



EDITORIAL COMMENT

Women in cardiology: Between the “glass ceiling” and the “sticky floor”

Mulheres em cardiologia: entre o *glass ceiling* e o *sticky floor*

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“The Red Queen to Alice: here, you see, you have to run with all your might to stay in the same place. To go somewhere else, you have to run at least twice as fast”

Lewis Carroll

“Through the Looking Glass”

The metaphors of the “glass ceiling” and the “sticky floor” are used to represent artificial barriers based on attitudinal or organizational bias that prevent women from attaining upper levels in hierarchy (business, leadership and academia) or keep them stuck at the bottom of a career with very limited possibilities of upward or sideways movements. These metaphors imply that “invisible or subtle barriers” are present but cannot be seen from below or from above (by either men or women), and have not been recognized and most importantly not been addressed for decades.¹

Specifically, the term “glass ceiling” was popularized in a 1986 Wall Street Journal article about corporate hierarchy highlighting the underrepresentation of women in CEO positions, although they made up a larger share of the chief executive officer roles. The landscape has not changed significantly over the last three decades. In a recent study by the Wall Street Journal, it was found that the number of women CEOs in the United State of America (USA)’s top 3000 companies has more than doubled, yet women still only represent less than 6% of all CEOs.²

Unfortunately this translates to medicine and particularly to clinical and academic cardiovascular medicine.

There is still a gender imbalance in favor of men in medical schools and in general medicine. Data from the USA and Europe show that this gap has been reducing slowly over time, even leading to a fear of a “feminization of medicine”, which is still far from becoming a reality. In fact, in 2016, women accounted for 46.4% of USA medical school graduates, while in England 45% of all doctors registered in 2019 were women.^{3,4}

Gender disparity turns out to be more evident when gender distribution in medical specialties is addressed, this is especially the case in cardiology. In fact, from the same database, 42.6% of internal medicine resident physicians are women, but in general cardiology, women represent 21.5% and only 12.6% are practicing cardiologists.³ If cardiology sub-specialties are taken into account, the balance clearly shifts to male dominance. In fact, interventional cardiology is traditionally a male only-field and this picture is consistent around the globe: in the USA, only 5.9% of board-certified interventional cardiologists are women, and in Italy, just 12.5%. But even in the non-invasive sub-specialties such as heart failure (HF), the gender gap is pronounced and with no change since 2011: 74.5% male to 25.5% female HF cardiologists.^{3,5}

In some European countries the figures are looking better, especially in Spain in the last decade, women have represented 68% of cardiology residents and 40% of all practicing cardiologists. In 2019, Portuguese women account for 31% of all practicing cardiologists, with quite an asymmetric distribution according to age ranks: 16% female cardiologists over the age of 61 rising to 43% under 50 years old.^{6–8}

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Although there has been increasing evidence of women in medicine and cardiology over time, gender disparities still continue. They tend to be unrecognized and often attributed to women's unwillingness to go into medical specialties that are assumed to be more demanding with more interference in family life, such as cardiology, nor to invest in an academic career which is less stable than a clinical career.

So, is the "glass ceiling" a "feminist" chimera in clinical and academic cardiology?

Let's look at the facts.

Fact 1: Of the 40% female cardiologists in Spain, only 19% serve as department directors and only 11% are service directors.⁷ In Portugal, the numbers are much more frustrating and service or department cardiology female directors can be counted on one hand.^{8,9}

