, or biometric systems) access to system resources, data encryption and use of software protections;
- integrity of the data processed, especially through the use of digital signatures against the risk of counterfeiting;

- confidentiality of the information transmitted;
- data liability.

Regarding the methodology to be used, it is sufficient to follow the guidelines proposed by the Organization for International Standards in ISO 7498-02, adopting the safety techniques recognized by current legislation (Decree-Law 10 November 1997 n. 513 "Regulation laying down criteria and procedures for the training, archiving and transmission of documents using computer and telematic tools"; Decree-Law 10/2002; Decree-Law 137/2003).

To this point, in order to adequately deepen the classification aspects of teleradiological matter (aimed at the health objectives of prevention, diagnosis, treatment, rehabilitation and monitoring), it is considered appropriate to carry out the specialist examination.

## Teleradiology

### *Definition and areas of reference*

"Teleradiology" is a Telemedical service that involves the electronic transmission of radiographic images (X-ray, CT, NMR, PET, etc.) from one geographical area to another for the purpose of reporting or consultation. More extensively, teleradiology is not simply the transmission of images but also the exchange of knowledge and information between equals.

Within the documents already mentioned (1,6) it is possible to infer the subsistence of the following areas of relevance to Teleradiology as a branch of specialist Telemedicine:

- Television: a medical act in which the doctor interacts at a distance with the patient, from which a telediagnosis may result, in turn, heralding the prescription of drugs or treatments; during the session, a healthcare professional close to the patient can assist the doctor as long as the connection allows interaction in real or delayed time.
- Teleconsultation: an activity of consultation at distance between doctors which allows one to seek the advice of one or more colleagues, on the basis of specific training and competence, on the basis of medical information relating to the taking-up of the patient, from which the indication of a diagnosis and/or the choice of a therapy without the physical presence of the patient.
- Teleconsultancy: professional service required to the doctor of the Radiological Area for a second opinion, which is formalized by a written report signed by the consultant himself. Depending on the possibility of communicating in real time between the two operator centers, it is possible to distinguish in synchronous (interactive) or asynchronous (non-interactive) performance. In addition, the applicant may be either a radiologist who wishes to benefit from the specific experience of a consultant of the same geographically decentralized specialty, or a specialist in another medical branch (also a General Physician) or even a generic user in order to have a second opinion on a radiological act performed.

Incidentally, these last two areas constitute the optimal application of Teleradiology to overcome the territorial inequalities in terms of resources and skills needed. As for the officiality of the telereport, it is good to specify how the digital signature of the act determines the full assumption of responsibility by all the doctors involved in the process, when the contrary hypothesis would constitute nothing other than the possible resolution of interpretative doubts in the absence of official and relative legal value.

- Remote management: extremely interesting and innovative, is also called by the Anglo-Saxons "Telemanagement" or "real-time radiology". It is therefore intended as an incidental management of a radiological diagnostic examination by a radiologist, distant from the place of execution of the examination, who uses the cooperation of the requesting doctor (formal relationship between two doctors) and the TSRM, present at the place of the examination, with whom it communicates, in real time, by telephone and/or telematic. The remote management is completed with the telediagnosis formalized by the report with validated digital signature of the responsible radiologist.

### *Infrastructural elements*

With the evolution in the medical field of new technological devices able to facilitate the processes of image acquisition and reporting, in the '80s it began to outline the concept of Picture Archiving and Communication System (PACS) as an integrated system for the digital management of diagnostic images, aimed at eliminating X-ray films. PACS systems have established themselves in this context, integrated management of the various types of images generated in Radiological Departments (computer and digital radiology, nuclear medicine, ultrasound, magnetic resonance, computed tomography, etc.) and more generally, in the different Departments of a Hospital (8). PACS means, therefore, the integration in a network of different subsystems that includes: the modalities for the acquisition of images and data, the archive, display and reporting workstations. The integration and speed of communication between the different components is a key point to ensure the effectiveness of the system; the introduction of a standard format for both images and communication protocol has certainly contributed substantially to the achievement of this goal. Nowadays first level Hospital are the largest health organizations, as regards the processing of data. They address information technology, as well as all areas where there is a need to secure huge amounts of informations, keeping them as fast, reliable and easily accessible as possible. The standard for medical imaging provides for the precise and unambiguous amalgamation and association of patient information (to which the data refers) with image data, master data and medical reports. Specific systems capable of associating and matching data of different nature in a single document exist; among these, as mentioned above, DICOM is a standard able to manage the transmission of images, complete and integrated with other information, in the computer network (9). The DICOM specifications are

