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Is it time to apply the new information and communication technologies to Nephrology?

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There have been in recent years, in parallel to progress in medicine, great advances in the development of computer systems and computer interconnection networks that have been of great benefit for healthcare. Despite this and the multiple applications provided by medical computing, there is little experience available as regards use of new communication and information technologies in medicine for the practice of telemedicine.

However, if telemedicine is considered as medicine practiced at a distance, any of us has probably used this form of healthcare, for instance when talking on the telephone with some colleague about any problem related to our patients. It is obvious that telemedicine is more complex than a simple telephone connection, and with the revolution occurring in the field of computing and computer connection, either through the Internet or Intranet, use of this tool is now based on communication and information technologies that allow for remote medical care. Based on these concepts, the WHO defined telemedicine in 1997 as «the provision of healthcare services in which distance represents a critical factor by professionals who use information and communication technologies to make diagnoses, advise treatments, and prevent diseases and lesions, as well as for permanent training of healthcare professionals and in research and evaluation activities, in order to improve the health of people and the communities where they live». Some years later, the former Spanish National Health Institute defined telemedicine as «the use of information and telecommunication technologies to provide medical services, either care, continued medical training, or health education, regardless of the distance to the place where patients

with their clinical records or professionals of the temporal variable are».¹

APPLICATION OF TELEMEDICINE. BENEFITS

The benefits provided by telemedicine may be inferred from the two above definitions and are briefly discussed below.

CARE

This is the priority objective. Telemedicine makes it possible to approximate both healthcare levels, primary and hospital care. The purpose of telemedicine is to improve the quality of services provided by facilitating access to specialised care while reducing the number of journeys, and thus the costs of services provided, trying to achieve the best diagnostic quality at all times. While care is the most significant service, telemedicine should be considered as a supplemental tool that may be used at any time but should never replace the traditional outpatient clinics, to which one can always resort. Supplemental tests may be sent to the hospital clinic from the health centre using a document or X-ray scanner.

CONTINUED MEDICAL TRAINING

This is a very important aspect of telenephrology that is becoming increasingly important in recent years. Continued medical training may be accessed through the resources provided by telemedicine, thus avoiding professionals the need for travelling to a given location. Organisation of training courses and clinical sessions that may both be directed from primary care to specialised care or the other way round. Groups of professionals at an equipped health centre may be reached from a remote hospital server, or a hospital group may be reached from the health centre. Training may

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also be organised between hospitals, between a hospital and one of several health centres, and even between health centres or other healthcare institutions. This is an application that should be considered important because it should contribute to the enrichment of professionals sharing some field of knowledge, as often occurs between the two care levels considered.

HEALTH EDUCATION

This application provides an interesting communication way between the hospital and primary care for aspects related to health education of the general population. From the viewpoint of nephrology, health education using telemedicine may be applied for education in cardiac, renal, and vascular risk, information about blood pressure measurement procedures, education in peritoneal dialysis, and even in some aspects of haemodialysis.

RESEARCH

Application of telemedicine in research is no less important, as it may allow for conducting research projects in different fields of health in connection with institutions working in this field by exchanging protocols through the network.

It may therefore be said that the main objective of this form of healthcare is to provide for an easier access to medical services, nephrological in our case, which will allow for specialized healthcare in the usual environment of patients with decreased costs. Telemedicine has also other additional advantages, such as improved training programmes promoting continued medical training, dissemination of medical knowledge, and health education for the population covered.

From the temporal viewpoint, there are two possible modalities of telemedicine:

- a) *Synchronously*: this is the usual modality. Consultation occurs when the patient attends the office at an appointed time to meet healthcare professionals, which in our case include the nephrologist, the primary care physician, and the nurse, in the same way as for a conventional visit.
- b) *Asynchronously*: in this modality, a consultation may be made to a server, in this case the hospital, from which a response to the problem posed may be sent through the computer after a time. This modality is used for consul-

tation on radiodiagnosis or any other test performed in primary care that requires validation by or consultation with the hospital.

