



Original Article

Promoting women's careers in life science and medicine: A position paper from the “International Women in Intensive Medicine” network

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ABSTRACT

Background: Women remain underrepresented and undervalued in leadership roles within scientific and healthcare disciplines, facing persistent gender discrimination and various professional barriers.

Methods: This paper presents the main findings and recommendations from the 2023 International Women in Intensive and Critical Care Network (iWIN) Roundtable, which convened a diverse group of experts to discuss equity and inclusiveness for women in their careers.

Results: The discussion highlighted three critical themes: social barriers (such as maternal identity and cultural pressures), the need for resilience-building through mentorship/sponsorship and support networks; and practical challenges, including childcare and limited career guidance. To address these issues, the panel proposed developing and empowering women's networks, emphasizing their role in promoting gender equality, fostering diversity, and supporting professional development. A key recommendation is the creation of a digital platform to increase the visibility of women scientists and connect them with opportunities for engagement and leadership. Additionally, the paper underscores the importance of institutional support for flexible work arrangements, mentorship programs, and leadership development initiatives.

Conclusions: The proposed strategies aim to not only advance the careers of women in science and healthcare but also to challenge and reshape the stereotypes surrounding who can be a scientist. By providing practical tools and fostering a culture of inclusiveness, these recommendations have the potential to significantly impact the representation of women in these fields and contribute to broader societal change.

List of iWIN Investigators is reported in appendix A. List of iWIN 2023 participants and chairs of the four roundtable appendix B.

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1. Introduction

It is well-established that women are underrepresented in leadership positions [1], undervalued in their academic careers, and experience gender discrimination in scientific and healthcare disciplines [2]. Thematic analysis of the literature highlights three key points related to the advancement of women in medicine [3]: a) Social Barriers: These include maternal identity and cultural pressure regarding work and family balance. [4] b) Building Resilience: The importance of role modelling, mentorship, sponsorship and support from others in fostering resilience. [5] c) Practical Difficulties: Challenges such as childcare needs, lack of timely career advice, and the constraints of part-time work. This paper presents a summary of the main advice and recommendations from the 2023 International Women in Intensive and Critical Care Network (iWIN) Roundtable, which convened a diverse group of experts to discuss equity and inclusiveness for women in their careers.

2. Methods

A two-day expert roundtable was held in June 27–28 2023 in Aci Castello, Sicily to discuss the current state, challenges, and future directions of equity and inclusiveness for women in their careers. This event was done in the context of the International Women in Intensive and Critical Care Medicine Network (iWIN) annual meeting. The iWIN is a global hub for research and innovation, primarily focused on professionals in intensive and critical care medicine. iWIN has an annual meeting since 2020 while the network’s primary audience is from the critical care field, the multidisciplinary team established during the meeting aimed to address broader issues related to equity, diversity, and inclusion (EDI) across various sectors, including academia and clinical practice. In 2023, the iWIN scientific committee organized four thematic tables in the context of one and half day summit (Fig. 1). Experts from all continents were invited to join working groups (see list of participants in the supplement), with no more than 20 international participants. Faculty spent the entire day exploring, understanding, and advising on specific solutions for a relevant pre-defined topic related to EDI. Following an entire day every group presented these ideas to all participants from the remaining 3 thematic tables. The faculty had the possibility to have a discussion and agree on actions points. The final half-day session allowed for a collaborative agreement on the most feasible and impactful solutions. The expert group in 2023 comprised medical doctors, psychologists, engineers, and journalists, all experienced in equity and inclusiveness issues.

The network’s goals are to develop and empower a women’s network. The task force agrees on creating a platform to increase the representation of women physicians and scientists, address intersectionality in their careers, and support their professional development in research and leadership. This includes mentorship, sponsorship, skill-building, and career guidance. Priorities also include improving work-life balance and normalizing pregnancy and parenthood. Key metrics to track progress and adaptation to cultural and geographical contexts are necessary. This paper provides practical actions for equity and inclusiveness and highlights best practices across various fields.

