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FOR INFORMATION

Question 14/2: Fostering the application of telecommunication in health care.
Identifying and documenting success factors for implementing telemedicine

STUDY GROUP 2

SOURCE: THOMSON-CSF - HEALTH SYSTEMS

TITLE: REFLECTIONS ON STANDARDS AND REGULATION IN TELEMEDICINE

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Summary

Telemedicine, "the practice of medicine from a distance", is being developed through the application of information and telecommunication technologies to medicine. When we talk about the introduction of standards in telemedicine, we are looking at the subject from the medical and technological angle. The establishment of such standards implies that the greatest number of countries should be able to have access to them at low cost.

While telecommunication standardization is relatively well advanced, standardization in respect of the medical process is still at the design stage. However, some key points should be noted:

- Telemedicine must be organized in such a way that the medical process can be kept track of; in other words, there must be user authentication and reports must be signed.
- The confidentiality of patient data must be respected.
- The system must ensure the integrity of information.

For standards to be drawn up, a number of medical requirements have to be met.

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For some years now, telemedicine has been expanding at a rapid rate in industrialized and developing countries alike. Projects and experiments are being undertaken all over the world.

This new form of medicine can be succinctly defined as: "The practice of medicine from a distance. As such, it includes diagnosis and treatment, and also medical training".

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More specifically, telemedicine means moving/transferring medical information and data rather than patients or health workers. The information may be of various kinds, depending on the type of telemedicine that is to be carried out and the branch of medicine in question. Data may be exchanged in real time or pre-recorded. The data displayed and exchanged include:

- alphanumeric text;
- complex radiological images (CTscan, MRI, mammography, etc.);
- images such us pathological slides;
- photographic images (photographs of lesions, ophthalmoscopy, etc.);
- surgical images in colour;
- recorded data in the form of curves (ECG, EEG, etc.);
- speech and sounds (distance meetings, stethoscope, etc.);
- complex animated images (scans, endoscopy, coelio-surgery, etc.);
- images of the participants.

This list is not exhaustive, but is intended to show the variety of information that can be shared in telemedicine. Depending on the purposes for which the information is being exchanged (diagnosis, training, etc.), it can be structured in a medically coherent whole.

Various studies have developed typologies of telemedicine applications. These classifications have often been found to be out of date or incomplete because of the rapid development of telemedicine in all directions.

Without seeking to produce a typology, I shall concentrate in this article on four major applications of telemedicine:

- telediagnosis;
- "telestaff";
- teleconsultation, tele-assistance;
- tele-education and ongoing medical training.

These four applications are the ones most frequently encountered nowadays, and they would seem to be the ones of most interest to developing countries, because of their impact in terms of public health, the ease with which they can be set up and their modest cost.

Before going into these applications in greater detail, one general comment needs to be made. When we talk about the introduction of standards in telemedicine, we mean two different things: medical standards (procedure for taking charge of the patient, medical responsibility, agreement on the type, number and quality of images to be transmitted depending on the field of specialization, the pathology suspected, etc.) and technological standards (image acquisition, data format, communication protocols, etc.). What must be clearly understood is that technology, even if it stimulates the development of telemedicine, must remain subordinate to medical requirements. The technology in telemedicine is merely a means of enabling doctors to work together. It must not impose a new way of working on the doctor, but must adapt to the medical organization. The establishment of standards for telemedicine networks implies that the greatest number of countries should be able to have access to them at low cost.

From the technology standpoint, most telemedicine developments are today based on the ISDN network, which is regarded as the lowest level giving a guarantee of adequate service for telemedicine purposes.

Telediagnosis

In many countries, the multiplicity of means of investigation, particularly in radiology, has led to a high degree of specialization for each type of examination in a given field. Practitioners cannot of course hope to have universal knowledge, but can now easily make contact with all centres of expertise. They are helped in this by the standardization of data transfer procedures. This is in contrast to the complexity of the process of interpreting examination results, which often calls for great experience and great diagnostic acuteness on the part of the expert.

The revolution in information and telecommunication technologies, from which the medical field is benefiting, has opened the way for an activity which can improve the quality of care, namely telediagnosis.

Telediagnosis enables doctors, with the aid of tools using telecommunication and information technology, to contact experts who can give them advice. This process requires that the information transmitted is confidential and that the medical reports are validated and authenticated.

This innovative approach opens up new prospects in the sphere of medicine. It enables the practitioners involved in the process to benefit from each other's knowledge. It also enables epidemiological information to be supplemented and circulated.

- **Telereading:** this means getting a specialist to interpret, from a distance, a medical record prepared by a non-specialist.
- **Second opinion:** in doubtful cases, practitioners can call in colleagues at the same level in the same field to confirm their diagnoses.
- **Tele-expertise:** a practitioner can obtain an expert opinion from a specialist at a centre of excellence (national or international).

