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# Can Telemedicine be Effective in Responding to Local Health Needs? Lights and Shadows from the Picture of Piedmont

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## ABSTRACT

Telemedicine (TM) allows health professionals to evaluate, diagnose and treat patients in remote locations using Information and Communications Technology (ICT) thus enabling healthcare access and equity. However, the process of digitalisation strongly depends on local contexts. With the ultimate aim of planning an accreditation path for TM services, the Regional Health Direction of Piedmont conducted, in 2017, an investigation through a questionnaire to the local Health Units, which explored several domains as defined by the national guidelines. This survey returned a picture of the implementation status of TM services over the regional territories. The results show that a rich experience exists in Piedmont, however the maturity levels of the different services are wide-ranging, suggesting that central governance is needed to ensure a solid framework for appropriate and sustainable services and to make their integration feasible in the regional Health System.

## KEYWORDS

Telemedicine, Policy making, eHealth, Public health, Socio-technical systems

## RÉSUMÉ

La télémédecine (TM) permet aux professionnels de la santé d'évaluer, diagnostiquer et traiter des patients éloignés des services de santé. Toutefois, le processus de numérisation dépend fortement des contextes locaux. Dans le but de mettre en place la procédure pour accréditer les services de TM, la Direction régionale de la santé du Piémont a mené, en 2017, une enquête en soumettant un questionnaire aux agences locales de santé, qui a exploré plusieurs domaines de service comme définis par les directives nationales. Cette enquête a permis de dresser un tableau sur l'état de la mise en œuvre des services de TM sur le territoire régional. Les résultats montrent qu'il existe en Piémont une riche expérience, mais que le niveau de maturité des services est très différent. Ils suggèrent qu'une gouvernance est nécessaire pour assurer des services appropriés et durables, et rendre possible leur intégration dans le système de santé régional.

## MOTS CLÉS

télémédecine, élaboration des politiques, santé numérique, santé publique, systèmes sociotechniques

## INTRODUCTION

### Motivation of the Study

Implementing digital health transition is challenging. Health organisations have to cope with the rapid pace of technological advancements and see to their take up in uneven local contexts. This is the case of Piedmont, an Italian region where, because of the morphology of the area and socioeconomic characteristics of urban settlements, a certain variability exists across the sub-regional areas.

In the last decade, a number of telemedicine projects have been launched. With the aim of assessing their implementation status and with a view to defining an accreditation path, in 2017 the regional Health Department has conducted a thorough investigation by administering a questionnaire to all the local Health Units.

The questionnaire was based on the national and EU guidelines and referred to the international literature. It investigated the structural aspects of telemedicine services and covered several domains: financing, technical aspects, organisation, legal and ethical issues, patient information and training, quality monitoring. Opinions about the benefits and criticalities of the services were also collected from those who had a main responsibility in managing the projects.

An innovative element of this work was to apply an analytic tool to get insights into the state of implementation of the projects. The application made it possible to exploit the data collected and obtain a quantitative assessment of the maturity level of each project.

A ranking of the surveyed TM services was also produced and the results returned to the health regional decision makers. A claim is made that the information gained in this study may help to set up a regional governance strategy of telemedicine.

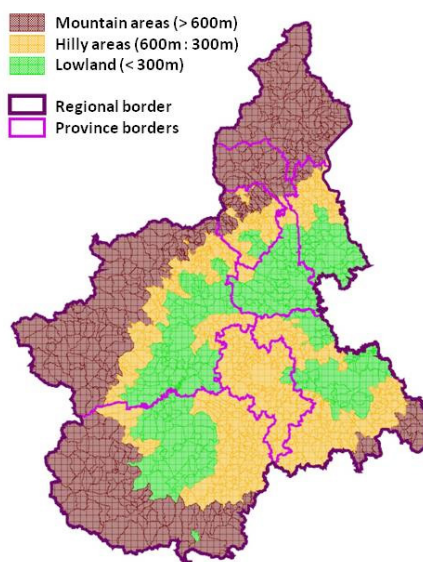
### An Overview of the Piedmont Region

Situated in the North-western part of Italy, Piedmont has over 4 million inhabitants, and is one of the Italian regions with the largest number of municipalities.

