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P15 Facing the Future: (R)Evolution in the Health Care Sector

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The culture of the project in view of new synergies for the (r)Evolution of the healthcare sector

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Abstract | The contemporary era, defined by Schwad (2015) as the "Fourth Industrial Revolution '' is the era that is outlined on the theme of major innovations and a growth of technologies of exponential type. At the social level, we are witnessing a progressive aging of the population, aging or rejuvenation, as some would argue (OECD, 2020). Technological growth and innovation is evolving the standards of health in which the population falls, is reshaping life expectancy and with it, also the age of seniority. Technological growth and population increase bring with them clear concerns about health management: we will face an increasing number of chronic diseases, and the demand for higher standards of personalized care, precision medicine, regenerative medicine, all of which will increase demands and put great stress on our health systems. The two years marked by the Covid-19 pandemic have already provided us with a demonstration of the consequences associated with extremes of demand for care. The Fourth Industrial Revolution, which holds the advent of Information Technologies and Artificial Intelligence, tells us of a future that will see an increasing interaction between humans, machines and computational intelligences, to alleviate us and empower our existence. This era will also speak about the increasingly imperative need to assert in the design treatment the component of acceptance and exaltation of human values in order to mitigate the possible outcomes of human alienation in the face of indefinable technological availability. Also in this case we can refer to the examples of degenerations resulting from the Covid-19 pandemic, with generalizing crisis phenomena and dismissive visions from the surrounding reality, such as the No-Vax, movements or other phenomena of technological alienation as in the case of the increase in the percentage of adolescents now in a cycle of self-induced isolation. Considering the areas of light and shadow of the challenges of our future, it is clear how we will need the increasingly synergistic action of the various disciplines of human knowledge, in order to arrive at the delineation of a correct exploitation of human values. With regard to this, the discipline of design, understood as that discipline useful to generate with efficiency, a bridge between technological innovation and human interaction, will be fundamental as able to bring positive and empathic elements to the design, to derive a generalized improvement in the quality of life, and in the case of healthcare, of care. Our research highlights the etymologically new figure of the "Medical Designer" and asserts in the design process new functions on the theme of medical devices: among them, the theme of autonomy and automation. In full response to the "trend" and aimed at assimilating to the already established potential of industries, they will be crucial elements of designs and investments of new devices. The research that derives from it has had practical implications arriving at the definition of forms of care that subjugate in a single device both the function of reading parameters, and the function of administration of care.

Keywords | Healthcare, Care System, Innovation Technologies, Aging, Design Thinking, Empathy, Perception, Medical Design, Medical Devices, Insulin Pump, IV infusion

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Introduction to the project | The exponential technological growth (A.McAfee and E.Brynjolfsson, 2014) and the transformations that are emerging at the demographic level (UN, 2019) causing changes at the environmental and social level, require from all disciplines of research and human knowledge to pay attention and propose models and virtuous scenarios to effectively respond to both positive and negative aspects of this change. [1]
The discipline of Design, a proactive discipline and based on the culture of the project, would be able to put in the treatment a transversal point of view, being able to perform a divergent and disinterested research drawing resources from both technical and human disciplines, and from the outputs of the research, to outline possible futuristic scenarios and at the same time to actualize them in the environmental context.[2]

In probing the transformations that are precisely affecting technology and demography, with consequences on the environmental-political-social context, and in an attempt to build a scenario for the future that is feasible and in balance, our analysis has repeatedly led us to consider the effects of these changes on the balances concerning the health care system or even more generally in the processes of care: Compared to the evolution of technological processes and the increase in life expectancy, is the health sector evolving in the same way to really respond to the increase in demands for care that we will see? (UN, 2019)

Actions and objectives | Starting from this priority question, the years of pandemic Covid 19 were added and with them the validation of the need to make useful proposals for an evolution of the health sector.
The actions carried out by the research team, of the Department of Design of the Politecnico di Milano, have considered different levels of intervention in response: the choice of the basic elements of this system, the proposal of systemic visions and scenario building for the health sector; some more vertical considerations in response to specific needs while believing in the vision that even starting from circumscribed innovations on the specific problem we can prepare the way from here to the next years.

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[1] 2021-2027 https://www.mur.gov.it/sites/default/files/2021-08/1.AllegatoEsteso_Salute.pdf
[2](https://www.fastcompany.com/90667677/where-design-can-make-the-biggest-impact-in-the-next-decade-according-to-over-30-experts)

The project presented in this contribution is part of a research still in development that aims to propose a model of response to the hypothesized scenario, through an innovation of current processes of care and an update in terms of functionality of some medical devices. In the definition of this project, once validated the concept and the design intentions, from the moment of the formalization of a "minimum valuable product" and a roadmap for the implementation of the project, the development team has interfaced with the obvious difficulties of understanding the parts that articulate the health care system, to assess how to test, generate the network of sharing so that it was possible to arrive at a formalization of this device with high technological potential. The present contribution, analyzes the elements that compose the sanitary scenery, today and in its evolutionary tendencies, evidencing the elements that to our opinion would go implemented in the construction of an integrated model and spendable to construction of a bridge between the world of the search and the technological progress and the effective putting to earth of the innovations in the medical field; until the formalization and the proposal of the verticalization of such elements in the so renamed figure of the "Medical Designer".