3. Core manuscript

3.1. Development and empowerment of women’s network

Developing and empowering women’s network have numerous advantages, below we highlight some general findings and trends that support the advantages mentioned:

- Gender Equality and Diversity: Many studies emphasized the importance of women’s networks in promoting gender equality and fostering diversity in various professional fields (for example, the American Medical Women’s Association, <https://www.amwa-doc.org/>)
- Professional Development: Literature often discussed how women’s networks contribute to the professional development of women, providing mentorship, skill-building opportunities, and career guidance.
- Networking and Support: The role of women’s networks in facilitating networking opportunities and offering emotional support was a common theme. These networks were seen as platforms where women could share experiences and address common challenges [6]
- Leadership Development: Several studies explored how women’s networks contribute to the development of leadership skills among women, preparing them for leadership roles in various sectors [7]
- Intersectionality: Recognizing and addressing intersectionality, considering factors like race, ethnicity, and socio-economic background, was increasingly recognized as crucial in women’s network development.
- Technological Platforms: With the rise of digital platforms, research focused on the impact of online communities and social media in supporting and expanding women’s networks.

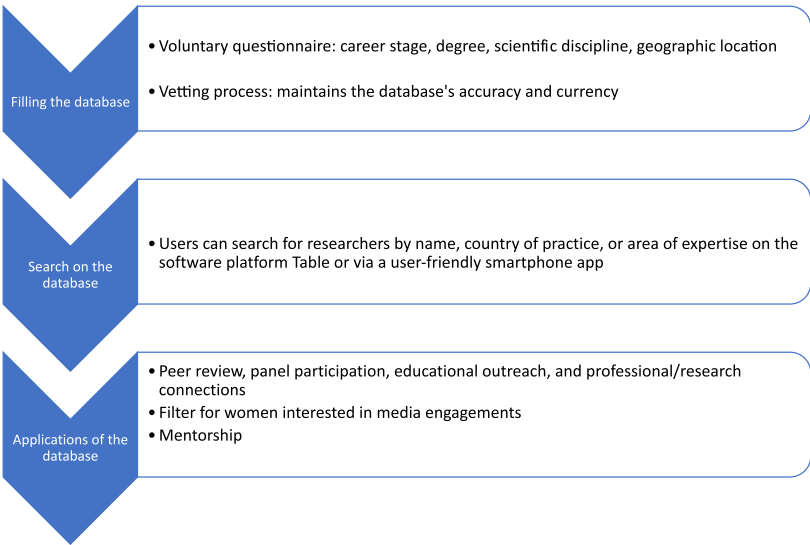


Fig. 1. iWIN 2023 roundtables.

- **Organizational Initiatives:** Literature also covered organizational initiatives to establish and support women's networks, including the role of companies and institutions in fostering a culture of inclusion.

Similar initiatives have been highlighted in recent literature. For example, Bhalariao [8] et al. reported on the recent experience of Riverside Community Hospital, which organized the Women in Medicine & Health Care Symposium on November 17, 2023. The symposium aimed to establish a supportive network for women in healthcare and featured a distinguished panel addressing issues such as gender bias, maternity leave, and fertility challenges [8]. Panellists shared personal stories, fostering camaraderie and mutual understanding among attendees. Research presented at the event underscored the significant challenges faced by women physicians, including higher rates of infertility and pregnancy loss. In response, the panellists provided valuable insights and resources, encouraging discussions around mentorship and peer support. Participant feedback was overwhelmingly positive, underscoring the importance of such platforms for community building and professional support [8]. The hospital plans to host quarterly events to expand this network and is also exploring the development of a formal mentorship program. These initiatives represent an important step toward addressing gender-related challenges in healthcare and creating a strong, supportive community for women professionals. Another, more global approach is that of the Lancet-SIGHT Commission on Peaceful Societies Through Health and Gender Equality, which explores the connections between gender equality, health, and peacebuilding [9]. Despite global efforts to achieve the Sustainable Development Goals (SDGs), conflicts and instability continue to impede progress, particularly in the areas of health (SDG3) and gender equality (SDG5). In response, The Lancet, and the Swedish Institute for Global Health Transformation (SIGHT) have launched a Commission to investigate how advancements in health and gender equality can promote more peaceful societies [9]. The Commission aims to provide actionable recommendations by 2021, with a focus on examining the interrelationships between health, gender equality, and peace [9].