Three out of four of the 1,181 municipalities are located in mountainous and hilly areas (fig. 1). Most of them are sparsely populated (fig. 2), suffer from limited economic development and poor access to services, and are characterised by the strong presence of elderly people in single-component families.

Demographic aging in Piedmont is relevant: in 2019, the average age was 46,5 years with 25% of residents aged 65 years or older; it is expected to rise to approximately 28% by 2030 (Rapporto Osservasalute, 2018).

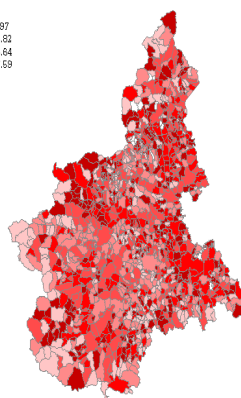
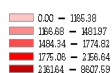
Figure 1. Piedmont municipalities by altimetry of the areas (source: ARPA Piemonte, 2018)



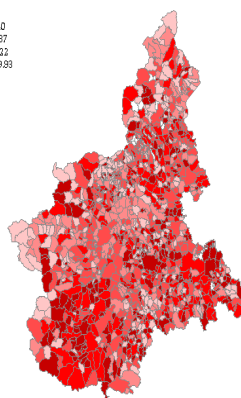
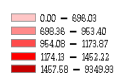
About 40% of the resident population is affected by at least one chronic disease; cardiovascular, respiratory and metabolic diseases are among the most prevalent (Università Cattolica del Sacro Cuore, 2018).

Figure 2. Standardised rate of hospitalisation by age with reference to the regional population by municipality (source: SEPI, 2018)

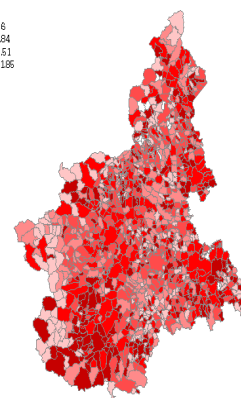
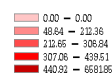
a) cardiologic diseases



b) respiratory diseases



c) metabolic diseases



These maps show that conditions of frailty and poor access to essential services exist in some areas of the region, which is at the core of a few regional policy strategies meant to improve the quality of life in these areas.

### The Regional Telemedicine Strategy

Public healthcare in Piedmont employs about 54,000 people and costs about 8 billion € per year (about 1,900 € per inhabitant in 2017). It is ensured through several facilities: 12 local Health Units, each provided with distributed sites, are responsible for the delivery of local healthcare services (primary and specialist care, outpatient services) and 6 public hospitals. The regional health priorities are set in accordance with national directives by the Regional Health Plan (RHP) which is periodically revised and approved by the Regional Council.

The 2007-2010 RHP included a specific action directed to territorial medicine. Following this indication a “telemedicine project for geographically decentralised areas” has been launched in 2008 by the Regional Health Direction, with the aim of defining a pathway to effectively combine innovative technological solutions with health needs expressed in those areas where, due to geographical characteristics, access to the regional services is limited.

This action assigned TM services a supporting role for monitoring health conditions of frail subjects, with a view to continuity of care. Such systems could, in fact, contribute to the optimisation of resources and to the improvement of care appropriateness for elderly people affected by chronic diseases, through supporting home care, favouring their maintenance in their own living and social context for as long as possible, and improving cooperation between health and social interventions.

### The Telemedicine Survey

Knowing the factors that contribute to the advances of telemedicine or that could hold it back is an important aspect for the development of the services, as is their institutional recognition (accreditation).

The latter is a key component of the implementation path not only from the point of view of the authorisation and consequent falls on the economic sustainability of the services, but also for the strengthening of the governance capacities of individual stakeholders (Health Units, Hospitals, and Regional Authorities).

With the aim of assessing the present implementation status of TM projects over the regional territory, in 2017 IRES Piemonte was appointed by the regional Health Authority to conduct a survey, based on a questionnaire submitted to all the Local Health Units.