developed from models that determine which are and with which relationships real entities interact, in the context of which the standard is applied (patients, images, etc.). The advantage is to clearly joint entities and relationships, defining the structure of information. A typical PACS system can only handle DICOM objects; these objects contain, in addition to the actual image, the patient and examination data to which they refer. The standard has been jointly developed by users and device manufacturers with the aim of making possible the connection between systems of different manufacturers. DICOM has, therefore, the fundamental components for dialoguing with computerised image management systems, namely the PACS, the hospital activities or the Hospital Information Systems (HIS) and in particular the Radiology Information Systems (RIS) department. Thanks to DICOM it is now possible to integrate imaging systems from computer and digital radiology, nuclear medicine, ultrasound, MRI and CT.

Ultimately, therefore, the PACS/RIS solution consists of acquisition equipment, storage and transmission systems, image display terminals. After capture, the images are sent to a central server with the function of a storage database, and from this through networks with or without wires (LAN/WAN), transmitted to PACS/RIS terminals, which allow the display and manipulation. Clinical data and complementary patient information are recorded and managed by different software, separated by images. Computer protocols such as the DICOM standard (Digital Imaging and Communication in Medicine), allow to integrate data managed by different computer systems, offering the possibility of simultaneous reading of images and patient's clinical history (history, previous examinations, laboratory parameters, etc.) (10).

However, the not always homogeneous deployment of IT protocols or systems (differences between PACS/RIS, registration numbers and security issues) may lead to some communication and management difficulties between different structures (11).

It should be stressed that the fulfilment of these requirements is necessary for the drafting and approval of the Document defining service standards which, by documenting the levels of competence of the healthcare structure through guarantees of access to the service, of technologies, professional, organizational and clinical, is an essential element in the path of institutional accreditation of health structures pursuant to Decree-Law 30 December 1992 n. 502 "Reorganization of the discipline in health matters".

#### *Operational protocol and figures involved*

From the point of view of the present case, it is possible to consider as a key moment of the process the editing of the report or "Telereporting", although always proceeded, accompanied and followed by an adequate, effective and safe remote management of the clinical-instrumental examination. This objective must necessarily be pursued through the construction and integration of a co-developed operational protocol between the Director of the Operative Unit concerned and the Health Department of the relevant structure, which necessarily provides:

- compliance with current legislation on personal and sensitive data pursuant to art. 30 of the General Data Protection Regulation (EU/2016/679);

- presence of verification and safety procedures ensuring that the images received relate to the patient for whom the examination is requested;
- provision of checks and verifications on the correct implementation of the pre-established protocols of examination and image transfer;
- provision for adequate controls to ensure that the technical equipment used allows for viewing without loss of image quality;
- availability of easy and immediate communication with the centre carrying out the survey;
- appropriate programming of tests for the clinical use of computer equipment, with operational tests and quality checks at regular intervals;
- availability of a RIS-PACS system, suitable display monitors and examination reporting system;
- availability of the digital signature of the examination request and the radiological report.

These aspects will be discussed further in this document.

