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The Implementation of Social Robots in Italian RSAs: Enablers and Barriers after COVID-19 Pandemic

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Abstract

Today the topic of robotics is at the center of the debate in many fields of application, especially in the health sector where robots are proving to be an innovative and effective support tool. Within the healthcare sector, the topic of social and health care and how robotics can be integrated through the implementation of social robots, i.e. automata specifically developed to interact and communicate with humans, stands out more frequently. The progress made by science, thanks to the use of artificial intelligence, allow to see in the social robot an aid in meeting the needs of the elderly, within the RSA and in support of operators.

The objective of this study is to provide tools for providers and policy-makers to create scenarios for using social robots in RSA analyzing what kind of impact the SARS-CoV-2 pandemic had. After a careful review of the literature on this topic, the research question is as follows: what are the needs that really emerged during the pandemic and *how* did these lead to a change in the enablers and barriers found in the literature, which respectively favor and undermine the implementation of social robots in RSAs.

To answer the research question, a multiple case study was conducted through semi-structured interviews. The sample under study consists of five general managers of facilities specialized in elderly care, located in Italy. The answers provided showed how the pandemic has had a significant impact on the propensity of the directors to adopt the social robot to support health workers. As a result of the responses obtained, two frameworks were constructed that schematize the drivers and barriers revealed by the study. In particular, it emerged how the social robot can be a significant means of companionship for the elderly, who more than any other category of the population blamed the absence of contact and social interactions.

On this basis, future research could be directed to a larger study aimed at a larger sample that could also involve other stakeholders: health care professionals, patients' families and the patients themselves.

Key-words: social robots; elderly; assistive care; enablers; barriers; COVID-19.

Abstract in lingua italiana

Oggi il tema della robotica sta al centro del dibattito in numerosi campi d'applicazione, in particolare nel settore sanitario ove i robot stanno dimostrando di essere un innovativo ed efficace strumento di supporto. All'interno del settore sanitario, con maggiore frequenza spicca il tema dell'assistenza socio-sanitaria e di come la robotica possa essere integrata attraverso l'implementazione dei social robot, ossia automi sviluppati appositamente per interagire e comunicare con gli esseri umani. I passi avanti fatti dalla scienza, grazie all'utilizzo dell'intelligenza artificiale, permettono di vedere nel social robot un aiuto nel soddisfare i bisogni degli anziani, all'interno delle RSA e a supporto degli operatori.

L'obiettivo di questo studio è quello di fornire strumenti ai providers e ai policy-maker per creare scenari per l'utilizzo dei robot sociali nella RSA, analizzando che tipo di impatto abbia avuto la pandemia di SARS-CoV-2. Dopo un'attenta revisione della letteratura su questo argomento, la domanda di ricerca è la seguente: quali sono i bisogni realmente emersi durante la pandemia e come questi hanno portato ad un cambiamento nei driver e nelle barriere presenti in letteratura, che rispettivamente favoriscono e ostacolano l'implementazione dei robot sociali nelle RSA.

Per rispondere alla domanda di ricerca, è stato condotto un *multiple case study* attraverso delle interviste semi-strutturate. Il campione oggetto di studio è formato da cinque direttori generali di strutture specializzate nella cura degli anziani, ubicate in Italia. Le risposte fornite hanno mostrato come la pandemia abbia avuto un notevole impatto sulla propensione dei direttori all'adozione del social robot a supporto degli operatori sanitari. In risultato alle risposte ottenute, sono stati costruiti due framework che schematizzano i driver e le barriere rivelate dallo studio. In particolar modo è emerso come il social robot possa essere un significativo mezzo di compagnia per gli anziani, i quali più di ogni altra categoria della popolazione hanno accusato l'assenza di contatto e interazioni sociali.

Su questa base, le ricerche future potrebbero essere rivolte ad uno studio più ampio indirizzato ad un campione più numeroso che possa coinvolgere anche altri stakeholder: gli operatori sanitari, i familiari dei pazienti e i pazienti stessi.

Parole chiave: social robot; anziani; assistenza sanitaria; driver; barriere; COVID-19.

Contents

Abstract	i
Abstract in lingua italiana	iii
List of Figures	7
List of Tables	8
List of abbreviations	9
1. Italian National Healthcare System and Extended Care Unit	11
1.1 Overview of the Italian National Healthcare System	11
1.2 The social-health system.....	15
2. Elderly care needs: request for assistance	18
2.1 Informal assistance	23
2.2 Formal assistance.....	25
2.3 Residential assistance	27
2.3.1 Health Care Residences (RSA)	27
2.3.2 Primary stakeholders involved.....	32
2.3.3 The impact of Covid-19	36
2.3.4 Financial overview	40
3. Social Robots	42
3.1 Fields of implementation	43
3.2 Applications in elderly care.....	46
3.2.1 Needs of elderly	48
3.2.2 Enablers and barriers to implementation – the issue of ethics	55
3.2.3 Benefits of psychosocial interventions on well-being.....	59
4. Research question and method	63
4.1 Research question.....	63
4.2 Context of analysis, data collection and method	64
4.3 Data analysis.....	70
5. Resulting frameworks	72
5.1 Enablers and barriers revealed.....	75
5.1.1 Enablers.....	76
5.1.2 Barriers.....	83

6. Discussion and conclusion	89
REFERENCES.....	94
APPENDIX.....	101
SURVEY QUESTIONS.....	101

List of Figures

Figure 1- schema of the three major levels identified by the DPCM	14
Figure 2 - elderly assistance in Italy.....	22
Figure 3 - Main characteristics of social robots currently on the market	54
Figure 4 - summarized results - ICT, information and communications technology; SAHR, socially assistive humanoid robots (Papadopoulos I. et al., 2020).....	56
Figure 5 - constraints translated into possible enablers of social robots	73
Figure 6 - barriers to the implementation of social robots.....	74

List of Tables

Table 1 - data as of 31/12/2019 on Lombardy region RSAs population (Crippa A. et al., 2021)...	30
Table 2 - coronavirus infections, deaths, and lethality by European country and share of elderly (absolute values and rates per 10,000 inhabitants) - status as of December 9, 2020 (Osservatorio Nazionale sulla salute nelle regioni italiane, 2020)	37

List of abbreviations

SSN/NHS: Servizio Sanitario Nazionale (National Health Service).

USL: Unità Sanitaria Locale (Unità Sanitaria Locale).

FSN: Fondo Sanitario Nazionale Unitario (Unitary National Health Fund).

ASL: Azienda Sanitaria Locale (Local Health Authority).

D.P.C.M.: Decreto del Presidente del Consiglio dei Ministri (Decree of the President of the Council of Ministers).

LEA: Livello Essenziali di Assistenza (Essential Levels of Assistance).

NSIS: Nuovo Sistema Informativo Sanitario (New Health Information System).

NSG: Nuovo Sistema di Garanzia (New Warranty System).

VMD: Valutazione Multidimensionale (Multidimensional Assessment).

WHO: Organizzazione Mondiale della Sanità (World Health Organization).

OECD: Organizzazione per la cooperazione e lo sviluppo economico (Organization for Economic Co-operation and Development).

GDP: Prodotto Interno Lordo (Gross Domestic Product).

ISTAT: Istituto Nazionale di Statistica (National Institute of Statistics).

COPD: Malattia Polmonare Cronica Ostruttiva (Chronic Obstructive Pulmonary Disease).

RSA: Residenza Sanitaria Assistenziale (Health Care Residences).

RSD: Residenza Sanitaria per Disabili (Health Residence for the Disabled).

CDI: Centro Diurno Integrato (Integrated Day Center).

ADI: Assistenza Domiciliare Integrata (Integrated Home Care).

ALS: Supporto Vitale Avanzato (Advanced Life Support).

SIGG: Società Italiana di Gerontologia e Geriatria (Italian Society of Gerontology and Geriatrics).

RAI: Strumento di Valutazione del Residente (Resident Assessment Instrument).

LTCF: Struttura di Cura a Lungo Termine (Long Term Care Facility).

FIMMG: Federazione dei Medici di Famiglia a Verona (Family Physicians Federation in Verona).

PAI: Piano Assistenziale Individuale (Individual Care Plan).

OSS: Professionista dell'Assistenza Sanitaria (Health Care Professional).

ASA: Assistente Sociale Ausiliario (Social Worker Auxiliary).

AI: Intelligenza Artificiale (Artificial Intelligence).

HRI: Interazione Uomo-Robot (Human-Robot Interaction).

USCA: Unità speciali di continuità assistenziale (Special Continuity Care Units).

IAT: Tecnologie Assistive Intelligenti (Intelligent Assistive Technologies).

ICT: Tecnologia dell'informazione e della comunicazione (Information and Communications Technology).

DS/DH: Chirurgia Diurna/Ospedale Diurno (Day Surgery/Day Hospital).

1. Italian National Healthcare System and Extended Care Unit

1.1 Overview of the Italian National Healthcare System

The path towards the development of the Italian national healthcare system (**Servizio Sanitario Nazionale** or **SSN**) goes back to 1948 when the constitution has recognized the right to health. The interpretation of this right has subsequently developed in 4 phases; the first stage was defined by the voluntary mutuality which provided for minimal compensatory measures reserved for members of mutual funds. The second stage was represented by the compulsory nature of sickness insurance with the creation of a multiplicity of mutual institutions, nevertheless membership of different mutual funds leads to a great inequality of assistance received and millions of citizens remain outside of any health coverage still.

In the third stage, between the 70s and the 80s, Law n.833 of 1978 institutionalized the SSN, an integrated public model whose functions are performed by operational structures of individual or associated municipalities (**Unità Sanitaria Locale** or **USL**). The SSN ensured health as a right of everyone and an equal assistance to all the citizens paying attention to prevention and rehabilitation as well as treatment; it also led to the rationalization of health expenditure, through the introduction of programming, as a means of monitoring the use of resources, and of a unitary national health fund (**Fondo Sanitario Nazionale Unitario** or **FSN**).

The current situation, since 1993, represents the fourth phase in which the individual law and sustainability of the system must coexist, the USL turns into **ASL (Azienda Sanitaria Locale)** and the regions greatly increase role and power becoming owners of the health structures in the territory and being responsible for them. The regional health planning becomes real; indeed, regions regulate the organization and operation of the health-care establishments defining the types and levels of services to be provided and the resources allocation criterion; on the other hand, the state preserves its power over the national health planning, the establishment of uniform welfare levels and the definition of the capital financing.

Other important stages for the definition of the national system are represented by:

- Legislative Decree n.229/99 (reform **Bindi**) thanks to which more attention is paid to the quality, appropriateness and effectiveness of services, the decree also emphasizes the strong importance of social and health integration and opens towards the progressive post-discharge care.
- Legislative Decree n.56/00, it reinforces federalist development of the health protection system.
- Prime Ministerial Decree (**D.P.C.M**) 29th November 2001, services within the essential levels of assistance (**LEA**) are defined; these represent the services that the SSN is required to provide to all citizens, free of charge or upon payment of a participation fee (ticket), with public resources collected through general taxation (taxes).

Through the 2000s regions pursued three different lineages.

“Quasi Mercato” models by means of the law 31/2007 defined free choice, without programming constraints, of the provider by the citizen: it determined the separation between the persons providing hospitalization and specialist outpatient services and the persons guaranteeing the health of their citizens and purchasers of the same services (ASL). Another important point of the model is represented by the attribution of equal rights and obligations between accredited providers of public and private law, and the company management for the recovery of effectiveness and efficiency of public health organizations.

The models of “Pianificazione regionale centralizzata” involve three regions such as Tuscany, Marche and Emilia Romagna among which competition between public and private structures is not encouraged; the organizational and management rules are determined by the region and the balance of the budget is not impartial as the health objectives are privileged. The last lineage instead is characterized by the late responders.

As already mentioned, the fundamental principles and commitments underlying the SSN provide homogeneously for the insurance of essential *levels of assistance* (LEA) to the population without any distinction on the basis of individual, social and economic status. Citizens, provided that they do not belong to exempt categories, are required to pay a variable ticket, as part of the health expenditure, which varies for each individual service foreseen by the LEA.

Individual citizens are granted:

- right of freedom to choose the place where treated,

- right to be informed about illness and therapy and to consequently oppose,
- right of the patient to be taken care of by the doctor or health team throughout the therapeutic process and right to privacy.

Health planning must put the protection of the citizens' health before all choices, compatibly with the available economic resources. The responsibility of protection is shared by state and regions; indeed, the state determines the LEA guaranteed throughout the national territory, and the regions plan and manage autonomously the health within the territorial scope of their competence; indeed, collaboration among state, regions, companies and municipalities is crucial to ensure a homogeneous service and levels of health care acceptable and adequate for all citizens. Within this structure, the professionalism of doctors and nurses, not only in a technical sense, but also as an ability to interact with patients and relate with colleagues in the teamwork, is crucial for the quality and appropriateness of the performances. Lastly, it is the duty of the national system to integrate health and social care when necessary.

The Prime Ministerial Decree (D.P.C.M) of 2001 is replaced in its entirety by the D.P.C.M. of 12 January 2017 which update the LEA and concisely defines:

- the activities, services and performances with greater detail and precision
- the updated lists of rare diseases and chronic and disabling diseases
- the nomenclators of the specialist outpatient and prosthetic care introducing technologically advanced performances in order to thereby excluding obsolescent ones
- the obligation on the prescribing doctor to report the diagnosis or the diagnostic suspicion

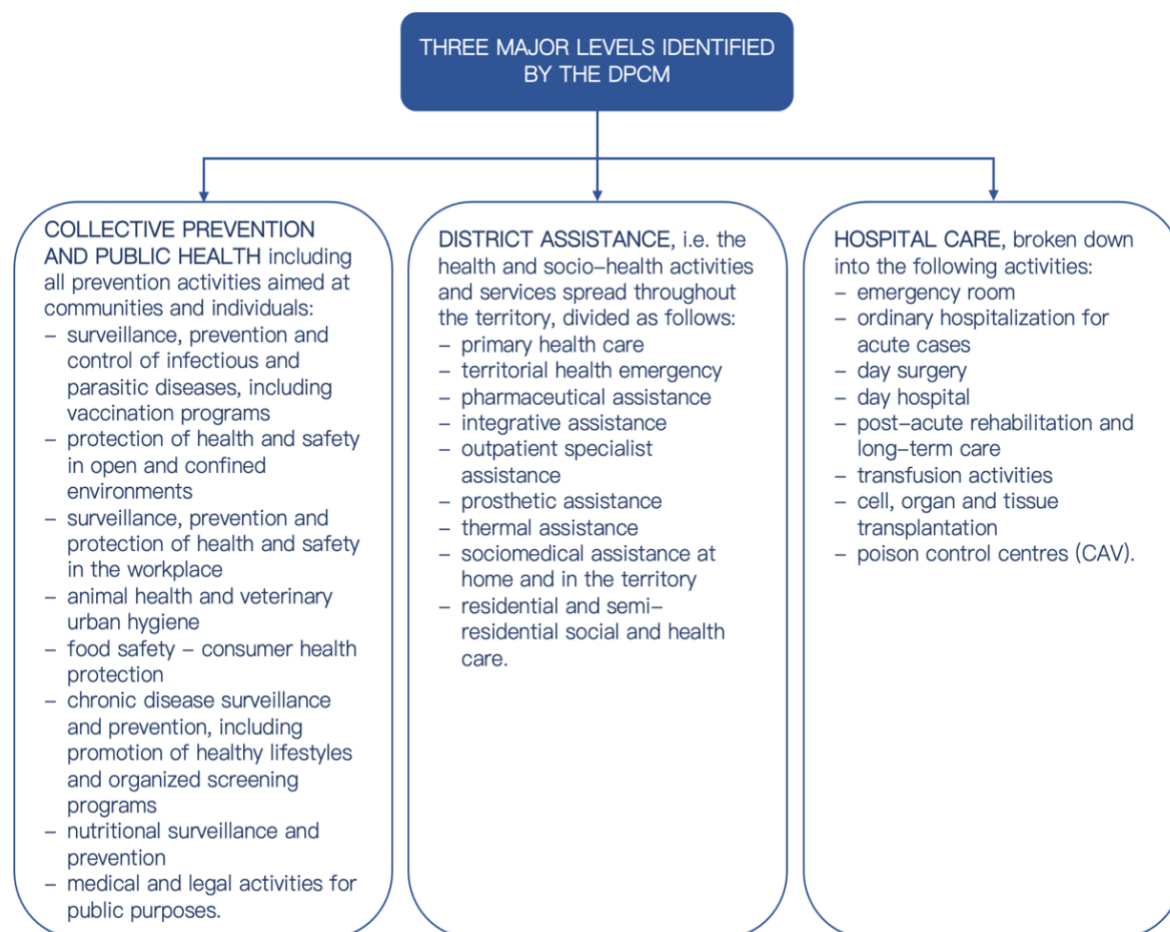


Figure 1- schema of the three major levels identified by the DPCM

A greater attention was given to **clinical appropriateness**, which refers to the efficacy and safety criteria implying that the choice made by the healthcare professional brings benefits to the patient, creating the least number of adverse effects.

The updated LEA includes specific conditions, in particular “conditions of feasibility” have been identified for a number of performances, while “indications of prescriptive appropriateness” have been identified for others.

The conditions of feasibility specifically define the clinical or personal conditions of the recipient for the particular purpose of the service; these can be provided by SSN only in cases where they exist, with an obligation for the prescribing doctor to indicate the note number and the clinical or diagnostic question on the prescription.

The indications of prescriptive appropriateness define specific conditions which refers to the clinical or personal status of the recipient for the particular purpose of the service and these can be provided by the SSN following an autonomous and responsible assessment of the prescribing doctor about their usefulness in the individual clinical case, without prejudice to the obligation to report on the prescription only the clinical question or diagnostic suspicion.

In order to keep the LEA constantly updated, a national commission has been set up with the aim to examine the different requests from the actors involved in the health system. These requests relate to: the integration of new performances and/or services as well as exclusion or modification of those already included in the LEA (e.g. introduction/alteration of conditions of feasibility or transfer of benefits from one care setting to another) and lastly new exemption for pathology or modification of benefits payable in exemption.

The achievements of LEA by all regions were strictly monitored through the employment of a LEA grid: a system of indicators developed on the basis of the data contained in the new health information system (NSIS). Lately, in 2019, the monitoring system has been updated switching to a new warranty system (NSG), a system of description, evaluation, monitoring and verification of health activity in all regions.

1.2 The social-health system

The national health system has the duty to respond to all the needs of citizens by effectively integrating the social-health system when the citizen requires health care and, at the same time, social protection. As a matter of fact, social-health system represents one of the elements grouped in LEA.

Social-health care includes the services necessary to meet the citizens' health needs, even in the long term, to stabilize the clinical framework, to ensure continuity between treatment and rehabilitation activities, to limit functional decline and improve the quality of life of the person associating health care services with support and social protection actions. For the achievement of these objectives, specific care pathways are defined, and these provide health benefits, provided by health professionals and health care workers for the treatment and rehabilitation of pathological conditions, and social welfare benefits to help people with problems of disability, economic distress or marginalization affecting their health. Among the latter, help in personal and environmental hygiene, in the management of the house, in the preparation of meals, etc.

The already mentioned D.P.C.M. of 12 January 2017, with the aim to update the LEA, defines the categories of citizens covered by the social-health assistance, but it also describes the areas of activity and welfare schemes (domicile, residence, day centre) in which health care performances are provided such as medical, nursing, psychological, rehabilitation performance and more, integrated with social benefits. The categories of citizens considered refer to:

- chronic non-self-dependent patients (including dementias)
- sick people at the end of their life
- people with mental disorders
- children with psychiatric and neurodevelopmental disorders
- people with pathological addictions
- people with disabilities (Mistero della Salute, 2019)

Depending on the specific condition of the person, the severity and modifiability of his/her condition, the severity of the symptoms and other factors contributing to the clinical picture, the benefits can be provided in an intensive or extensive way or aim at simply maintaining the state of health of the person and his functional abilities. Nevertheless, in Italy the LEA are far from their full and homogeneous application. There is also no convergence between the political and the institutional aspect about what criteria should be used for the screening of this condition of unevenness; a condition that also prevents a clear quantification of the need. As an example, data on the estimation of the number of elderly people who are in a state of reduced or absence of autonomy are not accurate.

One of the criticalities in the current context is that it is difficult to estimate: the demand for services and the volume of interventions that the system should ensure in the different settings and in the different levels of clinical and care intensity; the level of system costs and the necessary investments. For these reasons, it seems more than ever necessary the presence of multidimensional assessment tools (valutazione multidimensionale or **VMD**) validated and shared between the Italian regions and consistent with the need identified and endorsed by LEA. The multidimensional assessment is a useful and indispensable procedure for identifying the needs of each patient and family unit in order to facilitate the most appropriate approach to care. It includes clinical, psychological, socio-familial, nutritional and possibly spiritual dimensions (art. 30, DPCM 12 January 2017). Once uniformly accepted in the different regional programming models, these tools can be core in order to enable efficiency and equity in the response to needs and in the proportionality of the provision of services; it will also enable to stratify the populations in conditions of reduced autonomy according to the severity of the risk allowing to identify and plan the real needs of the different levels of prevention, support and care.

Unfortunately, all the international analyses, from the World Health Organization (WHO) and the Organization for Economic Co-operation and Development (OECD), recall how Italy discounts a serious delay in the development of supply units and long-term care services in all areas in which it is articulated: home, semi-residential and residential interventions. This delay is due to chronic lack of investments in local and non-hospital care which is still dramatic in some regions. Synthetically, the system of social and social-health housing is structurally under-dimensioned and underfunded, leading to the consequent insufficiency of supply in relation to demand.

