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Contents

An Organizational Model for Female Leadership in Healthcare. The National Centre of Oncological Hadrontherapy (CNAO Foundation) Experience During the Covid-19 Pandemic

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Abstract: The article aims at deepening the topics related to the governance of healthcare organizations with prevalently female management. The paper employs a case study approach, analyzing the case of the National Centre for Oncological Hadrontherapy (CNAO Foundation), trying to identify the relevant characteristics that impact operational management. The article uses a methodology based on a single case study related to the CNAO Foundation of Pavia, Italy. The CNAO Foundation is characterized by the presence of a predominantly female middle-management (of the 128 employees, 65 are women, 30 of whom are mothers). Women lead the Scientific, Medical, Technical-Nursing direction. Female managers are also responsible for Communication and Public Relations, Quality and Regulatory Affairs, General Accounting and Taxes, Clinical Administration, Purchasing Planning and General Services. Of the 13 current medical doctors, 11 are women, including the Medical Director, in contrast with the international average, which sees only 25% of physicians in a hospital environment being women. The analysis is conducted through the CAOS model, which allows mapping both the external as well as internal features of one organization. Starting from the experience of CNAO, the framework defines the characteristics of a possible organizational model that can enhance the role of women in healthcare management in highly multidisciplinary environments and with a high impact of innovation and technology. The article contributes to the issue of gender diversity in healthcare organizations, providing the definition of the main characteristics, challenges, and opportunities. The CNAO Foundation's experience, adequately placed in the literature, allows the identification of some best practices of actual applicability for public and private healthcare organizations.

Keywords: Healthcare, CAOS Model, Radiation Oncology, COVID-19, female healthcare workers, Leadership

1. Introduction

70% of the workforce in the social and healthcare sector worldwide is represented by women (Bismark *et al.*, 2015; Boniol *et al.*, 2019). However, only 25% of medical doctors are women (Langer *et al.*, 2015), which means that female health workers are mostly engaged in care roles (such as nursing, obstetrician, auxiliary), technical (technical staff of laboratory or medical radiology) or administrative. The differences also emerge in speciality schools' choice, among which surgical ones (in particular general surgery) seem less desirable by aspiring female residents (Lyons *et al.*, 2019). The real gap seems to emerge more when looking at healthcare leadership roles, primarily managerial (departmental or inter-departmental directors) (Ellwood and Garcia-Lacalle, 2015; Isaac, 2011; Langer *et al.*, 2015; Yedidia and Bickel, 2001). The recent literature highlights a positive trend towards the greater inclusion of women in scientific societies (Moreno, 2021), where a gap in the number of female members is still evident (Crown *et al.*, 2021).

The recent COVID-19 pandemic (WHO, 2020) has further accentuated the gender gap. The impact on women, often mothers, has proved to be relevant in all areas, including healthcare and business (Dal Mas and Paoloni, 2019; Newman *et al.*, 2019; Roth *et al.*, 2016). Social distancing measures and non-pharmaceutical intervention, which proved to be necessary worldwide, have included the enforced closure of schools and kindergartens (Wenham *et al.*, 2020) and the need to employ smart and remote work whenever possible. Distancing measures have also affected women working in the clinical and scientific fields (Minello, 2020). Among these, medical and

radiation oncology are also characterized by limited female representation, especially at management levels (Banerjee *et al.*, 2018; Hofstädter-Thalmann *et al.*, 2018).

The purpose of the paper is to investigate the issues relating to the governance of healthcare organizations predominantly managed by women. Through the analysis of the international literature and the study of a case, the relevant characteristics that have emerged as having a substantial impact on operational management are identified, also following the specific problems raised by the COVID-19 pandemic. While the literature agrees in defining the barriers to gender equality, especially at the leadership level, there remains a gap in identifying practical operational tools to mitigate the gender gap in the healthcare sector. In this context, the article examines the case of the CNAO Foundation - National Center for Oncological Hadrontherapy - in Pavia, Italy.