Building a platform: a way to develop and empower women's networks:

A 2017 study analysing colloquium speakers at 50 prestigious universities found that men were invited to give twice as many talks about their research as women [3]. Conference and symposium organizers repeatedly use the same excuses for this imbalance—from “We tried to find a woman to speak on this panel, but we didn't know any women who work on this topic” to “All the women we asked said no or were unavailable.” The gender gap in scientific forums trickles down into representations of scientists in the media. Women experts are less likely to be cited as sources in news articles about scientific developments, even though they are more engaged in science outreach and communication compared to their male colleagues [4,5]. Actually, underrepresentation of women perpetuates a broader issue in science—expertise relayed to the public does not reflect the true diversity of people and perspectives in science today and across society at large. Furthermore, the lack of visibility of women experts reinforces the idea that science can only be accessed and informed by people who conform to the white male scientist stereotype. These stereotypes influence the next generation's perceptions of who can practice science. For instance, in a 2018 study, only three in 10 US children drew a woman scientist when asked to draw a picture of what a scientist looks like [10]. That figure, however, is a marked improvement from when the surveys and the first study was conducted between in 1966, 1977, and 1983, respectively, when only 1 % of children drew women scientists [11].

To confront the stereotypes of who can be a scientist and to facilitate contact with women scientists, the Request a Woman Scientist platform was created in 2018 and serves to connect educational institutions, policy makers, members of the public, media, and others with women scientists across scientific disciplines and geographical regions. Women registered in platforms, have indicated their willingness to speak with

students or the media, consult on a project, sit on a panel, or serve as a conference keynote speaker. The platform helps people find women with the relevant expertise and experience and, at the same time, highlight other areas for inclusion to deepen representation across dimensions of diversity. In this regard, a survey of women in the database conducted in November 2018 [12] showed that of 1278 respondents, 11 % had been contacted since signing up for a variety of engagements, including media, peer review, panel participation, educational outreach, and professional/research connections. These engagements resulted in consultations for articles, video chats with students, and speaking opportunities at conferences and events [12].

The task force proposes to develop an online registry of volunteer women physicians and scientists who are eager to share their expertise (Fig. 2). This database will be constructed from a voluntary questionnaire that collects information on career stage, degree, scientific discipline, geographic location, and other self-identifying dimensions of representation. The information will be accessible through the software platform Table or via a user-friendly smartphone app. The app will feature dropdown menus that simplify database queries and generate lists of names, email addresses, and websites. Users can search for researchers by name, country of practice, or area of expertise. Based on their selection, they will be directed to the corresponding researcher's profile.

With enhanced functionality, targeted marketing, outreach in the global south, and future translation into multiple languages, this database will elevate the profile and participation of women scientists globally, thereby advancing scientific progress.

The database can serve multiple purposes. For instance, Users can search for researchers by name, country of practice, or area of expertise. A journalist looking for an expert in a specific field could filter the database for women interested in media engagements. An early-career trainee exploring academic careers or seeking mentorship could find a woman in policy to contact for an informational interview.

Women scientists can self-identify by filling out a Google form, and entries will be vetted by members of the Women Scientists organization. This vetting process includes verifying that the sign-up is from a self-identified woman in the field of medicine and ensuring the accuracy of the provided information. This process maintains the database's accuracy and currency.

The women in the resource are searchable by discipline (using predefined fields), location, participation interests, and additional self-defined keywords. The output consists of a list of names, contact information (typically email addresses), and websites (when provided), and can be exported as a PDF, CSV, or weblink.