Data recorded in 2015, proposed to the Ministry of Health by the OECD (OECD Health Statistics), show that the number of beds in proportion to the number of people over the age of 65 is significantly disappointing (Italy 1,9) especially if compared to the results coming from other European countries: Netherlands 7,9, Switzerland 6,4, Germany 5,4, France 5, Austria 4,6, Spain 4,4 and Greece 1,8. Among these countries Italy ranks second to last, far from the standards of the countries with which it should deal; hence this makes unrealistic and not truthful the amplified image that media is giving about an alleged excess of residential facilities for the elderly and for people with disabilities. Our country is lagging behind in developing its own system of long-term care for the elderly, especially those who are not self-sufficient. Home care and residential care are the two methods used, both with serious limitations and inadequacies.

The main manifestation of lack of interest on the part of politics does not lie in the well-known, and increasingly acute, underfunding of personal services. This is the most visible symptom, while the deepest lies in the frequent failure to seek better responses to the needs of the elderly and their families. In fact, not only is this issue not among the priorities of most politicians, but also, above all, those who have administrative responsibilities show, for the most part, weak planning in this regard (Fondazione Cenci Galligani, 2018).

2. Elderly care needs: request for assistance

Over time the average age of people has increased and the percentage of the population above retirement age has risen. In Italy nearly 14 million elderly people over 65 years of age, and of these, half (7 million) are over 75. This factor makes Italy has the oldest population in Europe with 22.8% of the total over 65 years old compared to the EU average of 20.3% (Eurostat, 2019), a figure 3 percentage points higher than the corresponding share a decade earlier.

Increased life expectancy will lead to an increase of the proportion of people over the age of 65 leading to an enhanced incidence of chronic-degenerative diseases. The direct consequence is reflected in a higher demand for health and social care with a stronger impact on health spending (Lopreite et al., 2017) as people over 65 use more health services than those under 65 (Michael D. Hurd, 2017). The consequences of population aging vary depending on whether the phenomenon depends on an increased life expectancy, decreased fertility, or increase of births. The elderly population presents many opportunities, but it also constitutes an ongoing challenge to the healthcare public health; indeed, studies have shown that the Italian health expenditure reacts more to population aging compared with life expectancy and per capita GDP (Lopreite and Mauro, 2017).

As a result, a far more serious problem arises: the cost of further medical care and in particular of long-term care, which is extremely expensive though it is precisely the sector most impacted by elderly population with disabilities (Vandersteegen et al. 2015). Formal care system is facing several challenges, and this has contributed to make the vast number of unpaid carers account for a large part of the provided care.

Caring for the elderly in Italy will always cost more. The general accounting office of the state estimates that, in the forecast of the national base scenario, spending on long-term care will rise from 1.9% of GDP in 2015 to 3.2% of GDP in 2060. ISTAT estimates that in 2013, approximately 2.5 million seniors were afflicted with functional limitations, furthermore in 2050 it is predicted that the elderly in Italy will be 21,775,809, reaching the 34.3% of the population (ISTAT, 2018).

It is worth mentioning that the old age is not a homogeneous category. As mentioned in the previous chapter, an important contribution to the definition of the VMD (multidimensional assessments) tools could be given by the identification of specific advanced methods; these should be established in order to read analytically, but also in their continuous way, the directions in which the needs of the elderly develop over time. The VMD of the elderly is an activity that requires adequate time and organization and through which particularly frail individuals and/or those at risk of frailty are identified among the elderly population. The problems of each person assessed are identified, described and explained: their functional capacities are identified, the need for care services is established, a care plan is set up in which the different interventions are commensurate with the real needs through the preparation of an individualized socio-health intervention plan (Nicolussi A., 2019).

Needs range from the simplest, but widespread, need for sociality, recognition and integration of the phase of life that follows the exit from the world of work, which today comes later than in the past, until the complex action of existential redesign, personal and family reorganization that accompanies the gradual and progressive appearance of functional limitations (Richardson et al, 1999). The intervention models must therefore be able to meet both intangible needs related to existential meaning, such as desires, expectations and fears, and objective physical needs, even of high complexity in the most advanced ages.

However, the elderly must come to terms not only with the deepest needs characterizing individuals in this new phase of life's maturity. **Frailty** is a state of increased physiological vulnerability related to aging and due to a reduced ability of the body to cope with stressful situations. Frailty in the elderly is a syndrome with a high risk of unfavorable clinical outcomes that affects a significant deterioration in the quality of life and is an important factor in disability and adverse events; it is a complex condition that goes beyond the concepts of senescence and disease (Gruppo di lavoro ISS Bioetica COVID-19, 2021). The definition of frailty applies to those individuals who are affected by multiple chronic diseases and often suffer from more or less disabling disabilities.

Indeed, aging is a key risk factor leading to the onset of chronic diseases and disabilities with increasing probability as years go by (Fehlmann T et al., 2020).

The most common diseases of old age are those affecting the musculoskeletal system, the cardiovascular system, the respiratory tract and the nervous system. In addition to these, metabolic diseases and neurological diseases which are also often due to a malfunction of the body caused by

cellular aging (Valdes AM et al., 2013). Finally, most cancers in Italy concern patients over 65 years of age and mostly affect the urogenital and digestive organs.

ISTAT took a *snapshot* of the state of health of the elderly in 2019, a moment before multi-morbidity - which refers to the simultaneous presence of multiple diseases typical of the third age - transformed the elderly into the main victims of Covid-19: in terms of hospitalizations, suffering and mortality.

According to data, about 7 million people over age 65, more than one in two, suffer from at least three chronic conditions. And once in 5 it is a heart disease. In 2019, the most prevalent serious chronic diseases among all seniors are heart disease (19.3%, almost one in 5), and the figure is stable when evaluated compared to 2015. Also compared to 2015, especially among men, on the other hand, chronic respiratory diseases (chronic bronchitis, bpcO or chronic obstructive pulmonary disease, emphysema) decrease, but cancer cases increase (+1.9%).

If we consider the over 75s, compared to 2015 in 2019 there is a decrease in multi-morbidity, in fact a reduction of just over two percentage points is observed: from 54.3% in 2015 to 52.0% in 2019. Among the over 85 are two out of three those with three or more diseases, with a higher percentage among women: 69% compared to 60% of men.

In a list of 22 diseases - so many are those considered by the study of the Institute of Statistics - the most common diseases for both sexes are:

- arthrosis (47.6%),
- hypertension (47%),
- lumbar (31.5%) and cervical (28.7%) pathology,
- hyperlipidemia (24.7%),
- heart disease (19.3%)
- diabetes (16.8%).

For men: bladder control problems (12%). For women: depression (15%), allergies (14.1%), and urinary incontinence (13.7%).

Again, according to the ISTAT study, 43.2% of Italians over 65 suffer from at least one serious pathology:

- stroke
- cancer
- Alzheimer's

- dementia
- heart disease, including heart attack or angina
- diabetes
- parkinsonism
- chronic respiratory diseases:
 - chronic bronchitis
 - chronic obstructive pulmonary disease or COPD
 - emphysema.

The percentage drops to 17% if there are at least two serious chronic diseases. Among 75-84-year-olds, 48.1% (52.4% among men and 44.8% among women) have at least one serious chronic disease, while the percentage of those with at least two serious chronic diseases is 19.4% (22% among men and 17.4% among women).

Among the over 85s, one-third say they are affected by at least two serious chronic diseases (34.1% among men and 29.1% among women). In 2019, one in 10 seniors has a severe reduction in autonomy, and among those over 85, 37.2%.

Many diseases of the elderly are associated or aggravated by lifestyle and can therefore be countered by preventive measures: a healthy lifestyle, proper nutrition and physical activity are the basis for prevention, but an equally significant factor is being able to carry out normal daily activities and not isolating oneself. It is key to not let common diseases of elderly compromise social life and everyday life. As long as the functional status is good, older adults should not isolate themselves. It is important to maintain a routine even when serious symptoms and illnesses are detected; this represents the main challenge in elderly care assistance services. For these reasons, caregivers literally play an indispensable role in the society, but despite their valuable contribution they often operate in inappropriate conditions of social support (Ng R. et al., 2021).

In Italy, the assistance to the elderly is provided according to two main services which ramify in further modalities depending on the structure and/or the individuals involved that serves as caregiver.

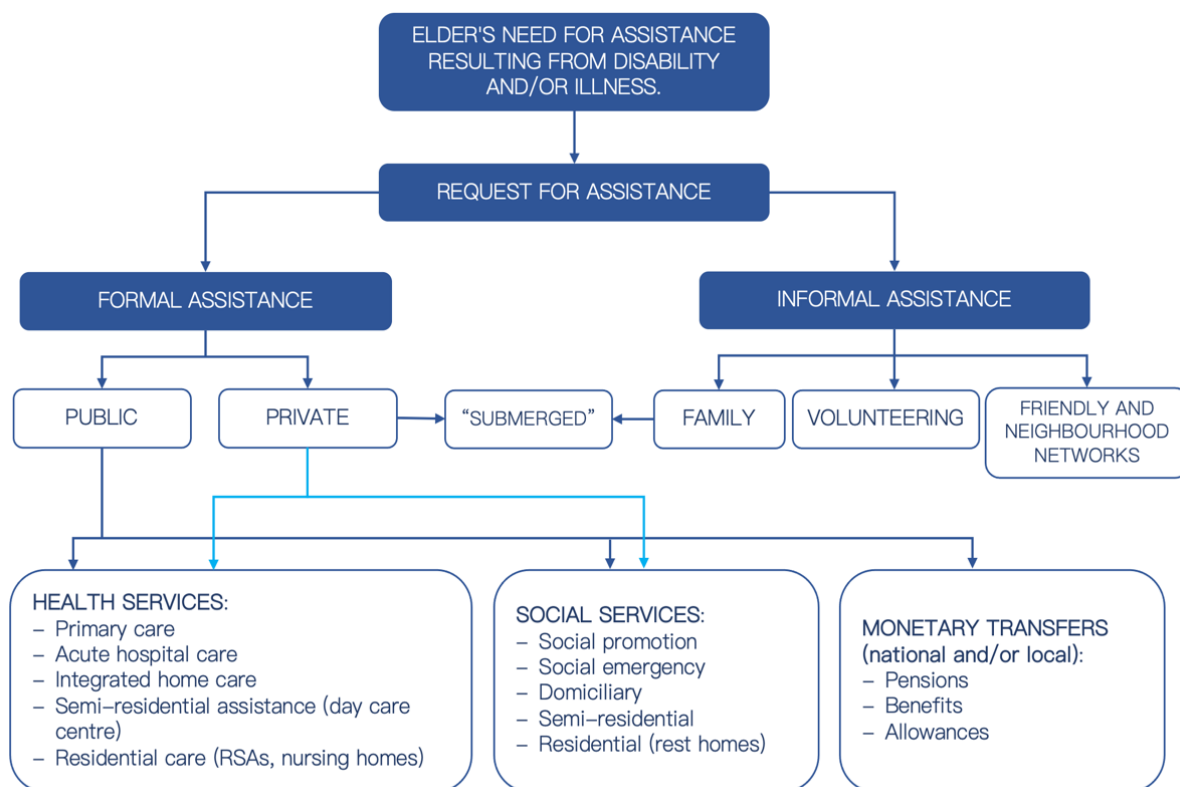


Figure 2 - elderly assistance in Italy

The term caregiver refers to all those who takes care of another individual, unable to take care for himself/herself, from a practical point of view, helping him/her to manage the disease and carry out daily activities, but also supporting him/her emotionally. According to the level of knowledge and experience in the field of elderly care, the function of the caregiver can be divided into two basic categories: the formal and informal caregiver.

2.1 Informal assistance

The field of informal assistance is defined through the role of the informal caregiver: an inexperienced caregiver who provides assistance to persons with whom he or she has a personal connection, without receiving any compensation; he/she provides constant care for his/her own loved one, despite the many and varied problems associated with caregiving.

Most of the time, the informal caregiver is a family member (usually spouse or child) or a relative, friend, who cares for a patient free of charge. The informal caregiver encounters technical, organizational and economic difficulties, as well as psychological and physical stress.

The duties and responsibilities of the caregiver may vary according to the degree of disability and self-sufficiency of the person and from the relationship to the support network around the family. In general, it can deal with transfers and mobility of the person, organization of the home environment, management of the logistical aspects of daily life, personal hygiene and nutrition as well as the administration of medical care, night care, assistance on holidays, to promote social integration, to accompany him/her to the doctor, to provide assistance in hospitals and much more. The tasks are often numerous and in facing of this commitment, the caregiver (family or informal caregiver) often does not have the necessary rest or vacation time, sick days, or time for doctor visits and preventive medical screenings, things to which a professional or formal caregiver is instead entitled.

The disease is likely to exacerbate misunderstandings, resentments and conflicts resulting into family relationships put to the test where the feeling of mutual recognition risks faltering. For this reason, the family/caregiver experiences feelings of guilt, but also difficulty in delegating and trusting. The caregiver therefore needs support, information, confrontation and dialogue in order to contain the disorienting effects of the disease and not to break the thread of meaning that motivates and sustains him/her in his/her care (Camak D.J., 2015).

Indeed, the caregiver burden can hinder the health outcomes of older adults involved and in the performance of the caregiver too, for this reason it is crucial to reduce this sense of burden which can easily result in psychiatric and physical illness (Shiba K. et al., 2016). In order to achieve this reduction, the increase of informal social support for caregivers is key, notwithstanding the availability of formal one (Cuijipers P., 2005). The main risk factors leading to caregivers' burden encompass female sex, a low level of education, residence with the individual receiving assistance, a high amount of time spent caregiving, isolation, depression, stress due to financial reasons and shortage of choice in being a

caregiver (Adelman R. et al., 2014). One last significant risk factor has risen in recent years, and it is contributing to enhance subjective burden with depressive symptoms: covid-19 (Rajovic T. et al., 2021)

The activity of care in favor of the family member for society has an economic value, which represent a further reason to provide social support to informal assistance; if this were to fail, in fact, the state would have to deal with the high costs of maintenance in a specialized structure or for hospitalization. For all these reasons, the family caregivers or informal, including through the many associations in Italy, ask the institutions for formal recognition of their rights through a national law that guarantees to be able to demand them (ISSalute, 2021).

Istat 2011 data estimate that in Italy there are 14 million informal caregivers, or 26.8% of the population, generating a total of 3 billion hours of help per year (ISTAT, 2011). A study of the United States estimates the value of caregiving to be around \$196 billion in 1997, which is far greater than the cost of home health care by formal caregiving (\$115 billion). According to a study conducted in 2015, the cost of informal caregiving in the United States is \$522 billion annually (Rand Corporation, 2015).

A study, conducted in 2012 in Italy, on social costs in oncology estimated that the savings to the National Health Service due to the "work" of care and surveillance of informal caregivers is about 19,400 euros/year per caregiver (Nicolis F., 2018).

On the basis of these data, it is obvious to assume that, if the costs incurred for formal and informal caregivers were added to the classic costs of health care, private health spending would have an exponential growth. What is certain is that the domestic assistance sector in its broadest sense (domestic helpers, domestic workers, caregivers) is among the few that have not experienced a contraction in Italy during the years of the crisis (DiMaria F., 2020).

As in the rest of the world, the main family or informal caregivers in Italy are women (up to 75% of the total), and among them mostly foreigners, between 45 and 64 years of age, who often work or have had to give up their jobs to devote themselves full-time to caring for those who are no longer independent (60% of cases).

The domestic and care work absorbs more than 800,000 workers. The census is complex and inevitably approximate by default, also given that the widely applied rule is that of undeclared work. In the care of the elderly, that is, the area that comes closest to the sphere of social-health assistance that the State is not able to provide, a recent survey revealed 500,000 caregivers who assist a quota of elderly who are partially or totally non-self-sufficient that exceeds one million (DiMaria F., 2020).

2.2 Formal assistance

The formal caregiver, i.e., professionals, paraprofessionals, or volunteers associated with an organization, who provide care in the home, community, or health care facilities, usually for financial compensation (not in the case of volunteers).

The principal embodiment of formal assistance is represented by the health care professional (Operatore Socio Sanitario or Oss). The health care professional is a figure of support to nurses according to assignment of task and according to delegation carrying out a long series of activities to ensure basic care such as: helping totally or partially dependent patients in activities of daily living, personal hygiene and small dressings, prevention of pressure ulcers, help for the correct intake of prescribed medications, detection of vital parameters, implementation of simple activities of diagnostic and therapeutic support, observation and collaboration to the detection of needs, transport of biological material, implementation of first aid interventions, dealing with bureaucratic practices. In addition, the social worker also deals with the activities of sterilization and sanitization. He/she carries out these tasks together with other figures, autonomously or on medical/nursing attribution, professional educator, physiotherapist or midwife attribution.

Formal caregivers, as well as informal ones, become also great experts on the "patient" for the purpose of setting any therapeutic path; in the absence of possible therapeutic paths and even in the advanced phase of the disease, he/she is a mediator of communication between the patient and the outside world, beyond the possibilities of verbal language. The caregiver itself is a therapeutic resource, often underutilized in the continuous confrontation with the operators. The caregiver is also able to influence the patient's acceptance of the disease and the adherence to prescriptions; furthermore, the operators in this role come into close contact with the patient to the point of impacting the patient's emotional state and therefore his psychological and behavioural reactions.

The bond that is created is strong leading the patient/elder to pour deep trust into the caregiver.

In essence, the social health professional is one of the operational pivots of the health care residences (Residenza Sanitaria Assistenziale or RSA), because it operates, cooperates and collaborates with a variety of colleagues to provide multiple services to the elderly assisted. They are a hinge between the universe of patients and the world of doctors and nurses: the initial reference point for the former, the strongest material support for the latter.

It should be kept in mind, however, that the Health Worker, not being a graduate and having specific characteristics of auxiliary care, has no decision-making power over functions that do not belong to him

and follows the instructions and prescriptions of the nurse or other health professions (e.g.: midwife, physiotherapist etc..) or technical health (e.g.: radiology technician), assuming support tasks.

Formal assistance for elderly is further divided into private and public assistance. They both articulate in health services and social services. The former include:

- primary care: the coordinated and integrated complex of services and health and social services, provided in care contexts as close as possible to the places where the patient and his/her family live (territory), aimed at the global protection of health in terms of promotion and prevention as well as the treatment of the most common diseases, chronic and otherwise, through appropriate mechanisms to ensure continuity of care.
- acute hospital care: it includes emergency room services, ordinary hospitalization, day hospital (medical examinations in one day) and day surgery (surgical operations in one day), long-term care and rehabilitation.
- integrated home care: ADI (Assistenza Domiciliare Integrata) consists of a set of medical, nursing and rehabilitation treatments integrated with social-assistance services (personal hygiene, personal care, meal assistance); the service is provided free of charge at the patient's home, financed by the National Health Service.
- semi-residential assistance (day care centre): an intermediate service, supplementary to any home care interventions, which ensures the realization of daytime activities for the non-self-sufficient elderly, with functions of a psycho-socio-assistance nature, maintenance of the person's potential and socio-relational autonomy.
- residential care (RSAs – Residenze Sanitarie Assistenziali –, nursing homes, rehabilitation): all healthcare facilities are designed to accommodate categories of people who are at risk, frail, or in need of ongoing assistance to manage their daily activities; the final objective is to improve the patients' quality of life.

Social services instead are defined by the following:

- social promotion: recognized and unrecognized associations, movements, and other social aggregations established in order to carry out activities of social utility in favor of associates or third parties, not for profit
- social emergency: services operated when life situations involve an unavoidable need related to the satisfaction of basic rights, subsistence and relationships; those situations that, due to traumatic or calamitous events, require first aid.

- domiciliary: home care service provided ensuring that the patient can continue to live among their memories and affections, without being deprived of a service of care necessary for their health condition.
- semi-residential: as an alternative solution to hospitalization, semi-residential structures aim to promote the recovery or maintenance of the residual psychophysical abilities of the patient, in order to allow him/her to stay at home and, at the same time, offering an important support to the family unit.
- residential (rest homes etc...): care activity aimed at non-self-sufficient or partially non-self-sufficient citizens and carried out in residential structures with different levels of specialization. The rest home for example can be likened rather to a residence or vacation home for the elderly, where social relations are encouraged through the organization of recreational activities, with the aim of keeping company to people who are alone or who can no longer be cared for by their loved ones.

Formal public assistance also includes monetary transfers such as pensions, benefits and allowances. Monetary transfers characterize more traditional, typically social welfare systems. Social transfers represent an instrument of public policy, having a unilateral character and provided by the State, consisting of a transfer of goods and services in cash or in kind to the beneficiary citizens. In a simplified manner, cash social transfers are income transfers, while those in kind can be defined as public spending that translates into the provision of services of various types. Pursue the economic and social objective of intervening in the redistribution of income, resources and wealth in general by producing variations in disposable monetary income, pursuing the principle of social equity and economic development.

2.3 Residential assistance

2.3.1 Health Care Residences (RSA)

It is worth clarifying that in Italy it is no single definition of Health Care Residence (Residenza Sanitarie Assistenziali or RSA). It can be defined as a residential socio-sanitary structure dedicated to non-self-sufficient elderly people, but also to disabled adults, who need full-time medical, nursing and rehabilitative assistance. In these facilities is guaranteed the presence of a doctor 24 hours a day and continuous support for the performance of daily activities, such as nutrition and personal hygiene. In the absence of a single definition and as a result of the heterogeneous regional regulations, a plurality of

diversified residential structures has been improperly defined RSA: from houses or welcome communities with 8-10 beds in residential structures for self-sufficient or partially dependent people who have very different organizational and management characteristics.