Another point of fundamental interest is the indispensable procedure for collecting the patient's medical history, as well as its adequate information in order to give a valid informed consent, respectful of his right to self-determination (12). Here too, within the teleradiological sphere, it is possible to assume clearly "*those radiological diagnostic examinations that, during hospitalization, due to their routine and routine, such as generally known elective investigations, reduced invasiveness, low level of exposure, can be considered universally known compared to the main indications, and for which consent may be deemed implicit, without further formalisation than the mere act of having voluntarily undergone the examination, during admission*" (13). In this sense, it is always up to the prescribing physician to demonstrate that the patient has been properly informed.

Ultimately, in compliance with and in accordance with current legislation (Decree Law 31 July 2020 n. 101) (14), the following figures involved in the process can be identified:

- prescribing physician: means a Physician or Dentist who is entitled to refer persons to a specialist doctor for the purpose of medical radiological procedures and who, where a general practitioner is involved in specific fields, is entitled to assume clinical responsibility for individual medical exposures within the meaning of this Decree-Law. If the request is received electronically, it must bear the qualified digital signature of the requesting doctor. The format of the request must compulsorily report all the elements useful for the justification of the examination, including the general or specific medical records that justify the request for the examination itself to comply with the specifications required by Decree-Law 187/2000 and the confirmation of the collection of informed consent. If the request of the attending physician has been formulated in analog mode (according to the format mentioned above), the same must be kept in copy, or stored in analog mode in the radiological archive, in order to ensure verification of the correct justification of the examination.
- radiologist: involved in the radiodiagnostic, radiotherapy and nuclear medicine procedures and

in interventional radiology or other medical use of radiation, for diagnostic, planning, guidance and verification purposes; he must manage the images entered in the PACS (Picture Archiving and Communication System). The system must keep the request made by the prescribing doctor, and the radiologist is always responsible for the radiological archive, including computer files, until the contents of the archives will be treated by the person responsible for the storage. It shall be responsible for clinically justifying the examination prescribed and for radiation protection.

- Medical Radiology Technician (MRT): the healthcare professional is entitled to carry out, independently or in collaboration with other healthcare professionals, on medical prescription, all operations requiring the use of ionizing radiation sources, both man-made and natural, of thermal, ultrasonic, nuclear magnetic resonance energies, as well as interventions for physical or dosimetric protectionism, and all related activities; carries out, with professional autonomy, the technical procedures necessary for performing diagnostic methods on biological materials or on the person, or technical activity-assistance, in implementation of the provisions of the regulations concerning the identification of the figures and their professional profiles defined by Decree of the Minister of Health (15) and is the healthcare professional responsible to the person of the technical and health acts of radiological interventions aimed at prevention, diagnosis and therapy. He conducts the performance, in an appropriate manner, according to rules of good technique, in compliance with the most recent indications of scientific literature, national and international guidelines and/or operational protocols previously defined on a company basis. From a managerial point of view, he then controls the input of correct patient data into the system, performs the examination, normally sends all the images of the examination of Diagnostic Imaging to the remote Radiologist assuming responsibility for the correspondence of the correct medical history. Finally, he ensures proper and complete storage in the PACS of all images taken or indicated by the radiologist according to the company protocol;
- Specialist in Medical Physics: graduated in Physics with a degree in Medical Physics or Health Physics, he monitors the physical quality of images and equipment also from a dosimetric point of view collaborating in the identification of protocols, quality control of computer equipment and methodologies and the implementation or coordination of quality control programmes;
- Radiation protection expert: the person, appointed by the employer, who has the knowledge, training and experience necessary for the fulfillment of the requirements referred to in Article 130 of the aforementioned Decree-Law. The skills and professional requirements of the radiation protection expert shall be governed by Art. 130;

In addition, other lateral figures involved in the process include:

- business informatics: they monitor and coordinate the proper management of the corporate network and security systems for accessing and sending images to the network as well as the control of the security procedures of the archives;
- system administrator of the radiological area: is the professionalism able to interact with the radiologist doctor, the medical physicist and the medical radiology technician to ensure the smooth operation and reliability of the systems for the transmission and storage of Diagnostic Imaging examinations.