2. Literature review

The gender issue appears relevant in the healthcare sector. Despite the introduction, worldwide, of gender policies and the achievement of gender equality at the level of enrollment of residents in graduate schools (Bismark et al., 2015), the accomplishment of clinical leadership roles remains extremely limited for women (Ellwood and Garcia-Lacalle, 2015; Isaac, 2011; Lander, 2016; Yedidia and Bickel, 2001). An international study (Bismark et al., 2015) highlighted how, even if women reach leadership roles, their active participation remains limited to more administrative rather than clinical positions. The same study also reports that CEOs are women only in 38% of large hospitals and 12.5% of mega hospitals (namely, those with more than 1,000 employees). In the academic field, only 28% of Medical Faculty Deans are represented by women and, in the clinical setting, female representation concerns only 33% of Department Directors.

2.1 The barriers to gender equality

Many barriers emerge from the literature that hinders gender equality in female leadership in healthcare (Bismark et al., 2015). In particular, the following elements can be recognized.

2.1.1 Perceived ability in terms of skills

Some studies have underlined that there is a social mechanism that leads to underestimating the ability of women to hold positions of responsibility. In a vicious circle, this has led many health professionals to develop insecurity, lack of self-confidence and a general underestimation of their own means, making them question their actual ability to be suitable for roles of great responsibility and leadership (Bismark *et al.*, 2015). This has often led to women's resistance in "self-promotion" and in backing or supporting, whenever possible, other women in leadership roles, even if the context was favourable, in terms of, for example, required skills and transparency in the selection process (Bismark *et al.*, 2015).

2.1.2 Perceived ability at the level of family balance

Some studies have underlined that women identify parenthood as the most significant obstacle compared to the possibility of assuming roles of responsibility (Banerjee et al., 2018; Dal Mas and Paoloni, 2019; Hofstädter-Thalmann et al., 2018; Kalaitzi et al., 2017). The compatibility between the role of a mother and that of an established professional is questioned, "whether we like it or not" (Bismark et al., 2015). Women often doubt their self-ability to juggle the two roles: that of a professional and that of a mother, especially given the impossibility of managing some positions of high responsibility with reduced or flexible working hours (Banerjee et al., 2018; Bismark et al., 2015; Lantz, 2008; Roth et al., 2016), and the fit between the so-called "biological clock" and maximum career expectation.

2.1.3 Perceived credibility

Studies show that there is resistance in women's appointment in positions of responsibility as, very often, women are not valued, especially in the clinical and hospital settings (Banerjee et al., 2018; Bismark et al., 2015). The role of a female leader in healthcare does not respond to the stereotype of a leader, as a woman's capacity for commitment and dedication is perceived to be lower than that of a man, primarily due to family ties (Banerjee et al., 2018; Isaac, 2011; Roth et al., 2016). An Australian study has identified that there is often even an intense pressure on female healthcare professionals with senior roles to behave with typically masculine attitudes (Bismark et al., 2015). The same study has stressed how, in cases stimulating contexts of stereotyped "masculinity" as the only credible context for leadership, the work environment has been strongly negatively affected, amplifying gender discrimination despite a female leader's presence (Bismark et al., 2015).

2.2 The benefits of gender equality

The studies analyzed report advantages in having women in charge, both for the leaders themselves and for the entire healthcare organization they manage, as summarised below.

2.2.1 Possibility of being an example in the organization of work

At the organizational level, women have shown a better organizational ability in balancing the work and personal / family needs, increasing flexibility (Bismark *et al.*, 2015).

2.2.2 Impact of diversity on decision-making and health outcomes

Gender-based healthcare working groups have repeatedly demonstrated the ability to lead to better outcomes (Cobianchi *et al.*, 2021; Gardner and Harris, 2020; Kubik-Huch *et al.*, 2020; West *et al.*, 2018), as well as a more structured and comprehensive decision-making process. In particular, women are generally more sensitive to sustainability issues, particularly social ones (Dal Mas and Paoloni, 2019; Ellwood and Garcia-Lacalle, 2015; Glass *et al.*, 2016), with more favourable effects also in the field of scientific productivity.