Speaking more generally of residential facilities, in Italy there are approximately 13,000 social and welfare facilities with just over 382,000 beds. 293,000 places are of the sociomedical type, 81% of which are dedicated to elderly people with different degrees of autonomy (ISTAT, 2018). Those defined as RSAs in the various regions are only a minority and with non-homogeneous operational attributions. Other residential facilities are more often defined as rest homes or sheltered facilities, and many regions provide for a distinction in the eligibility of the elderly for different levels of autonomy. The picture is more confused due to the diffusion of management bodies with reduced qualifications in many regions of Italy, especially in the areas of poorly defined social structures (for example, the so-called family homes). Confusion is high, and questionable offerings can be confused with individual examples of high human and professional quality. In this perspective, the 2017 LEAs (Livelli Essenziali di Assistenza), discussed in the first chapter, are not completely helpful as categorizations often lack clarity (services for people with disabilities, non-self-sufficient disabilities, or with addictions or mental disorders) and it is not rare to see how the same patient, all things being equal, can easily belong to different categories. Furthermore, Italy lacks a univocal definition of non-self-sufficiency.

In any case, the LEAs describe only healthcare or social-healthcare services; the lack of social LEAs does not favor the quality of social services and creates strong barriers to effective integration between the two sectors.

Several categories of dependent residents can be identified: the elderly, people with disabilities (both physical and mental), and people with terminal illnesses. The further distinction between the self-sufficient and the non-self-sufficient elderly is of great importance for the organization of social-health assistance, which should always be modulated in relation to the person's needs.

In general, family homes, assisted social residences and day care centers appear as places more suited to the self-sufficient elderly, while RSAs and protected homes are more suitable for the non-self-sufficient elderly (article 1, paragraph 7, of legislative decree 30 December 1992, nr. 502). However, many nursing homes today accommodate people with dementia. Another important fact concerns the presence of a conspicuous number of self-sufficient people housed in RSAs; these are elderly people

whose fragility is primarily social, relational or economic, and for whom it would be reasonable and desirable to propose home-based solutions (Gruppo di lavoro ISS Bioetica COVID-19, 2021).

Referring to data coming from the Lombardy region only, for the sake of simplicity, 93% of the inpatients of the approximately 60,000 RSA beds belong to the typical non-self-sufficient population, while 5% are received in the special Alzheimer's Units and 2% in other subgroups (vegetative states, advanced ALS) (Marchesi V. Regione Lombardia, dati da Scheda struttura, 2014).

In 2013, the regional Italian Society of Gerontology and Geriatrics (SIGG) conducted a specific analysis together with the Lombardy Region, using the RAI LTCF system, one of the standards of multidimensional assessment (where RAI stands for Resident Assessment Instrument, VAOR in Italy, and LTCF stands for Long Term Care facility). 3,772 inpatients from 74 RSAs were evaluated: the average age of the inpatients was 85 years, but more than a quarter of them exceeded 90 years, with 44 being over 100 years old; 81% were totally dependent in activities of daily living and just under 60% had high levels of cognitive impairment (Brizioli E., 2013). The VAOR system makes it possible to associate the results of the multidimensional assessment with an estimate of the time of care needed (Brizioli E., 2013). According to this analysis, the populations receiving care would require an average of 1,240 minutes of care per week, compared with about 1,100 average minutes provided by Lombardy's RSAs, and well above the 901 minutes defined by regulations as the minimum standard. With this time, Lombardy's RSAs could at best manage the simplest populations, which, however, represent about 1/3 of the resident population. Paradoxically it means that, at present, the regulatory framework does not provide the human and economic resources necessary to deal with the prevalent population.

Another detail also emerges: the 1,240 minutes per week of care intensity derived from the coexistence of two subgroups of the population, one with low care intensity (672 minutes) and a more substantial subgroup with higher intensity (1,412). In other words, the populations that require less care seem to represent the "reservoir" of time that makes it possible to deal with the more challenging ones (Brizioli E., 2013).

The percentage of the population living in RSAs increases dramatically with age: for example, it is about 1% for those aged 65 to 74, 6% for those aged 75 to 84, and 24% for those aged 85 or older (Mangano M., 2012); about 4.1% in 2010 (3.6% in 2009) are the elderly followed with integrated home care. Italy is far from the European averages (of the north-western countries) of 5% of inpatients and 7% of those assisted at home (Brizioli E., 2013).

	SAN PIETRO	DON MEANI	SAN FRANCESCO	SAN GIUSEPPE	AIROLDI E MUZZI	BRESCIA SOLIDALE	
						ARICI SEGA	VILLA ELISA
Average age	84,3	88	86	87,2	84	83,05	83,83
Average stay (days)	1.097	953	1.581	1.022	1.104	378,45	604,91

Table 1 - data as of 31/12/2019 on Lombardy region RSAs population (Crippa A. et al., 2021)

According to a study conducted by the Italian Family Physicians Federation in Verona (FIMMG), in 2020, nursing home patients counts:

- 53% admitted with more than 5 illnesses including serious ones,
- 9% with cancer in a severe phase,
- 73% have mental problems or *dementia*,
- 36% have nutrition problems with dysphagia,
- 20% suffer from bedsores
- only 16% can walk independently,
- 47% must be lifted with a lift and 7% cannot be moved from bed,
- 20% have a bladder catheter (Salvalaggio E., 2020)

There is no official estimate of how many non-self-sufficient people there are in Italy. Nevertheless, it is evident that the progressive and inexorable aging of the population, recalling that Italy is characterized by a life expectancy among the highest in Europe, will cause the phenomenon of non-self-sufficiency to grow considerably in the coming years.

Loss of self-sufficiency is a dynamic process that occurs with the appearance or worsening of various organic and functional pathologies. This should be addressed primarily by attempting to meet the person's new needs in the place where he/she resides; it is crucial not to underestimate the fact that institutionalization constitutes the severing of ties with one's home, family and friendship environment, and this represents an important risk factor for the general decline of the elderly person. In addition, it is always essential to work to promote the reverse path, that is, the recovery of autonomy and self-sufficiency, wherever possible.

The RSAs provide an answer to those who suffer from particular pathologies, thanks to programs that are not only assistance, but also care and relief dedicated to all those “elderly who cannot be assisted

at home, or in outpatient polyclinics and day hospitals", as stated in art. 20 of Law no. 67 of March 11, 1988.

Precisely for this reason, the main pathologies of the elderly managed in these facilities are really many: diabetes, neoplasms, heart disease and arterial hypertension, but also osteo-articular problems, respiratory, diseases related to the digestive system and chronic hepato-biliary problems, up to serious cases of Parkinson's disease and Alzheimer's, which is generically referred to as dementia, even severe ones. In this regard, the national surveillance systems PASSI (dedicated to the population aged 18-69 years) and PASSI d'Argento (dedicated to the population aged 65 years and over), coordinated by the ISS (Superior Institute of Health), in collaboration with the Regions, and conducted on the territory by the Prevention Departments of the Local Health Authorities (ASL), have produced an analysis of the data on chronic pathologies reported in the resident population in Italy. From the data emerges a dimension of chronicity and polychronicity that reaches important numbers with advancing age. After the age of 65 and before 75, more than half of people live with one or more chronic diseases and this share increases with age until it affects a total of three quarters of the over 85, half of whom are affected by two or more chronic diseases (Masocco M. et al., 2020).

Summarizing, Italian population is characterized by a long-life expectancy, but with a significant proportion of elderly people with chronic pathologies and polychronicity increasing their vulnerability to adverse health events. Pathologies are associated with a decline in aspects of life such as autonomy, mobility, functional capacity and relational life with a consequent increase in psychological stress, hospitalizations, use of resources (health, social, welfare) and mortality.

In RSA, the goals of care in chronically ill patients, since they cannot be aimed at recovery, are aimed at improving the clinical picture and functional status, minimizing symptoms, preventing disability, and improving quality of life. In order to achieve these objectives, it is necessary a proper management of the patient and the definition of care pathways that are able to take care of the patient in the long term, prevent and contain disability, ensure continuity of care and integration of social and health interventions (Piano Nazionale della Cronicità).

At the time of the patient's admission in the RSA, the PAI is filled out, i.e., the "individual care plan" (Piano Assistenziale Individuale) that makes it possible to draw up a daily medical and residential care routine made up of personalized programs. In many RSAs a great attention is given to a very special and carefree care: entertainment. Indeed, every day, within the walls of the facilities, the goal is to ensure expressive workshops, art workshops, outdoor activities (such as soft gymnastics in the garden, walks

in the park), mnemonic and cognitive games, outdoor educational workshops and trips, assisted by a specialized team and medical, nursing and residential assistance (Bolcato M. et al., 2021).

The RSA must act as an active subject of the network in the care process to guarantee the continuity of care, activating all those forms of service that allow on the one hand the territory to achieve the ambitious goal of keeping the elderly person at home as long as possible and, on the other hand, the structure to ensure the overall economic balance. Today it is necessary that RSAs really know how to put the elderly at the center of the project of assistance and care, that they design themselves more and more as a "home", as an environment that surrounds and makes the patients feel involved and active. RSAs must be "humanized" and not just highly "medicalized" and "sanitized".

Of course, the quality of RSA comes deeply from the professionalism and competence of the professional staff. Knowing how to enhance the individual skills of the staff and how to prepare them adequately is one of the main objectives of any facility providing assistance to the elderly; this in turn has a direct impact on the quality of the activities provided. The relational and personalized nature of the services gives a central role to the operators, who are materially and directly in contact with the recipients of these services.

2.3.2 Primary stakeholders involved

In RSAs it is fundamental to develop a multidisciplinary team that is able to guarantee a comprehensive care of the frail elderly person, given the complexity of their bio-psycho-social needs, establishing a professional case mix tailored to the person and aimed at integral care. According to the national legislation, the RSA must offer:

- a residential accommodation with a domestic footprint, while stimulating socialization among guests
- all medical, nursing and rehabilitative interventions necessary to prevent and treat chronic diseases and their possible relapses
- individualized assistance, oriented towards the protection and improvement of levels of autonomy, the maintenance of personal interests and the promotion of well-being.

Accordingly, all the professional figures identified in an RSA embody the specific assistance needs of the guest and formulate the relative objectives, sharing and formalizing them with all the other resources through the drawing up of the PAI.

In the first place, it is possible to make a subdivision of three related professional families:

- management (general manager, operations director, health director and any other figures with roles of responsibility in the structures);
- health-care sector (nurses, OSS - health care professional - and ASA - social worker auxiliary - personnel);
- rehabilitation and educational sector (physiotherapists, educators, animators, psychologists).

The main figures are described in the following paragraph.

The *General Manager* carries out the acts necessary to guarantee the regular functioning of the residence, he/she is responsible for all administrative, managerial and executive tasks, including those relating to actions that commit the Administration to the outside world. He/she submits a report on the activities carried out and on the economic and financial situation of the foundation, formulating the proposals deemed necessary for the development of it.

The *health director* in charge is responsible for the medical care of the elderly and arranges for both health and non-health related care services necessary for the best maintenance of the living conditions of the guest and for his/her care. Geriatricians are called upon to treat a "difficult patient", for this reason they must refine their diagnostic skills in evaluating the nuances of symptoms in a patient who is often paucisymptomatic and in recognizing the chain of events. Furthermore, geriatricians must know about activities and care in the area, social services. Inside an RSA in particular they have to be familiar with the teamwork, to know how to participate in the care team without wanting to be subordinate to other figures. Together with the team, they have to know how to fight every day for small patients' gains and, most of the times, how to achieve stabilizations rather than cures. Indeed it is not possible to experience the health director as an employee or as an external professional dedicated only to viewing medical records and patients: he or she must enter into the life of the facility dealing with health care guidelines and protocols.

The *nurse* represents one of the figures who are most in contact with the elderly. Professional nurses exercise the duties proper to their professional profile, working under the directives of the attending physician. They also exercise the function of liaison between the sphere of health services and the activity of assistance to the person carried out by the auxiliary socio-medical, ensuring the verification of the proper conduct of care activities. The nurses themselves perceive the role they play as crucial to the residents' experience, as a matter of fact they provide choices, they communicate important information, they comfort and live in the daily reality of residents with cognitive impairments (Abrahamson K. et al., 2020). Nursing assistant challenges include the use of nonverbal communication, balancing personal care with maintaining boundaries, and managing perceived lack of trust.

In addition to nurses, the *operators* assigned to the assistance OSS and/or ASA assure the tasks of direct assistance to the person, in application of the directives of the medical staff and on indication of the nursing staff, as well as in base to the ordinary programs of activity (day type and organizational model) and to the PAI. The interventions of these operators in the RSA, from the moment of the reception and the insertion of the elderly person in the structure, must be finalized not only to the maintenance and to the strengthening of the abilities, when possible, even if residual, but above all to help the elderly people in making sense to their own day and their time, to favor the participation to an active life and to increase the self-esteem: all this must represent the result of an aimed educational reaction.

The *physiotherapists* of the rehabilitation in RSAs operate under direct medical indication for the development of individual programs of treatment finalized to the maintenance and, whenever it is possible, of partial recovery of the individual. The physiotherapist in most cases does not have the role of setting precise short-term goals, as in other contexts: together with the elderly, the goal is to maintain residual skills. A work that develops over time, a relational work that brings both the elderly person and the physiotherapist to pursue the objective together, every goal is the merit of both, as well as every defeat is shared.

The *professional educator* in the RSA implements specific educational and rehabilitation projects aimed at maintaining, recovering and enhancing the potential of the elderly person in its entirety. Together with other professionals is part of a team to study and identify the most appropriate strategies to meet the needs of the person. The educator also has the task of promoting the socialization and integration of guests among themselves and with other professional figures; he/she takes care of relationships with external realities and with family members, thus represents a figure of connection between the health and social part (Bolcato M. et al., 2021). All their work is directed by the relationships trying to involve a greater number of guests at the same time, but also to implement individualized interventions with those who tend to isolate themselves. In involving more guests together, depending on the cognitive, mnemonic and physical deficits, different activities are offered with the aim of maintaining, exercising and/or enhancing their residual abilities. For example: crossword puzzles, reading a book, the memory game aim at the cognitive and mnemonic aspect; painting activities, the game of bowls and cards are aimed at the manual aspect of fine motor skills, personal expression, collaboration and socialization. The organization of parties and meetings are aimed at socialization, stimulation and recovery of personal interests. Each proposed activity, as mentioned above, in addition

to having the basic relational aspect, aims more or less explicitly to the maintenance and to cognitive, social and personal stimulation.

An RSA finds its strengths in the competences of the staff, in the activities offered and the coordination between the two, nevertheless, in addition to the care and activities of the elderly, a successful RSA must have a functional governance at its core; this is ensured and supported by the general director playing the role of strategist. Pedagogue on one hand and strategist on the other, attention to human relations, to people, to the social system, to welfare, and attention to techniques, methods and the appropriate use of tools: all these represent the basic skills that must be embodied by an efficient general director (Chisholm L. et al., 2018).

The proper strategy to undertake should have at its base a proper needs analysis, attention to stakeholders and proper placement, designing services that can professionally address all types of needs of seniors. Mentioning the attention to stakeholders, with the exception of the internal organization and the coordination between the professional figures, one of the distinctive elements of the RSAs involved turns out to be the relational expression, that is to say that the RSA incorporates in the dimension of care also the *family*, a part of the personal history of the elderly person. As a matter of fact the most frequent critical issue to be addressed is conflicts with this pivotal stakeholder.

The needs and preferences of the patient's family are the factors that mostly drive the choice of a RSA rather than another, and that consequently define the success of a RSA. Families choose the facility that writes a real-life project for their loved ones, a flexible project between home and the RSA, that does not sell a generic service, but a customized one providing specialized units. For this reason, an enormous amount of work is done in order to provide a true individualization of the product-service that the RSA offers. This peculiarity differentiates RSAs from hospitals, where the objective remains anchored in the dimension of health care.

The relationship with stakeholders must be authentic, heartfelt and experienced. It must be continuous over time and not one-off, indeed it must be a relationship of exchange. It emerged how the creation of a collaborative relationship with the relative directly affects the quality of services offered (Powell C. et al., 2018). Working on the possibility of having a quota of adequately educated and trained relatives within the residential facilities would allow for a more structured involvement with dedicated moments and spaces within the life project of the elderly person, with a view to legitimizing their presence and role and not competing with the operator (Backhaus R. et al., 2020). This would greatly lighten the workload of caregivers who, especially during the Covid season, have partly blamed the lack

of family members in the management of certain routine actions, with a significant increase in time dedicated to care.

Capturing the potential of the family member and wisely exploiting it would therefore also mean balancing the political-economic component of the facilities and having gains in terms of minutes, costs and expenses per person.

It is important to notice that the elderly residences are changing as a result of the change in the type of users and the evolution of the demand for care and assistance: elderly less self-sufficient, more in need of highly specialized and advanced care, more in need of treatment and medication. It is a new subject with an average age much higher than in the past, who has high comorbidity indices, medium-high clinical instability, high degree of functional dependence, reduced motor skills and motility in general, sometimes close to zero cognitive capacity, social problems and/or related to behavior (Scott-Cawiezell J. et al., 2006).

2.3.3 The impact of Covid-19

On May 8, 2020, near the end of what has been termed the "first wave" of the SARS-CoV-2 pandemic in Europe, newspapers headlined that in France residents of dependent elderly care facilities accounted for half of the deaths counted. In Italy, as of September 13 of the same year, 85.4% of deaths with Coronavirus were recorded in people aged 70 and older (Eurostat, 2020). Indeed, in these population groups, Covid-19 causes more severe and extensive symptoms, furthermore severe interstitial pneumonias with respiratory failure are much more common. As population age, the capabilities of defense system diminish and immune responses against Covid 19 may be less effective in people of advanced age. Analyzing the data of the table below, it is possible to compare how strongly coronavirus impacted on European countries with the highest percentage of elderly population, among which Italy ranks first. From the data it appears that there is no significant correlation between the mortality rate of those infected and the proportion of elderly people, so the excess mortality of those infected does not depend, or depends minimally, on the elderly structure of the population. Nevertheless, in Italy deaths occurred mainly among the elderly.

EUROPEAN UNION COUNTRIES	TOTAL CASES	DECEASED	TOTAL CASES (10.000 ppl)	DECEASED (10.000 ppl)	LETHALITY
HIGH ELDERLY SHARE					
Italy	1.757.394	61.240	291,15	10,15	3,48
Greece	118.045	3.194	110,1	3,0	2,7
Portugal	325.071	5.041	316,3	4,9	1,6
Finland	28.242	425	51,2	0,8	1,5
Germany	1.218.524	19.932	146,8	2,4	1,6
Bulgaria	168.165	5.156	240,2	7,4	3,1
Croatia	154.852	2.298	379,9	5,6	1,5
Latvia	22.104	288	115,1	1,5	1,3
France	2.309.621	56.352	344,7	8,4	2,4

Table 2 - coronavirus infections, deaths, and lethality by European country and share of elderly (absolute values and rates per 10,000 inhabitants) - status as of December 9, 2020 (Osservatorio Nazionale sulla salute nelle regioni italiane, 2020)

Numbers are the most effective way to see a dramatic reality from above: elderly people hospitalized in social, and health residential facilities have paid a very high price to the pandemic. The pandemic has highlighted certain characteristics of the elderly patient that increase their fragility, indeed the viral infection precipitated chronic degenerative diseases already present.

The virus has represented an extreme stress testing on services for elderly bringing back to the forefront the criticality of the assistance system to the non-self-sufficient in Italy, a sector that is fundamental to the maintenance of the social system and that involves millions of citizens.

During the worrying growth of the epidemic curve, social and health institutions and their managers have challenged themselves to find emergency solutions, which guarantee continuity of care and at the same time the highest possible quality of life, fighting for the health of their guests while facing considerable economic difficulties, due to a certain latitude of public institutions, mostly concentrated on guaranteeing the functioning of the hospital service.

Not only residential services have to be mentioned. Rather, the pandemic has highlighted the weakness of the territorial system and of a healthcare system essentially oriented towards specialist and hospital medicine. In any case, after decades of little or no planning, Italy has accumulated a

considerable delay compared to other European or OECD countries. For example, there is no surplus of residential beds, historically among the lowest in Europe and with a trend towards their gradual reduction (ISTAT, 2018). And yet, if the Italian population is constantly aging, it should be natural to devote attention to the network of services that accompany citizens in their old age, but the sector was already heavily in crisis before the outbreak of the epidemic. Services are scarce throughout the country, with very wide heterogeneity between regions that do not exceed 30% of the coverage of need with their offer. Net of emotional or ideological forcing, however, it is clear that there is a need to rethink services that are dated or inconsistent with the evolution of needs.