This major gender disparity in leadership does not occur only in southern European countries and is actually linked to salary inequities¹⁰ which leads us to Fact 2. In the UK, the pay gap between men and women is on the average 17% in favor of men. Tom Moberly, the British Medical Journal (BMJ)'s UK editor, stated in May 2019 that the gender pay gap "is worse among doctors than in the NHS as a whole".^{10,11} Wage disparities are often explained away as a result of women working part time or limited hours, or choosing lower paying specialties to allow for more time off raising a family. However, even after accounting for specialty, hours worked and other measures of productivity and achievement, women still earn less than their male counterparts.¹² Moreover, a study based on survey data from 8000 newly trained physicians in New York showed that starting salaries in 1999 were \$173 400 for male physicians vs. \$151 600 for female physicians. This gap grew even larger in 2008, when starting salaries were \$209 300 vs. \$174 000, respectively.¹³ Apparently the pay gap is linked to "the almost absence of female medical directors", who could otherwise strive for more equitable rewards. The vicious circle is quite apparent.¹⁴

Fact 3: Women are underrepresented in scientific societies. In 2019, female cardiologists represented around 33% in the middle range rank age group (40-50 years old) in the European Society of Cardiology (ESC) membership compared to 68% of male colleagues but only 16-28% >55 years old compared to 72-84% male cardiologists.

In 2014, female cardiologists on the ESC board and on the ESC committees were 7% and 13%, respectively, compared to 93% and 87% male cardiologists. These numbers grew between 2017 to 2019 to 31% on the ESC board and to 28% on ESC committees, but still reflected underrepresentation. There has been only one female ESC president in 70 years.

Fact 4: Women are underrepresented on editorial boards of major US and European cardiology journals.

According to a review paper by Balasubramanian et al.¹⁵ that addressed female representation in major journals in the USA (Circulation, Journal of the American College of Cardiology, JAMA Cardiology, American Journal of Cardiology) and European Journals (European Heart Journal [EHJ] and Heart), there were no female editor-in-chiefs for US general cardiology journals between 1998 and 2018 and only one female editor-in-chief for a general European cardiology journal. There were fewer women than men on editorial boards and the figures were similar in USA and Europe

(9% versus 20.7%, $p=0.02$; and 11.8% versus 12.8%, $p=0.60$, respectively). In 2019, Circulation Research and two new American College of Cardiology journals (Cardio-Oncology, Case Reports) appointed female editor-in-chiefs.

The study by Balasubramanian et al. highlighted the need to create diversity in editorial boards which can provide female role models for younger generations and foster fewer barriers to female academic careers.

Fact 5: The gender imbalance in academic medicine is even more pronounced, particularly in senior positions.¹⁶ An identical profile is seen across the Atlantic. In the USA in 2014, women represented 16.5% of the academic cardiologists but only 15.8% of those were full professors.¹⁷ Similarly in the UK, women account for 26.3% of clinical academics, 42.3% of lecturers and only 15.6% of professors.¹⁸

Additionally, male doctors are more likely to achieve higher academic levels at a younger age. One of the most important metrics for clinical and academic career progression are published research papers in peer-review journals with a high impact factor. Women in academia have fewer high-impact publications and are awarded fewer funding grants, which negatively impacts on their academic career progression.¹⁹⁻²¹ Tamblyn et al., in a study of peer reviewed research grants allocation, showed that women were assigned lower grant scores than men even after adjusting for more than 20 potential confounders, including publications and history of previous funding success.²²

A significant number of publications found that women are less likely to be lead authors when men are senior authors, suggesting a gender association between mentees and mentors.²³⁻²⁵ It turns out that the majority of women researchers (77%) have men, rather than women as mentors, according to a survey of young researchers at the National Institute of Health and in this survey, it was perceived as an obstacle to female scientific production.²⁵

One question arises: are women's publications poorer in quality to be accepted or to deserve funding grants? From Asghar's study, the finding that the median number of citations was higher for female leadership articles, indicating greater impact of the articles, is undoubtedly an argument against this hypothesis.²³

To confirm the existence of the "glass ceiling and dispel the idea of the possible low quality of research by women, two studies eight years apart (2008 and 2016) showed that manuscripts and conference abstracts led by women were accepted more often when reviewers were blinded to the gender of the authors.^{26,27}

In this issue of the journal Ana Timoteo's²⁸ study adds to the growing body of literature on female underrepresentation in cardiology by analyzing female authorship in the Portuguese Journal of Cardiology (RPC), which publishes Portuguese research in cardiology. The study analyzed first and last authorship, in primary research, editorials and review papers, between 2013 and 2018. In line with international publications on the same topic, the first author and the last author are surrogates for leader and senior authors and are also used to identify mentees and mentors, respectively. The senior author is associated with the position of director of the service or department where the research was carried out and should reflect the organization and leadership of the investigation itself.