2.3 The tools to support gender equality

The strategies to support or stimulate gender equality reported in the literature are listed below.

2.3.1 Individual / personal context

Regarding the dimension linked to the person, the literature has underlined the central role of support from others, especially colleagues and family members (Banerjee *et al.*, 2018; Bismark *et al.*, 2015; Dal Mas *et al.*, 2019; Dal Mas and Paoloni, 2019). In the workplace, it looks fundamental to rely on successful examples (for instance, female leaders who occupy positions of responsibility within universities, scientific societies, and organizations) and the presence of female mentors who can inspire and stimulate younger employees (Banerjee *et al.*, 2018; Kubik-Huch *et al.*, 2020; Lantz, 2008). At the family level, the importance of a support network emerges, both psychologically and operationally. Such support can come from family members, partners, and efficient childcare services for better management of young children and parental leave permits.

2.3.2 Organizational / institutional context

Equality can be promoted through the flexibility offered by the employer, ensuring a balance between work and family for mothers (Banerjee et al., 2018; Bismark et al., 2015) and the ability to recognize talents beyond gender (Lantz, 2008). Among the most mentioned techniques, the literature acknowledges flexible hours, the presence of support groups, the creation of manageable responsibility roles with reduced or part-time hours (Bismark et al., 2015) and straightforward career programs and salary levels (Banerjee et al., 2018). Lifelong learning and training are essential for full-time but also part-time staff (Bismark et al., 2015).

2.3.3 Institutional policies

Factors related to policies and institutions can also impact the promotion of women as health leaders (Gupta *et al.*, 2019). The presence of female leaders in university departments, scientific and professional societies can stimulate greater sensitivity to the issue, especially if accompanied by adequate measurement and control systems (Gupta *et al.*, 2019; Kubik-Huch *et al.*, 2020; Lantz, 2008) and transparency in recruitment (Kuhlmann *et al.*, 2017). Women's networking activities, promoted by academic and professional institutions, can be useful in sharing good practices and examples of success, supporting women in overcoming, in particular, their possible sense of inadequacy (Lantz, 2008). Gender equity should then be supported in broader social policy debates (e.g., with respect to pay equity, access to education, and support in the management and custody of young children) (Bismark *et al.*, 2015).

In this context, therefore, there is a clear need to identify solutions and operational tools that can effectively facilitate the role of leading women in healthcare (Banerjee *et al.*, 2018; Gupta *et al.*, 2019; Hofstädter-Thalmann *et al.*, 2018). The recent COVID-19 pandemic has exacerbated this context, especially concerning the issue of family management and parenting (Minello, 2020; Wenham *et al.*, 2020), in the presence of a very high-stress context, in particular, for female workers at the forefront of emergency management (Berardi *et al.*, 2021; Mavroudis *et al.*, 2021; Della Monica *et al.*, 2021; Talevi *et al.*, 2020; Wu *et al.*, 2020; Zhang *et al.*, 2020).

3. Methodology

The methodology used is based on a qualitative research method by analyzing a single case study (Yin, 2014). According to Massaro, Dumay and Bagnoli (2019), qualitative methods allow researchers to understand the

relationships between variables even within complex processes, thus illustrating the influence of the social context. The literature considers the single case study methodology to be applicable when a question about "how" or "why" is asked regarding current issues, over which the researcher has no control (Yin, 2014). Furthermore, the case studies allow for an in-depth understanding of the real world (Ridder *et al.*, 2014). To ensure transparency in the collection and management of data and information (Massaro *et al.*, 2019), the following sections illustrate, specifically: the context of the research, the process of data collection and analysis.