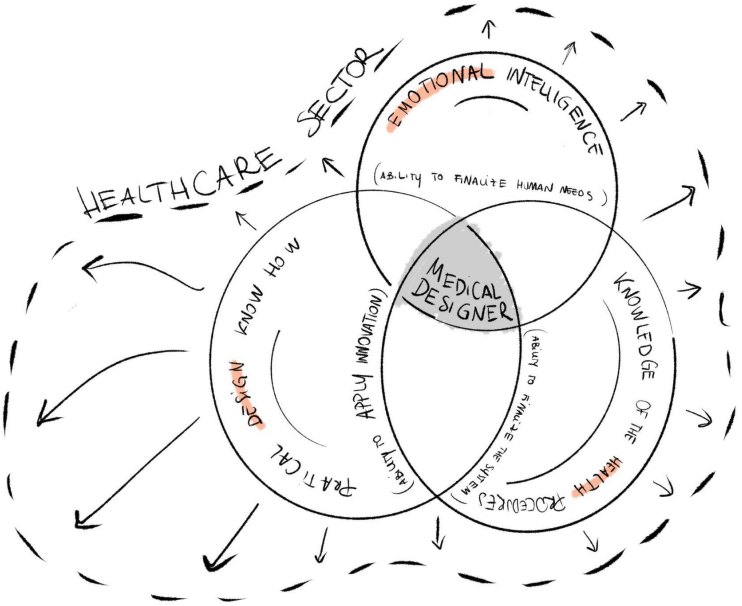

Figure 1: The proposed figure of the Medical Designer in the Healthcare sector.

1 The evolutionary scenario of Healthcare

1.1 The Definition of Health; The Idea of Salutogenesis; The Role of Health Promotion

The defense, protection and achievement of health, in individual and social terms, are among the most important issues and challenges of contemporary society.
The first definition of the concept of health, we find in the '70s, by the World Health Organization, as: "a state of complete physical, social and mental well-being, not only the absence of disease or infirmity". (WHO, 1948).

In the same years, several experts in the field of policy and health contributed to revise and implement the concept. Among them, Aaron Antonovsky, in 1979, coined the term "Salutogenesis" and supported the concept and the need to consider the human state as a continuum between health and disease, as the result of a dynamic interaction between aggravating and protective factors.

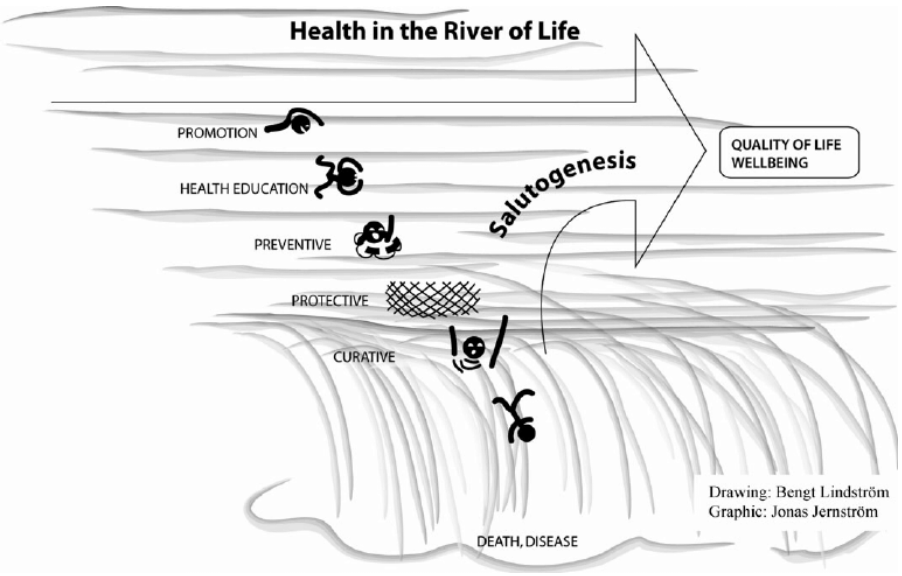

Figure 2: Health in the River of Life Drawing: Bengt Lindström Graphics: Jonas Jernström and Bengt Lindtrom (image reworked by Margherita Febbrari)

Starting from these first attempts at definition, it is interesting to underline how health is associated with a more permeating concept of balance with oneself and with the surrounding environment, thus understanding that the system of the individual, as well as the economic and social system in which he or she lives, must necessarily enter into a mutually beneficial interaction. Antonovsky considers all people as more or less healthy and more or less sick: modifying our vision of disease following this thought, would allow to overcome the mechanistic pathogenic model which conceives health as a totalitarian balance and a general absence of negative manifestations of our body, going instead to consider every individual as already sick, decaying and compromised (Antonovsky,1979). In order to achieve a positive state of health it would therefore be necessary to conceive of how an individual can transform his or her condition and, consequently, to give greater attention to the concept of prevention.

Since the Ottawa Charter (i.e. the First International Conference on Health Promotion, organized by the World Health Organization and held in Ottawa, Canada, in November 1986), a form of propaganda based on health promotion alone has been activated, in order to give individuals and communities the possibility to increase their control over it, in a more systemic vision.
Among the fundamental prerequisites for health promotion are several values that underline how health promotion is closely linked to a process of a political, social and cultural nature, the pursuit of which is also an essential asset for economic development.
The road to achieving good health for the various populations is today a global commitment that still requires a great deal of effort and time. The European Union and the United Nations, through their programs of action for research, innovation and technological development, such as Horizon 2020 [3]and Agenda 2030[4], highlight these needs and focus attention on the main areas of intervention.

[3]https://ec.europa.eu/info/research-and-innovation/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe_en
[4] https://unric.org/it/agenda-2030/

1.2 The transformations underway: Population growth, an aging population

We are slowly witnessing the phenomenon of global aging. At the national, European and international levels, this is a theme of fundamental importance, especially when it is related to the issue of health. The phenomenon of global ageing and its related consequences are a reason for study in terms of the global market regarding a possible change in demand and product demand, especially for the diagnostics and monitoring sector. As argued by the OECD[5], Europe will soon be faced with the challenge of having to offer increasingly specialized and high quality healthcare to a growing number of citizens, while at the same time maintaining the economic sustainability of its healthcare system.