Therefore, given that the clinical radiological act consists of a series of closely interdependent moments, which must also be guaranteed in teleradiology by identifying in the radiologist the coordinator of the whole process, it is common ground to distinguish the act of teleconsultation/telecounselling (in which the radiological medical act is guaranteed by the radiologist present during the examination) from the remote management (in which the clinical act is guaranteed by the radiologist responsible for remote management and is carried out through a multiprofessional team), as in the following practice (6):

- Doctor requesting and/or present at the execution of the examination: informs the patient or his representatives of the use of Teleradiology and collects the consent for the execution of the investigation and the transmission of data, then communicates by telephone with the radiologist verifying his identity and informs him of the clinical data for the purpose of justification. Finally, he transmits the digitally signed request and adds to the teletransmission relevant clinical data eventually required, receiving and storing the Radiologist's report in the patient's medical record;
- MRT: he is entrusted with the execution of the examination, of which the patient and his personal data assumes direct responsibility, as well as the technical execution of the examination also in relation to compliance with the rules on radiation protection. He also carries out the technical evaluation of the iconography and assumes responsibility for it, and then transmit the images and check the regular arrival and storage;
- Radiologist: together with the requesting doctor, he is responsible for the indication and appropriateness of the examination, and the justification of the examination and validation is indispensable that they remain under the control of the radiologist. He must interpret the images only if the clinical information, the quality or the number of the images allow a correct interpretation; every inquiry request, with the respective clinical question, must be the subject of a written report, closed and formalized by the digital signature.

On the subject of telereporting, it is worth recalling that this constitutes a public act, it has a medical value, it may be a source of liability or, conversely, it may be documentary evidence attesting to the formal and substantial correctness of the medical act also with regard to the duty to inform. The telereporting of examinations performed at a distance, for

problems related to the act itself, requires the radiologist to report also: place of the examination, name of the requesting and/or in situ doctor with the clinical information and the diagnostic question, name of the MRT responsible for the execution, transmission and storage of the examination, number of images received and used for the reporting.

The qualified digital signature and the time reference of the radiological report by the radiologist ensures its integrity and provenance. The awareness of the importance of the radiological report, to which the weight of public act is attributed, leads to the formulation of general schemes that contain all the essential points of the diagnostic process: administrative, technical and clinical in order to reduce/control clinical risk. Finally, for all professional figures involved in teleradiology, professional liability profiles can be identified in inexperience, imprudence and negligence. In this sense, Table 1 summarizes the specific competences related to the designated roles.

#### Legislative provisions and application limits

Decree-Law n. 187/2000 provides for the individual justification of each examination, the optimization and the clinical responsibility of the specialized doctor; those principles inspired the need for uniform application on the national territory, in particular of compliance with the criteria of justification, so it was promulgated a document called "Guidelines for procedures relating to clinically tested radiological practices (Art. 6, Legislative Decree No. 187/2000)" in order to ensure

a uniform application throughout the national territory and to ensure the appropriate use of the human and instrumental resources of the NHS, setting the reference criteria that allow the characterisation of the health service with radiological practice, and providing recommendations and operational indications to prescribers, as well as useful indications to better clarify the functions and responsibilities of the prescribing physician, the radiologist, the MRT and the medical physicist, as provided for by Decree-Law No. 187/2000.

#### Definition of standardised radiological practices

In particular, reference criteria were identified, as well as the operational procedures to be adopted in the case of:

- standardized radiological practices in ordinary hospitalization in public or private hospitals;
- emergency radiological practices - emergency in public or private Hospitals;
- X-ray practices on an outpatient basis in accredited and non-accredited local and private radiological facilities.

With regard to the first case, it was established that the Radiologist, in collaboration with the Medical Radiology Technician (MRT) and with the Medical Physicist, in agreement with the Health Direction of the facility, should provide prior identification of the standard radiological performance (standardised practices), which can be implemented at the facility, for which it is sufficient to assess the individual justification made at the time of the request by the prescribing doctor, which can be conducted by the TMR without the

Table 1. Summary of the specific competences related to the designated roles in Teleradiology.

