Excellence in healthcare:
Telemedicine project in an Italian region

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Abstract

Purpose – This paper aims to contribute to describe how the implementation of a hub and spoke model using telemedicine is able to improve quality of care for rural and remote areas.

Design/methodology/approach - The method adopted is a case study, preceded by a rapid theoretical focus on the role of the hub and spoke model and telehealth for service quality in healthcare. The case study refers to the Remote project (resources and organizations models in telecardiology) developed between the Department of Pediatric Cardiology of Brotzu, a tertiary hospital in Sardinia, located in Cagliari (Italy) and CRS4 (Center for Advanced Studies, Research and Development in Sardinia) with the aim to develop a real-time low cost telemedicine platform able to support clinicians with the telepresence of a specialist in real time during echocardiographic evaluations.

Findings – the adoption of the real-time telemedicine solution when supported by organization design, can promote new care models, encouraging a rational and effective use of resources.

Research limitations - The research limitations are linked to the single case taken into consideration; moreover, findings are confirmed by other studies about health organizations.

Implications - As a result of this research, the hub and spoke model supported by telehealth adoption by health organization is recommended.

Originality/value - The study has a normative value and its indications can be extended also in other clinical contexts that require operator-dependent diagnostic techniques.

Keywords

E-health, telemedicine, hub and spoke model, quality of care

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1. Introduction, aim and structure

Quality is a key issues facing health care in both developed and less economically developed country. In every country, there is opportunity to improve the quality and performance of the health-care system, as well as growing awareness and public pressure to do so: on the one hand, limited resources of capital and manpower and, on the other, institutional pressures towards improving the quality of services ((Baccarani C. et.al., 2000; Adinolfi P., 2003) Quality is an umbrella concept that includes six dimentions (Commettee on the quality of Health care in America, 2001): *effective*, delivering health care that is adherent to an evidence base and results in improved health outcomes for individuals and communities, based on need; *efficient*, delivering health care in a manner which maximizes resource use and avoids waste; *accessible*, delivering health care that is timely, geographically reasonable, and provided in a setting where skills and resources are appropriate to medical need; *patient-centered*, delivering health care which takes into account the preferences and aspirations of individual service users and the cultures of their communities; *equitable*, delivering health care which does not vary in quality because of personal characteristics such as gender, race, ethnicity, geographical location, or socioeconomic status; *safety*, delivering health care which minimizes risks and harm to service users. All these dimentions are rapidly increasing the pressure to change the way in which health care is delivered. Advanced information and communications technology (ICT) are considered one of the most strategic answers to the growing pressures of augmenting the quality of healthcare while reducing their costs.

Health is without doubt one of the contexts in which this action may reveal more of virtuous circles, helping to bring a stop to the increasing health expenditure, but also by promoting an increase in the quality of the performance and the availability of diagnostic and treatment paths more sophisticated. Applications of ICT in health are known under the term E-health, which refers to all that is related to information technology, telecommunications and medicine.

Starting from these reasons, recently public and private organizations in Italy have started initiatives with the aim to raise awareness in the health sector in order to facilitate the dissemination of clinical information systems. Such awareness-raising is even more necessary taking into account the comparison with the international scenario, which shows the different speeds supported by technologically advanced countries such as the US, UK and Canada and Italy in the introduction of ICT in the healthcare sector. The national and local governments of these countries have already started and implemented strategic plans to guide the transition and to accelerate the deployment of ICT. In the last decade, the Italian Ministry of Health has identified telehealth as one of essential component of the reorganization of health services focused on citizen and able to facilitate access to health services on national territory. The goal is to redesign the organization of the network of services, especially in order to strengthen the territorial scope of assistance. Technological innovation can contribute to a reorganization of health care , in particular by supporting the shift of health care from hospital to territory. The tools and e-health solutions include products, systems and services that if properly combined with the necessary organizational changes and the acquisition of new skills, can provide valuable support in developing systems for the prevention and care more effective and cheaper, easily accessible and timely.

In order to understand how the implementation of a hub and spoke model using telemedicine is able to improve quality of care for rural and remote areas of Sardinian a qualitative field study was conducted in an Italian region with the aim to identify the perceptions of physicians and providers regarding telehealth benefits as well as the key conditions for successful telehealth implementation.

The paper is structured as follows. The introduction presents the background and research question. The second session presents the theoretical background of the paper. The following session introduces the research method and the case study. The last two session present the main finding and discussion and conclusions.