Addressing Intersectionality for this platform:

The Platform of Experts on Women is designed to address intersectionality in women's careers among healthcare workforce, offering a comprehensive approach that recognizes the various overlapping identities and social factors influencing women's experiences. Intersectionality highlights how elements such as race, ethnicity, socio-economic status, disability, sexual orientation, age, and geographical location intersect with gender to create distinct challenges. Through research, policy, and targeted interventions, the platform seeks to tackle these complexities. By integrating intersectionality into all aspects of its work—including research, policy development, clinical care, education, and advocacy—the platform aims to make health systems more inclusive and responsive to the multifaceted experiences of women from diverse backgrounds. This holistic approach will help reduce disparities and promote equitable healthcare outcomes for all women.

3.2. Supporting women experience

Beyond the networking, women have to improve their professional development in research and leaderships. As previously showed, they are underrepresented in medical congress [13], but they are also less in a leadership position as principal investigators on ClinicalTrials.gov [14],

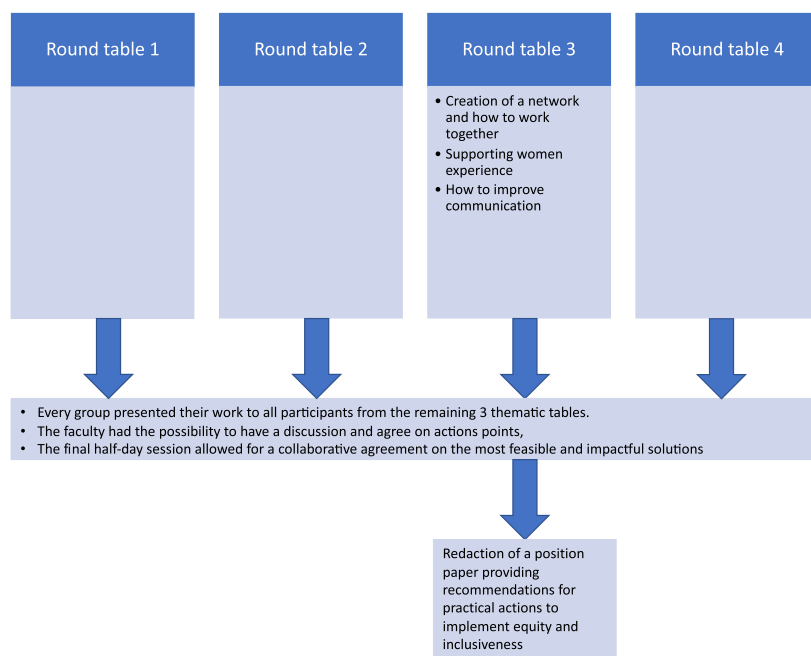


Fig. 2. Development of the platform database.

and less to receive research grant [15], and this can have implications for gender inequity in academic medicine career success [16,17].

As previously stated, women need to be supported in their ability to lead research studies or teams, and struggle against stereotype of scientist. In a recent study of the European Society of Anaesthesiology and Intensive Care (ESAIC), impostor syndrome was frequent in anaesthesiologist women (OR=2.45, 95 % CI: 1.75–3.44, compared with men) [18].

For all these reasons, supporting women by providing mentorship, sponsorship, skill-building opportunities, and career guidance is of at most importance [19]. To practically implement the proposed strategies aimed at promoting gender equity in leadership and addressing the challenges women face in their careers, a comprehensive approach is needed. Here's a structured breakdown of practical steps that could be taken:

Promoting workshops of leadership and unconscious bias may help women to access to the leading positions. These workshops should include interactive sessions focused on recognizing and mitigating bias, fostering inclusive leadership practices, and developing self-advocacy strategies. The expected outcome is to empower women to overcome barriers to leadership while cultivating a culture of inclusivity and awareness among peers and decision-makers.

Promoting the visibility of Role Models: Videos, interviews or podcasts of role model could promote different experiences in different key positions [20]. These media will highlight the personal experiences, challenges, and strategies for success of these role models, showcasing diverse paths to leadership. The goal is to inspire women at different stages of their careers by providing tangible examples of overcoming systemic challenges and offering insight into successful career navigation.