3.1 The research context. The CNAO Foundation

The National Center for Oncological Hadrontherapy - CNAO Foundation - is based in Pavia (Italy), and it is a unique health oncological institution aimed at treating radioresistant and difficult-to-treat tumours through the use of heavy particles, in particular protons and carbon ions (Barcellini, Peloso, Pugliese, Vitolo and Cobianchi, 2020; Barcellini, Vitolo, Cobianchi, Peloso, *et al.*, 2020; Barcellini, Vitolo, Cobianchi, Valvo, *et al.*, 2020; Cobianchi *et al.*, 2016; Cobianchi, Dal Mas, *et al.*, 2020; Vitolo *et al.*, 2019). Translational research is one of the main goals of the Institute, which also works on basic research in oncology (Cobianchi *et al.*, 2009; Fornoni *et al.*, 2007; Hogan *et al.*, 2012; Marzorati *et al.*, 2009; Turin *et al.*, 2018) The Institute's mission is not only to treat oncological patients but also to produce scientific evidence on the applicability and effectiveness of radiation treatment with hadrons. The CNAO Foundation is located in Lombardy, one of the Italian areas most affected by COVID-19, next to one of the leading Italian COVID hubs, the IRCCS Policlinico San Matteo Foundation (Grasselli *et al.*, 2020; Jereczek-Fossa *et al.*, 2020).

3.2 The data collection process

Data collection and analysis were carried out involving various stakeholders of the Institute, including radiation oncologists. In the period December 2020 - January 2021, ten semi-structured interviews were carried out with medical doctors, nurses, and clerks. Additional material was collected and analyzed, such as the Institute's website, social media channels, and scientific publications related to research projects and ongoing trials.

3.3 The data analysis process

The data acquired were analyzed using the CAOS model (Paoloni, 2011, 2021; Paoloni and Demartini, 2012). The CAOS model has already been used in numerous studies in various fields (Dal Mas and Paoloni, 2019, 2020; Paoloni *et al.*, 2020). Applied to the healthcare sector, the model is based on four specific sections: characteristics of the healthcare institution (C), the specific environment in which the institution operates (A), the organizational aspects and management styles (O), and the situational moment of observation (S). In this way, the CAOS model allows a multifaceted view both on the institution's characteristics and on the specific context at an environmental and situational level. The latter aspect is of particular importance when related to the pandemic context (Cobianchi, Pugliese, *et al.*, 2020; Dal Mas *et al.*, 2021; Romani *et al.*, 2020). Data coming out from the interviews were coded, and the findings were double-checked with the staff involved in the project.

4. Findings

The results are analyzed through the CAOS model (Paoloni, 2011, 2021; Paoloni and Demartini, 2012), in particular, through its four sections: the characteristics of the health institution (C), the environment in which the institution operates (A), the organizational aspects and management style (O), the situational moment of observation (S).

4.1 The characteristics of the health institution (C)

The National Center for Oncological Hadrontherapy is a radiation oncology centre that uses hadrons for the treatment of radioresistant tumours or tumours located in critical anatomical sites. The Center was strongly supported by the Italian Ministry of Health. After an initial construction phase, completed in February 2010, the Foundation obtained ministerial authorization to treat cancer patients within the National Health Service regime (Rossi, 2015). In these terms, a fundamental step in the CNAO authorization process was the introduction of hadrontherapy in the ELA (Essential Levels of Assistance). Over the years, the CNAO Foundation has acquired autonomy by becoming a Center of High Oncological Specialization in the treatment of tumours with heavy particles (in particular protons and carbon ions). Besides, the Center is oriented towards technological and radiobiological Research and Development with a view to the ever-greater personalization of treatment.

4.2 The environment in which the Institute operates (A)

The National Center for Hadrontherapy is based in Pavia, Lombardy. It is located halfway between the city's University Hospital (IRCCS Policlinico San Matteo Foundation), the Mondino Neurological Center, and the

Maugeri Foundation. It is also located in a Region, Lombardy, in which there are 35 Oncological Radiotherapy centers that treat approximately 35,000 patients annually (Palazzi *et al.*, 2018). Compared to the two additional hadrontherapy centers in Italy, the CNAO is the only Institute able to deliver treatments with carbon ions thanks to the presence of a synchrotron (Malouff *et al.*, 2020).