During this critical time, the debate has taken on dramatic overtones, bringing up the issue of limiting, if not closing RSAs. Personnel management is critical, with caregivers difficult to find, also due to policies that are not always protective applied by employers or intermediaries. The lack of personnel had constituted a strong limitation in the ability of residences to cope with the pandemic; in one third (33.8%) of the facilities involved in the first monitoring of the RSAs conducted by the ISS (2020) the absence of healthcare personnel was reported as one of the main difficulties encountered. With the second wave, the lack of personnel in the residences seems to have become even more serious, as well as being further aggravated by the extraordinary plans for the hiring of personnel put in place by hospital healthcare. Alarms have been sounded several times by associations representing managers of residential facilities, who have denounced the progressive lack of nurses and social-health workers from facilities to hospitals and the growing difficulties, for this reason, in guaranteeing adequate levels of assistance. In some cases, as had already happened during the first wave, the same facilities had to resort to external intervention (such as military doctors) to guarantee the regular functioning of services and assistance (la Repubblica, 2020).

With regard to the team, two main aspects were stressed by the pandemic and whose benefits were grasped. With respect to the first, a way of working as a team was highlighted that particularly influenced the resilience of individual operators. There was an ability to break out of the rigidity of one's own function to carry out actions to support or replace other colleagues. The second aspect regards the circularity in teamwork, which meant greater confrontation and co-participation in the planning and decisions inherent in the life project. The sharing of clinical, pharmacological, behavioral and family aspects related to a guest has been found to be a valuable moment to build an effective care plan.

But some of the things which have been grasped as positive towards cooperation within the residences, speculatively translated into a series of negative aspects for the residents. No matter how

well staff rotation was managed, this was the main reason for discomfort for patients who sooner felt disoriented (Noli M., 2021).

The factor that most critically impacted the wellbeing of elderly was *isolation*. The RSAs were forced to completely close themselves off from the outside world, keeping the elderly's family members at a distance, making any kind of physical contact with them impossible and limiting to a minimum even contact with caregivers and the rest of the patients in the residences (Noli M., 2021). The more fragile the elderly are, the more stringent the isolation put in place to preserve their physical health, to the detriment of personal well-being; in fact, single room isolation and monitoring are technically simple, but have a profoundly negative effect on elderly.

In addition, recreational activities have also undergone significant cuts, as a result of compliance with enacted safety restrictions, regulations regarding spacing and staff reductions (Fosti G. et al., 2021). The former represented everyday a fundamental moment to compensate for their need for sociability and to encourage their cognitive stimulation. In short, in order to optimize resources, contact was reduced to long-distance relationships, such as video calls with relatives, but every day from that moment on was characterized by pure loneliness, except for those few minutes during which the elderly was assisted and allowed to perform a video call with relatives (Valore in RSA, 2020). If it was possible, in part, to cope with the first problem mentioned thanks to the professionalism of the health care staff, the second problem could not be remedied to alleviate the discomfort of the elderly abandoned to their loneliness, without receiving stimuli and without being able to adequately interact either with their family, other patients or with the personnel.

The concrete implementation of these measures must take into account the special bio-psycho-social fragility of the elderly, especially those suffering from major neurocognitive disorders. In this perspective, the measure of isolation is likely to be seriously detrimental to the psycho-emotional integrity of the elderly, who, after the trauma of the change of living environment (e.g.: for the new residents), must also deal with that of reclusion in solitude, with the only intermittent company of operators unrecognizable because of the protective gear worn (Fosti G. et al., 2021). It is crucial to stress that such isolation lasted not few weeks, but a whole year. For an elderly individual, resident in an RSA not for terminal illness or cancer, thus with a still significant life expectancy, the isolation experienced (according to interviewees) could be associated with kidnapping.

It seems improbable that a multi-pathological, non-self-sufficient, highly frail elderly person would have the resilience to adapt to this disruptive change, but something similar applies to cognitively unaffected elderly people to whom, however, it is not easy to explain and make understand the reasons

for such procedures. Therefore, the risk cannot be underestimated: the procedures of isolation may trigger an example of "cascade decompensation" whereby the elderly devalue, through a continuous loss of self-esteem, their present and future life course surrendering and accelerating the onset of fatal terminal events thus, paradoxically, entry into residence determines the opposite effect to the one desired (Fosti G. et al., 2021).

Elderly frailty must be seen as a dimension that can be explained not exclusively from a clinical point of view, it is instead strongly influenced by social variables. Loneliness and social isolation are conditions that can jeopardize the capacity for self-management and self-defense as well as the maintenance of functional capacities and cognitive status. Social and relational needs represent essential requirements for any individual. In the general approach to the system of protection of the rights of the elderly, these aspects must therefore be carefully considered, nevertheless during pandemic they have been neglected (Gruppo di lavoro ISS Bioetica COVID-19, 2021).

2.3.4 Financial overview

The issue of the economic sustainability of the companies that today make up the Italian LTC system appears to be, in many cases and for many operators, the most urgent to address, first and foremost to ensure the continuity of the functioning of the network of services (Mangano M., 2012). During Covid's first period, there was a surge in costs primarily for personal protective equipment materials, but even before the Covid-19 pandemic it was observed that the model of financing the network of accredited public services based on rates and days provided did not represent an efficient, effective and equitable system for managing the flexibility of services, either in terms of the amounts financed or in the manner of implementation (Fosti G. et al., 2021). In other words, the ways in which the activities done by the managers are recognized, often beyond the regional standards set, do not allow margins to be found for adapting the offer on the basis of specific needs of users or imposed by changes in the context.

For more than a decade now, the RSAs have gone and continue to go through a period of significant transformation, reflecting to a large extent the changes that have occurred in the national welfare system, such as, as already mentioned, the exponential aging of the population, the increase in chronic conditions, with a consequent shift of the axis of care from hospitals to the territory, and the heavy changes that have occurred in the social fabric and in the composition of households (Pasquinelli S., 2020). It is worth emphasizing that demographic data confirm that family expenditures for a chronic or

non-self-sufficient elderly person are on the rise and preferably resolved within the family nucleus through home support or the contracting of one or more caregivers (DiMaria F., 2020).

In addition to the difficulty of operating in an extremely complex and dynamic environment, many of the phenomena underway are capable of generating consequences that, in the final instance, end up impacting on the economic and financial balance of these units. Thus, for example, the failure to adjust the public resources guaranteed at the regional level, rather than the impoverishment of families, are trends that affect (or can affect) negatively the revenue side (Pelliccia L., 2021).

At the same time, the modelling of the services offered to the users, increasingly compromised on a psycho-physical level, and the continuous adaptation to the regional standards of accreditation are dynamics that can also significantly affect the increase in management costs. Similarly, there are a series of other trends that, while presenting more or less marked characteristics (depending on individual regional contexts), have shown a certain convergence in making a stronger competition within the sector also regardless of the legal natures of the managing bodies, which are very different from region to region (Alvaro L.M., 2020). This refers, for example:

- to the increase in the supply of beds, which has rarely been followed by a proportional growth in the health quotas guaranteed by the regional health systems
- to the retreat of the public to direct management, with the consequent development of private business initiatives
- to the constant increase in the expectations that guests and family members have towards the services they receive (e.g.: increase in inter-structural mobility, but also in disputes) (Alvaro L.M., 2020).

It is the combination of the above-mentioned dynamics that surely leads to a growing interest in the issue of the economic-financial sustainability of the RSA, and this affects all the stakeholders in the sector.

This historical moment is deeply characterized by the need to find a balance between the policies of containment, the reduction of public spending and the ability to cope with the pressure due to the growth and transformation of social needs.

3. Social Robots

Today, the fourth industrial revolution is in full swing, and robotics is the most significant sector of it (Bahrin K., 2016). In this sense, collaborative robotics has brought an important change in many companies that, in addition to having become accustomed to the effective collaboration between people and technology, have evolved in terms of efficiency and productivity and covid has only intensified the interest of companies towards technologically advanced solutions. It is obvious that digitization has proven to be an essential ally in managing and minimizing the spread of the virus during this pandemic, thereby mitigating its social and, above all, economic consequences. The use of digital technologies has allowed businesses, workers and consumers to continue to interact, avoiding the total paralysis that would certainly have occurred otherwise.

The planning and implementation of digital strategies can generally help businesses build the next "normality". The 2020 pandemic also presents itself as a grim but effective learning opportunity to deal with a future with very undefined contours and increasingly rapid change. The post-crisis future certainly depends on how companies respond to the ongoing emergency and through what strategic and tactical investments.

Robots have been used in factories for several years now. Their use has been mainly in the industrial sector for heavy-duty operations or in hostile environments where they could replace humans. Collaborative robotics, on the other hand, allows a new generation of robots, defined as autonomous, to interact physically and safely with human operators, even sharing together the workspace (Malik A.A., 2020).

Thanks to advances in artificial intelligence (AI), a further leap has been made; robots are no longer an entity that requires the presence of a human to function and perform activities, technology has made them increasingly independent until there was no longer any need for intermediaries in the interaction between man and machine: mice, keyboards, CD-ROMs or memories of some kind represented indispensable "agents" while today are no longer needed. Today, communication, exchange and acquisition of information can take place in a variety of way due to the many types of sensors and the recent achievements of AI, starting with the most banal means for us humans: natural language (Graves P., 2019). With digital devices people can now converse and are able to give voice orders. Moreover, thanks to machine learning which extends from image recognition to the ability of AI to learn

autonomously, such devices can process enormous amounts of information. They can relate as well as extract meaning, patterns and regularities, from the most disparate data and this includes humans.

Humanoid robots represent a unique category in the world of intelligent objects, as they resemble human beings to some extent and therefore might evoke in people a natural tendency to perceive them as intentional beings. On the other hand, however, humans are keenly aware that robots are objects, artifacts, and thus should be treated as such. In this sense, Human-Robot Interaction (HRI) is an area of multidisciplinary research in constant development full of ideas for advanced research and technology transfer; it plays a fundamental role in the realization of robots that operate in open environments and cooperate with humans (Sheridan T. B., 2016).

Using a robot in a natural and dynamic environment inhabited by humans imposes precise requirements regarding sensory perception, mobility and dexterity, as well as the ability to plan tasks, make decisions and reasoning. Years ago, the main limitation to the development of this kind of "social" robots came from the lack of appropriate interfaces that allow natural, intuitive and versatile interaction and communication, in other words, human-friendly; interfaces of this type are considered essential to program and instruct the robot efficiently and the current state-of-the-art technology today is able to meet all these requirements (Hamid O., 2020).

3.1 Fields of implementation

When interacting with humans, robots are now able to anticipate a request, predict a need, suggest and recommend. The automation of robots and software is pushing towards goals that were unthinkable until recently. The replacement and consequent marginalization of the human component is advancing rapidly: from performing simple and routine tasks, machines have moved to the appropriation of more complex and intellectual tasks, even if still ordinary (Sheridan T. B., 2016). AI is definitely aiming at conquering higher prerogatives, once considered exclusively human, and everything is happening at an unprecedented speed. It is clear that robots are no longer mere machines assigned to perform specific tasks, on the contrary, they have evolved and diversified, so much so that they are now able, as mentioned, to interact more or less integrally with man and to be implemented in a wide range of different fields.

In this regard, today it is possible to speak of *social robots* and lately, to emphasize a further qualitative leap; artificial intelligence is now evolving towards emotional artificial intelligence, characterizing the so-called *emotional robots*. Although automata do not feel emotions, they simulate them, solicit them, induce them, and make use of them (Graves P., 2019). To understand how far research has gone, think about the fact that, in the near future, it will be possible to find a robot to welcome us at the arrival area of an airport, a robot to examine patients beforehand in a hospital or clinic or even a robot to greet people at a job interview.

In large airports, somebody will have already come across a small robot that, upon entering or arriving at an airport, smiles at travelers and welcomes them into the environment while at the same time performing other tasks i.e., cleaning or assisting passengers in wayfinding, accompanying them to the gate or reminding passengers to comply with current hygiene regulations. These robots are able to speak more than twenty different languages, answer flight inquiries, read barcodes and much more. The artificial intelligence used also makes it possible to profile passengers and immediately personalize talking points. The ultimate goal is to improve the consumer experience, and indeed the recorded experience shows that people appreciate the small attentions the robot gives; despite not being human, the advanced technology makes the robot's interface more sociable and familiar, with in addition a calm personality that conveys hospitality to the user, and it is capable of listening, watching and responding to people who approach it.

Already in use in Italy is the use of machines employed in the emergency room and infectious disease departments to provide virtual access to specialists, such as cardiologists, neurologists, dermatologists or ophthalmologists, and tele-visit patients directly from the bed into the hospital room. In the Covid wards of the Policlinico di Bari, two small robots are used to ensure remote consultations and specialist visits. The hospital has purchased two robotic devices dedicated to telemedicine equipped with a system of very high-resolution cameras, tele-auscultation and a private doctor-patient communication system. This is named the 'InTouch Lite' system, which allows medical staff to perform remote teleconsultations and tele-visits on patients admitted to intensive care, sub-intensive care and isolation wards (la Repubblica, 2020). Through the two telemedicine devices it will be possible to make more timely diagnoses and initiate treatment more quickly, and not only. Among the advantages of the use of robotics will be the reduction of travel and time spent in the emergency room and the possibility of multi-specialist consultations.

The most advanced and groundbreaking robot has been developed in Europe, by a Swedish company, the Furhat Robotics. According to Furhat's CEO, social robots represent the most natural, accessible and engaging user interface for humans. In collaboration with TNG, one of Sweden's largest employment agencies, Furhat created the world's first unbiased robot recruiter: Tengai (Furhat Robotics, 2021). As a matter of fact, an artificial intelligence system can work on predictivity and make a fair selection; it can be programmed to actually assess the candidate's profile and inclinations, regardless of any other discriminatory considerations. The current level of development of artificial intelligence (analyzing data and building predictions with them) can express an assessment capability, thus it can conduct an impartial personnel selection activity.

Tengai only has a face with human characteristics, as it is designed to be placed directly on the desk, to look straight into the eyes of its interlocutor and converse with him/her. The robot then tilts its head slightly, nods, its face lights up, plus it smiles and winks. It tries to elicit empathy in the people it interacts with by following their words and making assent noises, it aims to make interaction with androids as natural as possible and ultimately engaging. Particularly in the work environment for which it was created, it aims to interact and at the same time evaluate the candidate, without generating in the latter discomfort or, worse, rejection (Furhat Robotics, 2020).

Furhat robotics does not just stop in the realm of work, it also enters the business of healthcare by recognizing how important prevention is. Developed in conjunction with Merck Sweden, the result is a robot named PETRA; based on established frameworks, PETRA can detect the signs of the most common, but still under-diagnosed, diseases in the world: alcoholism, diabetes and hypothyroidism (Furhat Robotics, 2020). Just like Tengai, PETRA is used to interact in a direct and dynamic way with patients: through targeted questions, the patient explains his symptoms which are collected by the social robot and studied, providing a response to the patient. It should by no means be considered a doctor, but it can, if necessary, refer the user to a nearby clinic for follow-up checks, or suggest the most appropriate medical specialist to consult based on the circumstance, all in an empathetic and respectful manner.

It is worth mentioning that robots are not all the same, they are characterized by varying degrees of autonomy. Robots possessing a certain degree of autonomy are therefore capable of finding solutions and solving problems, even in unforeseen situations. Some machines are able to perform only predetermined sequences of operations, even without the presence of humans, but still without any "degree" of autonomy (Senft E. et al., 2019). Others act through machine learning and then, finally, the latest generation machines are able to build new algorithms without human intervention: they can

autonomously verify the coherence of their own tasks according to pre-established objectives (Hurtado J.V et al, 2021). The latter can have anthropomorphic appearances, they can mimic some human abilities such as leg and arm movement, perception and movement in physical environments. Research is developing increasingly sophisticated humanoid automata with advanced technologies that give these machines cognitive and sensory capabilities.

3.2 Applications in elderly care

As robots increasingly operate in more social settings filling an educational or companion role, in parallel, HRI is becoming an area of increasing need for further study; one of its main objective is to highlight the importance of considering both humans and robots as social entities. For this reason, within this domain, key aspects have to be studied for example the importance of robot facial expression which should match the capability of the social robot to interact, the expectations of the interlocutor and his/her acceptance towards the robot. It is worth mentioning that interactions are shaped by prior experiences, expectations, and beliefs that are continuously updated; it is therefore crucial to try to move beyond contrasting pre- and post- interaction measures (Horig S. et al., 2018). The continuous research and development of affective HRI, and the application of social robotics will continue to evolve and promote assistance and enrichment in users' lives (Hamid O., 2020).

To date, the interactions between people and social robots have generated positive effects on people of different ages in diverse contexts (de Greeff J. et al., 2015). Robots are expanding in the domestic sphere as good companions and social assistants for the elderly, children and pets, while performing domestic task as well, and not least, today they monitor homes and manage smart homes (Henschel A. at al., 2020). Within these, the most fascinating field in which to study the applications and the consequent effects of social robots is the health field and in particular the one related to elderly care; robotics for elderly care is a developing field from the point of view of technology and evidence of effectiveness and experience of use.

To the question if aging can be improved thanks to a robot, there is no univocal answer, the perspectives are increasingly interesting, but there's still needed to study and most importantly it is not enough to consider only the technological aspects of the issue, but also human and organizational ones. As discussed in previous chapters, aging can be associated with frailty, progressive loss of various abilities, disability and dependence. All those phenomena often make it necessary to resort to hospital

care, but also residential, territorial and home care, this results into a growing healthcare expenditure and much more.

Several initiatives have been launched to promote management of elderly patients at home, with repercussions, however, often in terms of the role of informal care givers and out-of-pocket spending on private care. In this scenario, welfare technologies, and in particular care robots, can play an important role. *Welfare technologies* include all technologies that can improve the lives of people with different types of needs (health, social, etc.). Within them, a key role is played by robotics identifying both the robot object and the methods developed so that the robot can interact with the human being thanks to sensors and behavior algorithms. Care robots developed specifically for the elderly and/or their caregivers, aim to contribute to the maintenance of independence of the person or the recovery of functionality after acute events.

Another key aspect to evaluate is that robots can ease the burden on caregivers in hospitals and residential homes; the entire process of care could benefit from the exploitation of social robots in terms of efficiency due to immediate access to care and high speed in providing specific tasks. Also, robots could replace human caregivers in those situations in which the assisted patient is particularly vulnerable.

The aging of the population inherently places greater demands on health and social resources. The system has been heavily compromised by the coronavirus and it has struggled, if not failed, to ensure proper care for the elderly. Despite the fact that the state presses the elderly to administer the third dose of vaccine, the virus continues to circulate and RSAs are still one of the most likely causes of outbreaks, mainly due to contact with the staff and the continuous replacements that it undergoes; in these realities precisely the health staff is scarce, so in order to control the situation and avoid unnecessary hospitalizations it is necessary to activate, in these districts, the socio-health task force that makes use of nursing staff and doctors of Usca (Special Continuity Care Units).

In any case it is vital that, in addition to covid-related activities and resources, the normal course of services for all the elderly in the RSA is ensured, especially the restoration of the dynamics and activities that should normally characterize the structures. On the one hand, to regain control of the residences by ensuring the best care for the well-being of patients, and on the other hand, to meet the needs of families, key stakeholders, who continue to invest in ensuring that the treatments required and the desired services are provided for their loved ones, thus ensuring an economic income for the RSAs as well.

In order to deal with these problems, while respecting the current hygienic and distancing norms, the health system is therefore definitively requesting a different and more technological approach that can ensure a quality service for the elderly, while respecting the norms, but above all providing the social contact that has been lacking and that represents a fundamental necessity for the well-being of elderly patients. Robots are intended to take on an increasingly central role, to increase the quality of service while reducing overall spending; it is necessary to start considering them as a real opportunity, a real solution to the problems discussed. However, in a health care structure like the Italian one, the implementation of the social robot in the RSA could still find obstacles, both from a financial point of view and of intrinsic acceptance of the robot as a health care resource that could replace humans.

3.2.1 Needs of elderly

The use of robotics as a care tool for the elderly and as a response to their needs must take into account that these vary according to the clinical condition from which the patient suffer, and as already seen in previous chapters, patients residing in RSAs are diagnosed with specific diseases more frequently than others; in this way, the needs of several patients can be grouped together under specific categories and responded to by dedicating the same types of activities and attention.

In literature, most of the studies conducted in this area deal primarily with dementia, a term that refers to a wide range of symptoms associated with a decline in memory or other thinking skills that is severe enough to reduce a person's ability to perform daily activities. Alzheimer's disease accounts for 60-80 percent of cases while vascular dementia, which occurs after a stroke, is the second most common type of dementia. In essence, dementia represents one of the major plagues of modern society, which is why it is also one of the main causes of admission to RSA. For the same reason, it is common to speak of Intelligent Assistive Technologies (IAT) which are properly designed to support and improve the quality of life of older people with dementia, from robotics to apps.

The major complexities associated with dementia are given by an organizational and structural deficiency in response to the complex social and health needs of people with dementia, as well as the lack of qualified services and structured care pathways dedicated to them.

The study conducted by Cayton H. (2006) shows the main needs of patients with dementia. The needs identified, present in all humans, seem to be more pronounced in people with dementia, as they are more vulnerable and less able to take action to meet them. Among these, the main needs are described as follows:

- *comfort*, which may come from the weakening of one's abilities or the end of a way of life that seemed to be well established
- *identity*, it is in fact essential to have an identity both cognitively and affectively, this means having a sense of continuity with the past and therefore a story to tell; it is possible to do much to preserve the identity of a person even in the presence of cognitive decline, and in this it is essential to know the life story of the individual and be empathetic
- *employment*, to be involved in a personally meaningful way in activities that generate pleasure; the need for employment manifests itself in the desire to make a contribution, and to satisfy this requires creativity and knowledge of the person's background
- need for *inclusion*, rooted in man's social nature; social life tends to diminish as the disease progresses and if this need is not met it is easy for the person to get worse and withdraw
- *attachment*, the loss of a primary attachment figure severely undermines one's sense of security

An all-encompassing need in people affected by this disease, which can be inferred by putting together the above points, is the need for love or generous and unconditional *acceptance*, without any expectation of a direct reward.