The ultimate scope of the investigation was also to define an accreditation pathway to ensure appropriateness, accessibility, and effectiveness, and to include TM into the public healthcare system.

It was composed of eight sections exploring the different dimensions as defined by the national (Italian Ministry of Health, 2014) and European guidelines (Telehealth Quality Group, 2016).

The survey detected 45 telemedicine projects out of which 43 provided the complete set of requested information. The results show that a rich telemedicine experience exists in Piedmont, both in terms of the covered medical specialties and of the types of service implemented (Ocellini & Scelfo, 2019).

## 1. RESULTS OF THE SURVEY

### 1.1. Main Insights

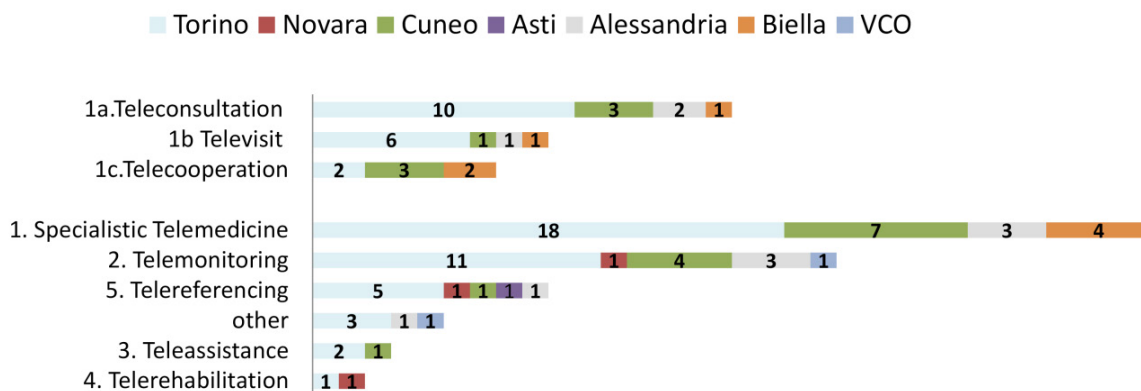
Telemedicine services can be classified in three main types (Bahshur *et al.*, 2011):

- *Store-and-forward* (or asynchronous): where data or health information, are stored and then later sent to a medical provider. One application is telereporting where a specialist (i.e. radiologist or cardiologist) being located far from the site of the medical investigation, receives data or images and draws up a report (synchronously or asynchronously).
- *Remote (or tele-) monitoring*: where key healthcare data and indicators (such as blood pressure or blood glucose levels) are measured at patient’s home and sent regularly, over the internet, to the healthcare provider. This service is extensively used in the management of chronic diseases.
- *Real-time interactions* (or synchronous): where patients and providers, interact in real time. Interactive services can provide immediate advice as for televisit or telerehabilitation when technology is used to communicate and perform clinical assessment and therapy for rehabilitation patients, or for teleconsultation and telecooperation where two or more health providers interact with the purpose of defining a diagnosis or medical treatment when an expert or a second opinion is needed.

At first a classification of the projects according to the *prevailing type of service* was applied.

The questionnaire revealed that 15 initiatives provide specialistic TM services (teleconsultation, televisit, telecooperation), 10 are telemonitoring services, 11 offer some combination of specialistic TM and telemonitoring services, and 9 offer other types of services (telereporting, teleassistance and telerehabilitation) (see fig. 3).