Ana Timoteo found that:

- i) Lead female authorship of original research and review papers is higher in RPC than in international journals (38.6% to 50% of first female authors in RPC vs. 20.3% in the EHJ and 27.8 in the BMJ), probably reflecting the higher proportion of young female cardiologists in Portugal and maybe a lower acceptance in high impact-factor journals.
- ii) Senior female authorship was low but identical in the RPC when compared to EHJ and BMJ (19.3% in RPC vs. 6.6% and 19.6%, respectively).²³ From one side this results from the lack of female role models in research and its impact on leadership and co-authorship positions: “women are less likely to be lead authors when men are senior authors”.^{20–23,28}
- iii) There was a reduction over time in leader and senior female authorship with a clear worsening at the RPC during the five years of study analysis, decreasing from 45.2% to 38.6% in leader authorship, and from 19.3% to 7.9% in senior female authorship. On the contrary, two previous bibliometric analyses in high-impact factor international journals, despite showing lower female author representativity (16.5%²³ to 26.7%²⁴) evidenced a raise of 9.5% for the lead author position and of 6.6% for the senior authors, between 2008 and 2016. For the RPC, this highlights the very low proportion of senior female cardiologists as a whole and also as service or director departments, perpetuating the vicious cycle of “peer-review homophily”.²⁹ A higher number of male cardiologist editorials in 2018 could also have an impact on the drop in female representativity in published research.²⁹
- iv) Female cardiologists were clearly underrepresented in RPC editor-in-chief and associate editor positions (100% of cardiologist on the editorial board are male) but also as reviewers (36% in 2013 and 35% in 2018) with no change over time. This corroborates previous publications.^{20–24} The overrepresentation of male cardiologists on the RPC editorial board does not seem to have introduced gender inequity in the acceptance of original female research papers but did manifest itself in gender disparity when most editorials invitations were sent to male cardiologists.

Whitelaw et al.²¹ recently published a study, registered in the International Prospective Register of Systematic Reviews, addressing authorship gender disparities in HF clinical trials. Their systematic review of 403 HF randomized controlled trials (RCT), published in high-impact medical journals between 2000 and 2019, showed that: i) women were under-represented as lead (15.6%), senior (12.9%), and corresponding authors (11.4%);

ii) from a total of 4346 authors in any authorship position in these RCTs, including co-authorship, only 19.6% were women. The authors reinforced the need to enhance female co-authorships (author collaborations) to promote networking, grants, publications and more potential involvement in clinical trials;

iii) most importantly, the proportion of female lead authors, co-authors and in any authorship position did not change over the last 20 years;

iv) women had lower odds of lead authorship in RCTs that were multicenter, if they were coordinated in North America

or Europe, had tested drug interventions or had men as the senior author;

v) women had lower odds of leading RCTs that were funded by pharmaceutical companies and with no change for at least 12 years: of 20 908 recipients (physicians) of industry funding, 75% were men.^{30,31}

Therefore, the evidence tells us that the “glass ceiling” in medicine and in cardiology is a reality, based on persistent subtle barriers that prevent women from reaching identical clinical and academic career positions with an equivalent salary, compared to their male counterparts, even if they have comparable skills, experience and productivity.

In parallel, the “sticky floor” concept has evolved from the negative perception of women’s unwillingness to work in some medical specialties such as cardiology or to invest in an academic career, in recognition of women being “stuck to floor positions” in academic medicine, due to the lack of institutional and industry resources.