2. The Integrated service network and the hub and spoke model

Demographic change, the chronic disease treatment, the increasing of demand for high-quality and for more personalised care, the scarcity of available resources are all trends that increasing the pressure to change the way in which health care is delivered. The development of new models of care will normally aim to address all the dimensions of quality described earlier (i.e. effective, efficient, accessible, acceptable/patient-centred, equitable, and safe) and will seek to improve outcomes by organizing integrated responses.

For decade, the model for delivering healthcare in Italy has been decentralizing and the hospitals as the one stop shop for all health needs. There is a need to innovate and introduce a new organizations models able to satisfy healthcare quality. The integrated service network is an architecture that emphasizes optimal utilization of scarce healthcare resources and high quality collaborative working relationship. (Meneguzzo M, 1996; Cichetti e Lomi, 2000). A new model of care may need to integrate the contributions of primary, specialized, and social care organizations. This new model should span the whole continuum of care in order to improve quality outcomes. The "hub and spoke" model for healthcare means having multiple practising sites where the "hub" is the anchor site of the specialty area and the "spokes" are connecting secondary sites serving that specialty. The goal is improving access to care, decreasing the time to receive care, and decreasing the number of patients transferred to the larger health care facility. The main value of the hub and spoke model is in its connectivity: a uniform operating system across institutions, shared language, information technology, instruments and devices, as well as the consistent level of patient care with the same physicians practising across an integrated platform. This tightly coordinated web cuts costs by concentrating the most expensive equipment and expertise in the hub, rather than duplicating it in every village. It also creates specialists at the hubs who, while performing high volumes of focused procedures, develop the skills that will improve quality. The development of more integrated, accountable care systems should bring other benefits in addition to the opportunity to reduce costs. A number of studies (Shortell et al. 1976; Shortell et.al., 1994; Cicchetti 2004; Lloyd J. and Wait S., 2006; Protti D., 2009) have shown that integrated care is positively correlated with improved quality, which is achieved through the coordination of care among specialties, the effective use of information technology–based decision-support tools, and other key aspects of integrated systems. The hub and spoke model evokes the idea of a plurality of mutually independent and autonomous entities that offer services integrated, working in a coordinated way in order to ensure high quality services. in this way it is possible both to guarantee equity in the access of care and contain health costs.

3. E-health, telehealth and quality of care

The development of an integrated service network requires the support of appropriate information tools that facilitate integrated data management, cooperative collaboration of different actors operating in the area and continuity in the management of patient care. EHealth encompasses all applications of ICT towards supporting and interconnecting health service processes and health system actors, both at the local level and remotely. Scholars

argue that e-Health applications are the most appropriate technologies in order to improve the quality and safety of healthcare delivery with the use of up-to-date healthcare information and communication technology to meet the need of citizens, patients, healthcare professionals, and healthcare providers (Adler-Milstein and Bates, 2010; Vitacca et al., 2009; Ferretti et al., 2014; Torre T., 2016). Furthermore, e-health involves interactions between doctors and patients and highlights new challenges, opportunities and threats to all the organization. Health information systems can be classified as the set of elements and procedures whose digital output supports the decision-making processes for health care. They are able to re-organise and improve processes, input, output and quality services, aiming to increase hospital efficiency and provide services of a higher quality while reducing costs (Rossignoli et al., 2014). E-Health applications have emerged as integrated healthcare information systems that provide consistency of data and are necessary to serve patient-centered care, where healthcare information exists with many healthcare providers (Watkins et al., 2009). Accelerating the adoption of e-Health applications will provide "caregivers with all relevant information about every patient; encourage the sharing of medical knowledge through computer-assisted clinical decision support; facilitate computerized order entry among providers for tests, medicine, and procedures; and ensure secure, private, interoperable exchange of health information" (Agrawal R., et.al., 2007).

Healthcare ICT covers a wide range of systems, applications, and services targeted for a variety of users for diverse purposes of use. Telehealth can be understood as a specific domain of the more comprehensive concept of eHealth, with the aim to realise care integration. Telemedicine, a term coined in the 1970s, which literally means "healing at distance", signifies the use of ICT to improve patient outcomes by increasing access to care and medical information. Recognizing that there isn't one definitive definition of telemedicine, the WHO has adopted the following broad description: " The delivery of health care service, where distance is a critical factor, by health care professionals using information and communication technologies for the exchange of valid information for diagnosis, treatment and prevention of disease and injuries, research and evaluation, and for the continuing of health care providers, all in the interests of advancing the health of individuals and their communities" (WHO, 1998). Four elements are germane to telemedicine:

1. Its purpose is to provide clinical support;
2. It is intended to overcome geographical barriers connecting users who are not in the same location;
3. It involves the use of a growing variety of applications and services using two-way video, email, smart phones, wireless tools and other forms of telecommunications technology;
4. Its goal is to improve health outcomes.

