

INNOVATION AND TELEMEDICINE: AN APPLIED PROJECT

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ABSTRACT

Telemedicine, defined by the World Health Organization as 'integrative part of telecommunication systems in the promotion of public health', generates different positive results: more efficiency, less costs, better patient's quality of life. Thanks to the advances in diagnostic technologies, information technologies, remote monitoring and long-distance care, telemedicine have increased the viability of home-based care, even for patients with serious conditions. At the same time we observe the increase in the elderly population suffering from pluripatology and chronic diseases, that causes an increasing recourse to medical and hospital care; but prolonged hospital stay can determine loss of function and psychophysical disorders. Telemedicine is 'the investigation, monitoring and management of patients and education of patients and staff using systems which allow ready access to expert advice and patient information, no matter where the patient or relevant information is located'. We are empowering in different areas new biomedical and information technology as a support to clinical practice. The goal is to make a case study and to use for future analysis. In the experimental phase 4 patients were followed on hemodialysis and 4 in peritoneal dialysis, previously evaluated for clinical, social, logistical and psychological conditions. It is estimated that today there are 50.000 patients on dialysis and about 10.000 new cases a year only in Italy. Naturally there are threats to solve because users face difficulties, in terms of interaction with robots, in their usual context of life. The right methodology needs to coordinate the entire hospital, different professionals, patients, providing tools for care givers that follow patients, training technicians, aligning data col-

lection and communication. The project reached great results in relation to the indicators: efficiency in dialysis, compliance with health protocols, impact on patient quality of life. Telemedicine and telecardiology projects are active at the 'Hospital at Home Service of Bari'.

Key words: health, telemedicine, home-based care, hospital at home, robotics, ict.

INTRODUCTION

The increase in the elderly population, often suffering from pluripatology and severe exacerbations of chronic diseases, causes an increasing recourse to medical and hospital care. However, prolonged hospital stay can determine, especially in frail elderly patients, loss of function and psychophysical disorders related expulsion from their usual context of life. It is therefore desirable for a review of the health strategies and the formulation of new care models in order to focus the different issues related to clinical care (Henderson, 2013). For this purpose, in different areas, we are increasingly used new biomedical and information technology as a support to clinical practice.

In recent years robotics and home automation have experienced a great development and multiple applications in the medical and welfare field have appeared. The European Union 'Ambient Assisted Living Joint Programme 2008-2013' arises among its objectives to improve the quality of life of older people, including through the use of technologies that facilitate the home maintenance in conditions of autonomy and safety. To this end, in recent years we have been carried out various projects that provide for the presence of robots home to remotely monitor the health and safety of the elderly: Companion Able (2008-2012), SRS (Multi-Role Shadow Robotic System for Independent Living, 2010-2013) and RobotEra (2012-2016), to name a few. However, despite the developments are very promising from the point of view of technology and the improvement of living conditions of individuals, there are problems of implementation of their use by users, particularly when elderly, due in particular to the difficulty of interaction with the robot in their usual context of life.

Another important element is also 'smart home', an innovative concept that integrates technology to domestic environments in order to maintain or possibly improve functional status, security and quality of life, currently they have a value mostly experimental, with no certain evidence to support their large-scale use (Kelly, 2008).

One of the innovative methods that is having a positive impact on health and quality of life is telemedicine, defined by the World Health Organization (WHO) as "integrative part of telecommunication systems in the promotion of public health." There are many definitions in the literature of the term telemedicine, more or less similar. The most frequently quoted definition is the one proposed by a commission of experts appointed by the European Union (1999), which he defined as telemedicine 'the investigation, monitoring and management of patients and education of patients and staff using systems which allow ready access to expert advice and patient information, no matter where the patient or relevant information is located'.