This can undermine their professional development and reinforce imposter syndrome, preventing them from taking off and breaking the glass ceiling.^{21,32}

Such subtle but strong and long-lasting barriers – glass ceilings and sticky floors – have a multifactorial etiology and although persistently identified, they have not been modified over decades: gender bias, traditional gender-roles, more male eligibility and protection (males-choose-males), hospital and academic structures that are unsupportive to family-related demands (choosing between family and profession should not be an option) and lack of supportive mentors to foster clinical and academic ambition among women.³³

This persistent issue of inequity should be addressed with the same rigor that medical communities, scientific societies and medical related institutions have applied to other major medical challenges, to move from a vicious cycle to a virtuous one.

Success begets success. Attitudinal and organizational biases that un-favor women, prevent them from stepping on the “glass escalator” and from shattering the “glass ceiling”.

Concrete and actionable solutions at individual and institutional levels can provide the best outcomes if they are acknowledged by all the stakeholders, developed, implemented and continuously monitored.

Among the recognized options, captivating women and promoting their entry into cardiology could be a first step to filling the gender gap. At an individual level, women must recognize the importance of participating in academic and clinical decision-making processes. The search for formal leadership training should be pursued with the aim of learning effective strategies for prioritizing and delegating.

At an institutional level, adjustments should be made to support career flexibility and work-family life integration. Institutions should provide equitable remuneration and access to management boards.

In order to fill the gender gap, female mentorship must be improved. Increasing the presence of female role models can improve mentorship. Participation in national and international networks, leadership research, clinical trial collaboration and sponsorship opportunities are key to success.

Industry corporations involved in grant funding should receive antibias training. Scientific societies should include female cardiologists in their management boards, in journal editorial boards, as reviewers and members of scientific advisory boards, but always based on merit.

Ana Timoteo's study highlights the gender gap in Portuguese cardiology research based on the inequity of opportunity and treatment of female cardiologists by clinical and scientific sponsors. The data corroborate recent international publications, reinforcing that this is a worldwide problem.

Female trainees of the future should acknowledge their competency and merits in order to demand equity: no more, no less!

The world beyond the "looking glass" is real and I quote Michelle Kittleson "women should not feel that they must work twice as hard as men to be considered half as good".³⁴

Inequity based on gender or other cause identifies a diseased system that requires specific diagnosis and treatment. Its recognition is the first major step towards a cure.

Conflicts of interest

The author has no conflicts of interest to declare.