   Telehealth services come in many different forms, but can usually be divided into one of two types based on the timing of the interaction between patient and health professional: store and forward (asynchronous) when telemedicine involves the exchange of pre-recorded data between two or more individuals at different times; and real time (synchronous) when telemedicine requires the involved individuals to be simultaneously present for immediate exchange of information (Alley E.B.,1995; Levon U.and Abramson E.,, 2016).

   Thus, introducing telehealth implies some change for organizations. Indeed, the typical telehealth model involves a hub hospital that is staffed with specialists of some spoke (satellite) hospitals or clinics. When a specialist is needed, the professional and patient place a videoconference call from the spoke unit to the hub hospital and interact with the specialist. Several benefits of telehealth digitalization have been well documented in literature (Jennet P.A, et. Al., 2003; Moffat J.J. and Eley D.S., 2011; Bacigalupe G. and Askari S.F., 2013; Ossebaard H.C., 2016). The literature reports that while telemedicine offers great

opportunities in general, in terms of improving the efficiency of healthcare organizations, it could be even more beneficial for regions with limited infrastructure, where access to specialized professionals is too difficult (Hailey D. et.al., 2004; Gagnon MP, et.al, 2005). In particular, telemedicine can aid communities traditionally underserved – those in rural or remote areas with few health services and staff – because it overcomes distance and time barriers between health care providers and patients (Bashshur R. et.al. 2000; Heinzelmann P.J. et.al., 2005; Craig J and Patterson V., 2005; Mishra A., 2003; Froelich W., 2009). By increasing the accessibility of medical care telemedicine can enable patients to seek treatment earlier and adhere better to their prescribed treatments and improve the quality of life for patients with chronic conditions (Chanussot D. et. Al., 2008). Telemedicine has been advocated in situations where the health professional on duty has little or not access to expert help; it is able to offer remote physician access to otherwise unavailable specialist opinions, providing reassurance to both doctors and patients (Benzion I. and Helveston E.M., 2007). Remote care and diagnosis via telemedicine in less economically developed countries thus benefits both patients and the health care system by reducing the distance travelled for specialist care and the related expenses, time and stress. Telemedicine also provides opportunities by opening up new channels for communication and facilitate cross-site and inter-country collaboration and networking. Furthermore, it also provides opportunities for learning and professional development by enabling the dissemination of information and the remote training of health care professionals. Telehelth is not a separate medical specialty and has the potential to increase quality and access to healthcare to lower cost (Bashshur et al, 2001). It also ensures timely and high quality services for large segments of the population living in remote territories with difficult socio-economic conditions, particularly rural areas. One of the positive benefits of building high speed networks is that they allow for real time monitoring and interaction with patients without requiring their physical presence at a care center. For instance, this technology can support the delivery of specialized services in a timely fashion for remote populations, facilitate access to education for clinicians, and save travel costs for patients and professionals. Patient satisfaction with the use of telemedicine to access care and the use of telecommunications technologies to connect with specialists and other health care providers in order to meet unmet medical needs has consistently been very high. The source of satisfaction for most patients is the ability to see a specialist trained in the area most closely related to the patient's condition, the feeling of getting personalized care from a provider who has the patient's interest in mind, and the ability to communicate with the provider in a very personal and intimate manner over the telecommunications technologies

4. Research method and data

A case study (Yin, R.K., 2014) was conducted to explore the research question of this study. As Rogers states: "data about the innovation process are obtained by synthesizing the recallable perceptions of key actors in the innovation process, written records of the organization adopting, and other data sources". The case under consideration is a telehealth project developed between the Department of Pediatric Cardiology of Brotzu, a tertiary hospital in Sardinia, located in Cagliari, and CRS4 (Center for Advanced Studies, Research and Development in Sardinia). The interviewees included department heads and their medical staff and technology providers. Interviews lasted two hours, were tape-recorded with the consent of respondents and a verbatim transcript was made. The data obtained from the interviews were triangulated with those collected using other methods, including field observation and official documentation, regional laws, archives, historical data and

organizational plans provided directly by the organization, scientific journals and local newspapers. Although the number of interviews may be considered small, they were related to the key role that the respondents had in the planning and development of this innovation, gives higher level of reliability and validity to the research findings.