In a comparison between today and 50 years ago, the percentages of people over 65 in the various countries:

Country	%over65 1972	%over65 2021
Europe	5.9	20.6
Ital	11.5	23.6
Germany	14.2	22.0
France	13.2	21.1
USA	10.3	17
Japan	7.2	28.7
China	3.9	12.4
India	3.4	6.8

According to estimates reported by World Population Prospects (2019) by 2050, the number of people aged 65 and older will exceed the number of adolescents, aged 15-24.
Aging is understood as "a progressive and generalized functional decline leading to loss of adaptive response to stress and increased risk of age-related diseases" (Pistolesi, 2020).

The aging process, as reported by a report of the Instrumental Society of the University Ca'Foscari Venice (2006)[6] can be divided, based on age, into three stages

from 45 to 65 years, presenile age or middle age
from 65 to 75 years, gradual senescence
from 75 to 90 years, full senescence

Even if the reference age for the elderly threshold is commonly established at around 65, an age at which it is assumed that people leave the labor market, the process that is generating a progressive aging of the population leads us to evaluate this number as inadequate for contemporary society.

In this regard it is interesting to note the indicator: HLY - Healthy Life Years, or disability-free life expectancy or the Global Activity Limitation Indicator (Jagger et al., 2010). This is an indicator introduced in 2012 used to monitor the level of health of the population from a productive/economic factor. It presupposes the concept of "quality of life", in that it assesses the average age around which there is a serious level of disability and loss of self-sufficiency.

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[5] https://www.oecd.org/italy/health-at-a-glance-italy-IT.pdf
[6]https://www.unive.it/pag/fileadmin/user_upload/dipartimenti/filosofia/doc/laboratori/laris/library/invecchiamento-pienamenteattivo.pdf

According to the OECD,[7] introducing the concept of quality of life alongside the theme of population aging means assuming that the new elderly will still be an "employable" population with an increasingly high level of education, having spent a lifetime doing intellectual and physically less demanding work than in the past.
It could therefore be deduced that the increase in the demographic sense of the elderly population can be considered as an "enrichment" and with the movement of this indicator further and further ahead in the average age, it can be assumed that society is not aging, but rather "rejuvenating".

The International Monetary Fund (2012)[8] speaks of a large socio-economic burden with regard to the treatment of age-related diseases, care and welfare costs. It has also been shown that even the perception of a poor level of health generates a greater consumption of health services and this consumption is further added to a consumption of health services (such as specialist visits and investigations, analysis and treatment) that already stands at 80% for the population over 65 years.

1.3 Access to health: health systems and the issue of digitalization

The health system of each country is made up of the set of services and social assistance activities implemented and has the task of promoting and guaranteeing access to care.[9] Health systems are divided into public, private and mixed systems. According to the WHO, what should characterize a good health system is the ability to meet the expectations of citizens, and equity, understood as the indiscriminate and transparent response to the needs of the person (WHO, 2020).

The contemporary era is outlined on the theme of major innovations and exponential technological growth. What Brynjolfsson and McAfee (2014) called the "Great Transformation" or Schwad (2015) defines as being the "Fourth Industrial Revolution". Innovation and technological growth is precisely showing us how an evolution in health standards is possible, improving life expectancy and moving forward the average age at which a population is considered elderly. The demand for assistance from national health systems will therefore increase. The current pandemic has demonstrated the consequences of extreme demand for care and what it means to put health systems under stress.[10] It will therefore be fundamental and necessary, first and foremost, to set out on a path of transformation of the national and international systems that deal with the care and promulgation of health.

The health service, until now focused on the treatment of disease, will see the transition to a system centered on systematic forms of care, monitoring of citizens-patients and predetermined and organized prevention. The global discussion, involving governments, institutions and companies, committed to questioning the future of healthcare, keeps its gaze on the next generations that will have to be healthier than the previous ones, so that it will be possible to keep the welfare system in balance (Maffei, 2017).

The Dutch company Philips (2016) presents an overview of the main themes of this transformation: "it will be necessary for the healthcare system, with its already limited resources, to facilitate basic care, access to prevention campaigns and the treatment process. In response, better care and lower

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[7] https://www.oecd.org/italy/health-at-a-glance-italy-IT.pdf
[8] https://www.imf.org/en/Publications/AREB/Issues/2016/12/31/International-Monetary-Fund-Annual-Report-2012-Working-Together-To-Support-Global-Recovery-26104
[9] https://www.salute.gov.it/portale/lea/dettaglioContenutiLea.jsp?area=Lea&id=5073&lingua=italiano&menu=vuoto
[10] https://www.wired.it/branded/article/sanita-futuro-rapporto-janssen-censis/

cost are needed." The answer highlighted is the digitization of the health system: the enhancement of IT and the development of the first integrated systems of health services, as Saxon (2018) states, are the basis of what will be the digitization of medicine.

Bernardo Mariano Junior, Director of Digital Health and Innovation and Chief Information Officer of WHO, defined the organization's priorities as follows: "*institutionalization of digital in the health sector for full inclusion in health systems; integration, to break a siloed view of the healthcare sector; inclusion to not leave less wealthy countries behind; and attention to privacy and ethics.*"

In an international survey in 2014, McKinsey was already proposing solutions for healthcare organizations regarding the planning of the transition towards a complete digitalization: the research shows the predisposition of people to the use of quality digital services, in combination with the more traditional physical services, in a blended logic and the awareness of the value of new technologies and the possibilities offered by medicine 4.0 that are placed, therefore, at the basis of this process of transformation of healthcare systems, in a continuum of factors that enable the improvement of human life and the transformation into socially and technologically augmented individuals. In the near future, there will be increasingly connected, technologically enabled, and empowered individuals to manage personal health (Mesko, 2016).
An introductory report on medicine 4.0 (Cappelletti, 2018) introduces a definition of medicine as a "therapeutic gesture", a "know how", which tends to become a "know how to be", that is, a systemic framework of explanation and interpretation of the "cases" of the object-subject", through a highly personalized, participatory, preventive and predictive therapy.
We therefore speak of empowerment as the process of social action, through which people, organizations and communities acquire skills about their lives, in order to change their social and political environment, to improve equity and quality of life" and is made possible by technological innovations (M.A. Zimmerman, 2000).