This process covers a number of different and complementary objectives:

- Expert opinion in emergencies to determine, among other things, how quickly intervention is needed and how the patient is to be transferred.
- Teleradiology, through the transmission of complex scanner, ultrasound, MRI or other images to confirm radiological diagnoses.
- Teleconferencing via video transmission with real-time dialogue among doctors.
- Help with the decision on therapy to guide the initial treatment and its adjustment in relation to follow-up (chemotherapy, surgery, radiotherapy, physiotherapy, etc.).
- Multicentre study of international cooperation in clinical research.
- Expert analysis with a view to optimum use at the best cost of the different care facilities, distinguishing between simple treatment that can be given locally and more complex treatment requiring the patient to be transferred to a selected reference medical centre identified.
- Initial and further training of different categories of health workers, and in particular medical staff (tele-education).
- Economies and cost optimization by avoiding many unnecessary transfers of patients through international consultations made accessible as a result of progress in international cable or satellite transmission.

If technological standards are to be drawn up to meet these objectives, there are a number of medical imperatives that have to be met:

1) The number of images in a file may be large (several dozen for a CTscan, a dozen or so for a pathological diagnosis, four to six for a mammography check). That means that its size may be more than 40 or 50 Mb without compression.

   - For this reason, before transfer, there has to be a high compression rate, but **with an algorithm that is not visually destructive**.

2) The telemedicine process must be organized in such a way that the medical process can be kept track of.

   - For this reason, the system needs to have a recording system of the **incoming and outgoing log** type, showing when, to whom, and from whom what kind of file has been sent or received.

3) The practice of medicine has from its earliest days depended on there being trust between patient and doctor. Such trust depends in part on preservation by the doctor of professional confidentiality.

   - For this reason, the system must allow the **patient's data to be kept anonymous**. Particulars of the patient's identity and his or her medical data must be kept separate. The patient's name should in no case be transmitted.

4) A medical record is a structured and coherent body of information enabling a doctor to formulate a diagnosis. The way the data are organized differs from one field of specialization to another.

   - For this reason, the medical record must **contain all a patient's examination results in all the different fields**.

5) All medical reports must be signed. Telemedicine must therefore make it possible for **reports to be signed electronically**.

6) The system must require **user authentication**.

7) It is important to ensure the **integrity of information** both against outside intrusion and as regards its content. Care must be taken to ensure that the information transmitted is complete and not degraded.

8) A diagnosis is based essentially on a precise analysis of the images transmitted. Often the telemedicine software also allows them to be processed in such a way as to bring out the medically significant information.

   - For this reason, the system must ensure that **the original images from an examination are systematically transmitted**, in addition to the processed images, so that the experts can do their own processing.

9) Nowadays the transmission protocol must comply with the most open and accepted standard in the world on both LAN and WAN networks. That is, of course, the **TCP/IP protocol**. This must be part of telemedicine transmission standards.

10) More and more hospital establishments are computerizing their operations. So far as possible the telemedicine system must be able to **import or export** medical records from or to the hospital information system.

"Telestaff"

The notion of "telestaff" consists essentially in the setting up of multidisciplinary virtual meetings to determine, following a diagnosis, what is the best strategy for therapy. This process often follows the telediagnosis and means that decisions can be taken on how to treat the patient (transfer to

another hospital, choice of therapy, dosage, frequency, follow-up, etc.). "Telestaff" is maintained by two essential technologies: videoconferencing and transfer of patients' records.

The patients' records transfer system has to comply with the same standards as telediagnosis.

For videoconferencing, it is necessary to distinguish the type of "telestaff" being organized. If at the meeting it is simply a matter of being able to see and hear the different parties involved, a bit rate of 128 kb/s may suffice. If, on the other hand, medical images are to be transmitted, and in particular animated images (scan, endoscopy, etc.), there has to be a minimum bit rate of 384 kb/s so as to approach the definition and fluidity of the imaging apparatus. The systems used today comply with the standards fixed by ITU: H.320, H.323, T.120, etc.

The image definitions (CIF and QCIF), while in common use, are still not good enough in relation to doctors' real needs for purposes of analysis. One day attention will have to be given to the question of new videoconferencing standards with better image definition.

Teleconsultation and tele-assistance

There are two aspects to teleconsultation. On the one hand, there is direct remote consultation between a patient and a doctor. On the other, there is a consultation between the patient, accompanied in person by a doctor or other health worker, and a doctor elsewhere whose advice is being sought. In both cases, the essential technological medium is videoconferencing. However, in cases where the local doctor is present, he prepares for the consultation by sending the medical record in advance, the purpose of the consultation being to explain to the patient the treatment it is proposed to give him or her.

The considerations put forward earlier on standards are also valid here.

Tele-assistance consists in getting an expert to help the doctor during the performance of an operation or other medical intervention. The idea is to let an expert guide a doctor (ultrasound surgeon, etc.) through the task in question. For this purpose, the transmission of images of the action in real time is essential. Videoconferencing here makes an efficient contribution to the handling of the case.

Tele-education

This subject will be dealt with separately at a later stage.