Figure 3. Distribution of telemedicine services by type and province (Data from the Regional Health Authority, processed by IRES, 2017)

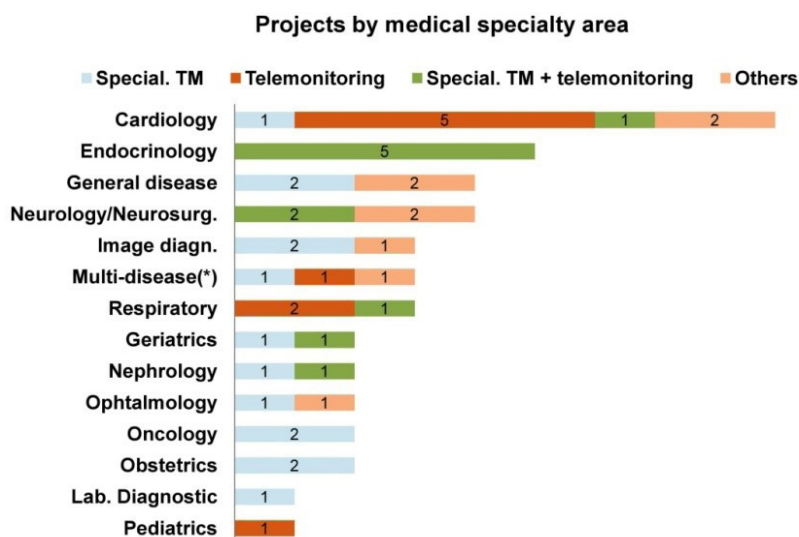


Telereporting serves the largest basin of patients (about 465), followed by specialistic telemedicine (182), teleassistance (147), telemonitoring (72) and telerehabilitation (48).

The majority of the initiatives concern the provision of care under the *ordinary regime* (30 projects). Cardiology and endocrinology (diabetes) are the areas of care where services are most widespread (9 and 5 projects respectively, fig. 4). This is in line with epidemiological data on chronic diseases in Piedmont, which demonstrate the high prevalence of these two pathologies. Telemonitoring in particular is the most widely used in cardiology; 26 projects (about 60%) involve integration with established clinical pathways or a preliminary clinical trial.

As for the geographical distribution 45% of services have been implemented in the metropolitan area of Turin. Digital connectivity is ensured by different type of connections distributed evenly among fixed, wireless and mobile networks. About a third of the projects uses a combination of digital network services and a majority has introduced data protection measures. Technological requirements are dealt with on a local basis and regional/national interoperability does not seem to be an issue.

Figure 4. Distribution of TM services by specialistic area



Financial support is provided almost equally by national/regional public funds (38%) and private grants (40%) of local donors. Resources are allocated without any specific strategy. This picture reveals that the long-term economic sustainability of the projects is not ensured.

Concerning training and information, almost 90% of the projects provide training and/or refresher courses for doctors and operators. The proportion reaches 100% for projects that have been in place for more than 7 years. Only 2 out of 3 projects include a training directed to patients and caregivers; this is the case for the most recent projects (less than 10 years). In 75% of cases, it is intended to produce evidence to improve the service delivery process. In 11 cases the new service has been reviewed by an Ethics Committee.

With regard to the benefits of telemedicine services, the most frequently reported benefits relate to raising the patient’s quality of life (37%), improving the appropriateness and timeliness of care (30%) and strengthening the ability of healthcare personnel to take action (26%).

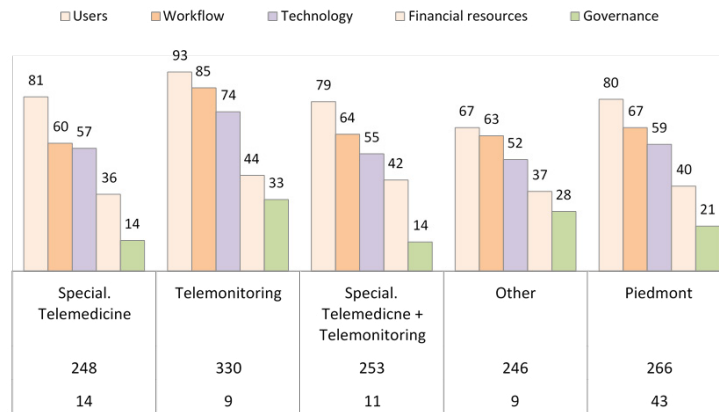
On the contrary, lack of reimbursement rules and financial support was reported in 42% of services; organisational shortcomings in 35% and technology-related problems in 28% of the responders. These criticalities reveal a common denominator: the lack of institutional recognition and of an accreditation pathway to ensure appropriateness of care, adequate investments and economical sustainability.