1.4 The paradigm shift in Healthcare roles

According to the biomedical model, the physician has always been defined as the only expert in the disease, while the patient is the one who suffers from it. What we are witnessing is precisely a change in the role of patients: they are increasingly moving from the object of innovative action to the subject of change.
"Starting from an analysis related to the current transformations on roles in healthcare, the subjects that generate the drive for innovation and transformations in the healthcare sector are the end users: the patients or those who mediate their needs and action, the so-called "caregivers". The user, as bearer of needs and of a personal and sensitive specific knowledge, generates a world of relationships, opportunities and actions, which go beyond the traditional mechanisms of production of technological or market-driven innovation" (Maffei, 2017).
This paradigm shift therefore conceives of man as a being in his own right with respect to the disease that disables him. This type of "humanizing" approach to care reconsiders all the points of encounter between user and system, the touchpoints along a holistic path, not going to define procedures that are univocal, as it is essential to consider the relational value with the individual patient. Another actor that can benefit from technological innovations is the medical staff, subjected to a series of repetitive tasks and responsibilities that can compromise the degree of empathy with the patient.

2 Case Studies in Healthcare

The fourth industrial revolution allows us to hypothesize a future that will see an increasing interaction between man and machines. In this context, it will be very important to design a profitable relationship between the digitized reality and human society in order to finalize the strategies necessary to ensure that technological intervention is synergistic and compatible with the needs of a changing world.
Technological innovation, it has already been mentioned, is permeating the medical and personal care sectors: for example, the introduction of AI in healthcare systems will allow for an increasing automation of work practices, dividing responsibilities and lightening workloads, and will make the user experience in the care pathway more participatory, increasing the sustainability of systems.

Doctors will therefore be facilitated in reducing errors and responsibilities; healthcare systems will be lightened thanks to widespread efficiency, moving from a "hospital-centric" scenario to "de-hospitalisation"; the life of the patient will be technologically enabled, to the point of generating a change in the perception of the same.

And it is precisely with regard to this last point that the discipline of design can make its contribution starting from the construction of preferable future scenarios, in favor of the needs of the user and in a vision of common good, up to the definition of projects that find their own application in a short time and that are finalized to bring a new systemic vision to the concept of care.
With regard to these considerations, three emblematic and, in our opinion, effective case studies have been selected to illustrate the kind of innovation that the discipline of design, through a methodology that considers the final needs of the user in relation to the type of innovations currently expendable, could bring with means and projects properly calibrated to the medical sector.

2.1 Case study: insulin pumps

The first case reports an emblematic example concerning the field of the design for the pathology of diabetes on which we can trace some levels of innovation that can be interesting because they put the attention on a design based on the will to multilaterally improve the management of the diabetes disease.

At the basis of the treatment of the pathology of diabetes we find the obligation on the part of the patient to provide reliable and accurate glycemic readings for all hours of the day. Thus, glucose meters exist for monitoring blood sugar levels. Based on the levels of glucose in the blood, the next step is based on the prescription and infusion of a hormone replacement therapy based on synthetic insulin, the hormone able to bring back to correct levels the blood glucose and ensure the assimilation of sugars.[11]

[11]https://www.siditalia.it/divulgazione/conoscere-il-diabete#:~:text=Definizione,che%20viene%20prodotto%20dal%20pancreas.

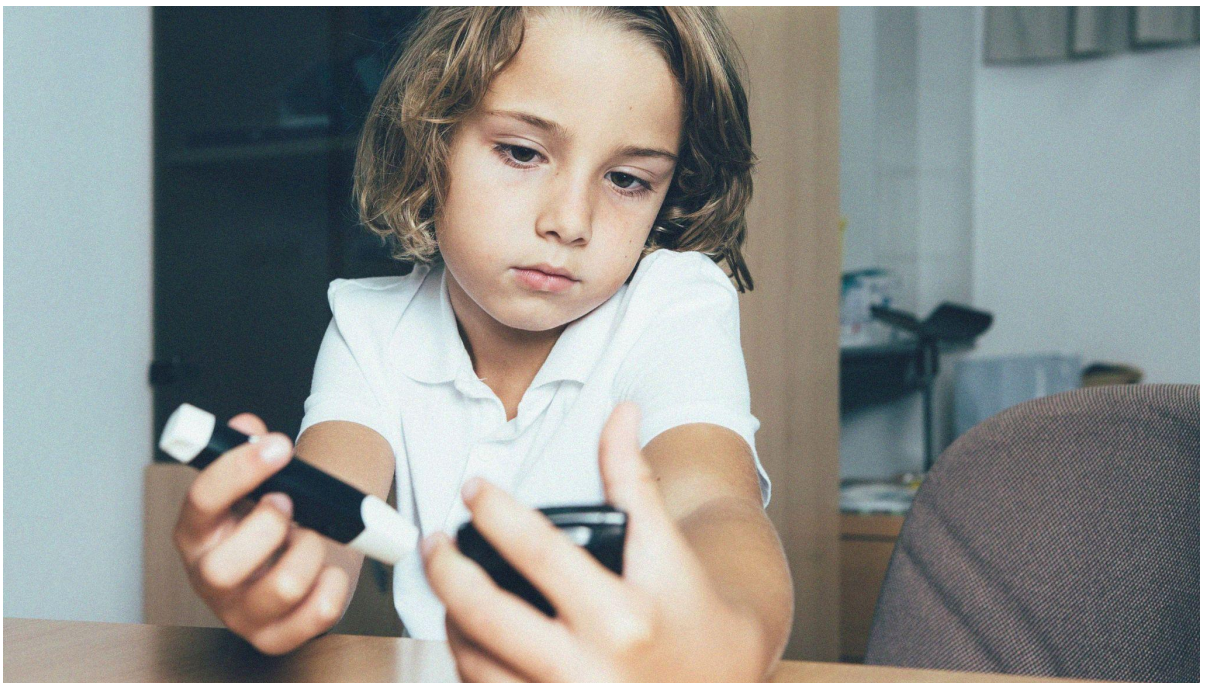

Figure 3: Little girl performing the traditional glucose measurement procedure by drawing a small amount of blood from her fingertip