Function Activity	Prescribing physician	Radiologist	MRT	Specialist in Medical Physics	System administrator of the radiological area
Investigation proposal and prescription	R	lv	In		
Verification of the need for further clinical history information	In	R	lv		
Clinical information and consent to prescription radiological examination (G.U. 261/2015)	R	lv	In		
Assessment of the consistency of the request with the procedure and justification of the performance	In	R	lv		
Technical Health Information and Data collection of women on fertile age	In	R	lv		
Assessment of examination justification in case of certain, suspect pregnancy or that cannot be excluded in absolute terms	lv	R	In		
Request for clinical Reassessment to justify Inconsistent cases	lv	R	In		
Possible new clinical classification	R	lv	lv		
Technical performance of the radiological performance		lv	R		
RIS-PACS infrastructure failure management, flow monitoring and reconciliations	In	lv	lv	In	R
Transmission of images to the radiologist and verification of regular arrival		lv	R		
Management of malfunctions		lv	lv	In	R
Report examination and forwarding report to the requesting doctor (in cases where the report is not transmitted by computer the MRT prints it and delivers it to requesting doctor)	In	R	lv		In
Ending examination and Archiving	In	lv	R		In

Legend: R: Responsible; lv: Involved In: Informed

need for the presence in the radiological room of the Radiologist, after verification, conducted by the TRM himself, of compliance with the prescriber's request with the contents of pre-established protocols, approved by the Health Department of the facility (see previous paragraphs) unless on minors or pregnant women. The list of standard procedures was limited in scope to the traditional non-confrontational projective radiological investigations reported in Appendix 1 of Decree-Law n. 187/2000 (Table 2), proposed by the department physician, consistent with the clinical indications of appropriateness for the execution, identified in advance by the head of the diagnostic radio service. Below is the list in Appendix 1 at the time.

With regard to the case of radiological practices in emergency hospitalization in public or private hospitals, it is also specified in the aforementioned guidelines that *"If the emergency hospitalization benefit is provided in an emergency room in a disadvantaged area or at a first-aid station where the radiologist is not present, the first-aid prescriber or specialist in the facility shall provide, once the medical history and consent have been collected, prescribe or carry out the complementary imaging services deemed necessary and appropriate. The absence of a radiological report, not foreseen in the case of radiological activity complementary to specialized activity, implies the need to keep the recor-*

*ding of the examination. Alternatively, when requested, the radiologist, available or in telemedicine, may be involved to conduct the radiological investigation"*. Obviously, in this case, the use of Teleradiology resources can only be provided for investigations that do not require administration of intravenous or intracavitary contrast medium (in agreement with the provisions of the standard procedures of Appendix 1) and presupposes the adoption of the operational protocol referred to in chapter 2.3 of the present paper.

Finally, with regard to the third case relating to radiological practices on an outpatient basis at local and private radiological facilities (accredited or non-accredited with NHS), the following is specified: *"The performance of diagnostic imaging performed in the clinic, both under accreditation with SSN-SSR that private, are performed exclusively by professionals of the radiological area qualified, Radiologist and TMR, according to their respective professional roles and skills. In all the territorial structures where activities of diagnostic imaging are carry out in outpatient, it must be provided in organic, during the course of the activity, the presence of at least one radiologist and TMR in a number proportional to the access and type of activity carried out"*.

Therefore, from the contents brought by the guidelines of clinically tested radiological practice (14), it can be deduced what are the limits of action of the radiologist in

Table 2. Guidelines provided by Decree-Law n. 187/2000, art. 6, Appendix 1: exhaustive list of radiological practices admitted to standardization SIRM: Società italiana di Radiologia Medica e Interventistica (Italian Society of Medical and Interventional Radiology).