Accordingly, the caregiver's actions should be characterized by the following behaviors (Riffin C. et al., 2017):

- encourage the patient's independence as long as possible
- encourage the patient to carry out daily activities alone and with his/her supervision
- to maintain the residual memory of the patient through photos, memories, memory games
- involve the patient in daily family activities
- do not treat the patient as a child, protecting him/her from all events as excessive protection can, in fact, worsen the sense of marginalization and isolation
- use verbal and non-verbal language to communicate closeness to the patient.

Care robots can potentially provide an answer to the need for assistance, supporting or replacing traditional human caregivers, in at least three key areas:

- physiological (movements, nutrition, hygiene etc.)
- in social activities (communication, companionship, emotional management)
- for mental health in the case of cognitive problems or dementia

In order to do so, robots must prove to be multi-tasking, or at least this continues to be the most common expectation. In 2020, Joseph Engelberger, the father of robotics developing the first industrial robot, had envisioned the "Elderly Care Giver", a complete and therefore multifunctional caregiver robot for the elderly (Van Aerschot L. et al., 2020). Since then, several prototypes (Wakamaru domestic robot, Care-o-Bot, Hector, Hobbit project) have been developed to meet this ambitious goal. However, none of these have reached the market while, in the meantime, less ambitious solutions have reached the elderly, such as My Spoon by Secom or the Obi, both capable of supporting the individual with mobility problems, in nutrition. Then in 2019 Intuition Robotics launched ElliO as the first robot capable of responding to the elderly's need for "social" interactions. A year later Temi (Roboteam) was launched: a non-humanoid looking mobile robot, described as a kind of Alexa on wheels, capable of reliably and autonomously interacting with the elderly, guiding them in their movements.

On the more technical side, the 2020 Multi-Annual Roadmap of SPARC (The partnership for robotics in Europe) explicitly requires that robotics technology meet the following criteria:

- *reliability*, which represents the ability of the system to perform its tasks without systematic errors; in addition, the need to be able to rely on a robot that can correct its errors in an acceptable time frame (Vercelli A. et al., 2018)
- *user acceptability* of the interaction with the robotic solution
- skill in *managing* the human-robot relationship; most of the robots available to date are capable of autonomously performing only *pre-defined* tasks, instead reliable robots capable of anticipating the specific need for assistance are being developed
- *autonomous decision-making* which translates into the need to be able to count on a robot capable of managing the *uncertainty* that may arise in the daily life of an elderly person; to date, the adaptability of a robot to different environmental and behavioral conditions is formed through the development of imaginary scenarios or tests conducted on real contexts, but involving few cases/subjects (Van Aerschot et al., 2020). Learning and probabilistic algorithms are potentially able to provide a solution, whose reliability must, however, still be tested especially in the long term.

Regarding health requirements, significant inputs come from surveys conducted involving key caregivers of the elderly in a study by Lukasik S. et al. (2020) which shows that personalizing the assistance that the robot is able to provide is a key requirement. Each elderly person has specific needs regarding the type and intensity of support they require. Instead, the matter of who can decide and

intervene on personalization is still open and the study shows that doctors and nurses believe that the elderly person should not intervene on the settings in order to avoid unintentional errors, considering that they may have clinical repercussions. Furthermore, the requirements are not only related to who they assist, but also to the particular type of support offered.

Combining all of these claims and looking at the solutions already available on the market, it is reasonable to consider that robotics for the elderly population has a low technological maturity. This perception is confirmed by the fact that in 2015 out of the 107 robotic solutions identified by a systematic review, only 6 were on sale while the remainder were in development or even still in conceptualization (Bedaf et al., 2015).

The care of people with dementia has particular specificities, but, at the same time, it is the paradigm of a medicine attentive to the biological, clinical and care fragilities induced by chronic diseases. As widely discussed, Covid-19 has had a heavy impact on the elderly both from the clinical point of view and for the negative repercussions on their quality of life: months of isolation, of interruption of treatments and changes in habits will have long and serious consequences on the elderly and on those affected by dementia in particular.

It has been witnessed in recent months the difficult care conditions both in the hospital and in the RSAs of people with dementia who have contracted Covid-19: isolation, sedation, restraint, increased complications such as delirium, increased disability and mortality, precisely. In some regions there has been a progressive weakening of medical care in RSA. This has resulted in the inclusion of inexperienced physicians with the difficulty of ensuring sufficient management of contingent problems. Patients with behavioral disorders often received only emergency (pharmacological) treatment, with clinical consequences that added to the already precarious conditions of being affected by dementia and coronavirus. At the basis of the functioning of RSA certainly are the professionals; the health emergency has therefore indicated the need to change many aspects of the training of health personnel.

For what concern possible future scenarios, the scientific literature (Shishehgar et al., 2018) shows that the robotic solutions under study focus mainly on the need to reduce *social isolation* of the elderly and to a much lesser extent on dependence or physical or cognitive impairment; this need is further intensified due to the reasons just mentioned.

In this regard there has been an increase in the use of social robots (for companionship purposes) as substitutes for pets, for example, resulting to have a positive impact on the experience of loneliness. Several versions of robots resembling companion animals have been put on the market, whose

characteristics are better adapted to therapeutic needs. Robotic animals would allow for the extension of pet therapy with the main goal of creating robotic animals capable of eliciting the same range of emotional responses as real animals, providing that feeling of companionship for the lonely elderly people, but without the commitment of having to care for them. In the latest pet robots, AI allows for human-machine interaction in specific contexts. Some are equipped with sensors that can react to touch, they can recognize voices. In this regard, a scoping review has been conducted exploring the effects, the enablers and barriers emerged in the use of a Japanese social robot, PARO, a therapeutic robot seal, designed to be adorable and therefore have a calming effect on patients. According to the authors, Hung L. et al. (2019), as a result the basic hypothesis was confirmed i.e., the robot was able to elicit positive feelings in patients, decreasing behavioral symptoms and promoting social interaction. On the other hand, significant barriers were found to limit the use of the social robot such as cost and workload, risk of infection (due to the robot's fur being not easy to keep clean), and ethical issues.

Robotics appears to be a valuable ally in response to some of the needs encountered by elderly patients. It is then possible to summarize the roles that social robots can play and their benefits through a simple classification. As a matter of fact, four categories of robots are increasingly implemented in dementia care:

- rehabilitation robots
- service robots
- telepresence robots
- companion robots.

Rehabilitation robots are mainly used in physical rehabilitation and can support or assist various physical or cognitive functions of the user, especially locomotion and motor control.

Service robots are mainly used to provide direct assistance to dementia patients, thus replacing or complementing the assistance provided by human caregivers. For example, Fraunhofer IPA's Care-o-bot, a German mobile robot assistant, has been successfully tested to assist with specific memory deficits of older adults with dementia and assist them in completing a variety of activities of daily living (Fraunhofer Institute, 2017).

Telepresence robots, such as Giraff and VGo, have proven effective in providing remote monitoring of adults with dementia and enabling remote control or interaction between patients and caregivers, often in combination with telephony and long-range remote control (Casiddu, N. et al., 2015).

Finally, companion robots, such as PARO, provide a broad spectrum of psychosocial support, including eliciting positive emotional responses. Another key example comes from the humanoid social robot MARIO. To specifically address social isolation and loneliness in elderly with dementia, researchers from the EU-funded MARIO project conducted a pilot study with the companion robot “MARIO Kompai” (managing active and healthy aging with use of caring service robots) in three centers in Ireland, Italy, and the United Kingdom. In the study conducted by Casey D. et al (2020) it was showed that such service robots can have a positive influence on older people living with dementia. The care robot was developed by a consortium of experts from the healthcare sector together with the robotics industry and dementia specialist groups. A key feature of the robot is the user-driven design approach, with feedback from the patients themselves, in pilot studies. The MARIO project was established to provide an interactive and extensible robotic platform aimed at healthy aging. In addition to addressing the needs of people with dementia and caregivers, it focused on supporting caregivers and physicians through comprehensive geriatric assessments.

According to the project’s coordinators, human companionship is the best way to promote social health, but the reality is that the healthcare services do not have sufficient resources to provide this service. Despite some challenged encountered about voice recognition and the difficulties in conducting the study of social robots in real-life settings, most of the participants provided positive feedbacks; contrary to the previous case, of the animal robot PARO, the greatest criticality encountered was not only of ethical origin, but it concerned the fear that social robots like MARIO could replace the humans health operators.

In order to compare and summarize the main technical features of the social robots mentioned, a schematic table is provided below.

NAME	MAIN FEATURES	APPROXIMATE PRICE	WEBSITE
Temi	<ul style="list-style-type: none"> Control and monitoring of vital parameters Physical exercise Cognitive stimulation Conversation Interaction with family members 	4,000 \$	www.robotemi.com
Paro	<ul style="list-style-type: none"> Reduces stress Increases socialization 	6,000 \$	www.parorobots.com
Mario	<ul style="list-style-type: none"> Limit problems related to loneliness, isolation, and dementia in elderly persons Assist caregivers and doctors with comprehensive geriatric assessment (CGA) Support and receive "robotics applications" from the developer community so that usefulness is improved over time for end users Customizable for acceptance by end users 	<i>Price not defined yet</i>	www.mario-project.eu
ElliQ	<ul style="list-style-type: none"> Control and monitoring of vital parameters Physical exercise Cognitive stimulation Conversation Interaction with family members Reduced size compared to Temi 	1,500 \$	www.elliq.com
Fraunhofer IPA's Care-o-bot	<ul style="list-style-type: none"> Control and monitoring of vital parameters Execute everyday jobs, fetch and carry objects Control of the technical home infrastructure as e.g. heating system, etc. Support for getting up from the bed or a chair Intelligent walking aid Media management Day-Time-Manager (time for medicine etc.) Communication with medical and public facilities (physicians, authorities, etc.) 	275,000 \$	www.care-o-bot.de
Giraff and VGo	<ul style="list-style-type: none"> Remote visiting Patient monitoring 	5,000 \$	www.vgocom.com

Figure 3 - Main characteristics of social robots currently on the market

On the whole, those who use robotic companionship, both humanoid or pet animal like, report mainly a reduced exposure to stress as an advantage. But these robots can be supportive in many other ways: they remind patients what medications to take, encourage them to be active imitating the movements they should make, and help them stay in touch with family and friends thanks to integrated

screens that allow to make video calls, furthermore they could measure vital parameters. The robot is also able to store the individual habits and preferences of older people providing personalized actions as a consequence.

3.2.2 Enablers and barriers to implementation – the issue of ethics

The transition of a robotic device from the industrial into the social sphere might be considered a normal consequence of technological development, yet the implications of such a transition are significant, not only in terms of legislation and welfare policies, but also from an ethical standpoint. The processing in question necessitates that people interact with non-human beings, or are exposed to these interactions (Malik A.A., 2020). Nevertheless, people show differences in their attitudes: some individuals are more likely to attribute intentionality to robots, others are more likely to describe robots in a purely mechanistic way.

A systematic review conducted by Papadopoulos I. et al. brings together current evidence of barriers and enablers in the implementation of social robots, particularly humanoid robots, in social care. Unfortunately, the study highlights that none of the obtained evidence has an experimental design at its basis, furthermore the main method used was surveys of rather small samples.

The final result is based on individual-level aspects, exploring the acceptance of robotics from older adults aged 60 or more, both with and without a certain degree of cognitive impairment and living at home or in residential care facilities, from care staff and informal caregivers. An in-depth investigation is lacking about the elements surrounding the inherent acceptance of the social robot, i.e. the organization, the environment, the social and cultural context, legal and political aspects.

Putting together the collected results, among the main enabling factors stands the propensity towards technology, also due to the education that was given to the interviewees; in this case, these subjects would find familiarity with the social robot and in its technical use, finding it useful for daily life and for their own well-being. Although it is common belief that a robot's interface is not pleasant for the user, the present research brings out that users prefer human-like communication over human-like appearance. Consequently, it is highlighted the user's need to be able to converse freely with social robots, which in turn must convey positive emotions, motivation, and an attitude that promotes HRI. Moreover, due to the advanced technology, the interviewed users presented positive expectations

regarding the personalization of the product and services provided, which will completely adapt to their routine and preferences.

On the other hand, some of the interviewees showed a limited inclination towards technology, often a feeling of fear. The idea of interfacing with a robot seems complex stating that it would be difficult to use and may also require excessive workload. Another aspect that strongly concerns these users is the possibility of having to face technical problems for whom the possibility of making mistakes increases.

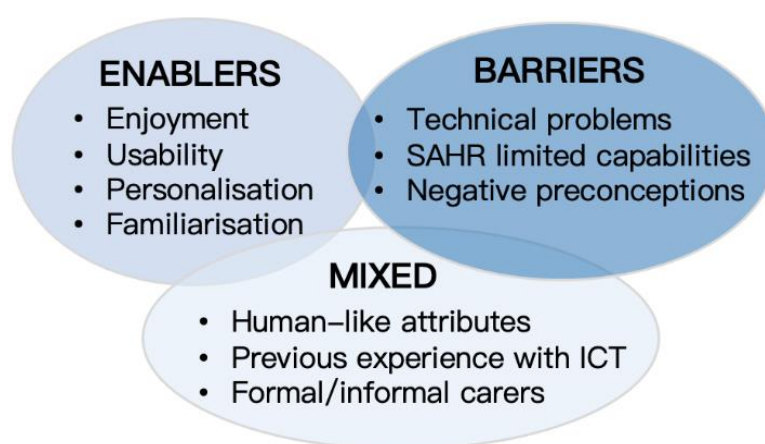


Figure 4 - summarized results - ICT, information and communications technology; SAHR, socially assistive humanoid robots (Papadopoulos I. et al., 2020)

Although assistive robots open promising possibilities to improve the quality of life of the elderly with dementia, thus, to alleviate the multifaceted burden of the healthcare system, their adoption remains lower than expected due to a translational gap in the intersection of technology and healthcare (D’Onofrio G. et al., 2019). This gap does not stem exclusively from current strategies for implementing robots in neuro-geriatric care but relates to the three intrinsic dimensions of the relationship between technological products and end users: the social, legal, and ethical dimensions.

First of all, the low distribution and adoption of social and assistive robotics for dementia care has been attributed to an information gap in technology design, healthcare, and society; this is one of the primary causes of weak acceptance of robots among older adults and/or cognitively impaired ones. From the available literature, it can be drawn that researchers and developers in the field of robotics have performed a limited investigation about the specific needs, desires, and expectations of the elderly

population; what is often taken more into account are practical needs rather than the ones related to the patient's *emotional sphere*, which is just as important to care for.

Hung et al. (2019) argue that many robotic devices are developed without proper involvement of patients and their caregivers' perspectives. The reasons are multiple. Research has often conducted quantitative analyses (which were often defined as of low methodological quality) of the needs of elderly patients, but almost no analysis is done on what specifically are the real difficulties that the elderly face in their daily lives (D'Onofrio G. et al., 2019).

Second, scientific studies themselves, that should directly involve older adults, are time-consuming. It is difficult to obtain direct information from target users, thus prototypes are often developed in the absence of user needs assessments. Since unmet user expectations are an important indicator of suboptimal adoption, the lack of user-centered approaches risks generating a vicious cycle in which unmet users' needs cause further lower adoptions.

Ultimately, factors related to cognitive or physical limitations have been found to represent further barriers: problems with memory, learning, and orientation, limited understanding of verbal instructions, problems with performing purposeful tasks, poor recognition of audiovisual clues. As a response to these challenges, researchers should recommend the creation of platforms for knowledge dissemination, they should provide incentives for user-centered research, and promote user-centered functional designs (Niemeijer AR. et al., 2010).

Knowledge dissemination therefore becomes a key concept to foster interaction between all stakeholders involved thus promoting implementation of robotics in healthcare; increasing awareness especially among healthcare institutions and professionals may significantly encourage this process. In particular, the introduction of social robots within RSAs could increase the perception of robots as a standard care practice. On the other hand, instead reluctance towards robots (e.g.: for ethical reasons) consequently conveys the same aversion to the elderly raising a further obstacle (Hurtado J. et al., 2021). The "failure" of some potential social robots in the healthcare field highlights how the technology can be efficient, but above all a favorable context is needed for it to be accepted and shared.

Delving into the relationship between *ethics* and robotics, which is still a matter of debate for many, robots immediately evoke very mixed emotions in the collective imagination, ranging from pure wonder to fear of something incredibly powerful, whose limits are not known yet. This perceptual range derives

mainly from the fact that robotics boasts an unimaginably wide range of real and potential applications. For this reason, the programming of autonomous robots, to the extent that it affects human life, also involves the consideration of anthropological, sociological and psychological aspects and generally related to the human sciences (Sætra H. S., 2020).

A relevant issue is raised when talking about both animal and humanoid robots. Despite possible positive effects, many have referred to robotic animals mentioning *deception* when they are used as therapeutic tools and companions for people who, given their mental state, could confuse them with living beings.

In other words, the use of robotic animals for people suffering from dementia can be criticized in the same way of *dolls therapy*. The latter consists in providing a doll to patients with dementia during specific therapeutic sessions with the aim of reducing all psychological, social and behavioral disorders on the basis of attachment theory, the doll acts as a transitional object, an anchor in a moment of uncertainty. According to critics, they would deprive elderly of autonomy, competence, causing disempowerment and disparagement because it would be a practice based on the assumption of not telling the truth to the person assisted (i.e.: presenting as reality something that is only a simulacrum) (Cayton H., 2006). Dementia is often seen as a second childhood, consequently someone could demonstrate an attitude toward the elderly person similar to that they would have toward a child, instead caregivers and relatives negatively judge this behavior and tend to describe the dolls therapy, for example, inappropriate.

However, through robots, people with dementia may also have the opportunity to form relationships and become attached and involved in forms of social interaction; in this way they experience less anxiety and fear towards the world around them.

Sætra H. efficiently summarize the negative aspects emerged, primarily related to characteristics associated with quality of care. It is important to highlight that these represents mainly hypothesis based on psychological studies. First, social robots contribute to a fundamental structural change, leading to more machines than humans; and for many, this has a purely negative connotation. Second, the idea of robot-performed care processes is highly questionable to those who view human-robot relationships as insufficient or, worse, harmful. Likewise, as anticipated, undesirable forms of deception lead individuals to view the process as demeaning and inhumane. Finally, looking at the end result, human-robot relationships could lead to undermine humans. According to some, human contact is in fact a basic

human need, increasing the use of robots in care may lead to deprivation of basic needs, and mental disintegration (Johs-Artisensi J.L., 2020).

Going to investigate the point of view of the directors of RSAs, a further barrier emerges from the financial point of view. The intrinsic inclination of managers towards the use of technology undoubtedly influences the acceptance of social robots as a tool in elderly care. However, it is evident that, as managers, they find themselves in the position of having to make a trade-off between investment costs and economic benefits deriving from the implementation of social robots. It is clear that such a choice must be supported by encouraging results from studies investigating the use of social robots; the benefits must overcome the barriers.

In the absence of an economic return that can improve the balance sheet, and consequently increase the income of the directors, no incentive would arise leading to use part of the available capital in investing in social robots, much less appealing would appear the eventual replacement of a human resource. All this may result in a behavior that is detrimental to patients.

3.2.3 Benefits of psychosocial interventions on well-being

It is worth to investigate more deeply the emotional sphere of the elderly patient with dementia. This is intended to emphasize that the care that must be provided to the patient goes far beyond the care strictly related to the patient's physical well-being, such as pharmacological care. As human beings, everyone requires extra attention, and the elderly in particular. The scientific community's consensus on *psychosocial interventions* has become unanimous, both for preventive purposes and for maintaining residual capacities, including cognitive stimulation. Social centers support and emphasize the importance of a non-exclusively pharmacological orientation, and the need for a global approach has been strongly reiterated and confirmed (Cayton H. et al., 2006). In this approach, a further step forward has been taken by including psychosocial interventions in the context of the appropriateness of care. If cognitive stimulation was in fact an activity whose effectiveness was left to the mere observation of the operator, today it is an intervention strategy in the field of dementia with its own foundations and protocols, supported by scientific evidence.

Cognitive stimulation interventions as non-pharmacological and psychosocial treatments have as their main purpose to promote coping and adaptation of the person to his or her condition, to provide

support and assistance throughout the course of the disease. These interventions have a direct impact on cognitive abilities and psychological and behavioral systems.

A very important part of the rehabilitation work is to build and maintain a "new" and different care environment with respect to everyday life, which is often frustrating, marked by isolation, loneliness, with few stimuli and characterized by continuous "mirroring" with a dimension of disability and loss. The main cognitive functions that allow humans to understand the environment in which they live and interact with it are:

- Attention
- Memory
- Language
- Motor skills
- Ability to orient in time and space
- Recognition
- Abstract thinking, planning, executive control functions.

The elderly person affected by cognitive impairment often feels fragile and helpless and for this reason tends to perceive the outside world as potentially threatening. In these cases, his or her behavioral reactions may be overly guarded and susceptible. All changes, novelties or events that take place suddenly can arouse alarm and fear. One of the most recurrent and invasive fears is that of being abandoned and finding oneself alone, usually expressed through the continuous search for physical proximity to the caregiver.