4.3 Organizational aspects and management style (O)

Currently, the staff belonging to the various departments are divided as follows:
Management and Services: 16
Clinical Department: 59
Financial-Administrative Department: 12
Technical Department: 38
Research Department: 4

Over the years, the CNAO Foundation has been able to carry out scientific and medical collaboration programs at an international and national level, promoting research and development in the fields of oncology, biology, and physics, with an intense knowledge sharing activity and translation of clinical and scientific knowledge to enable an inter and multidisciplinary approach (Barcellini, Gadducci, Laliscia, Imparato, Vitolo, *et al.*, 2020; Cobianchi, Dal Mas, *et al.*, 2020).

The CNAO Foundation is a relatively young work environment (the average age of the workers is 39, range: 23-62), and 65 of the 128 total employees are women, including 30 mothers. The CNAO Foundation encourages the active role of women in its governance. In particular, women are in charge of most leadership roles in the clinical, management, and research areas. Women are in charge of the Scientific Direction, the Medical Direction, the Technical-Nursing Direction, Communication and Public Relations, Quality and Regulatory Affairs, General Accounting and Taxes, Clinical Administration, Purchasing Planning and General Services. Out of a total of 13 medical doctors, 11 are women, including the Medical Director.

4.4 The situational moment of observation (S)

During the pandemic, especially during the first wave, the CNAO staff was forced to rethink and reorganize their work routine (Barcellini, Filippi, Dal Mas, Cobianchi, Corvò, *et al.*, 2020). To ensure worker safety and reduce the epidemic impact, the CNAO Foundation has encouraged flexible work, especially for the administrative and managerial employees.

Regarding the staff of the Clinical Department in close contact with the patients, various solutions have been applied. In particular, the Medical Physics staff has adopted flexible shifts with the possibility of working from home by connecting remotely to the planning stations of the radiation treatment to avoid delays in starting treatments and limiting internal gatherings.

The technical-nursing staff reorganized the shifts considering first the needs of mothers with young children or colleagues with fragile or at-risk family members.

In the so-called “transition” phase (Cobianchi, Pugliese, et al., 2020), medical staff members were encouraged to work employing flexible shifts without direct contact for two weeks. In this way, in the event of an emergency (for example, a staff member tested positive for Covid), the colleague returning from the "flexible shift" was potentially Covid-negative (considering the isolation period of 15 days), and could replace the infected fellow.

In addition to the clinical department, 40 employees worked remotely in the research and administration departments, while others benefited from the partner's flexible work.

Despite this reorganization, neither the scientific production nor the clinical mission have been compromised. The number of patients treated daily has remained constant, and several clinical cases have been discussed in a multidisciplinary context using teleconferencing tools. The clinical follow-up activity has been reorganized and, whenever possible, carried out remotely to minimize patients' travel. From a scientific point of view, three new clinical trials were submitted to the local Ethical Committee, with CNAO Foundation being the coordinator or promoter. Furthermore, the CNAO Foundation applied as a scientific partner to four national and international grants. In both the trials submitted to the local Ethical Committee and national and international grants, most of the Principal Investigators (PIs) and co-Principal Investigators (co-PIs) were women.

The reorganization of the work activity in a monothematic (oncological) structure such as the CNAO Foundation was necessary due to the pandemic emergency. However, this reorganization has made it possible to find new organizational opportunities that can be used to improve female workers' wellbeing, allowing them to balance, above all, work duties with personal life. Some of the solutions adopted in the emergency phase and in the transition phase could be exploited in the "new normal" phase to develop a new managerial model in the clinical and scientific field (Berardi *et al.*, 2021).