References

- Hede A. The glass ceiling metaphor: towards a theory of managerial inequity. *Canberra Bull Publ Adm*. 1994;76:79–85.
- Fuhrmans V. Where are all the women CEOs? *Wall Street J*. 2020;(February).
- Mehta LS, Fisher K, Rzeszut AK, et al. Current demographic status of cardiologists in the United States. *JAMA Cardiol*. 2019;4:1029–33.
- NHS Digital. Hospital and Community Health Services (HCHS) workforce statistics: gender in NHS Trusts and CCGs in England by staff group and grade, March 2019. Health & Social Care Information Centre; 2019.
- Stone AT, Carlson KM, Douglas PS, et al. Assessment of subspecialty choices of men and women in internal medicine from 1991 to 2016. *JAMA Intern Med*. 2019;180:140–1.
- Douglas PS, Rzeszut AK, Bairey Merz CN, et al. Career preferences and perceptions of cardiology among US internal medicine trainees: factors influencing cardiology career choice. *JAMA Cardiol*. 2018;3:682–91.
- Sambola A, Anguita M, Giné M. Is there a gender gap in Spanish cardiology? *Rev Esp Cardiol*. 2019;72:195–7.
- PORDATA. Disponível em: pordata.pt/Portugal/ [assessed 03.02.21].
- Ordem dos Médicos. Disponível em: ordemdosmedicos.pt/estatisticas-nacionais/#1507303097839-12786d52-6feb [assessed 03.02.21].
- Moberly T. *BMJ*. 2019;365:l2312.
- Appleby J. Gender pay gap in England's NHS: little progress since last year. *BMJ*. 2019;365:l2089.
- Duckett JM. Dose of discrimination: the gender wage gap between men and women in medical professions. *Wichita State University*; 2005.
- Lo Sasso AT, Richards MR, Chou CF, et al. The \$16819 pay gap for newly trained physicians: the unexplained trend of men earning more than women. *Health Affairs*. 2011;30:193–201.
- NHS Employers. NHS Women on Boards: 50:50 by 2020; March 2017 <https://www.nhsemployers.org/case-studies-and-resources/2017/03/nhs-women-on-boards-5050-by-2020>
- Balasubramanian S, Saberi S, Yu S, et al. Women representation among cardiology journal editorial boards. *Circulation*. 2020;141:603–5.
- Penny M, Jeffries R, Grant J, et al. Women and academic medicine: a review of the evidence on female representation. *J R Soc Med*. 2014;107:259–63.
- Blumenthal DM, Olenski AR, Yeh RW, et al. Sex differences in faculty rank among academic cardiologists in the United States. *Circulation*. 2017;135:506–17.
- Fitzpatrick S. A survey of staffing levels of medical clinical academics in UK medical schools as at 31 July 2011. London: Medical Schools Council; 2012.
- Witteman HO, Hendricks M, Straus S, et al. Gender bias in CIHR Foundation grant awarding. *Lancet*. 2019;394:e41–2.
- Lundine J, Bourgeault IL, Clark J, et al. The gendered system of academic publishing. *Lancet*. 2018;391:1754–6.
- Whitelaw, et al. Clinical Trial Factors associated with author gender. *JACC*. 2020;76.
- Tamblyn R, Girard N, Qian CJ, et al. Assessment of potential bias in research grant peer review in Canada. *CMAJ*. 2018;190:E489–99.
- Ashgar M, Usman MS, Aibani R, et al. Sex differences in authorship of academic cardiology literature over the past 2 decades. *J Am Coll Cardiol*. 2018;72:681–5.
- Ouyang D, Sing D, Shah S, et al. Sex disparities in authorship order of cardiology publications. *Circulation*. 2018;11:e005040.
- Martinez ED, Botos J, Dohoney KM, et al. Falling off the academic bandwagon. *EMBO Rep*. 2007;8:977–81.
- Budden AE, Tregenza T, Aarssen LW, et al. Double-blind review favours increased representation of female authors. *Trends Ecol Evol*. 2008;23:4–6.
- Roberts SG, Verhoef T. Double blind reviewing at *EvoLang 11* reveals gender bias. *J Lang Evol*. 2016;1:163–7.
- Timóteo AT. Ainda persiste um gap de género na investigação cardiológica nacional? Uma revisão de dados da Revista Portuguesa de Cardiologia. *Rev Port Cardiol*. 2021;40:501–4.
- Murray D, Siler K, Larivière V, et al. Author-reviewer homophily in peer-review. *eLife*. 2018, <http://dx.doi.org/10.1101/400515>.
- Chopra SS. Industry funding of clinical trials: benefit or bias? *JAMA*. 2003;290:113–4.
- Rose SL, Sanghani RM, Schmidt C, et al. Gender differences in physician's financial ties to industry: a study of disclosure data. *PLoS One*. 2015;10:e0129197.
- Mullangi S, Jagsi R. Imposter syndrome: treat the cause, not the symptom. *JAMA*. 2019;322:403–4.
- Zhuge Y, Kaufman J, Simeone DM, et al. Is there still a glass ceiling for women in academic surgery? *Ann Surg*. 2011;253:637–43.
- Kittleson M. Trials of women in cardiology. *JACC*. 2020;76:1931–3.