The management and adequate care of the patient becomes even more complicated if we consider the reduction of personnel and the impossibility of performing many of the planned psychosocial actions; likewise, it has been practically impossible to prevent the onset of senses of abandonment and loneliness of patients, as it was discussed at length in chapter 2.3.5.

At first glance, robots do not seem to be able to intervene in this field, indeed their psychosocial intervention might seem counterintuitive; however, therapeutic relationships are necessary to achieve a positive treatment for the patient and, whether the presence and availability of caregivers is lacking, social robots can be introduced. According to what has been seen in the literature, the potential of social

robots extends to all of the above points. The strongest contribution that has emerged is specifically related to the decrease in levels of depression and anxiety experienced by patients when undergoing digital mental health programs; however, the intervention of robots, especially in Italy, still requires critical evaluation with real and prolonged evidence of contact between elderly and social robots (Robinson N.L. et al., 2019).

However, it has already possible to infer from the literature that social robots are programmed to effectively intervene on the main cognitive functions, mentioned above. In an RSA, specific activities could be organized and conducted autonomously by the social robot, dedicating itself each time to stimulate a different cognitive factor. Moreover, it is possible to observe that digital inclusion improves not only the cognitive abilities, but also the physical and mental health of the older people, providing the opportunity to enhance their independence (D'Onofrio G. et al., 2019).

A study conducted by Margaret L et al. showed that robot social behavior has the ability to model people's trust toward, responses to, and impressions of a robot in human-robot interactions. In addition, in situations of aggregation, such as in RSAs, the presence of a robot in the middle of a group of people brings to light other aspects e.g., how the robot influences behavior even among humans themselves; according to the results, social robots could also increase group cohesion, productivity and engagement in the activity. Its robot could also guide the interaction, encouraging socialization even towards the most solitary and silent patients by drawing their attention and guiding the conversation. In ultimate analysis, social robots have an increasing impact in shaping the behavior of humans with whom they interact (Margaret L. et al., 2020).

Among all categories of population, elderly surely are most likely to experience social isolation which in turn could cause sense of frustration and uselessness. The moments of aggregation represent a very important resource for them inside the RSAs; the Maslow's hierarchy describes five categories of human needs which dictate the individual's behavior, among these there is the so called *social* or *belonging need*. For this reason, building interpersonal relationships can be a strong vital drive for patients, and the satisfaction of this need could also be met thanks to the interaction with a social robot. When this aspect lacks, individuals go through mental disintegration.

The possibility of psychological and emotional comfort is increased if a robot shows a characteristic expressive face of humans, if its behaviour conforms to human social norms deemed appropriate to its

robot role and function, and if it has the capacity to be emotionally responsive to the user (Graves P., 2019).

People could still perceive a lack of certainty with regard to the consequences of forming relations with robots, but in these terms, it is crucial to highlight how easily everyone, today, forms social bonds with machines and this leads to a feeling of enjoyment most of the time. In analyzing the social robot MARIO, Casey D. et al. in their review have examined that the human-robot relationship emerging was positive and the patients with dementia under analysis often referred to the robot as “he” or “she”, defining it as a *friend*, thus showing positive emotional responses; the same responses emerged also by patients interacting with PARO.

Finally, the small positive moments that could be collected from the relationships with social robots should not be undervalued, instead these could represent a source of happiness improving the overall quality of life of people with dementia. Further investigations should be conducted in order to analyze how the relationships human-robot evolve over the long term.

In ultimate analysis, the caregiver of the third millennium is profiled on the basis of the needs of new patients; health needs, but not only: reducing loneliness, growing old in good company and safety, with the help of technology, is the direction to aim for and the main enabler supporting the implementation of social robots in residential structures (Kang B. et al., 2020).

4. Research question and method

4.1 Research question

From the available literature it has been possible to investigate the effects of social robots on elderly patients requiring nursing care, but especially the main limitations. However few experiences, or limited ones, have been recorded about social robots actually implemented in an RSA, in particular none of these has been conducted in order to show the effects of prolonged and direct interactions with social robots, and what are the consequences of a real implementation in an elderly care center, from the point of view of the main parties involved: patients and the staff of the facilities.

Moreover, in most cases, the research was conducted through questionnaires whose answers are given based on constructed scenarios and not on top of field experiences. It is difficult for the elderly patient who has no experience with social robots, or advanced technology in general, to imagine real scenarios of interaction, therefore their contribution results to be limited; as a result, it is unlikely that their real needs emerge.

The main consequence inferred is the lack of a clear definition of social robot *companionship* when, instead, this concept could represent the main enabler for the implementation of social robots, but above all it determines one of the best factors able to improve significantly the well-being of elderly patients. Furthermore, few studies have investigated the process of how to actually use the robot to meet the clinical needs of patients and also, they lack the right theory that should guide the implementation.

Covid-19 is still a part of the society, and it is something that the population probably have to learn to live with, adapting the services provided accordingly. Indeed, Covid-19 has strongly impacted any aspect of the entire society, especially the health care system, and the effects have been abundantly investigated in many fields; however, in the post-pandemic phase it is still not known the point of view of the major stakeholders in the field of elderly care, what their thoughts are on the matter, and whether their perspective meets or clashes with what is reported in the literature. In this regard, the literature further lacks research on two main points:

- the new wider range of needs caused by pandemic and isolation, experienced by elderly people in need of care services, e.g. need for companionship, contact, entertainment and stable caregiver figures
- what the actual effects of social robots in RSAs might be in the aftermath of the pandemic, how these might represent a response to the new needs arisen, and thus be perceived under a positive perspective than in previous years.

In essence, Covid-19 is able to have a significant effect on acceptability factors of social robots, modifying and/or adding enablers and barriers to their implementation; still these effects must be identified and studied.

In view of all the present aspects, the current paper aims to highlight ***how the enablers and barriers related to the implementation of social robots in RSAs have changed after the pandemic***; consequently, it seeks to shed light on the profound sense of *companionship* that a social robot could accomplish.

4.2 Context of analysis, data collection and method

The following study was carried out by conducting a multiple case study through semi-structured interviews, as a tool, submitted to the general managers of five RSAs of Italy.

Before presenting the structure of the interviews and which method has been adopted in analyzing the responses, it is worth to analyze the *context* of the analysis conducted introducing briefly the five RSAs in question and the main aspects that characterize them: from the number of beds, type of patients treated, services provided and number of staff, to indicating their prerogatives in the technological field or the advanced technologies already adopted, if any. The structures will be identified by a letter, and accordingly will be identified the respective directors, in order to ensure their anonymity.

Context

STRUCTURE A:

Established in 1955, it is an institutional accreditation with the Abruzzo Regional Health Service for the Diagnosis and Treatment of acute and chronic medical-surgical pathologies.

Outpatient services are provided:

- Clinical
- Physiokinesitherapy

- Outpatient clinic
- Endoscopy
- Outpatient

Type of admissions:

- Ordinary
- Pac - complex outpatient paths
- Day hospital
- Day surgery

Number of beds: 75 beds in total

- General medicine: 30 beds
- Surgery: 29 beds
- Urology: 5 beds
- Gynecology: 11 beds

Surgical Specialties: 3 beds DS/DH (Day Surgery/Day Hospital)

STRUCTURE B:

Established in 1965, it has residences for the elderly in agreement with the National Health System and located within the social and health centers of Gavinana (Pistoia), Zagarolo (Rome) and Vieste (Foggia). The foundation has been committed since 2020 to stay close to its guests and make them feel less lonely thanks to technology to facilitate contact with family and relatives; the residence *smartphone* proves to be a tool of reassurance for both residents and relatives and friends, with video calls in particular. According to staff, many seniors are adapting surprisingly quickly by being able to get in touch with this new technology, so far unknown to them.

The foundation hosts users who may have been discharged from the hospital in the phase following clinical stabilization or who may come from the territory due to the worsening of chronicity.

GAVINANA (PT):

Number of beds: 130 beds in total

- RSA for self-sufficient or partially self-sufficient guests: 60 beds
 - Non-self-sufficient guests: 30 beds (basic module)
 - Self-sufficient guests: 30 beds, 20 of which for the BIA (Low Intensity Assistance) module
- RSA for non-self-sufficient persons: 70 beds
 - Basic module: 28 beds

- Guests in a persistent vegetative state: 14 beds
- Alzheimer's patients: 8 beds
- Patients after the acute phase of the disease (intermediate care): 20 beds

VIESTE (FG):

Number of beds: 60 beds in total

- RSA for non-self-sufficient: 30 beds
 - Reserved for the elderly over 65 with physical and psychological limitations after the acute phase, requiring therapeutic social rehabilitation treatment over time
- RSD for the disabled: 30 beds

Robotic equipment implementation (2018):

- *Hunova*, rehabilitative robotic medical system specialized in daily clinical activity of therapy, rehabilitation and exercise
- *Gloreha Sinfonia*, robotic device for hand rehabilitation, which adapts to all phases of neuromotor recovery

ZAGAROLO (RM):

Number of beds: 100 beds in total

- Three high maintenance RSA units: 20 beds per unit
- Two extensive RSA units for non-self-sufficient people: 20 beds per unit

STRUCTURE C:

Founded in 1884 in Lombardy, the Foundation is proposed as a real "place of care", a peculiarity that has been further developed with the strengthening of medical and rehabilitation services, with the acquisition of modern equipment and with the introduction of therapeutic activities animative. The structure has always paid particular attention to the ongoing training of its staff.

While paying continuous attention to scientific and technological processes and modernization, the Foundation has always privileged the *human dimension* of the relationships between operators and users and the serenity of the work environment, in the awareness that well-motivated operators are the

necessary prerequisite for maintaining a context based on hospitality, warm and sincere human relations and professionally high-quality care.

Operational areas: geriatric, rehabilitation, psychiatric and territorial services

- Clinical Psychology
- Pharmacy
- Specialist and Diagnostic Medicine
- Physiotherapy Services
- Services for the elderly
- Rehabilitation
- Disability and Psychiatry

Number of beds:

- RSA for non-self-sufficient: 227 beds
- Alzheimer's Unit: 20 beds
- Non-contracted beds in solvency regime (65€/day): 20 beds
- RSD for disabled: 90 beds

Integrated Day Center (CDI): it is intended for elderly people who are not self-sufficient or at risk of losing their autonomy. It has 15 beds and offers assistance, health and rehabilitation services.

STRUCTURE D:

The foundation takes special and assiduous care of the ongoing training of its operators, considered a strong point for the value of the assistance provided. There are 15 active therapeutic-work placements. The structure aims to provide a concrete response to the moral and material needs of the elderly and those who are in situations of hardship due to disabling diseases. It takes care of the elderly in its physical, social, psychological and relational components with a strategy based on the centrality of the resident and the enhancement of the role of the operators.

Health Services:

- Social health care
- Nursing assistance 24h
- Support to the internal clinic of general practitioners
- Geriatric counseling
- Physiotherapy activities and group gymnastics
- Animation and occupational therapy services

Special Projects:

- Pet Therapy
- Museum activities
- The Co.Re. (choir composed of seniors, operators, family members and volunteers)
- Time Slips (spaces in which people with dementia can test themselves using the communication skills (language, sounds and gestures) that still remain to them.

Number of beds:

- RSA for self-sufficient: 10 beds
- RSA for non-self-sufficient: 89 beds
- Alzheimer's module: 21 beds

Integrated Day Center (CDI): intended for 16 users without behavioral and cognitive disorders. It offers rehabilitation, recreational, cultural, occupational activities and numerous opportunities for socialization to elderly people in self-sufficient or non-self-sufficient conditions.

STRUCTURE E:

Senior services ASP of Bologna.

Management and Coordination of Services to People and External Relations: Elderly Services, International Protection, Child Resource Services, Family Center, Severe Adult Exclusion, Housing Services, Support Services, Reporting Pool.

Data collection

Given the limitations identified in the literature and the objective of the thesis that resulted, the best method to respond to the perplexities that arose was considered to be that of a *multiple case study*, which by definition allows to correctly answer the "how" and "why" specific phenomena occur in certain situations, exploring the key features, the meanings and the implications of the case (Rebolj A. B., 2013). Consequently, the best way to answer the question "how have enablers and barriers changed as a result of covid-19" was certainly to get in touch with the reality of Italian RSAs and the needs of the guests within them. It was therefore essential to obtain direct information from those who are in close contact with the elderly and who know and manage their needs, trying to provide the best possible services to ensure their well-being: the *general managers*.

The case study was carried out in a period still characterized by several restrictions in Italian regions due to coronavirus; this therefore forced the use of digital media to communicate with the directors. A series of questions was defined to be submitted in the form of a semi-structured interview, a fundamental tool to leave the interviewees free to answer the questions without limits and to range, stressing particular aspects, to demonstrate their significance. Thus, the interview was performed through video calls, lasting 30 minutes to one hour, in which the directors kindly and enthusiastically agreed to participate.

It was felt that the general managers of the RSAs represented an important source of information and, as opposed to caregivers or the elderly guests themselves, were able to make objective judgments about the needs to be met within an RSA, and especially how these have changed due to Covid-19. In addition, they have always been present and involved during the entire duration of the pandemic, in fact, unlike the caregivers, the directors of RSA could not be called upon to play different roles, so they were witnesses of every change within the structure and every regulation provided by the emergency system.

In this perspective, the objective of the case study, through the interviews, stems from the need to investigate in greater depth what have been the real difficulties encountered in their facilities during the pandemic, which of these reflect those found in the literature, and which ones continue to persist even after the lockdown. Furthermore, this phase was fundamental in order to understand what inefficiencies persist in the system; consequently, from the answers collected, it was possible to obtain and classify the current needs of the RSAs and especially the needs of patients. Finally, according to these needs, it was possible to translate what are the enablers and barriers that *currently* characterize the implementation of social robots and if and how these factors differ from those extrapolated from the literature.

The interviews consisted of fifteen open questions, to which interviewees could answer freely without restrictions in time or arguments, aimed at obtaining information about different aspects of the RSAs: the organization implemented during the pandemic, how the needs of patients were addressed, what were the major critical issues and if and how, despite them, they carried on with routine activities; in this way, several specific needs emerged. Other questions were asked in order to obtain information about how social robots, in their opinion, can adapt to the needs and difficulties experienced and what functions they should mainly perform. Ultimately, the respondents were asked about what are, according to their opinion, the future prospects of their facility and whether they see in these a possible

implementation of social robots, also giving indications regarding their willingness to pay (even though it is not the object of study of this thesis). The structure of the interview can be found in Appendix.

The following document has been formulated following an *inductive method*: a logical procedure opposite to that of deduction, whereby from the observation of particular cases one rises to universal statements; it represents a commonly used approach in the analysis of qualitative data, allowing to reach concepts from raw data (Thomas D.R., 2006).

In this analysis, the particular cases concern the single situations found in the RSAs considered. From the answers to the interviews, therefore from the text, they come extrapolated the needs; every need could be satisfied from the abilities of the social robots, therefore, to represent an enabler, or in contrary case a barrier. Each enabler and each extrapolated barrier are defined as nodes. Finally, a general framework is defined that collects and ties together all the nodes.

The interviews performed via video call were recorded and subsequently transcribed highlighting the directors' emotions, the pauses, and the emphasis they placed on certain points, as if to indicate the importance of certain aspects. Administrative documents and additional insights (e.g.: official websites) were gathered and analyzed in order to further validate the information obtained.

4.3 Data analysis

The data analysis process followed the inductive process described above, starting from the transcription of the interviews and performing a process of *coding* of the text. The structure of the questions interview was meant to first bring out the needs encountered by managers in dealing with elderly guests of their RSAs. Therefore, each response given was first analyzed and categorized into *macro-categories*, each of which expressing a specific need; the macro-categories of needs identified are as follows:

- need for communication and contact between the elderly patients and their loved ones
- need for cognitive stimulation
- need for contact by elderly patients
- need for motor rehabilitation and adequate physical activity

- need for entertainment, to carry out recreational activities that entertain, reassure and bring a smile to the patient's face
- need to monitor vital signs
- need for support in remembering and administering medications

Each of these macro-categories already underpins the services provided by RSAs, as a matter of fact the organization of the structures is normally set in order to respond to each, but this is often not enough; moreover, because of the coronavirus, the health system has not been able to respond and adequately meet most of these needs in the last years, generating a situation of immense discomfort for the elderly and decreasing the overall quality of RSAs' services.

The consequences encountered by the managers interviewed match what has emerged and has been reported in the literature review, namely the lack of close contact between patients and caregivers and inability to meet each other, lack of contact between patients themselves, isolation from the outside world, the suspension of almost all recreational and physical activities addressing cognitive activation and to counteract loneliness. Thanks to the interviewees were addressed additional points, not particularly investigated by the literature, such as the monitoring of vital parameters, e.g., what are the basic parameters or more useful ones in the normal routines of the structure, and the administration of drugs e.g., frequency, protocols etc.

Each macro-category is in turn the result of a series of activities and factors (defined micro-needs) that if performed and satisfied, respond to the macro-need. In this regard, the interview responses allowed us to identify some of these micro-needs and whether and how each of these was addressed by the manager and the organization of the facility. E.g., the *need to monitor vital signs* branches into monitoring of daily parameters, monitoring of particular parameters due to specific events/illnesses, recording of data, diagnosis and prognosis.

The micro-needs have undergone through further analysis that led to a classification and subsequent schematization of the enablers and barriers in two different frameworks, thus having a clear vision of the factors favoring or opposing the implementation of social robots in RSAs.

According to this methodology it is possible to identify the needs that arose by further analyzing the context in which that need is experienced, and the impact of the pandemic in its identification and subsequent resolution by the RSA. Consequently, mentioning the words of the interviewees, it is possible to understand how these needs could be buffered. What, according to managers, should be the role played by the social robot, identifies an enabler; or if not, where managers do not find the social robot to be a possible solution, a barrier is identified instead.

5. Resulting frameworks

The structure of the questions asked during the interview have allowed the collection of the micro-needs, introduced in the previous chapter. Among these, the answers provided have especially facilitated the collection of what the interviewees felt were the *limitations* of the system either due to the inherent structure of the system itself or due to failures of the system.

By translating the limitations arisen, it was therefore possible to identify specific areas in which social robots *can* intervene, coming to the aid of patients and/or supporting caregivers; these represent ideas of future potentialities social robots can embed and would therefore give more value to social robots, encouraging their adoption in RSAs. Each constraint compatible with this reasoning was then analyzed and interpreted as a possible **enabler** that would favor the implementation. E.g.:

- *constraint*: caregivers have less and less time to devote to support the elderly in recreational activities
- *consequence*: the social robot could monitor patients during some of these activities autonomously.

On the other hand, in the same way it was possible to understand where the social robot *cannot* intervene, or can intervene only minimally, thus representing a **barrier**. E.g.:

- *constraint*: for legal reasons medication administration can be performed only by healthcare professionals
- *consequence*: the social robot *cannot* independently administer the drug (barrier), but it *can* support staff in the preparation of the drug (enabler).

Regarding the constraints that lead to finding factors enabling the implementation of social robots, these can be distinguished into:

- constraints due to healthcare personnel
- constraints arising from the therapeutic practices to be performed.

The first grouping includes all those limits that derive directly from humans, such as fatigue and all other aspects that may complicate the interaction with the elderly, the others derive from organizational aspects of staff and their cost, ordinary and extraordinary, proportionate to the working time.

The second grouping is divided into monitoring of vital parameters and observation of therapies, paying particular attention to the factors of the process that could be simplified through the implementation of the social robot.

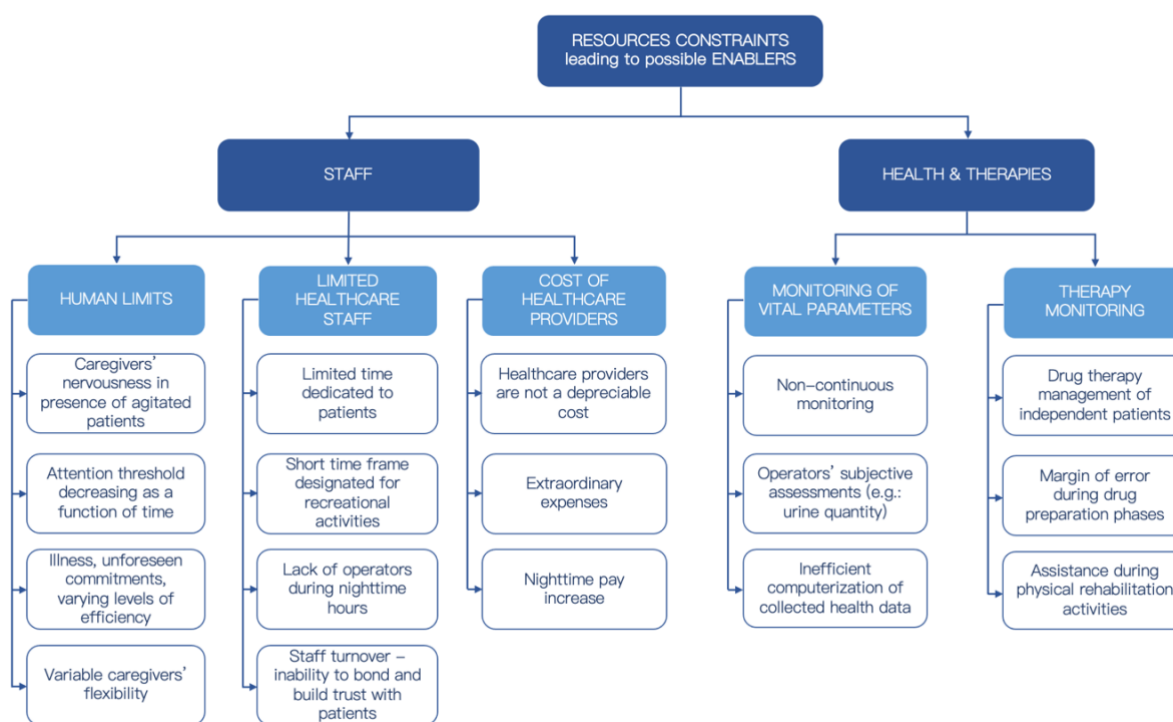


Figure 5 - constraints translated into possible enablers of social robots

In terms of the limitations that identify barriers, these relate not only to processes that are strictly related to the services of RSAs, but also to factors that are indirectly related to them.