Looking back a few years ago, it was common practice for the diabetic patient to monitor glucose levels by taking a small amount of blood from his fingers and based on the value found by the glucometer, it was necessary to respond with boluses of insulin.
In the traditional case description, the diabetic patient was therefore subjected to a series of relevant stresses to maintain the correct medical procedure, necessary for the treatment of his disease. The levels of disability generated by having to repeat this practice several times a day did not allow complete autonomy to the diabetic patient.

Figure 4: Omnipod, one of the most popular combination pumps for diabetes disease care

The design in the healthcare sector in this area has found a great innovation when it has connected in a single device both actions necessary for the management of this disease. Currently, most insulin pumps are composed of a wearable glucometer and a micropump for insulin infusions, both placed directly in contact with the patient's body. The two components of the device, communicating with each other, are able to automatically set a therapy and maintain it throughout the day without requiring any kind of effort to the patient. Since both devices are wearable, the monitoring of blood glucose levels does not occur intermittently, but rather, it is possible to ensure constant monitoring.

Beyond the obvious positive feedback in the satisfaction of functional factors of care, with this kind of innovation we also find the satisfaction of complex emotional and social needs. The most trivial example in this case is when talking about children or adolescents: the management of a disease such as diabetes generates a series of psychological fragilities, starting with the embarrassment of having to wear this kind of "object" in front of other people. To arrive at a definition, thanks to technology, of products that are as "transparent" as possible, that combine a level of clean aesthetics and that do not generate embarrassment, would allow us to arrive at the true fulfillment of patient care, the care of the patient's mental well-being.

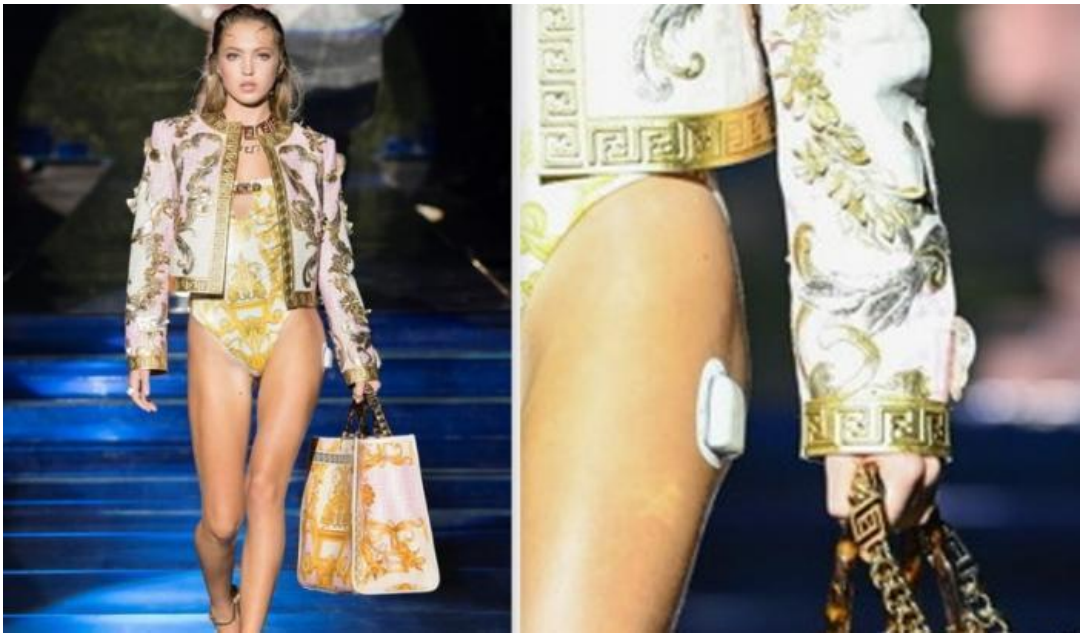

Figure 5: Lilla Grace Moss Hack, daughter of Kate Moss, walking the runway for Versace wearing her pump.

Stefania Rinaldi, Senior Marketing Director of Novo Nordisk, during the Wired Health 2021 conference talks about "patient engagement" and cites the case study of the diabetic patient; "not too long ago a diagnosis of diabetes determined a change in the way of life, for perspectives and ambitions. Today, thanks to technological innovation and new treatments, there are people who live very well with the disease and achieve important results at work. We are able to constantly monitor blood glucose without the classic taking of blood from the finger. The patient can be the protagonist of their disease and constantly monitor their vital parameters."

2.2 Case study: the MEIV device

The project in this paragraph presented talks about a medical device that was born at Politecnico di Milano, in the Department of Design and that specifically was developed within the three-year Final Synthesis laboratory, Academic Year 2017-2018, in the degree course of Industrial Product Design. The project is currently part of the archive of medical devices that are allowing the research group of the EDME laboratory to carry out a series of design proposals for innovation in the field of medical

devices in particular with regard to the desire to be able to pose alternative systems to the administration of care.
The aspect that we want to highlight of this project, in addition to the type of problem that tries to solve, lies in the methodology that has affected the development of the system. The idea was born from a phase of analysis in the field of therapeutic activities related to the field of extra-hospital emergency. Once found the limits of part of its devices we proceeded in an attempt to define a solution to modify part of the procedures, specifically, of the intravenous therapy. The realization of the device and the solution in technological terms was made possible by the collaboration within the university laboratory of the Fluid-o-Tech S.r.l. company, which provided one of its most advanced components for fluid control: a proportional valve with IOT control. The company, is currently the owner of the patent that we will illustrate (without any particular detail on the technological solution for obvious reasons of secrecy on the patent).