SIRM Radiological Nomenclator Code	Pratica radiologica
87.09.1	Face, head and neck radiography (larynx, nasopharynx and salivary glands)
87.11.1	Dental arch radiography
87.11.3	Orthopan
87.12.1	Brain X-ray
87.12.2	Oral X-ray
87.16.1	Facial bones X-ray
87.17.1	Nasal sinuses X-ray
88.17.2	Sella turcica X-ray
87.17.3	CSF shunt X-ray monitoring
87.22	Cervical spine X-ray
87.23	Thoracic spine X-ray
87.24	Lumbar spine X-ray
87.29	Total spine X-ray
87.43.1	Ribs, sternum and collarbones X-ray
87.43.2	Other ribs, sternum and collarbones X-ray
87.44.1	Thorax X-ray
88.21	Shoulder and upper limb X-ray
88.22	Elbow and forearm X-ray
88.23	Wrist and hand X-ray
88.26	Pelvis-ankle X-ray
88.27	Femour, knee and leg X-ray
88.28	Ankle and foot X-ray
88.29.1	Total pelvis and lower limbs X-ray under weight
88.29.2	Axial patella X-ray
88.99.3	Total body dual-energy x-ray absorptiometry
88.99.6	Lumbar body dual-energy x-ray absorptiometry
88.99.7	Femour body dual-energy x-ray absorptiometry
88.99.8	Distal body dual-energy x-ray absorptiometry

Telemanagement: in the case of hospital activity in ordinary hospitalization, it will be possible to use remote management procedures within the limits constituted by procedures contained in Appendix 1, excepting the only categories of minors and pregnant women and in any case where the document of assessment of the individual justification of the patient drawn up by the medical department requesting the examination is available; in emergency-urgency, on the other hand, the use of officially validated Telemanagement procedures may be limited to investigations that do not require the administration of contrast agent and, if not, the First Aid Doctor will perform the examination, and the storage and registration of the same. No forecasts have been approved for teleradiological work in private.

These provisions, confirmed by the document of the Guidelines for quality assurance in teleradiology (6), where it is also reiterated the concept that for the purposes of remote reporting it is absolutely desirable that the organization has a RIS-PACS system, so that the doctor who must draw up the reports can also freely dispose of all the iconographic documentation, recent or previous, of the various patients. Last mention is for further application area of Teleradiology, to date extremely limited, consisting in the extension of the process to inter-company procedures: the only ones currently possible seems to be that relating to the activity of screening programs based on “double blind” reading.

## Conclusions

Ultimately, the extension of the Telemedicine branch to Clinical Radiology has undergone a rapid increase in the last years, although it has existed in practice for about 40 years as it is possible to reconstruct the onset of the first RIS-PACS systems in the mid-1980s; in Italy, on the other hand, the Italian Society of Medical Radiology (SIRM) wrote its first position paper in 2001, understanding the important positive effects that teleradiology could have had on the daily field. It is certainly the growing shortage of hospital staff (especially at night or on public holidays) and the need to cover areas that are sometimes difficult or isolated to bring to the fore an innovation capable of connecting experienced professionals, of international organizations and sometimes of multidisciplinary teams to shed light on the importance of implementing a healthcare system currently undervalued and undersized, as amply demonstrated by recent pandemic experience. Obviously, it can not ignore the urgent commitment and duty to ensure patient safety without impacting on the quality of care and management costs borne by NHS. These limits are highlighted by the progressive growth and spread of Artificial Intelligence (AI), with the concomitant risk of marginalisation and replacement of the healthcare professional (17).

With regard to the matter, an early 2000s review by Ashcroft and Goddard (18) highlighted the ethical challenges associated with the use of new technologies in the healthcare sector, stating the risk of drastically reducing standards of confidentiality, data security, access and control of information, professional skills, consent of the assisted person, quality of the doctor-patient and interprofessional relationship.

In an effort of optimism aimed at the future, one feels like expressing a calm propensity towards the unknown,

corresponding to an expanding universe characterized by as much questions as much potentials that, over time, will emerge in their concreteness.

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