Telemedicine encompasses many areas, including remote monitoring, remote diagnosis (telecardiology, telepathology, teleophthalmology, teledermatology, etc.), As teleconsultation (teleconference between medical specialists, general practitioners (GPs) and possibly patients), remote management of procedures (eg. telesurgery), the tele-rehabilitation (Laerum, 2005). Telemonitoring, in particular, consists of an advanced service that provides the ability to provide patient care, at home or at the residential facility protected where necessary lies, via the ICT evaluation of clinical parameters measured at a distance through the use of suitable tools that send data kits measured at a central reference and from this, according to the enabled protocols, health professionals - MMG, medical emergency department (ED), medical specialists - representatives of patients under observation. The data collection can be done either automatically through personal health monitoring devices

(portable, wearable or implantable), or through the patient's active cooperation (insert web of physiological parameters measurements) (Landers, 2010).

TARGET

An e-Health platform, funded by the Italian Ministry of Education, Universities and Research that involved 26 partners, 10 public organizations and 16 private companies, which has been tested by the Region of Puglia with the aim to improve the patients' quality of life by providing them home dialysis treatment.

The goal is to make the case study as a good practice for the future analysis, development and adoption by the Italian health system. It is difficult to develop a project of this kind without the interaction between the public and private system. In fact, it is thanks to the boost of private companies that innovation, first theorized, has been put into practice. Telemonitoring is a complex process that includes the integration of skills, structures and procedures. It means transforming the system of a way of thinking and acting. It means laying the structure of a new system addressing critical matters that obviously could not be predicted, such as privacy and security issues.

SAMPLE

It is estimated that today there are 50,000 patients on dialysis and about 10,000 new cases per year in Italy. The current procedure requires that patients in hemodialysis treatment stay in hospital for 4 hours a day 3 times per week, this affects significantly their social and professional life rhythms. Receiving home treatment is possible through the home hemodialysis and home peritoneal dialysis. In particular, the prototype of this innovative technology platform interacts with the patient during the treatment through the control room at the hospital, which creates a digital dialogue between local remote control devices and hospital information systems. In the experimental phase, four patients were followed on hemodialysis and other four in peritoneal dialysis previously evaluated for clinical, social and family, logistical and psychological conditions. Clinical alerts, tailored to the clinical conditions of each patient, have ensured the safety of the procedures.

The detailed program in the Operational Experimentation Plan has been fully respected and at 3-month follow-up the eight selected patients are still in the dialysis treatment, with remarkable satisfaction for the assistance received and the appreciable improvement in the perception of Quality of Life.

METHODOLOGY

The hospital, doctors, nurses and the medical staff must be coordinated by providing tools and information for care giver personnel that follow the patients, train technicians for remote monitoring and align the instruments for data collection and communication.

The starting point of the process involves the construction of a control room and of different communication systems with patients, such as internal communication system and cameras; statistical prevention systems; integrated systems that communicate with the dialysis apparatus and able to analyse and store data related to the blood test done by the patient with innovative devices that interface directly with the patient's medical record. The use of digital medical records of each patient is fundamental for such a project, without the communication integration, it would not be possible to do anything.

Home dialysis is preceded by a training period that goes from 4 to 6 weeks, during which the patients become able to perform the treatment independently and to return to their daily life.

Home dialysis allows the patient to decide what time of day to dedicate to the treatment, in an equipped area in his/her home with the necessary technology without being left alone. A special

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monitoring system allows the patients to connect directly with the control room at any given time, during which the medical personnel follows the entire operation and receives real-time data about the patient's clinical status, allaying any concerns with the chance to face any kind of emergency situation in due time. This gives the patients the same quality of care they would receive in the hospital, protecting their privacy and to ensure a constant and personalized monitoring, resulting in optimization of time, space and thus economic resources.

RESULTS

A preliminary analysis of the data indicates the success of the experimental phase, with the achievement of objectives and in accordance with the indicators set out below:

- Efficiency dialysis
- Compliance with health protocols
- The impact on patient quality of life

The experimentation has allowed therefore to:

- 1) bring assistance to the patient's home, respecting the hospital protocols;
- 2) improve the assisted monitoring, demonstrating how home dialysis can prevent acute adverse events and reduce hospitalization;
- 3) improve the perception of the patient's quality of life;
- 4) integrate the various points of healthcare provision optimizing structures, time, human and economic resources at local level;
- 5) create a network of support for the patient and his family members, putting them in direct communication with your general practitioner and other health care providers involved.