Interview schemas were elaborated from the literature and previous research done by the team [Gagnon M.P. et.al, 2006;Fortin et.al. 2003). A different schema was prepared for clinicians and technology provider. The interview schema for physicians was divided into two parts. The first part comprised questions about motivations and the effects of telehealth on clinical practice. The second part of the interview covered perceptions about the benefits and limitations of telehealth use in one's practice as well as the conditions that would facilitate telehealth integration into clinical work. Finally, were interviewed technologies providers. Questions addressed their opinion about the key conditions for successful telehealth implementation and the main barriers to its diffusion in Sardinia. To increase internal validity the article was presented and discussed with the project manager and the technology provider.

5. Description of the project

The Remote project (resources and organizations models in telecardiology) under study was financed by regional low 7/2009 with the aim to develop a hub and spoke model with a real-time low cost telemedicine platform able to support clinicians with the telepresence of a specialist in real time during echocardiographic evaluations. In this way the specialists can collaborate with their colleagues in remote areas by helping them to obtain the best diagnosis possible for specific pathologies, thanks to a real-time audio–video connection with the examination room, including echocardiograph visualization. This project was funded by the Department of pediatric cardiology and CRS4 with the main objectives to improve patient access to care and provider access to specialist expertise and knowledge sources, the reduction of both patient and physician transfers and the emergency management. The Department of pediatric cardiology is the reference center in Sardinia for the diagnosis and treatment of congenital heart disease. Congenital heart diseases (CHDs) are the most common congenital disorders affecting 6 to 13‰ live-born infants. Critical CHDs, defined as those requiring surgery or catheter-based intervention in the first year of life, occur in approximately 25% of those with CHDs. Although many newborns with critical CHDs are symptomatic and identified soon after birth, others are not diagnosed until after discharge from the birth hospitalization. In infants with a critical cardiac lesion, the risk of morbidity and mortality increases when there is a delay in diagnosis and in timely referral to a tertiary center with expertise in treating these patients. More than 50% of patients with a missed or delayed CHD diagnosis die at home or in the hospital emergency department with a median age of 13.5 days. In the region of Sardinia, one of Italy's major islands, there is a mean incidence of CHDs of 20.25‰ (more than twice the incidence in literature). Often, congenital heart diseases is an emergency in Sardinia because the newborns take place in centres failing specialist. In general, specialists in this field are rare and their lack is particularly critical in Sardinia where the 17.3% of population is concentrated in two big cities and the remaining 82.7% is dispersed across a great number of small villages in a relatively large territory. The distances between the center and the eight main health districts (ASL-*Azienda Sanitaria Locale*), corresponding to the main cities are not extreme but the logistic infrastructure can cause critical travel time for patients' life. Futhermore, from overcoming geographic barriers, exists a significant disparity in the distribution of pediatricians and subspecialists across the regional territory. In Sardinia region there is only one specialized center located in Cagliari. This model can constitute a barrier to the access of specific exams, particularly in sparsely

populated areas and in extremely specialized care, such as pediatric cardiology, because of a lack of physician with a precise expertise in the pathology. Echocardiography is the focus of a CHD evaluation, and it is only accurate when performed by an expert. To mitigate the high risks deriving from this situation, the platform developed by CRS4 and Pediatric Cardiology unit of Azienda Ospedaliera Brotzu allows echocardiographic exams to be performed remotely, without physical interaction between the patient and the specialist. The ultrasound analysis is operated by a third doctor who physically visits the patient, while the specialist guides the operator directly, viewing the echographic output and the examination scene at the same time (Triunfo R. et.al., 2010). Implementation of telehealth equipment in hospitals and their connection to the principal health communication network of Sardinia took place during 2011 and it involved as spoke unit the hospital N.S. della Mercede, a small general hospital in Lanusei (Fig. 1) , a town in the center of Sardinia. While not far away from the main city of Cagliari, (about 140 km), it takes about 3 h by car to get from one town to the other because of the mountaineous area and the lack of highways.

Fig.1 - Cities involved in the experimentation

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6. Main finding and discussion

All the interviewees agree that telehealth was perceived as a powerful tool to improve health services for populations living in remote areas. The above described tools allow to enjoy several benefits, some of which are more difficult to be assessed in terms of money, although equally relevant. Based on the interviews to healthcare manager and on reports, the main benefits have emerged:
- Increased process efficacy, as a consequence of real time transmission who optimize the communication between the local centers scattered in the territory and referral center and interact with all the actors, reduce the repetition of exams and helps guarantee the correctness of its execution and the subsequent diagnosis;
- Increased the quality of the service care, in terms of access to specialized services, improves the continuity of care and to save costs for patients.