Limitations related to the *nature of the services provided* can be divided into

- limitations due to **patients' conditions**, i.e., particular clinical conditions that would not allow an effective interaction with robots
- limitations due to **technical aspects** that a robot would be unlikely to perform, such as being able to identify the mood of patients or be able to establish a complex relationship with them, in short factors that belong to the emotional sphere; moreover, among these technical limitations there is also the administration of drugs, which must be carried out by health personnel for reasons that fall within the legal sphere.

Limitations that instead are *indirectly related* to the services provided are divided into:

- limits of **economic nature**, these in turn are the result of the inadequacy of the funds allocated to the health care system and in particular to RSA, and the issues arising from the possible incompatibility of social robots with physicians
- limits of an **ethical nature**, which emerge from subjective opinions, and which are still a cause for debate, even among those interviewed.

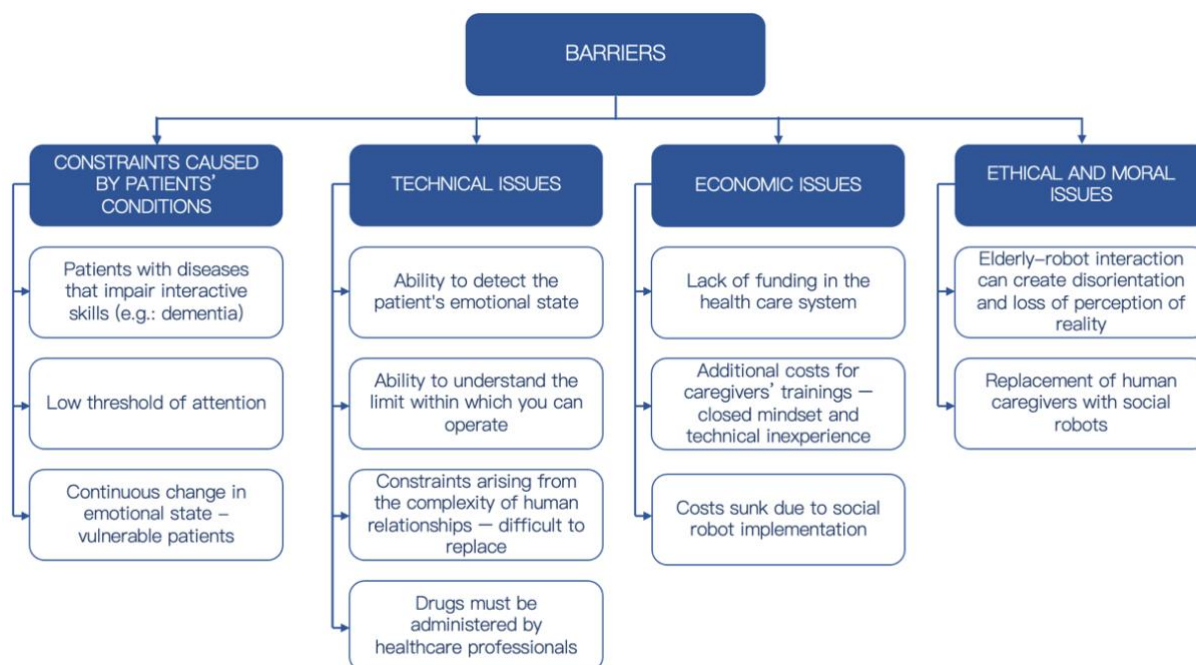


Figure 6 - barriers to the implementation of social robots

5.1 Enablers and barriers revealed

Before analyzing in depth each enabler and barrier emerged, it is worth setting forth in aggregate the managers' testimony regarding the pandemic period they faced and what this meant for the lives of patients in the facility.

Given the dynamism of the events during both waves of the virus, the managers had to keep pace with ministerial decrees and urgently activate all the measures issued by the superstructural bodies, and therefore adapt the organization of the structure and the services provided in a sudden and continuous way; at the same time, they also had to cope with the lack of staff for front-line involvement in the emergency or because infected by the virus itself. Managers and RSAs have never been called upon to be in the forefront of the decisions taken at the healthcare level. On the contrary, they have always found themselves having to undergo decisions, taken by others, that often did not meet or resolve the real needs of the RSA.

The pandemic has hit residential facility residents very hard especially the urge to close themselves off from the outside world, completely isolating their frail patients. Caution was important, but the problem of contagions in the residences depended only marginally on visits, which were practically reduced to zero since the beginning of the emergency. The main thing instead that they blamed is that the prolonged period of closure of all forms of contact has caused further serious problems for the guests.

The same thinking has been noted by several managers, who expressed that healthcare management has often remained deaf to the needs of RSAs, continuing to preclude any form of contact; an indiscriminate policy of limiting the number of admissions, including other external personnel, has had very significant repercussions on the levels of assistance guaranteed and on the quality of life of the guests. It is therefore necessary to allow in-person visits in a controlled manner, and to establish and enhance forms of telepresence as well.

All managers showed concern about the loneliness suffered by their structure's elderly: many were letting themselves die, their health is deteriorating and they could have to deal with many losses, not due to Covid. There is an urgent need to embrace elders and interrupt their isolation. The loneliness that the whole population have suffered in recent months, they have paid the price of their lives.

According to managers, each elderly person is commonly accustomed to a routine that involved contact with certain professional figures in determined situations during the day: from hygienic care and social moments to medical visits and physiotherapy sessions. These represent moments in which a

significant trust is created on a human and intimate level that leads the elderly person to feel a certain emotional stability and to build a routine. When these professionals change, the elderly must now let themselves be helped by a new individual letting this unknown person enter their more personal sphere. Likewise, the new caregiver does not know the story of the elderly person he/she now has to care for, increasing the discomfort. The routine in essence is crumbled, and the elderly person feels disoriented from a cognitive point of view.

5.1.1 Enablers

Starting from the enablers' framework, the first part of the identified constraints, which are translated into future opportunities that may favor the implementation of social robots, concerns the limitations related to the **staff** of the RSAs which in turn are identified in limits given by the human nature, limits due to the organization of the staff and costs of the same.

Human limits

In observing with the interviewees, the possible uses of the social robot, for manager A it was spontaneous to associate to a robot firmness and decision in movements that does not characterize humans in the same way. It must be considered, in this regard, that health workers often have to deal with elderly people with impaired physical and cognitive abilities; in an RSA, the health worker must lift the patient several times in a day, from the bed or chair. Faced with patient agitation, which often results in sudden rough movements, Manager A argues that "*the caregiver is inevitably and unconsciously just as **agitated**, affecting his movements... the social robot, on the other hand, remains impassive and doesn't get scared: it picks up the patient and lifts him up*". The social robot would not lose its grip on the elderly person, ensuring a solid support and reducing the risk of falls.

The above mentioned represents one of the reasons why taking care of elderly patients is often challenging, and the efficiency and **attention threshold of the caregiver** decreases as the hours pass. Unlike a caregiver, the social robot as a machine, has performance rates that do not decrease as rapidly as those of the caregiver, depending on time; that is, unlike humans, they do not feel fatigue and are prone to make fewer mistakes, and to always ensure the same level of attention to patients.

Linked to the same factor, the operators as human beings have a life outside the facility that influences their work, both in terms of efficiency, possible **illnesses or non-work-related commitments**. During the pandemic there were numerous cases in which staff were seriously

understaffed due to contagions or to cover the role of other doctors in other healthcare facilities. In addition, from now on, despite the fact that the vaccine has decreased the lethality of the virus and the contagions as well, anyone who tests positive to covid-19 would be forced to isolation for several weeks representing a significant issue for the organization of the RSA that must quickly adapt to the inconvenience. The use of the social robot in this case would help in replacing possible deficiencies. Manager A in fact states that *"we had to deal with these two strands: that of adapting the organization on a daily basis, and in a very sudden way, and on the other hand... having the staff subject to the risk of disease"* even within the structure itself, where the risk was certainly not less.

But in dealing with unforeseen events, managers have to consider that **healthcare workers have a variable flexibility**. An unforeseen event involving only one operator may affect the rest of the staff, so it is crucial *"to adapt the organization on a daily basis and in a very sudden way"*, says manager C. Staff must be flexible to perform all kinds of tasks if necessary as they may have to perform tasks other than daily. The social robot, on the contrary, can be programmed to perform efficiently all the planned activities, switching from one function to another by a click, remaining moreover immediately updated on the changes, or simply supporting each caregiver in new activities.

Limited health care staff

It is challenging for the operators, between protocols and therapies to be followed, to **dedicate enough time and space to the elderly person** to be able to carry out play activities or stimulate cognitive functions, such as memory, viewing images, playing games etc., but also being able to show interest in patient's wellbeing, recognizing possible signs of depression, of sadness, and quickly remedying them. In essence, the operator cannot often dedicate himself/herself to a single elderly person by fulfilling all the attentions that they require as humans. Nevertheless it is key to remember that the social robot would not be able to efficiently recognize the patient's emotions, but it could represent a meaningful contact, and otherwise be used to just provide specific attention during the day, like *"enter the patient's room in the morning to say good morning, make him/her sing, revisit with him/her recipes of his country and memories of its history, all those attentions that make the elderly feel better, reminding home"* according to manager A. Furthermore, although the robot is not human, it can be an invaluable source of **companionship** for patients suffering from cognitive impairment. Often these patients in fact begin to feel a sense of inadequacy, e.g., when they realize that they no longer remember something; in these moments the patient needs to feel someone close, whether an animated presence or

not, who can make him/her feel less alone and above all who at the same time does not make him/her feel burdened by his/her condition. In a period, affected by Covid-19, in which health workers have less and less time to devote to patients, indeed, they themselves are forced to have the minimal contact to perform basic care, manager A states "*think how helpful it can be for a very cognitively impaired person to have an interlocutor who does not judge...who responds to you for what you say. [...] It allows you to relate, it allows you to be yourself and it gives you that feeling of always having a familiar voice close by [...] and that I think can be valuable.*" In addition, the manager also addresses the issue of ethics, but he expresses that "*anything that puts the sick person in a position to be themselves and to feel a sense of well-being, I think ethics should take a back seat*".

Similarly, related to the constraint referring to the **short time frame designed for recreational activities**, manager B states that "*the time frames dedicated to some activities, like the educator's part, are short! Why?*". The educator has a cost and cannot ensure a constant service, it is an external resource which was further limited due to coronavirus. The manager B goes on to say that he would like to be able to leverage every resource available as much as possible, both to provide better service to patients and to amortize resource costs. "*The more I use it, the more I am amortizing the cost of purchase*" he continues. In this sense, exactly as said before, the social robot could dedicate itself entirely to these activities, which then would no longer be bound to precise and limited time intervals. With a screen built into the social robot, seniors could be entertained with games followed by the social robot's voice guiding and prompting them. In addition, the social robot could promote moments of aggregation, involving guests in conversations and stimulating the attention of even the most silent elders.

During pandemic, the **lack of resources** is also suffered **during night hours** of service. Manager D says that an innovative resource "*could help the work of the staff, particularly at night because the number of operators is lower than during the day*". The social robot could be adopted by RSAs to intervene during these time slots (which are normally the least chaotic), to monitor the structure and the guests. Through heat or sound sensors, it could detect, for example, possible falls of the patient or recognize if the latter wakes up at night in the grip of a crisis; thus, it would be already programmed to immediately launch an alarm signal, if necessary, thus rapidly intervening on the elderly.

As already mentioned, one of the main difficulties encountered due to covid-19 was the need to change staff continuously and instantaneously, and such **staff turnover causes inability to bond**.

The seniors found themselves disoriented by this situation. Manager A points out that they were isolated in their rooms from everything and everyone, the only contact was with the health worker on duty, who was often a stranger; the elderly were forced to let an unknown person enter their privacy early, representing a source of great stress. All forms of routine were lost. What would be useful to elderly patients in these conditions is to have something stable and known, such as a voice; social robots could intervene in such terms, programmed with a friendly voice that soon the elderly will recognize and associate to something familiar. According to manager A, the robot must then "*enter every morning the patient's room, open the curtains, say good morning, put on a song, perform in the meantime the first disinfection of the room, and lift the patient from the bed*" in this way the elderly will feel comforted by a known contact, making easier the work of the health worker who later will perform the care maneuvers. At this stage, the robot could also start to cognitively stimulate the elderly person reminding him what he has to do during the day and offer to take the guest to other rooms. According to manager A, the main function that the social robot has to cover is first of all relational.

Costs

Going into the economic merits of the matter, it is easy to see that **healthcare providers are not depreciable**: this constraint comes from purely economic considerations, but nonetheless significant for the facility. Unlike the health care staff, a social robot represents a depreciable cost over time and consequently a self-funding. Taking into consideration the mechanical deterioration of the machine, it is sufficient to consider that the depreciation it undergoes every year represents for the structure a provision of resources that can be reinvested in the purchase of another social robot at the end of the useful life of the previous one.

Given the lack of staff due to covid, interviewee B in fact states that "*now the people are not there. This is already an inkling that maybe tomorrow I will also have shortages of nurses, attendants, entertainer etc. So, if I can find something that strategically manages to provide for these functions... it's good [...] but this resource must be recognized*". The words of the interviewee want to highlight the lack of a more in-depth research about the actual effects of social robots at economic and financial level, a result that would then be reflected in the performance of the structure and its reputation with stakeholders. In fact, again according to interviewee B, patients' relatives must perceive the presence of the social robot as a plus that gives more value to the services provided.

In addition to what has just been said, it is common for an RSA to have to face **extraordinary expenses** when it comes to staffing, and now as never before, because of Covid-19, these expenses weigh more heavily on the coffers of the system such as the need to purchase safety and security

equipment necessary to carry out activities in compliance with anti-contagion health regulations. The presence of a social robot, for example, does not imply this expense; on the contrary, it is safer from a health point of view, simply by performing regular sanitization. Among the extraordinary expenses are also those related to night shifts, which as mentioned above could be performed by social robots, or expenses for extra hours performed by operators.

The second part of the enablers framework shows all those constraints of the systems detected among the patients' **health** and in the **therapies** conducted; in turn this area can be distinguished in monitoring of vital parameters and monitoring of therapies.

Monitoring of vital parameters

Regarding the **monitoring of vital parameters**, the interviewees were asked how these were monitored and if a robot could possibly perform this activity. Managers showed interest and inclination to the idea that social robots could support operators in measuring vital parameters, which normally could **not be measured constantly**; they also proposed interesting different points of view. Manager D believes that a social robot can definitely be introduced under this perspective, "*because it helps a lot also the work of the operators, especially at night [...] it could be really effective in being able to give that information that otherwise would come in other forms and not even in such immediate times*".

Manager C affirms that nurses, being the monitoring activity of their competence, "*could devote themselves to other operations in the meantime*"; according to her, therefore, some objective and measurable parameters (e.g. temperature) can be left to the competence of the social robot, as manager E also affirms "*evaluating the instruments that today allow to detect some parameters in an objective way [...] this can be possibly done (by a social robot)*".

Manager A, on the other hand, proposes a significant point of reflection; he states that the parameters usually discussed, i.e., pressure, saturation, temperature are not as important in an RSA as they are in a hospital, indeed they are measured when necessary. It must be taken into account that elderly people who attend RSAs usually have a rather long-life expectancy and especially that it has sudden changes and stable phases; manager A also underlines that the nursing activity does not start from the detection of the above mentioned vital parameters.

In this regard, reference is made to the next limit: **operators' subjective assessments**. Manager A sheds light on all those parameters that seem to be underestimated, but which are indispensable though for an efficient care of elderly guests. These parameters above all would require an objective evaluation, nevertheless they are often established in a subjective way by the health operators. Among these is the detection of the amount of urine excreted by the patient, "*this is a fundamental data for us! Because it*

allows us to make an accurate analysis of electrolyte imbalance" confirms manager A. When the urine is not collected through a catheter, which gives a direct measure of the amount produced, the operator tries to give an approximate measure based on the weight of the diaper (a value therefore subject to different interpretations). A social robot that could accurately give a precise value for parameters of this type, according to Manager A, would be more beneficial still. In order to understand how much the wellbeing of patients can depend on even the simplest attentions and operations, Manager A explains that *"monitoring urine and fluids is important because electrolyte imbalance makes the skin dry and, like when we sunbathe without putting on moisturizing cream, our skin ends up breaking. So, through electrolyte imbalance, very often our seniors get sore!"*.

Regarding the collection of measured parameters, manager A exposes the problem of **inefficient computerization of collected health data**, especially of inefficiently digitized medical records. In fact, the problem arises from the number of records to be monitored which is significantly high, each patient has his/her own, often even created at home. It would be essential that the social robot, in support of this, *"has functions such that it can easily communicate with the world of medical records [...] it is important that when the social robot download these data, it can download them in a place where there is a software that welcomes them"* according to manager A. The social robot has undoubtedly the potential to be a mobile digital medical file containing all the medical records, it could move from one room to another in support of each operator, thus it could open the necessary file and read the data by voice while it is projected on the integrated screen. Ensuring the right security, the social robot could be used as a portable computer from which to update live patient conditions, perhaps coupling this with the robot's ability to measure parameters itself.

Therapy monitoring

One of the questions provided addressed how the assumption of medications by the patients is managed. The answers of the interviewees led to outline, among the constraints of this phase, the matter of **drug therapy management of independent patients**. Manager A states that in the RSAs the administration of medications no longer occurs independently by the elderly, it always occurs through the nurses. In day care centers, for example, where the elderly person is still self-sufficient, according to manager E *"the operator must still be present and perform the so-called drug administration assistance, that is, he/she must only remind the patient to take the pills, supervise that he/she takes the right box, opens the blister, puts it in his/her mouth, drinks some water and swallows it"*. A social robot could be programmed to guide the patient to recognize where and what the pills are and the process to be followed for administration, for example via a screen. The support of the social robot would also be

of great value because "*there is always the possibility of error, so any help that can come in this sense is welcome*", confirm Manager E.

Manager's words allowed the identification of a further difficulty in the system: **margin of error during drug preparation phases**; indeed, manager E explains how the therapy to be administered to the patient (i.e., type of pill, dosage, frequency and time of intake) is defined in the therapeutic card, the nurse displays the card and prepares the correct dose of the drug with the name of the patient for whom it is intended. In this process, manager E says, "*the errors that can occur reside in these steps: prescribing, preparation and administration to the correct individual*". Margins of error can occur primarily because of a substitution of staff, thus the nurse who takes over in the middle of the process may make an error in administration for example. These types of errors can be prevented with the support of digitization, in particular a social robot can keep every piece of information in the therapy cards up-to-date, at their fingertips, and can also associate each card with the photo of the patient to whom it corresponds, associating and/or identifying the patient through the use of facial recognition.

The last point inherent to therapies, concerns **the assistance during physical rehabilitation activities**, also in this case through the responses of managers it was found an activity that represents a fundamental moment in the care of the elderly, for which a limited number of hours is allocated, further decreased due to the pandemic, and performed only in the presence of a physiotherapist. During the days not devoted to physical therapy, social robots are seen by managers as a way to encourage cognitive stimulation to keep patients moving. In this regard, manager B states that "*imitation, mirror neuron activation I think can be leveraged through a social robot*". The social robots can then attract the attention of patients, acting as an aid, stimulating specific movements that in turn will be imitated by the patient.

The stimulation of patients with forms of entertainment or with physical movements, the presence of the robot in various stages of the day and during routine activities performed with health workers, the possibility of having something to talk to; these are all aspects that represent in any case an extra attention towards the patient, a moment of distraction and contact with the social robot, strengthening the relationship with the latter and representing an increasingly common presence in the eyes of patients. Moreover, at a time when everything seems to be off and the world seems to have stopped inside RSAs, the elderly are increasingly left to themselves, without stimuli; the social robot, despite the infinite possibilities it presents, must in any case provide **companionship** to the elderly.

5.1.2 Barriers

The ultimate goal of this analysis is to verify which, among the needs that affect the RSAs object of the case study, represent consequently barriers that hinder the implementation of social robots. In the search for barriers, particular attention was paid to those aspects that can hardly be addressed by a social robot and that, consequently, invalidate their support function towards elderly patients.

Constraints caused by patients' conditions

The first category of barriers that it was possible to identify, through the analysis of the interviews, is constituted by all those constraints caused by clinical and emotional conditions peculiar to some patients. Manager B makes a distinction between guests with dementia and those without dementia, who instead have pathologies that do not affect their cognitive and behavioral abilities. In this regard he says that *"the interaction (of the social robot) with people [...] lucid, able to learn and interact is facilitated. It will be different for those who have pathologies for which, unfortunately, even interaction with operators becomes difficult"*. For this reason it appears to be more complex to let a social robot interact autonomously with **patients with diseases that impair interactive skills** (e.g.: dementia), which would mean not obtaining the same benefits that could be obtained from contact with guests not affected by the same level of impairment. Manager B goes on, recalling that there are already modules dedicated to people with dementia, and that in themselves are effective in stimulating patients and reducing psychological, social and behavioral disorders, such as doll therapy, commonly used for patients with dementia.