The device was born from the desire to overcome the problems concerning intravenous infusions in the emergency context. In fact, with regard to the recovery measures of the patient in an extra-hospital context, the administration of liquids and/or drugs plays a role of primary importance: for example, without a maintenance of the correct "volemie" (volume of liquids in the circulatory system) it is not possible to ensure a circulation of drugs inside the body of the patient before the arrival at the hospital.

Figure 6: the extra-hospital emergency environment



Figure 7 / 8: explanatory images of the use of IVs in the extra-hospital environment.

The project therefore wants to propose an improvement on the functionality of the IV object by altering the current gravity operation of the device: currently to ensure an effective and continuous infusion of fluids and / or drugs is necessary to maintain a distance from the patient's body of at least 50 cm. From the analysis of patient recovery procedures in out-of-hospital emergencies, we found that this device has a significant deficit in terms of operation because it is not always possible to ensure in those places a support of the bag, so that it is at a sufficient distance from the patient's body. In addition, the IV device has a number of complications related to its original configuration (poor control of infused liquids, risk of tearing of the bag system and the outflow device, etc.) that do not guarantee a constant standard in patient recovery operations.

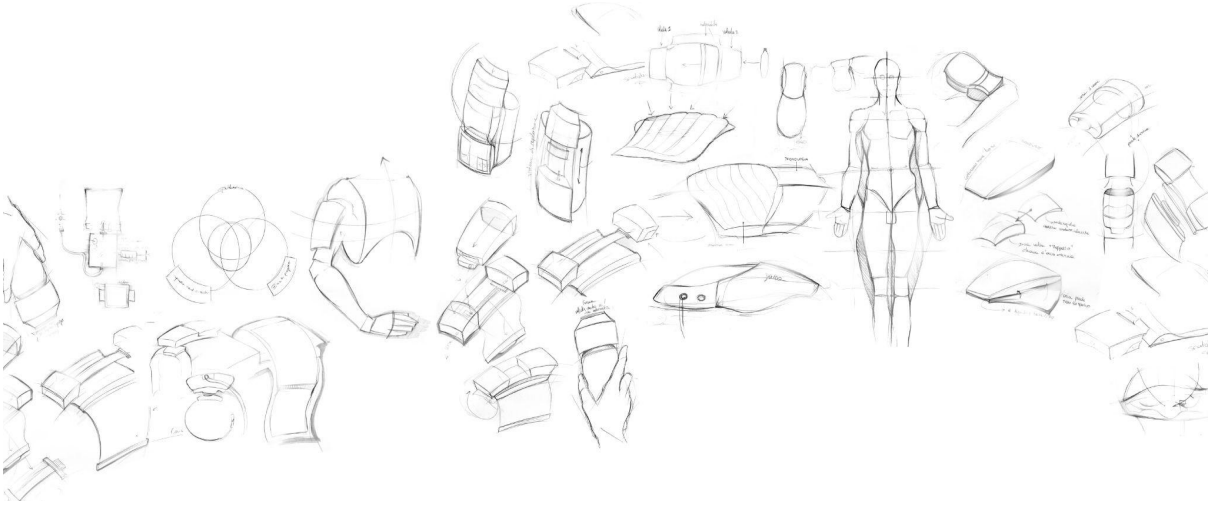

Figure 9: design sketches for the concept phase and formal concept development.

The technological solution present in the MEIV (Medical Emergency IV) device was to develop a technology that would allow to generate a pressure on the liquid without requiring the use of components for the movement of liquids particularly wasteful in terms of energy. The ultimate goal was to create a new bag and outflow system that was both wearable and remotely controllable.

Figure 10 / 11 / 12 : images of the MEIV project

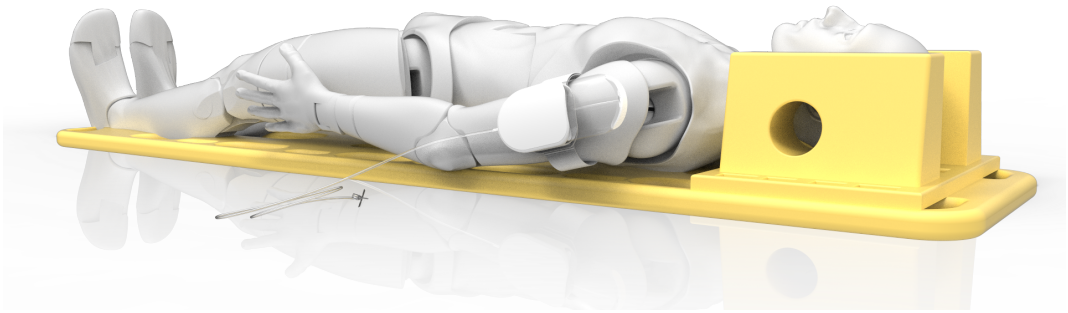

Figure 13 : images of the MEIV project

The decision to make the device wearable and remotely controllable feeds two issues that we believe are important in the design of medical devices from now to the next years: the theme of automation of functions and the theme of achieving patient autonomy.

The synergistic action, in a single device of functions able to automate the care and autonomy of the patient generates, in our opinion, a fertile ground as regards the application scenarios of a system of medical devices able to compensate for the main alterations of the care systems that point to the digitization of data and functions of the health system and to the theme of "dehospitalization".