For almost the interviewees, one of the most immediate benefits of telehealth is the real time trasmission who allows to support clinicians with the telepresence of a specialist in real time during echocardiographic evaluations. "*Pediatric cardiology is one of those clinical discipline requiring a specialized operator to obtain a reliable result: echocardiography is*

*the focus of a congenital heart disease evaluation, and it is only accurate when performed by an expert. In general, specialists in this fields are rare and their lack is particularly critical in some regions with high incidence of this kind of disease, like Sardinia. The platform developed allows echocardiographic exams to be performed remotely without physical interaction between the patient and the specialist. The ultrasound analysis is operated by a third doctor who physically visits the patient, while the specialist guides the operator directly, viewing the echographic output and the examination scene at the same time (*Medical specialist).

Telehealth technology enables providers to offer more services and higher quality care to their patients. The system allows a specialist at a tertiary care center to remotely guide the execution of an echocardiographic exam performed by a medical doctor in a geographically remote secondary care center, seeing both the exam scene and the sonographic video stream while directly interacting with the operator in realtime. Carrying out the remote consultation through the transmission of audio / video streams in real-time enables the physician to start counseling at the same time of the examination rather than after viewing the whole documentation sent by the remote center (store-and-forward protocol). Telehealth is also viewed as an efficient means to perform follow-up visits in order to improve continuity of care and reduce the wait times for patients who do need subspecialty care visits. In some cases, telehealth can also allow a better emergency management, an accurate, priority-aware management procedure significantly reduces the time to diagnosis for urgent cases: "*It is possible in this way to obtain a rapid and efficient evaluation of critical situations where it might be necessary to transfer the patient to a specialized centre, such as the tertiary hospital Azienda Ospedaliera Brotzu for paediatric cardiology in Sardinia"(*rural pediatricians)

According to respondents, the system increase patient access to care by delivering it when and where patients need it, ensuring the complete coverage of population needs in terms of health care services. Due to the particular geographic conformation of the region, moving a specialists to the remote center or the patient to the referral center means a significant increase of time before the diagnosis. With this system, local physician can benefit of great specialized services without transferring the patient, saving significant travel costs for patients and their family: "*With telehealth we can have access to specialised services without transferring the patient. It doesn't make sense to transfer a patient only for a diagnosis when it can be done remotely. Given the scarsity of pediatric specialized, telehealth might be less expensive or time consuming option for patients in remote underserved areas* (Medical specialist).

Another benefit identified was the repetition of exams and guarantee the correctness of its and the subsequent diagnosis: "*direct interaction between the operator and the specialist (real-time voice and video chats) enables correct exam execution. Due to the complex nature of the examination and even more to the difficulties in diagnosing a CHD in children, echocardiography in pediatric field is considered a highly operator-dependent practice. This reason invalidates the use of the traditional procedure of second opinion. Thus, our system deals with this issue by providing the specialist with video feed of the examination thanks to a robotized camera with a variable magnification, in addition to the bidirectional real-time voice channel between the operator and the specialist. Driven by the specialist, it makes possible to assess patient conditions and to focus on the precise positioning of the probe, the correctness of the projections performed by the operator and also on the proper use of the ultrasound device itself*" (Medical specialist, technology provider).

At the professional level, telehealth was perceived as an excellent means of communication for remote physicians by providing them with easy access to a second opinion and contacts with their peers. Telehealth offers a means for providers to discuss patient cases with subspecialists: "*Thanks to computerized booking and scheduling procedures, the system can optimize the communication between the local centers scattered in the territory and the*

referral center" (technology provider*).* Telehealth technology enables health care centers located in remote regions to offer more services and higher quality care to their patients. Telehealth services can help extend the expertise of pediatricians and subspecialists at children's hospitals and large tertiary care centers by enabling them to reach providers and community hospitals in remote settings. This can in turn empower those providers to care for their patients without having to refer them to other specialists or transfer them to other hospitals. Interviews conducted with rural pediatricians showed that they were strongly supportive of multiple telehealth strategies, so long as the goal was to enhance rather than replace relationships between rural pediatricians and subspecialists. Teleconsultations between pediatric critical care specialists and remote providers led to similar severity-adjusted mortality rates, and improved adherence to pediatric critical care best practices and treatment guidelines.

