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The Case for Telemedicine from a Sustainability Perspective

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Abstract
This article examines telemedicine from a sustainability perspective, emphasising its alignment with the triple bottom line: social, environmental and economic benefits. Socially, telemedicine democratises healthcare by facilitating constant communication between patients and physicians, especially for the elderly, chronic patients and those with mobility difficulties. With regard to the environment, a life-cycle approach reveals the considerable potential of telemedicine to reduce greenhouse gas emissions by minimising patient travel. Furthermore, telemedicine also has the potential to decrease other environmental impacts, such as energy consumption in healthcare facilities and waste from personal protective equipment. From an economic perspective, telemedicine facilitates more efficient resource allocation, enhances system sustainability, and has thus the potential to reduce costs. It enables earlier and more optimal treatment of patients, improves adherence to treatment plans, and reduces hospitalisations and emergency room visits. The article examines the role of telemedicine in the transformation of the healthcare landscape, particularly in the context of Ministerial Decree 77 and the National Plan for Recovery and Resilience (PNRR), with a focus on the Liguria Region. The Liguria telemedicine plan, which was approved in 2023 and financed by the PNRR, has been designed to meet the health needs of an ageing population. The initial results indicate a growing adoption of telemedicine, particularly in the fields of endocrinology and diabetology. The discrepancies in data between sources signal the necessity for enhanced data integration.

Keywords: Telemedicine; Sustainability; Standard; Digital health

Introduction

Telemedicine presents advantages from a sustainability perspective, encompassing social, environmental and economic aspects.

Telemedicine has a social sustainability component, with the potential to equalise the healthcare system. Patients can utilise telemedicine to maintain regular contact with their general practitioners, as well as specialists, which is particularly beneficial for older [1] and chronic patients and those unable to travel. Telemedicine facilitates frequent monitoring [2] and enables patients to participate in remote clinical trials [3], to which they previously might have lacked the opportunity to take part in due to distance, thus decreasing the dropout rate. It serves as a tool for equal access to care and enables the delivery of more personalized and effective care for all patients.

It is challenging to draw a singular conclusion on the eco-advantages of telemedicine due to case-by-case variability and significant data gaps. Nevertheless, many studies proved that telemedicine has great potential to significantly reduce Greenhouse Gas emissions, primarily by eliminating patient commutes to hospitals [4, 5]. Additionally, telemedicine can lower other environmental impacts, such as energy demands for climate control in sanitary facilities and waste generation from personal protective equipment use during in person visits [6].

The concept of economic sustainability encompasses not only the reduction of costs [7, 8] but also the improved allocation of resources and the assurance of long-term system viability and endurance [9]. Early and optimal patient treatment and enhanced adherence are key elements in the optimisation of the economic impact of the system [10]. Digital health interventions can improve efficiency and convenience for patients and providers, reduce healthcare costs from decreased hospitalization and emergency room visits.

This paper will analyse the changes to the treatment landscape and the role of telemedicine, focusing on the analysis of the Liguria Region, presenting data on telemedicine usage in this area. In particular for Liguria, the Regional Health Authority (Alisa) initially implemented telemedicine with resolution 417 of November 2020.

Materials and Methods

The Ligurian population as of 1 January 2021 was just over 1.5 million residents.

The average age was 49.3 years and individuals over 65 years old were 28.7% of the total, compared to 23.5% at the Italian level. The Ligurian territory is characterized by a persistent gap between the coast and the hinterland with a prevalence of mountainous and hilly surfaces.

The continuous aging of the population - with the consequent greater incidence of chronic pathologies, such as heart diseases, chronic respiratory diseases, diabetes and tumors - combined with the conformation of the territory give rise to the necessity of using all possible tools for the management of complex medical care, with an accent on telemedicine.

The Liguria Region approved the Telemedicine Plan (2023) based on population health needs, taking into account already existing experiences - such as televisit and teleconsultation - and incorporating telemonitoring and teleassistance, which have yet to be fully developed. The plan will be developed in accordance with the National Telemedicine Platform, with funding provided by PNRR. It will benefit from the use of standardized technology and uniform measurement methods. Moreover, the sharing of health data is a crucial aspect of any telemedicine project, and will be facilitated by the Electronic Health Record project.

Results

Of the four possible telemedicine activities proposed and funded by the PNRR, televisits were chosen for evaluation. This choice depended on the fact that televisits were already formalised and employed during the COVID-19 period.

Televisits reporting can be considered a relatively novel activity, that will require additional time to become fully operational. For this reason, to ensure data consistency, two different information sources were cross-referenced. The first step was to corroborate the data from the telemedicine platform, according to which approximately 60 teleconsultations were conducted in 2020, about 1,250 in 2021, around 3,300 in 2022, and about 4,000 in 2023. In contrast, the Ligurian Data Warehouse (DWH), which provides data derived from Ambulatory Specialist Reporting, recorded no activity in 2020 and 2021 but reported nearly 6,700 televisits in 2022 and about 8,200 in 2023. The discrepancy between the two sources is mainly due to ASL3 Genovese, which reported a higher number of televists than what was recorded on the platform. Excluding ASL3 Genovese, the local healthcare authority that provided the most televisits is IRCCS Gaslini. However, both healthcare authorities primarily provide endocrinology and diabetology consultations remotely, as stipulated by the regional programming resolution (DGR 389/23). In 2023, there were almost 27 million specialist outpatient services for external patients, compared to nearly 25 million in 2022.

The following table shows the trend of televisits for the years 2023 and 2022. It is highlighted that the number of televisits is limited compared to the total number of follow up visits, but the prospect of reducing patients' travel and movement is of crucial relevance, as already highlighted by the data from the Gaslini Institute.

Table 1. Trends of televisits 2022-2023 in Liguria. In the analysis first visits, visits for rehabilitation plans, and emergency room visits were excluded, as they were considered inconsistent with the analysis

% of visits /total outpatient services		% of first visits and follow-ups / total visits		% of follow-up visits /total first visits and follow-up visits		% of video visits / follow-up visits		of which, out of region		Gaslini: of which, out of region	
2023	**2022**	**2023**	**2022**	**2023**	**2022**	**2023**	**2022**	**2023**	**2022**	**2023**	**2022**
9.4%	9.5%	75%	75%	45.5%	45.3%	1.0%	0.8%	6.2%	4.0%	29.6%	26.3%

Discussion

A novel model of healthcare is emerging, centering on territorial medicine and the patient as the primary focus. One potential model is value-based healthcare [11, 12], which is founded on the pursuit of value, with a particular focus on the value derived for the patient. The model entails strategic and methodological processes that are also based on the incorporation of cutting-edge technology to enhance services and outcomes. The value for the patient represents the central axis around which services are organised and operated.

The growing utilisation of telemedicine, testified also by the Ligurian data, is a crucial step in the adoption of this model. However, another fundamental aspect of this process is data, as its measurement and evaluation facilitate the creation of more efficient care pathways, which in turn result in improved outcomes and reduced costs. It is therefore of the utmost importance to implement effective data collection mechanisms, such as the Electronic Health Record.

Conclusions

The implementation of telemedicine represents a viable model for the sustainable provision of healthcare services, whereby patient outcomes are balanced with cost efficiency and environmental responsibility. The effective collection and utilisation of data, as exemplified by the EHR, are of paramount importance to ensure the optimal impact of telemedicine. In a perspective of transition towards value-based care, strategic and technological advancements are fundamental. It is mandatory that telemedicine platforms are implemented to be able to bring together the many projects that have been financed in recent years, especially at a European level [13].

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