Teleradiology consists of the electronic transmission of radiologic images from one location to another for interpretation and/or consultation (Ranschaert et al., 2012). Its goal should not be to optimise the cost/benefit ratio, but to ensure throughout the national territory accessibility to the diagnostic imaging investigation and a correct diagnosis.

Teleradiology should not be considered only as an electronic transmission of images to other locations. To assume a diagnostic role, it must ensure adequate image quality and align with the principles of the medical-radiological act. (Dalla Palma and Tamburrini, 2004). Therefore it is necessary to define the different areas of application, and to establish specific requirements for its implementation as a high-potential resource in order to avoid being transformed into a risk for the population.

To perform a diagnostic role teleradiology should preserve radiodiagnostic quality standards, and the methods must be in compliance with the principles of radiological care. Furthermore, it requires rigorous organisation under the responsibility of a radiologist, based on defined rules known by all operators, formalised by protocols.
drawn up by radiologists, and achieved with the help of other healthcare professionals and involved facilities (Lagalla, 2001).

Teleradiology represents a medical procedure which can be carried out in different situations: tele-didactics, teleconference, tele-distribution, tele-consultation, tele-consultancy, tele-management (Guidelines for quality assurance in teleradiology, 2010).

For clinical diagnostic purposes teleconsultation, tele-consultancy and tele-management are the modalities of implementation of the medical x-ray that use the technology for remote transmission of images and use the interaction between the most dedicated professionals in communication with each other.

Tele-consultation consists of collective activities among physicians who communicate using informatics/telematics networks to provide patients in remote locations with healthcare services including evaluation, diagnosis and treatment. Teleconsultancy is a professional service by which the physician transfers the patient’s data through the Internet to an expert (consultant) for a second opinion that is formalised by a written report signed by the consultant and by the specialist who requested the consultancy.

The tele-consultancy can be synchronous (interactive) or asynchronous (not interactive); regarding modalities, it can be between two specialists or in a team (eventually multidisciplinary).

The tele-consultation, allowing you to take advantage of specific expertise in certain areas, can be considered as the optimal application of teleradiology to compensate for the uneven geographical distribution of the resources and skills necessary for the achievement of excellence.

Tele-management is the administration of a radiological diagnostic examination by a radiologist, far from the place of the test, who collaborates with the requesting physician and radiographer, on the site of the test, in real time, by telephone and/or electronically.

Tele-management is completed with a remote diagnosis formalised by the report with a digital signature validated by the radiologist responsible for remote management.

The digital signature is the legally recognised computer equivalent of a handwritten signature. The digital signature ensures: that the report is certainly ascribable to the person who has signed; the authenticity of the content, that is the exact correspondence to what was signed; and the ‘non-repudiation’, that is when it is impossible for the author to deny the subscription or the contents of the document.

Pending the enactment of specific laws, the remote radiological diagnosis must find specific justification and should be performed only if the following safety and quality criteria have been respected:

a) privacy of the patients;
b) acquisition of consent;
c) assurance that the images received are related to the patient for whom the examination is required;
d) assurance that pre-established protocols have been applied;

e) assurance that the images were displayed without loss of quality;

f) complete and formalised clinical/anamnestic information about the indication and consensus on the examination, the clinical status of the patient, the diagnostic question;

g) easy and immediate communication with the centre in which the investigation was carried out.

To obtain this, is necessary to continuously maintenance or upgrade both the software and hardware in accordance with the quality criteria (Guidelines for quality assurance in teleradiology, 2010).

Obviously tele-management can be performed only for diagnostic imaging examinations which do not require the administration of contrast media by vascular access or catheters in emergency conditions. For these conditions the physical presence of a radiologist is requested.

The clinical-radiological act in teleradiology is no different from the traditional one, and must therefore refer to the behavioural patterns of the latter, which are already well codified and partly regulated.

It is possible to identify in teleradiology some ‘moments’ that constitute rings of a process: Justification, Consent, Execution and Sending images, Report and Storage (Dalla Palma and Tamburrini, 2004).

**Consent**

The use of teleradiology requires preliminary information to be given to the patient to obtain valid consent. The examination subject therefore must be informed, also in accordance with current law, that the iconography is transmitted electronically to another location and should have clearly spelled out all the reasons for the use of teleradiology.

**The Report**

The interpreting physician is responsible for the quality of the images being reviewed. The use of teleradiology does not reduce the responsibilities for the management and supervision of radiologic medicine. Potential liability may result from erroneous interpretation, incomplete or faulty transmission of images, incomplete or faulty communication of radiologic reports, misinterpretation, or faulty communication of over-reads.

In Italian emergency departments and Level I and II trauma centres, the presence of the radiologist is mandatory 24/24 hours. In the emergency department, the radiologist could have enough time to properly set up the diagnostic management and it could be prudent or necessary to use teleradiology (tele-consultation) in selected cases.

In these cases the telematic support for an opinion from a more experienced colleague could help to reduce the number of errors (value added of teleradiology).

In the emergency department, the use of teleradiology between different hospitals has the only value of consultation (the radiologist may request an opinion, if the procedure is formalised, to a radiologist working in a
different emergency department) pursuant to Art. 60 of the Italian Medical Ethics Code.

In addition, the plenary session of the National Bioethics Committee, on April 21st 2006, expressly states that the diagnosis should always be made by the radiologist, physically visiting the patient (radiological-medical procedure) and that tele-medicine involves the only consultation activity, becoming necessary for a particular case (e.g. having more qualified information and decision support).

Regarding the arrangement of teleradiology systems, the management of the RIS-PACS requires the redefinition of specific tasks for the involved professional figures in which we can list radiologist, technician, medical physicist, computer expert, administrative support, system administrator of the radiological area, head of corporate records (Guidelines for quality assurance in teleradiology, 2010).

Together with the requesting physician the radiologist is responsible for the indication and the appropriateness of the exam. The justification for the examination and the validation that it is necessary remain under the control of the radiologist. In fact, the reporting takes the value of validation of the whole process from the justification through to the radiological examination.

The radiology report, as a public act, has a medico-legal impact. The telereporting of tests, carried out at a distance, requires the radiologist to report in addition to the data normally reported, also: place of the test, name of requesting physician and/or in situ with clinical information and clinical question, names of the technologists responsible for the transmission and examination, number of pictures received for telematic support and used for reporting, the qualified digital signature and timestamp of the radiologist and technician.

For all professionals involved in teleradiology can be configured responsibilities for professional incompetence, recklessness and negligence (White, 2002).

Conclusion

Teleradiology has the advantages of avoiding unnecessary transfers of patients to other emergency departments (Stormo et al. 2004; Hazebroucq and Fery-Lemonnier, 2004), ensuring proper treatment for patients’ management (Kalyanpur et al., 2004) and reducing costs (Kalyanpur et al., 2004).

The disadvantages and the risk of poor management are represented by depersonalisation of the radiological procedure, lack of responsibility of the health staff, use to compensate for a lack of radiologists, especially in some peripheral contests, the risk that the presence of the radiologist in the emergency department could be supplanted by a distant reporting centre. Teleradiology should be used to enhance one’s practice, not to invade the practice of another radiologist (Lee, 1996).

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