2.3 Case study: a restraining blanket

Through this last project we underline the actions of intervention of departure regarding the work of a Product Designer. In spite of the fact that this is a project with a lower level of technological and functional complexity than the previous ones, it refers in the discussion to the themes concerning the insertion in the project of empathic elements aimed at modifying the perception regarding the objects to construction of the medical world.

Figure 14: The sensory blanket acquired in nursing homes

Emilie Dissing Wiehe, at Det Kongelige Akademi in Denmark, developed her graduate project by creating a product for elderly people with dementia. The project is a reimagining of an existing product already in use in clinics with dementia patients. It is a blanket stuffed with a portion of sand or small weights, in order precisely to increase the weight. These "gravity" blankets generally weigh between 7 and 15 kilograms. It has been seen that these blankets have a beneficial effect, containing the patient's body. A plaid that stimulates the senses and embraces the body with the desire to give a feeling of security and calm.

This blanket works on the theme of haptic perception, which is that process that is implemented for the recognition of objects based on touch. It is a sum given by the perception on the surface of the skin of the roughness or finish of the object and then consider the proprioception, or the position of the object in relation to the body.
The choice of color, texture, material, in this case generate a project with an emotional and empathic force.


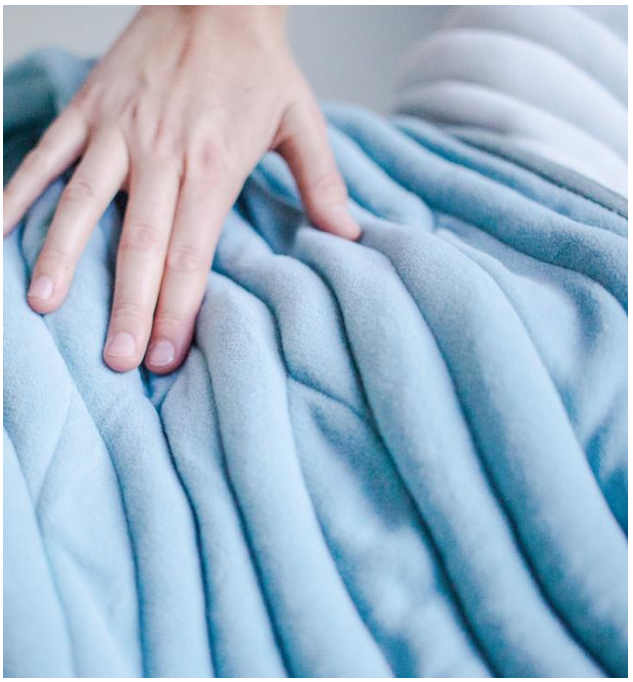

Figure 14 / 15 : Images of the restraining blanket designed by Emilie Dissing Wiehe, at Det Kongelige Akademi in Denmark

Conclusions

The role of the Designer in healthcare: from catalyst of transformation to implementer of innovation

Design is able to respond to global needs and challenges through the project. Already in 1971, with the book "Design for the real world", Papanek defined design as the interdisciplinary human action able to bring innovation and, through the creative process, respond to human needs.
As Jones (2013) states with an exact quote for medical design, "Designing for care brings a holistic, systemic design perspective to the complex problems of health care. We are already improving services by designing better artifacts, communications, and environments. What remains is the mindset of professional care in designing people, professionals, and society. Like physicians, designers in health care can take responsibility for helping people and societies become healthier in all aspects of life."
In this sense, in the design for medical it is now essential to focus on the configuration of the enabling elements for people: their constitution, mediated by a conscious design, is in fact able to generate added value in terms of usability, accessibility and inclusiveness.

The most inflated word regarding the understanding of the condition and experience of a user of reference, is the term "UX Design", a term absorbed by the market and useful to establish a categorization of design processes not only aimed at the spasmodic production of relatively useful objects, but also to assume that, in addition to the production technique, the relevance in the use of materials, ergonomic and dynamic forms, etc.., there should be a perceptive and emotional element on the part of the end user, who will actually use the product or service system. Design Thinking introduces the concept of empathy in the design process. In other words, next to the classic methodological architecture of Project Cycle Management - PCM 70s, design thinking adds a phase in the process of listening to the end user, even before taking steps towards the design artifact.

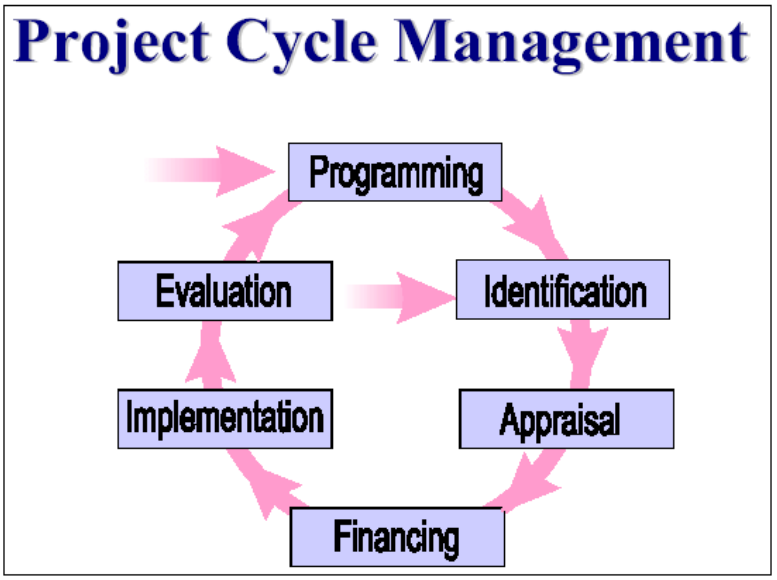

Figure 16: The Project Cycle-Graphical Presentation. Available from: https://www.researchgate.net/figure/The-Project-Cycle-Graphical-Presentation_fig3_23731023