"For fifty percent of seniors it can work, for the other fifty percent you need to interact, seize the moment, see the senior's condition at a specific time, their attention span or whatever, and use a strategy accordingly", says Manager E. It is very common to observe significant **variability in attention thresholds in the elderly**, which often turns out to be independent of disease. The ability to stay focused depends on several factors, including the interest towards the subject matter, but also the ability of the interlocutor to entertain the patient. Some patients managed by Manager D are part of a specific Alzheimer's module, for which the use of computers is dedicated. Through computers, patients have access to games that promote cognitive and sensory stimulation; studying the interaction, manager D states that *"the level of attention dropped rather quickly, let's say that in the first twenty minutes/half hour people were still focused [...] then they began to abandon the use of the computer and ask questions directly to the operator"* thus seeking human contact.

Another common aspect to consider in the elderly is the vulnerability that leads to **continuous change in emotional state**. Manager E then expressed that "*the elderly do not have the same mood every day, just as they do not have the same level of attention, these can vary. So the person facilitating the video call (with patient's relatives) sometimes has to interact. I don't know about social robots how they can interact*". The instability of some patients turns out to be a significant barrier that may affect their interaction with the social robot; such behaviors are difficult to address, often even by the caregivers, who must in fact have great empathy, patience and sensitivity in order to get the desired attention and relieve the patient. Consequently, the "programmed" behavior of a social robot may not adapt to the vulnerability of the elderly person.

Technical issues

With respect to what has just been reported, the biggest obstacle turns out to be the robot's **inability to detect emotional states** and adapt its behavior accordingly. The question to ask is whether and to what extent this phenomenon would imply a mismanagement of the relationship by social robots with the elderly.

The major concerns that emerged from the interviews focus on the technical aspects. The social robots can, thanks to technology, objectively measure many parameters of the patient, "*but not the regulation of pain, because you have to evaluate also the disposition of the body, the expressions of the body, of the face*" states manager E. The same aspect is taken up by manager C: "*however, that aspect of verification in person is missing, that is [...] maybe he/she has all the vital parameters in compliance, but he/she is depressed, not happy... the wellbeing of our people also depends on these aspects*". This technical barrier is closely related to the previous constraint of elder vulnerability. Results such as to allow social robots to be able to correctly interpret the different emotional states of the patient, would require a significant development of artificial intelligence which in turn requires significant funding in R&D and more years of study. This would imply a higher cost for the end user and consequently the product could easily become out of the market for RSAs, especially considering the current financial availability of the sector and the degree of technological advancement it has currently adopted.

In interviewing manager D she states with conviction that she would never allow her patients to be left alone with a social robots, without the supervision of a caregiver. She explains her position by stating that "*(through the caregivers) I always have the supervision of a real live person, clearly capable, who can decide how far the boundary is, how far you can go, and where you go over the boundary*". Among the human facets of the patient, which the social robot cannot adequately perceive, is that of a person's tolerance limit. In the event that the social robot fail to recognize this boundary, it would risk making

the patient more nervous and in extreme cases cause a form of rejection towards the social robot by the user with whom it has interfaced. This would have negative repercussions both from an economic and functional point of view, as the ultimate goal of bringing greater well-being to patients would be violated. Manager E also assess that *“there is a different identification. The machine, I want to call it a machine, however despite being helpful, it is still a machine. I don't identify myself with the machine. Do I need it? I use it. I don't need it anymore? I don't use it”*. The manager's strong thinking suggests that the social robot should maintain a marginal role within the RSA. It shouldn't be seen as a replacement for the human, nor should it consequently cause a decrease in staff; more important is to make sure that residents also perceive it simply as a tool to support caregivers. Therefore, the robot, as a tool, must be effective and useful, otherwise it will not be implemented.

During the interviews it was investigated how the video calls, the only contact of the guests of the RSAs with their relatives during the pandemic, were carried out. This is one of the main activities for which the social robot is designed, however Manager C states *“I do not think that the robot can completely replace the figure of the educator who introduces the call, making the introduction and chatting and interacting with the family member, because the family member needs to hear some more information about their loved one ... that is that he is well, eating, is cared for, but certainly when they come to video call also the educator or the animator is questioned by the family members”*. This barrier is intended to highlight the impact that the social robot can have on certain stakeholders, particularly family members. The implementation of the social robot should allow healthcare professionals to better manage time and costs related to patient administration. Therefore, activities such as video calls, could be performed by the social robot, thus allowing the use of human capital where it is most needed. The problem exists when family members want information about their loved ones, which also allows them to establish a human relationship and trust with the staff on duty. This type of **relationship is difficult to establish with the social robot**. It requires more mental resilience on the part of the family members, thus another hurdle towards implementing social robots.

The technical problems that characterize social robots also depend on reasons closely related to the area of legal responsibilities. *“It must always be a health care provider who administers the medication! So the help is addressed toward the operator, because the elderly person cannot take the drug”* is noted by Manager E. Manager C adds that *“the administration of the medication can only be devolved to the professional nurse, because there is a responsibility in the administration”* as already encountered in the analysis of the enablers. Regarding the **administration of drugs**, it is necessary to observe the reference legislation, which provides that only health personnel can perform this task. From taking the

drug from the blister to the dosage of drugs in nursing homes is the exclusive responsibility of nursing staff. As a result, social robots may be more concerned with the logistical process of preparing medications, rather than administering them. It would need to be considered how, at this stage, the social robot could be a support for caregivers and a beneficial resource for the organization.

Economic issues

This category highlights the economic barriers that currently exist in the healthcare industry. It is important to specify that some of them are related to the intrinsic structure of the sector, while others as a consequence of the possible implementation of the social robot.

Lack of funding in the health care system is a direct barrier and unfortunately not easy to be resolved. "*As social and health facilities dedicated to the care of elderly and frail people, we are the poor children of health care [...] there are no big numbers to be able to foresee big investments; so... this is the problem, that is the barrier to entry*" summarizes manager B. The funds available for social and health services are already severely limited and the pandemic has only worsened the situation because of further expenses, such as the purchase of all anti-covid devices, to ensure safety and compliance with hygiene standards within the facility. Consequently, the lack of cash could significantly postpone the introduction of social robots into the system. A possible solution is proposed by manager A who suggests leasing with redemption as a suitable purchase formula for the needs of RSAs, given the limited economic resources. In particular, this purchase method could include structuring and personalizing the robot ad hoc for the needs of the RSAs.

Analyzing also other stakeholders involved, social and health workers would be the protagonists of the implementation of social robots in RSAs, they are the ones who, before the elderly, have to accept to be supported by robots integrating them in their activities. All this requires a reorganization from several points of view and, unfortunately, human resources may decrease by being substituted. In this regard, manager A underlines that "*the operators of the structures are not open at all, the health world is a very closed world, not very generous, not very welcoming [...] there is a need to do training*". Often people are distrustful and afraid of new technologies, showing a **closed mindset**. As a matter of fact, machines replacing humans in working activities represent a problem that has always plagued individuals during every revolution or technological advancement. This implies the need to ensure that healthcare personnel learn to collaborate with social robots in order to reach a peaceful, but, above all, functional relationship between healthcare workers and robots within the structure. This is possible, for example, through **training**, which represents an investment in HR, i.e., **higher costs** for the RSA.

Linked to the purely economic aspect, it must be stressed that social robots must be designed specifically to interact with the elderly and, in turn, must perform specific actions. This means that this investment has a specific nature and therefore cannot be directed towards activities of a different nature in order to recover the costs incurred in the event, for example, of failure or inconsistencies with the service. This represents the definition of **cost sunk**.

Ethical and moral issues

The nature of these barriers is quite different from those detected above. The same respondents had mixed views on the impact that social robot can have from an ethical and moral perspective.

Elderly-robot interaction can create disorientation and loss of perception of reality, according to manager D *"dialoguing with a social robot and identifying it exactly as if it were a person, can also be depersonalizing and still leads to distract from what can then be the perception of reality [...] I would find it unethical to attach a strap to an elderly person (wearable) with the robot, or to have a person with dementia accompanied outside by a robot because in my opinion there would be a strong... **lack of awareness with respect to reality**".*

A completely opposite opinion emerges instead from manager A who affirms therefore *"anything that puts the sick person in the condition to be himself and to feel a sensation of well-being, I believe that ethics must take a back seat [...] it will be unethical to make them talk to the machine, but it's fine in the absence of health personnel"*. Analyzing from an ethical and moral point of view the impact that the social robot can have on an elderly person, Manager D proposes that it is unethical to replace, even partially, the figure of a human being with a robot. On the contrary, bringing up the recent example of how the pandemic has radically changed the reality of RSAs, Manager A refers to a *"seizure of the elderly"* who have found themselves living alone in their rooms for months, i.e. human relationships have been reduced to a minimum. Therefore, it is evident how this constraint is extremely subjective and depends on the modus cogitandi of the interlocutor. Summarizing the two opinions, it is clear that a person-to-person relationship has greater value than a person-to-robot relationship, but in the presence of a sector that suffers from various inconveniences due to lack of personnel, which affect the elderly, limiting the support of social robots because of ethics could be disadvantageous.

*"The use of this figure would take me away from the presence of people. It scares me because every time I read about the introduction of a tool, this represents one **less people working** and so I don't agree so much"* states manager C. The implementation of social robots in RSAs can be unethical when it is

expected to replace part of the staff. Nowadays, as briefly mentioned, this is a rather recurrent phenomenon in the industrial sector, which often increasingly aims at obtaining capital intensive rather than labor intensive production functions in order to optimize economic returns. In contrast to the industrial sector, residential care facilities have different outputs, including the well-being of patients and consequently of the workers related to them. Therefore, this situation is nothing more than a trade-off that RSAs must take into account when they intend to introduce any form of new technology into the facility.

In ultimate analysis, manager E's words "anything can happen" underscores how the unpredictability of machines is what most intimidates managers to adopt a social robot in their facilities and let it interact autonomously with the elderly, without due oversight. This is due to the fact that humans still can't trust the machine, it is still seen as something imperfect and uncontrollable, that can get damaged or not work properly; "it terrifies me to think about using the robot to perform entirely the animation activity" manager C. In addition, the human relationship is still considered of enormous benefit, indeed as much as we can humanize a robot, the interaction between humans remains very important according to managers. The robot must assist the human, not replace the human. Again, according to manager C, it has to be something that breaks the monotony, not part of it. On the contrary, there is disagreement with the thought of manager A who argues, as investigated mainly in the analysis of the enablers, that it may rather be significant to make the robot a *stable resource* within the structure, which represents a fixed point of reference for the elderly, which can then be perceived as something that transmits familiarity and gives peace of mind to the elderly, who do not get nervous in the presence of a new, unfamiliar health worker.

6. Discussion and conclusion

The main objective of this thesis was to identify how the enablers and barriers that respectively favor and hinder the implementation of social robots in the field of social care, and in particular within RSAs, have changed. Transversely, the main needs that emerged in facilities during the pandemic were identified, among which the main one appears to be the need for companionship for patients.

In order to achieve these results, a multiple case study was performed involving five different managers of residential care centers. The managers were subjected to semi-structured interviews with the aim of identifying the above-mentioned needs; starting from these, it was possible to translate which factors could be solved through the functions of social robots (thus identifying an enabler to the implementation of the latter) and on the other hand which functions were unlikely to be addressed by a social robot (identifying a barrier to the implementation). In turn, it was possible to classify and schematize the results found by constructing two frameworks: one representing the enablers (in the form of system boundaries to be addressed with robotic technology) and the other one grouping the barriers.

As far as enablers are concerned, the main factors that would favor the implementation of social robots concern the need to cope with the lack of staff: the facility needs fixed resources to support the elderly in a post-pandemic phase in which human-to-human contact is limited, as well as contact with family members. Social robots could devote fundamental attentions to patients, such as conversation, entertainment and cognitive stimulation, for which increasingly less time is dedicated by operators; moreover, these same activities have currently undergone cutbacks due to the pandemic, negatively affecting the well-being of residents. It has also been found that, even for patients with complex clinical situations, the *companionship* of the robot would be beneficial in order to have an interlocutor who listens to them, does not judge them and therefore does not put the patient in front of his compromised condition, on the contrary it would converse and respond to any stimulus of the patient without creating discomfort. Furthermore, social robots could be an important resource to provide monitoring of vital parameters with objectivity and frequency and at the same time it could collect the necessary data and organize them digitally. In these terms, the need has emerged to digitize certain processes within the healthcare sector as well; the digitization of medical records archives would be particularly beneficial.

With regard to the barriers outlined, the greatest obstacles derive from a significant uncertainty towards technology; robots are still seen as unsafe tools to perform care activities independently. Part

of the answers obtained from the interviews showed that it is important, for some, to maintain a strong distinction between the human caregiver as the main support for the elderly, and the robot, as a mechanical support tool. The greatest fear is that the elderly would not be able to perceive the difference between the two and consequently they will have a distorted perception of reality, especially for the ones with cognitive and physical impairment. The latter, due to their clinical conditions, could experience greater difficulty in interacting with a robot that would not be able to recognize their moods and adapt its behavior accordingly. A significant barrier, however, which derives from factors not strictly related to the stakeholders involved, is the economic one; the social health sector does not have available funds to be able to afford an advanced social robot that meets the needs identified. Last, but not least, managers highlighted the concept of ethics, which has already been widely discussed in the literature; in this perspective, the vision of managers is deeply divided, in fact, two managers believe that a strong interaction between elderly people and robots is immoral, while according to the other three managers the pandemic turned out to be a game changer: the severe lack of staff and the loneliness experienced by patients as a result of isolation are already significant reasons to put ethics aside and adopt the social robot.

The study has therefore contributed to provide an analysis, still missing in the literature, of what the real situation was within the RSAs in the pandemic and post-pandemic phase; in particular, the point of view of managers has been deepened, since it represents a category of stakeholders often put in the background in this research area, when instead they represent an eye that meticulously monitors the dynamics of the RSAs giving an objective and external perspective. Thanks to this analysis, it was therefore possible to see how the Italian healthcare sector still seems immature to the acceptance and implementation of social robots as autonomous tools for elderly care. In spite of the technological advances achieved by artificial intelligence, the idea that robots will be able to replace the role of the caregiver still causes uncertainty.

However, today it is essential for managers to be able to provide their guests with an environment as familiar as possible in which they feel safe and at ease; in these terms it has therefore emerged that it is necessary to have a stable emotional point of reference for the guests, the social robot must be something familiar so that guests do not get nervous in the presence of a new, unfamiliar caregiver, or that in any change in the organization, they can find the social robot as a fixed point.

A further contribution comes from having performed an analysis of the needs of patients making a step forward compared to the literature in which factors related to the predisposition to technology have covered a central role. This study has instead focused on other facets that characterize a possible human-robot interaction that dig deeper the emotional sphere. Considering these aspects, three out of five

managers were undoubtedly inclined to the use of the robot, imagining positively what role they could assume within their organization and showing curiosity about the multiple functionalities that could be integrated into it. As a matter of fact, all the circumstances in which managers see a possible implementation of social robots are linked to functions closely related to the emotional sphere of the elderly. The basic function of a social robot must be of assistance by providing greater attentions, contacts and care. Consequently, an inhuman figure, but capable of caring, would already bring relief to the loneliness of the patient in the absence of other contacts. The point of view with which the social robot should be seen is to represent an added value to the health care staff through a partial replacement of the latter aimed at optimizing the whole process, not losing sight of the fact that all this should be done in function of the profound well-being of the elderly. In essence, there is a clear need on the part of most managers to provide companionship for their guests.

Covid-19 has weakened human relationships to the point of fearing contact with others, disintegrating the primary function of every human being: the social one. The entire population emerged from the pandemic damaged, with an even greater need for interaction with others; even more disruptive, in a negative sense, was this experience for the elderly, forced into isolation. From the words of the managers, the suffering experienced emerges powerfully, which is the suffering that now allows them to see in the social robot glint of hope, a support that can become fundamental, especially if another wave of the virus were to be faced.

Nevertheless, as already mentioned, all five have underlined the economic limitation at the base and, in compliance with this, the effort necessary for the correct implementation, that is: preparation of the healthcare personnel, who must know how to use the robot and must above all be comfortable in being supported; the social robots must be adequately integrated within the structure, which requires a significant reorganization of the system. In essence, the investment that characterizes the adoption of a social robot is given by the combination of an investment in purely economic terms, and a significant effort at the human and organizational level, to adapt the system. At the moment, the studies addressed and the data available could not represent a solid basis to justify such an investment. Despite the fact that today researches have reached impressive levels of advancement in the field of robotics and artificial intelligence, the population still sees robots as unsafe and unpredictable.

One of the managers came up with an innovative solution to deal with this problem, which is to exploit a purchase formula equivalent to leasing with redemption. As seen from the results, the managers give a different importance to the functionalities that the social robot can have (ability to measure parameters, to cognitively stimulate the user, to disinfect the areas of the structure, to converse with the users etc.); consequently the purchase formula of the leasing could include the ad hoc personalization

of the robot. In this way each RSA can choose which functionalities to implement according to the relevance of the need to be satisfied. The number of features implemented will be directly proportional to the increase in price, so an RSA can stay within a given budget by making sure to fill the most relevant needs. As a result, even healthcare facilities that are more accustomed or have more significant financial constraints may approach the world of robotics. A decisive aspect lies in the fact that the robot purchased with this formula can be redeemed or "upgraded" at the end of the leasing period, i.e., since research continues to perform technological advances, the future improvements can be integrated into the robot, through updates to the next version. Alternatively, maintenance services could be provided to upgrade the robot during its useful life.

The main limitations of the study lie in the fact that the results obtained come from a research involving a limited number of RSAs, therefore, it is possible that from a small sample it may not be possible to obtain all the facets of needs that would emerge from taking a larger sample. Moreover, the study focuses on care centers in Italy only and from the point of view of only one category of stakeholders of the sector: managers. Confirmation of the findings by other categories is therefore lacking.

For future research, it would be important to analyze, in this field, how much patients feel comfortable in interacting with an innovative technology, in interacting with something non-human, whether this can really alter the perception of reality of the elderly or not; moreover, it would be important to investigate which, from the patients' point of view, are the needs not currently satisfied by caregivers, thus revealing additional drivers that would favor the implementation of the social robot.

On the side of caregivers, the main obstacle is the acceptance that a robot could replace them in their work; how they perceive the possibility of having to collaborate with social robots as well as one would collaborate with a new colleague, finding a new balanced reorganization; how, within the same organization, the social robots could effectively support the care process.

On the part of family members, it is crucial to investigate whether the social robot represents an additional resource that gives added value to the care services they are investing in; whether the social robot represents an additional cause for concern in the event that contact with their loved ones is limited once again due to the pandemic, and whether, as a result, they would have an even more detached view of the dynamics within the RSA and the well-being of their loved one.

In general, therefore, the research should not stop here, even the analysis of the category of managers itself should be extended to a broader study, which analyzes many more RSAs with different levels of technological advancement.

A study of a strictly economic nature should also be undertaken in order to investigate what the implications of social robots within the health and social care sector are at a strategic level. Furthermore, it should be analyzed what economic and financial means would allow an effective introduction of social robots even in the less technologically advanced care settings.

From a strictly technological point of view, there is a lack of evidence in the literature on how social robots can really interact with elderly patients and those with compromising physical and cognitive diseases; in particular, whether the inability of social robots to understand the emotional state of patients may have implications on the management of the relationship with them.

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APPENDIX

SURVEY QUESTIONS

1. Following the Covid-19 emergency, what was the biggest challenge that led to a most significant change in day-to-day operations in your organization? What solution did you adopt to address it?
2. How much has the pandemic affected and how will it affect the relationships between hosts and the world outside?
3. Do you think a social robot that sets up video calls between residents and their family members would be helpful in fostering social interaction?
4. How do you encourage cognitive stimulation in residents to counteract neurodegenerative diseases?
5. In addition to this cognitive stimulation, is there also a side of physical stimulation? How do you encourage residents to engage in physical activity beyond simple walks or activities?
6. Some colleagues may say "it's unethical." What do you think about the fact that a person with dementia might associate a robot with a person and therefore is it unethical?
7. A social robot that entices people to engage in gaming activities, such as board games or even watching television, can be effective in reducing stress levels and improve people's well-being as well?
8. How are residents' vital parameters monitored? What are the main complexities associated with collecting vital signs?
9. How do you organize rehabilitation activities within your facility? What are the main difficulties in carrying out these activities?
10. Can it be useful for the robot to suggest physical activities to the individual guest based on their activity throughout the day having monitored it first with a wearable?
11. How are residents reminded to take certain medications? How can the medication administration be improved?
12. So, could the robot also perform an activity to help with drug preparation to help the operators?
13. Taking into consideration the information reported in the interview, would you confirm the need for a robot in your facility? Under what circumstances or functions do you see that this social robot could be used? What would be the primary functions?

14. If you can take advantage of this social robot technology, how much would you be willing to spend approximately: under ten thousand euros, between ten and twenty thousand, or between thirty and sixty thousand?
15. In your opinion, should training be provided for healthcare providers to facilitate acceptance of social robots?