Mentorship programs: Establish formal mentorship/sponsorship programs that pair junior female physicians with both male and female mentors, providing structured support for professional development and personal growth. Develop training for mentors to address cross-gender mentorship concerns and focus on gender equity issues. Indeed, mentoring should be an opportunity to mitigate gender inequities, although that both women and men mentors recognized the challenges their female mentees faced [19,21]. Men endorsed greater concern surrounding mentoring someone of a different sex in a recent study, whereas even in

mid- to senior-career faculty experiences, women were less likely to report sponsorship surrounding receiving providing invitations to write editorials and receiving invitations to serve as visiting professors [22]. The outcome will be stronger mentor-mentee relationships, increased access to professional networks for women, and greater visibility for female physicians in the field.

Promoting representativity of women in Authorship and Editorial Roles: Encourage mentorship that fosters co-authorship between female and male authors, with a focus on senior female physicians mentoring junior female physicians. Support initiatives that boost women's participation as authors, particularly in senior roles, by establishing writing groups or committees dedicated to women's contributions to research. This will help increase the proportion of women as first and senior authors, which has been shown to improve the likelihood of female co-authorship. Accordingly, mentorship of younger physicians improves the visibility of women, as demonstrated in studies about authorship [21,22], showing that women comprise less than one-third of first authors and one-fourth of senior authors of critical care research, but that when the senior author was female, the odds of female co-authorship rose substantially [23]. Additionally, advocate for greater representation of women in editorial roles, especially as editors-in-chief of key journals. Initiatives should encourage qualified women to apply for these positions while educating editorial boards on the importance of gender diversity. Representation of women among editors could also help to reduce this gender gap [24], whereas women represented only 10 % of the editors in chief for critical care medicine in a recent study [25]. The perspective of iWIN has been reported elsewhere [26].

Be aware about work life balance and tackle maternal discrimination: Women career is also impacted by the parenting and domestic responsibilities, as inequities persist in these tasks between male and female physicians [27,28]. Perceived discrimination based on gender and maternal discrimination is common among physicians [29,30]. Moreover, female physicians, particularly surgeons, have a significantly greater incidence of miscarriage, infertility, and pregnancy complications compared with the general population [31].

There is a need to cultivate a culture that normalizes pregnancy and motherhood, as highlighted by studies among US surgeons [32]. To support women returning to work, we should offer flexible schedules, part-time options, and expanded childcare services. [33] Providing

back-to-work training and keeping them informed and connected during their leave is also essential. The panel emphasizes the importance of promoting and developing sustainable teams through education and professional development. Achieving this should be a priority, with further efforts required; progress on this will be reported separately." In this regard, a survey study [34], conducted among 1056 women physicians from March to August 2022, aimed to evaluate the impact of delayed childbearing and infertility on career trajectories. The results revealed that while a majority of respondents understood the age-related decline in fertility, many delayed family building, with 36.8 % experiencing infertility [34]. To accommodate parenthood, many women made substantial career adjustments, including taking extended leave (28.8 %), reducing work hours (47.1 %), or even leaving the profession entirely (4.3 %) [34]. These findings indicate that concerns about fertility and family planning significantly influence women's career paths in medicine, contributing to persistent gender disparities and academic attrition. The study underscores the need for policy reforms to address these challenges and foster a more equitable environment for women in medicine.

In a more pragmatic way, there is a need to implement support systems that provide flexibility for women balancing parenting and professional responsibilities. This includes offering flexible work schedules, part-time options, expanded childcare services, and back-to-work programs for women returning from maternity leave. Such policies aim to retain women in the workforce while supporting their family responsibilities.