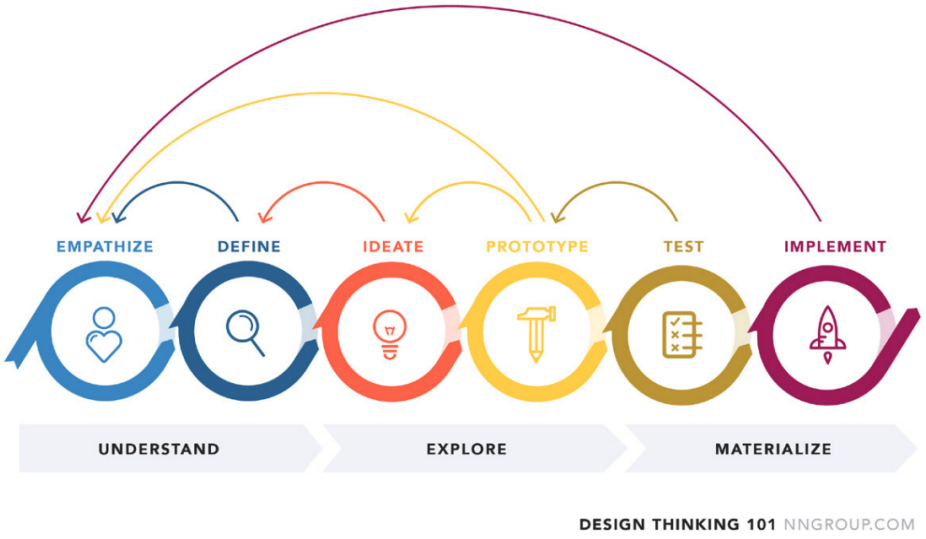

Figure 17: The Design Thinking Cycle. Source: Design Thinking 101, NNGroup, www.nngroup.com/design-thinking.

Although these are only theories, validated by the verification of their functionality once applied, it is interesting to start from this consideration in the definition of a new approach to the project, which welcomes from a methodological point of view this innovation.

The empathic component, as we repeat, is not a component completely divorced from the medical sector: it is enough to refer to the common imagination in the representation of the doctor-patient relationship and the importance it holds for the effective creation of a process of care.

Figure 18 / 19 : Two latex gloves filled with warm water to simulate the warmth of human contact. The idea that Lidiane Melo, a nurse at the Federal Hospital of Bonsucesso in Rio de Janeiro, has put into practice to make Covid-19 patients admitted to the facility feel less lonely. There is also a specific medical-health function: "I made this glove with hot water to improve my patient's perfusion and see saturation better, and I hope she feels that someone is holding her hand," explained Lidiane when the photo went viral.

The products that surround us, and in which we decide to invest for our living, can affect a person's life in a positive way as an aid, as a facilitator, or in a negative way, as a barrier, as an obstacle. To define many of these aspects contribute the choices through which a device, an object, a device, a tool, are thought, designed, tested and then made.


Figure 20 / 21 : photographs from the intensive care unit of the Civile Hospital of Brescia

If many situations of disability are generated not so much by the disease and functional limitations of a person, but by the inadequacy of the environment, the context or poorly designed tools, the proposals at the end of these case studies go precisely in this direction: that is, they highlight the elements necessary for the design of medical devices, in which technology, functionality and usability come together synergistically for a value that must necessarily be recognized as "common, for all".

The "design of care", whether on a level of facilitation of the user undergoing chronic pathologies, or for a diabetic girl living her life without the discomfort of the disease, or in the case of the blanket that stimulates calm and safety, is a design that starts from small innovations, which sound more like expedients, but which lead to the construction of a new perception of objects for care.

Marco Maiocchi, former professor of Design at the Politecnico di Milano and author of over 170 articles and books, in 2010 states in "Design and Medicine": "*Design for healthcare should be a humble and helpful design. A design that does not seek protagonism, but remains faithful to the objective of improving the conditions of hospitalization and care. A modern design, therefore, very current and very sober, which should find effective forms to be recognized and to make people understand its value and the potential of its role in society. A design that does not express itself with works of art or heroic gestures, but that manages to take in hand all the complexity of an experience and acts in a distributed way on the different aspects of a hospital ward, an outpatient clinic or a residence for chronic diseases, to produce a general quality of an experiential nature, which will probably be perceived more for the absence of negativity and malfunction than for striking innovative aspects*".

Design can maximize people's quality of life and address their needs. Interaction with products can be improved in terms of functionality and/or in terms of perception. Proper device design feeds into the theme of inclusivity: in a systemic view, a properly designed device does not solely facilitate the vertical needs of the patient but is designed for the system that revolves around the human. A properly designed device facilitates the physician, the healthcare professional, and the caregiver

network. It enables the positive expansion of medicine in terms of prevention, personalization, participation, and prediction.

Designing enhanced product perception means considering factors such as color, shape, smell, material, and its surface. The theme of the improved perception of products, on a logic that combines concepts such as the Aesthetic Usability Effect (Lidwell, Holden, Butler, 2005) or considers the issues of Emotional Design (Norman, 2004), returns a different reading of the mechanisms of care and prevention: applying these concepts will enhance, humanize and democratize the care and the healthcare sector.

The designer stands in this universe of values as a translator of the relationship between man and machine, applying an empathic vision in the definition of human needs. The designer with the right tools to turn to the interpretation of the medical sector, stands as an added value in the contribution of innovation, from the definition of the central elements in terms of market competition, to the ability to bring meaning to the product. For this to happen, it is necessary to let technological innovations bring positive and empathetic elements into the design configuration.

"*Good design enables, bad design disables*" *(Paul P. Hogan).*

Figure 22: Representative image of the use of devices for cancer therapy and interaction with one of its end users.

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