5. Discussions and conclusions

The literature in health governance and gender studies has highlighted the presence of barriers to women's access to leadership positions. Simultaneously, the same literature has recognized and underlined the advantages of health leadership more devoted to the criteria of diversity and inclusion. However, despite these advantages and the demonstrated positive impact on clinical and management outcomes have been measured, the operational difficulty for women to assume these roles of responsibility emerges, despite the presence of qualified professionals and regulations that stimulate equal opportunities in leadership roles. Among the main constraints to implementing gender equality, women's difficulties in combining professional and family functions emerge, especially for working mothers. Despite the possible presence of practical tools (such as family support services), the literature shows how the fear of not being able to balance the two roles tends to limit the application to management roles.

The recent COVID-19 pandemic has further exacerbated these issues (Sousa *et al.*, 2021). Indeed, on the one hand, women in healthcare have been called upon to cope with difficulty in family management following the social distancing regulations (Minello, 2020; Wenham *et al.*, 2020), dealing at the same time with the high stress and amplified workload because of the pandemic (Berardi *et al.*, 2021; Cobianchi, Pugliese, *et al.*, 2020; Mavroudis *et al.*, 2021; Della Monica *et al.*, 2021).

In this context, the CNAO Foundation's experience can represent an example of the possible solutions to be adopted to minimize the gender gap.

The tools already identified by the literature included flexibility, especially for working mothers (Banerjee *et al.*, 2018; Bismark *et al.*, 2015), the ability to recognize talents, especially in the selection and promotion phase (Lantz, 2008), the presence of support groups (Banerjee *et al.*, 2018), clear career plans and continuing education (Bismark *et al.*, 2015). All these elements can be identified in the management of the CNAO Foundation. However, it is possible to include some new ideas.

One first aspect is that of self-organization. Supported by the management and intermediate managers, the CNAO Foundation’s workers managed flexibility by using a self-organizing approach to the individual's needs, trying to calibrate activities in presence, remotely, and flexible hours. Specifically, the group attempted to spontaneously meet those who had more significant problems, for example, in managing children in distance learning, taking into account the working condition of the other parent (whether a worker in smart working or employed in the frontline of emergency management). Self-organization may not always appear possible, taking into account the constraints of public bodies’ labour regulations. However, the creation of support groups, or the possibility of women to emphasize their limitations to their line manager, could allow a degree of flexibility that increases the likelihood of managing work and family life without affecting productivity.

One second aspect that emerges from the experience of the CNAO Foundation is the importance of implementing adequate tools for measuring and monitoring performance, having in mind that one size cannot fit all (Cobianchi *et al.*, 2021). The managers of CNAO accompanied the extraordinary flexibility measures for staff, especially women, with a parallel internal system of evaluation of results, both in the clinical setting (mainly about the number of patients treated) and in the research field (scientific works submitted to journals, participation in national and international working groups, and managed projects/grants). This measurement and control system was put in place beyond the ordinary procedure of the Institute, to assess the level of performance despite the extraordinary situation characterized by working flexibility, new working tools (e.g. telework) and unusual absence of workers following contagions or enforced quarantine periods.

A final aspect is that of remote work and e-health that both patients and healthcare personnel could employ (Grenda *et al.*, 2020; Miceli *et al.*, 2021). The CNAO Foundation has facilitated, whenever possible, the use of

telework and remote communications, both for administrative staff, partly for technical staff, for medical physicists, and the management of the relationships with other institutes and clinics for projects and patients in a multidisciplinary environment. Once again, the CNAO Foundation has agreed with the staff on the tools' applicability and the relative measurement of the results in progress to assess their sustainability in the long run.

The National Center for Oncological Hadrontherapy experience, therefore, introduces, in particular, the issue of self-organization combined with an adequate system of measurement and control of results as a policy of flexibility to facilitate women in their career path.

The CNAO Foundation case appears attractive as a health institution with a prevalent female presence, both in leadership positions and at the workforce level, in a particular situational context, such as the Covid-19 pandemic. CNAO's management experience can form the basis for developing a broader organizational model to facilitate the flexibility of female work and, therefore, the possibility for women to lead corporate positions. This organizational model can also be of practical application for other institutions of a variety of different sectors.

Future research avenues could lead to comparative studies with similar institutes.

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