In the experimental phase they were followed up four patients on hemodialysis and four patients on peritoneal dialysis, evaluated suitable for home dialysis for clinical, social and family, logistical and psychological conditions. Clinical alerts, tailored to the clinical condition of each patient, have ensured the procedural safety. Among the technical problems have been recorded 1% of ineffective fistula. During the follow-up, there were no problem. After three months the selected patients are still in home dialysis, with remarkable satisfaction for the assistance received and the appreciable improvement in the perception of Quality of Life.

The questionnaires distributed to patients about the quality of life have found the perceived health status were related to the frequency of discouragement and fear employees from health problems. It was pointed out the type and time of physical activity carried out and the health interfering with interpersonal relationships, with the creative activity, with household activities and freedom of movement.

It was verified the ease of usability of the devices and a significant appreciation of the telemonitoring service. Around the 70% of monitored patients said they would find it useful to the service and you want to continue the telemonitoring for a longer period, by virtue of the achieved benefits.

Around the 90% of care givers involved in remote monitoring of their family, said full satisfaction with the perceived feeling of peace of mind for your family and for himself thanks to the support received.

These techniques means increased effectiveness of the treatment, can be done several times a week in less time, it is possible to have a better monitoring of the dialyzing patient, they feel more safe because there is always a doctor available, there is more sustainability for hospital and patients who no longer have to move, there is an optimization of human.

CONCLUSION

An editorial published in the New England Journal of Medicine in October 2010 by Landers (AimoninoRicauda, 2011) has highlighted the benefits of patient care at home, emphasizing 5 key points that are favoring the development of home care: the more age the most advanced of the population, the increase in chronic diseases, advances in technology, the high consumption of health care resources and the ever increasing health care costs. The rapid change in the structure of the population, with growing numbers of older and "very old", has profoundly changed the functioning of the network of hospital and non-hospital services. The treatment of acute conditions, that was until a few years ago the cornerstone of the doctor, you go alongside the need to take care of a large number of elderly people with chronic diseases evolving, often in multiple association. Despite the epidemiology highlights the growing problem of chronic and social and economic aspects that are related to it, the scientific progress in this area, cultural and technological has been much more limited. In elderly patients only pay a long-term strategy of integration between technology and ongoing support. To the technology of "machines" we have to support the health organization's strategy and in particular organizational appropriateness. The hospitalization at home may be considered as part of the continuity of care, a "bridge" service between the hospital and the community. however, it is a difficult "challenge" because it has to meet specific requirements of acceptability, appropriateness, effectiveness, efficiency and safety of interventions (Tamone, 2012).

The possibilities for telemedicine development are extensive. Current technologies used in traditional visits will always be more often replaced with electronic and digital devices able to take measurements and transmit them remotely. In a not too distant future, patients will be able to connect directly from their home by a medical center distance (Eklund, 2012). However, it is necessary to promote the awareness, confidence and acceptance of the technology and also the humanization of the relationship "at a distance", precisely define the possible fields of application and legal aspects (protection of patient data at the collection level, storage, use, authorization, accreditation and registration of services and professionals, liability and jurisdiction) and technical (availability of broadband, the tool safety and ease of use). Despite the statements of the European Commission (COM-2008-689 / Final) and the opinion of the European Economic and Social Committee (EESC TEN / 378, 15.7.2009), which emphasizes the need to strengthen the role of telemedicine through the definition of standards of quality services more efficient and homogeneous, in Italy have not yet developed telemedicine services on a large scale, but were made only fragmented projects, experimental, limited to specific geographic areas and not fully integrated in the health system. guidelines at the level of national health planning and tariff standards on performance are therefore necessary. national guidelines have recently been defined by the National Health Council and submitted to the Minister of Health but are not yet effective because, as a measure, must undergo a complex institutional process before final approval.

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