Another important benefit was greater pressure on the health care system to find new ways to provide high-quality care more efficiently. A direct benefit of telehealth's ability to overcome the distance between patients and providers is the avoidance of the costs of transporting patients between health care facilities. Given that the transportation of medically complex patients requiring life support and close monitoring is expensive and not without risk, a telehealth service that could extend the reach of experts at lower cost and without endangering patients would seem to provide cost savings and more efficient care delivery. The respondents have reported that telehealth is economically beneficial for both the Sardinian health service and patients by comparing the system's cost to that of savings to be made in patient transport: "*Currently, patients suspected of CHD are sent to Cagliari (Brotzu Hospital), by their General Practitioner (GP) or, in emergencies, sent directly by other hospitals, often by ambulance. A specialized visit then occurs to confirm CHD, or not. Visits that do not confirm CHD are indicated as* unnecessary *below.* W*ith the presence of telemedicine system, the main costs are those related exclusively to the system set-up and maintenance, while the main economic benefits consist in the savings due to avoiding patient transfers to the hub centre: the patients could be first visited in the spoke centre and then only in urgent cases sent to the main center. the telemedicine platform could help reducing the costs to 66% of the total expenditure for year*"*".(* medicals specialists, technology provider*).*

Therefore, the main economic benefits are:
- for the patients, in saving the cost of all transfers required for outpatient consultations;
- for the health structures, in saving the cost of transfers (ambulance and team) and of unnecessary hospitalization.

In addition, services that can offer parents a means of obtaining medical care, without having o miss work, are thus a potentially huge benefit for families and society in terms of recovered workforce productivity: "*The telehealth was well accepted by families, who most liked it for the convenience,time saved, and the ability to stay at work*" (Medical specialist). Telehealth services can also lead to better use of limited resources, such as the availability of subspecialist appointments, by providing a more efficient way to communicate between providers.

Physicians and technology provider were also asked to discuss the factors facilitating telemedicine development in Sardinia. At the technological level, the various components of telehealth systems must correspond to users' expectations in terms of reliability, ergonomics, mobility, and user-friendliness. Telehealth networks should assure the required level of security in order to protect data confidentiality and patient privacy. At institutional level, the respondents point out that obtaining governmental and institutional support is e a critical factor in the success of telemedicine. At financial level the respondents point out that, unlike other telemedicine initiatives, the system developed is a low-cost platform open source. There

was been initial equipment costs to start the project but there aren't costs of equipment maintenance, personal training and ongoing technical support.

7. Conclusions

Our findings present implications in terms of public healthcare strategies. In particular, if policy-makers are desirous of improving patient care quality and cost reduction, then the promotion of sustainable health systems is important. This suggests an urgent need for care provided at the prime point of need, favouring services in the home or in the community whenever possible. It also points to a need for improved coordination, partnership working and integration in the delivery of health promotion, public health and social care services. This can be achieved by public healthcare sector adopting e new organizational model of service delivery in order to improve the quality of clinical practice. The case study under consideration shows that the adoption of the real-time telemedicine solution when supported by organization design, like hub and spoke model, can promote new care models, encouraging a rational and effective use of resources. Telehelth is a key component in future integrated care. The system described in this paper addresses to diagnostic contexts in which the lack of specialists is critical because the ability of the operator performing the examination is essential to obtain a correct diagnosis. Telehealth shows several potential benefits for rural and remote populations and could definitely improve patient care as a result of increased accessibility to specialised services, better continuity of care, significantly reduction of the time to diagnosis for urgent cases, speed of intervention, reduction of patient/physician transfers, correct diagnosis and finacial benefits. However, despite growing evidence of its benefits, telehealth is not yet integrated as part of a strategy at regional level. Policy-makers can play an important role in this change process by facilitating its diffusion in all the territory.

This analysis is local and is focused on a specific situation, but the design principles that guided its development enable it to be applied in other clinical contexts that require operator-dependent diagnostic techniques. At the moment, the telemedicine system is under trial in emergency structures for the FAST (Focused Assessment with Sonography for Trauma) examination in Trieste IRCCS (Institute of Hospitalization and Care Scientific). Another added value of the system derives from its adaptability to support learning sessions. In conclusion, the benefits of telemedicine system confirm the need to implement the telemedicine system on a regional scale in order to improve critical gaps in access for rural and underserved populations, and those with more complex health needs.

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