**1.2. The Maturity Assessment Model**

To complement the examination of the collected data, we applied an analytic tool based on the model of the maturity level of a TM project proposed in van Dyk and Schutte (2013). The scheme is articulated in three dimensions that allow to assess if and to what extent a digital innovation project is able to be successfully implemented in medical practice, and to contribute to the improvement of the health organisation.

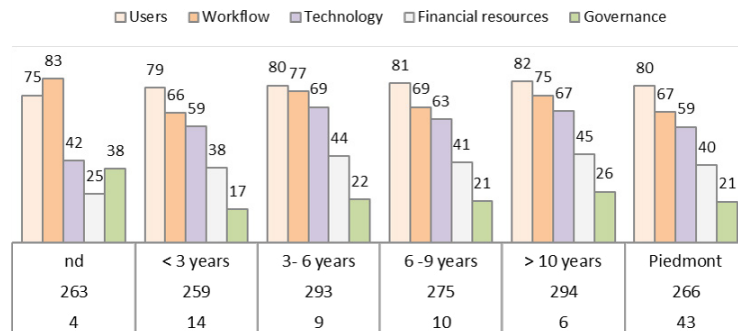
The application of this tool allowed to assess the maturity level of the overall and individual regional TM services. It showed that telemonitoring services are more mature (fig. 5a) and the same appears to be true for “older” services (fig. 5b).

Figure 5a. Average maturity level by type of service (data from the Regional Health Authority processed by IRES Piemonte, 2017)



For each type of service rankings on single dimensions are displayed above the bars while the average maturity level (second row below x axis) is displayed together with the number of projects falling in each category (third row).

Figure 5b. Average maturity level by age of service (data from the Regional Health Authority processed by IRES Piemonte)



For each age range rankings on single dimensions are displayed above the bars while the average maturity level (second row below x axis) is displayed together with the number of projects falling in each category (third row).

**2. A CASE STUDY: TELERADIOLOGY IN THE MOUNTAIN AREA OF LOCANA**

The teleradiology project R@dHome was established in 2007 as a pilot project by Turin University Hospital “Città della Salute e della Scienza”. The service targeted a basin of fragile patients hospitalised at home within the metropolitan area of Turin, with the aim of providing domiciliary radiologic examinations when their conditions would make hospital transport difficult and critical.

Images are acquired through a portable x-ray tube and sent, via wireless broadband connection, to the reference hospital where radiologists could provide real time medical reports.

The pilot study was included in a randomized clinical trial (Ricauda *et al.*, 2011) which demonstrated the benefits of the service in terms of patients' and caregivers' quality of life and degree of satisfaction.

In 2011 an experimental phase was implemented in the municipality of Locana, in the province of Turin, whose territory is mountainous and wide extending, has about 1,500 inhabitants (22% being over 65) and is 40 km away from the nearest hospital.

This phase included 100 patients, whose x-ray images were stored on digital media (a CD) and delivered in real time together with a hard copy of the medical report.

Thanks to this system, admissions to local radiology facility have noticeably decreased, as well as the social cost; the patients and caregivers' quality of life improved, and they all show great satisfaction. The service terminated in 2011 due to lack of economic support.

## CONCLUDING REMARKS

The survey has shown that Piedmont owns a rich and varied experience in TM, both in terms of the covered specialistic areas and type of implemented services.

The degree of maturity of the various initiatives allowed to assess that the longer the age of a service, the higher the probability to become stable and sustainable. This condition however could only be ensured if a central governance defines the framework for TM institutional recognition.

The geographical distribution of TM services seems to have a potential for meeting the health needs of the local population. The issues however raise questions about how to properly address the different aspects of accessibility and ensure economical and organisational sustainability to those that respond effectively and appropriately to the local health needs.

Although not exhaustive, the regional profile returned by the analysis highlights the opportunity to adopt a model of regional governance of telemedicine, capable of tailoring the services to local health needs, and the guidelines of economic and health planning.

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