Additionally, cultivate a culture that normalizes parenthood by recognizing pregnancy and motherhood as natural aspects of a physician's life. This can be achieved by offering accommodations like reduced hours, fewer on-call shifts, and enhanced safety standards for pregnant women. To tackle gender and maternal discrimination, enforce anti-discrimination policies, establish reporting mechanisms for perceived discrimination, and ensure leadership teams address concerns promptly, fostering a more supportive and equitable work environment for female physicians. It is essential to delve deeper into how maternal identity impacts not only women but also men within each institution, as well as the influence of marital status on these dynamics. The discussion on social barriers currently highlights maternal identity and cultural pressures, which predominantly affect women, but it would be beneficial to examine how these issues also impact men and individuals from diverse backgrounds, thereby enhancing the inclusivity that is a hallmark of gender perspectives.

Key Metrics for Tracking Gender Equity Progress: tracking progress toward gender equity requires clear metrics. Key indicators include the percentage of women in leadership roles, gender balance in hiring and promotions, and regular reviews of pay equity to address salary gaps. Organizations should monitor engagement in mentorship and sponsorship programs and analyse retention rates, especially among mid-career and senior women. Additionally, tracking the uptake of parental leave and flexible work policies by both genders ensures accessibility. Surveys assessing workplace culture, along with monitoring publication and authorship rates in research settings, provide insights into gender equity. These metrics enable data-driven decisions and accountability for continuous improvement.

Ensure the long-term sustainability of gender equity initiatives: organizations should integrate these programs into their core policies, embedding metrics in performance evaluations and hiring processes. Fostering a culture of continuous improvement through regular training updates and employee feedback is essential, as is securing visible support from senior leadership along with accountability measures tied to equity outcomes. Ongoing resource allocation is necessary to prevent short-lived initiatives, while collaboration with external organizations can enhance innovation in gender equity strategies. Establishing clear metrics for progress and adapting policies to address evolving societal needs will further support sustainability. Long-term mentorship programs should be developed to create a pipeline for diverse leaders, and

embedding gender equity into the organization's core values will help ensure that these initiatives remain relevant and prioritized over time. By reflecting on these strategies, organizations can create impactful and sustainable gender equity initiatives that foster lasting change.

It is noteworthy, male allies play a crucial role in advancing gender equity, particularly in leadership, where women are underrepresented. Their support can include advocacy and sponsorship, where they promote women for leadership roles and boost their visibility. Through mentorship, male allies offer guidance and normalize gender diversity in leadership. They can also challenge unconscious biases in recruitment and promotion, fostering a fair and inclusive work culture. Additionally, male leaders can support policies that address work-life balance and promote diversity initiatives. Together, these actions help create a workplace environment where women can thrive in leadership roles.

3.3. Policy implication

It is important to align gender equity initiatives, such as tracking pay equity and increasing female representation in leadership, with existing laws like the Equal Pay Act or the Equality Act. This ensures compliance and helps prevent legal risks related to discrimination. To effectively implement gender equity strategies, organizations should:

1. Align with Employment Laws: Ensure initiatives comply with existing gender equity laws to avoid legal risks.
2. Promote Pay Transparency: Regularly review salary data to support policies that address pay disparities.
3. Enhance Parental Leave Policies: Advocate for flexible work arrangements and expanded parental leave to promote work-life balance.
4. Address Unconscious Bias: Develop frameworks to tackle implicit biases and enhance mentorship opportunities.
5. Influence Promotion Policies: Integrate gender equity metrics into institutional promotion and tenure criteria.
6. Lobby for Policy Reforms: Use successful mentorship and sponsorship programs to advocate for broader legislative changes.
7. Navigate Local Challenges: Adapt strategies in regions with less developed gender equity laws to provide models for future improvements.

By considering these recommendations, organizations can drive meaningful progress toward gender equity while influencing the broader policy landscape.