Telemedicine may be named teledermatology, telepneumology, telenephrology, and so on, depending on the medical specialty. Depending on the application given to telemedicine, we may speak of telecare, telediagnosis, teleteaching, and so on. Availability of a telecommunication device that allows for optimum transmission of information is crucial. There are currently several data transmission networks available. Because of their quality-cost-efficacy ratio, lines to be used for telemedicine would be ISDN, ADSL, and mobile networks using SM, GPRS, or UNTS.

It is obvious that implementation of the above enhances communication between healthcare professionals, which should in turn lead to an improved daily clinical practice. Just as new communication and information technologies have been able to promote universal access to medical information, use of the Internet allows people to communicate at any time and in any place of the world.² Implementation of new technologies therefore allows for taking specialised care close to patients in rural or less well served areas, and also, as may be inferred from the definitions and the main benefits provided by telemedicine, for access to training and health education programmes. This is much more relevant if we consider the increased life expectation of the Spanish population, which is associated with an increase in chronic conditions that may require healthcare closer to patient homes. Access to patients through telemedicine opens a new way that may also save healthcare costs.

Various telecare experiences in different medical specialties have been reported in recent years. In Spain, some autonomous communities have also incorporated into their strategic plans the use of telemedicine in their healthcare networks in some specific aspects.³ As regards patients with kidney disease, there is some experience with this form of care in some field of nephrology. Some reports of patients with chronic kidney disease included in renal replacement therapy programmes using dialysis have been published. Early experiences were performed in Australia⁴ and the United States⁵ by connecting peripheral centres with a central hospital. Telemedicine applied to home haemodialysis was subsequently used in Canada⁶ and Greece.⁷ Despite the fact that peritoneal dialysis (PD) is currently the home dialysis procedure par excellence, telemedicine has also been little used in such cases.⁸⁻¹¹ In Japan it has been used in elderly patients.⁹ In Spain, the nephrology group from Hos-

pital Severo Ochoa in Leganés reported its experience in follow-up of its patients on peritoneal dialysis by telecare.^{10,11} This group showed that telemedicine is a useful tool for follow-up of stable patients on a peritoneal dialysis programme that also saves healthcare transport expenses, and its studies have also demonstrated that in this dialysis procedure, both patients and administration itself could benefit from use of these new technologies.

Even less experience is available in clinical nephrology. Data from patients with HBP in whom telemedicine was used have been reported, and some group has shown an improved diagnosis of essential hypertension as compared to conventional care.¹²⁻¹⁴

In our health area, telemedicine was implemented in 2002, and was introduced throughout the region in 2003. In 2004, it was incorporated into the portfolio of services of our section. Telemedicine was initially implemented for cases of HBP in 4 healthcare centres, but over time and with the subsequent incorporation of patients into the practice, this has become a general clinical nephrology practice. We have recently reported our results demonstrating that a nephrology practice using new information and communication technologies is feasible, and neither care teams nor patients seen have complained of any impairment in care quality.¹⁵ As stated in the article published by our group in this same issue of NEFROLOGIA,¹⁶ by performing at healthcare centres virtually all laboratory tests and supplemental tests required in a conventional nephrology practice, we have achieved that the patient referral rate to the hospital for supplemental tests is also very low. This also decreases the saturation occurring in central services, with improved use of resources. Savings in health transport have been an additional advantage.

The natural improvement achieved in communication between professionals from two care levels may promote a better understanding of a specialty traditionally unknown and limited to the hospital setting, as is nephrology. This latter aspect may have an incalculable value because when chronic kidney disease is currently considered a real epidemic of which we may only be seeing the tip of the iceberg and that is also a first order vascular risk factor,¹⁷⁻²¹ and earlier recognition of the disease by removing barriers such as patient journeys may allow for an easier prevention of situations that may lead to kidney disease or promote its progression.²² Finally, real time connection through videoconference with primary care physicians promotes continued training and consultation about clinical nephrological problems from healthcare centres.

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