3.4. Adapting gender equity strategies for diverse cultural and geographical contexts in healthcare

Adapting gender equity strategies to diverse cultural and geographical contexts requires flexibility to reflect varying social norms, healthcare systems, and gender dynamics. Leadership and unconscious bias training must account for local power dynamics, emphasizing culturally relevant leadership styles and addressing intersecting biases. Visibility of female role models should focus on local or regional figures, especially where examples of women in leadership are scarce. Mentorship programs should be sensitive to existing structures, with options for peer-mentoring or same-gender mentorship in regions where gender interactions are restricted. Work-life balance strategies must consider local norms around domestic responsibilities, with flexible work options adapted to each context. Addressing maternal and gender-based discrimination may involve informal measures in regions with weaker legal protections, and organizations should lead by example in promoting progressive workplace policies. Increasing women's representation in authorship and editorial roles requires support from regional academic institutions and networks, while affordable professional development opportunities can be offered through partnerships and online resources. Finally, progress monitoring should leverage local

networks and culturally relevant metrics. This adaptive approach ensures that gender equity strategies are tailored to the specific challenges women face in different regions, promoting global progress in healthcare leadership.

3.5. The economic benefits of gender equity initiatives in healthcare leadership

A tangible return on investment (ROI) can be anticipated from these initiatives within Iwin, highlighting their economic benefits.

1. Enhanced Productivity: Supporting women with mentorships, flexible work, and leadership development increases productivity, improves patient outcomes, and boosts operational efficiency.
2. Fostering Innovation: Diverse leadership teams, including women, drive innovation, leading to new treatments, technologies, and potential commercial success.
3. Reducing Costs: Initiatives to support women in leadership lower turnover and recruitment costs, saving money and retaining institutional knowledge.
4. Gaining a Competitive Edge: Organizations committed to gender diversity and inclusion attract patients and top talent, increasing market share and financial performance.
5. Ensuring Legal Compliance: Addressing gender equity proactively avoids legal disputes and safeguards the organization's reputation and financial stability.
6. Boosting Patient Satisfaction: Diverse leadership teams enhance patient satisfaction, leading to increased patient volume and revenue.
7. Attracting Funding: Organizations demonstrating a commitment to gender equity are more appealing to funding bodies and grant providers.
8. Capitalizing on Global Opportunities: Diverse leadership, including women, helps organizations understand and leverage international market opportunities.
9. Achieving Long-Term Financial Success: Gender-diverse leadership correlates with better long-term financial performance, making it a wise investment.
10. Improving Public Health: Women's representation in leadership leads to more comprehensive healthcare policies and potential cost savings across the system.

3.6. The work of the iWIN platform to support women's career in life sciences is planned in the annual meeting have reflected the iWIN core values namely

Innovation, Diversity, Equality, Advocacy and Leadership (IDEAL). The 2023 mentorship pilot program has involved 6 mentees and 6 mentors in developing research activities. Members have sponsored juniors with the help of the iWIN international junior committee (volunteers) and first year medical school students (see publication in appendix 3). The iWIN network has also launched many initiatives having completed 22 rounds tables with experts from all continents. The iWIN leadership has completed 10 publications on diversity, equality, inclusion and women health in Q1 journals. Leadership by role model has been promoted using a dedicated YouTube channel (<https://www.youtube.com/@iwin729>). The platform has done 2 International surveys, the latest on well-being in the workplace under review in a scientific journal. iWIN has offered since 2022 free access to the annual conference to award best abstracts submitted by junior colleagues and medical students.

4. Conclusions

The 2023 IWIN round table panel's report highlights the persistent

underrepresentation and undervaluation of women in leading positions within scientific and healthcare disciplines. Addressing this issue requires a multifaceted approach, as discussed during the two-day expert roundtable in Summer 2023. The panel provided several key recommendations for achieving equity and inclusiveness, emphasizing the importance of developing and empowering women's networks. For a more inclusive approach to gender equity in medicine, it is need to emphasize that the participation of all individuals is fundamental to achieving true equity.

Ethics approval and consent to participate

Not applicable.

Consent for publication

Not applicable.

Availability of data and material

Not applicable.

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Declaration of competing interest

The authors have no competing interests to declare in relation to the subject of the manuscript

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Supplementary materials

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Appendix 1

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