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REVIEW

Women in Cardiology in Australia–Are We Making Any Progress?

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Women remain largely under-represented in cardiology worldwide, despite gender parity among medical graduates. This is particularly notable in procedural subspecialties such as interventional cardiology and electrophysiology and is consistent at all levels of training. Cardiology continues to have the lowest proportion of females of all adult medicine specialties.

This is a review of existing literature and statistics pertaining to women in cardiology and highlights the relative paucity of data or publications within Australia.

Australian data from the Medical Training Review Panel reported that the proportion of females in cardiology advanced training (22%) has not changed over the last 9 years and that there is a significant attrition as trainees progress through the various stages of training. In 2018, females represent only 16% of first year cardiology advanced trainees in Victoria and Tasmania. This represents a decrease from 20–25% in previous years.

The factors affecting gender parity in cardiology are complex and diverse, from personal reasons such as family planning, work-life balance and perceived gender bias, to recruitment inertia and an imbalance in opportunities for career progression, research, financial remuneration and leadership positions.

Worldwide, a number of initiatives have been explored to address the gender divide in cardiology, including networking and mentorship programs and Women in Cardiology working groups, dedicated to addressing the issue of female under-representation in cardiology. Unfortunately, the progress we are seeing worldwide is not being realised in Australia.

A collaborative approach is essential to achieve gender parity in cardiology. This involves introspection and accountability by College bodies and policy changes committed to promoting workplace diversity by welcoming and retaining female talent. We must recognise and address the current barriers and support women pursuing a career in cardiology.

Keywords Women in Cardiology • Gender disparities • Gender diversity • Recruitment inertia

Introduction

Worldwide, women are under-represented in the field of cardiology. This is most notable in procedural sub-specialties, particularly in interventional cardiology [1–5]. At present, as most STEMM (science, technology, engineering, mathematics and medicine) fields begin to recognise and address the issue of gender inequality [6–9], efforts to improve gender disparities in cardiology have fallen short in a male-dominant profession [10,11].

Worldwide, there is an evolving recognition of female under-representation in cardiology, along with concerted efforts by the international cardiology associations to address this issue. However, further initiatives are required to

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continue to build toward equal gender representation, particularly in Australia, where this issue has been less vocalised. We must examine current practices, identify the contributing intrinsic and extrinsic factors, and work collaboratively to rectify this longstanding issue.

This article examines the current challenges facing women in cardiology in Australia. We explore both internal and external barriers in recruiting and retaining talented female cardiologists, outline existing supports and propose future avenues for change.

The Current Situation

From Medical School to Consultancy: Where is the Problem?

Women now represent more than half of all medical students [12] and about 47% of all junior doctors [13]. Despite this, a persisting gender disparity develops between medical school and specialty training [14]. The proportion of females entering subspecialty training remains low, representing only 34% of all advanced trainees, an increase from 16% in 1986 [15].

In Australia, at the advanced training level, significant gender disparities emerge, particularly in certain medical specialties. In 2015, cardiology had the lowest proportion of female advanced trainees (22.6%) of all physician adult medicine subspecialties [16]. This was similar in surgical specialties including orthopaedic surgery (9.4%), cardiothoracic surgery (15.2%), vascular surgery (18.2%), neurosurgery (21.6%) urology (23.4%), as well as in nuclear medicine (28.6%). Conversely, women were well-represented in advanced training in specialties such as obstetrics and gynaecology (79.7%), paediatrics (74.9%) and public health medicine (68.8%).

This trend continues at fellowship and consultant level. Cardiology has the lowest proportion of female fellows (14.9%) and consultants (13.2%) [3] of all adult physician specialties, with comparable trends among surgical consultants (general surgery 14.0%, neurosurgery 13.5%, plastic and reconstructive surgery 13.1%, vascular surgery 10.8%, urology 8.9%, cardiothoracic surgery 5.1% and orthopaedic surgery 3.5%) [3].

Australian Data: Are We Making Any Progress?

We reviewed and collated data from the Medical Training Review Panel and the Medical Deans' Australia and New Zealand reports, to examine trends in the number of female cardiology trainees within Australia and New Zealand across all levels of training between 2009–2015 (Figure 1 and Table 1, below). This demonstrated significant attrition in the number of females before reaching the stages of advanced training and consultant level (20–25% and 15%, respectively) [12,16–28].

Unfortunately, the proportion of female cardiology advanced trainees has remained static, despite gender parity among medical graduates. In 2018, females represent only 16% of Victorian and Tasmanian first year cardiology advanced trainees (and only 20% of female candidates offered advanced training positions), a drop from 23% in 2017.

This raises an important point: does this reflect recruitment inertia, recruitment bias, personal preference or a combination of these factors?

Gender Disparities in Subspecialties of Cardiology

Within cardiology, female cardiologists demonstrate a predilection toward non-procedural subspecialties, including clinical cardiology (79%) and echocardiography (31%), compared to intervention (10%) and electrophysiology (9%) [29].

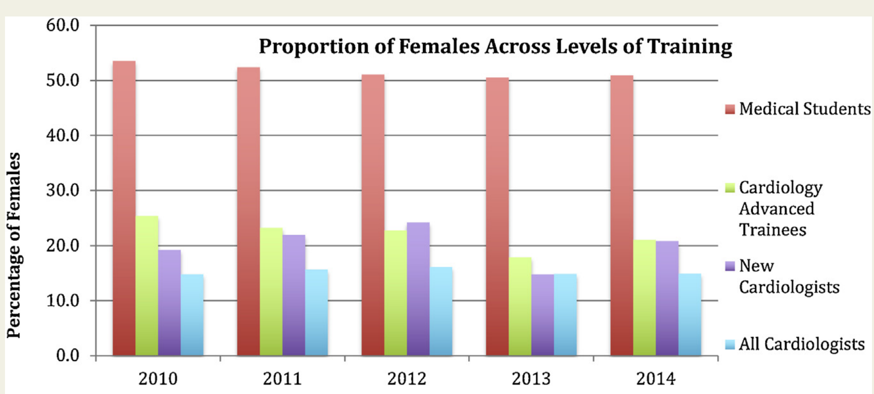

Figure 1 Proportion of females across levels of training in cardiology.
Figure 1 demonstrates the percentage of females at each stage of training. Proportions have remained static between 2010 to 2014, with a decreasing proportion of females at higher levels of training, and at completion of training. This graph demonstrates that while there is gender parity (approximately 50% females) at medical student level, the proportion of females is much lower at cardiology advanced training level (approximately 22%), and even lower at consultant level (approximately 15%).

Table 1 Proportion of females in adult medicine cardiology advanced training.

Year	Females (%)
2009	22.5
2010	25.4
2011	23.2
2012	22.8
2013	17.9
2014	21.1
2015	22.6

Table 1 demonstrates the percentage of female cardiology trainees at advanced training level (adult medicine) over the time period 2009 to 2015. This table shows that the percentage of female trainees has not changed over these 7 years, with the proportion consistently at approximately 22% (range 17.9–25.4).

The gender gap permeates into leadership positions and cardiovascular research. The number of female doctors appointed to senior leadership positions in hospitals and medical schools is extremely low [30,31], and far fewer women have publications in scientific journals. A recent meta-analysis of 10 million articles among 6,000 scientific journals over 15 years found that women made up only 25% of authors publishing in cardiology, and predicted that, based on recent trends, it will take 71 years for women to achieve gender parity in cardiovascular research [10]. Moreover, there is a large and consistent senior author gap among female cardiologists, despite an increasing number of first author publications [32].

Why Is Under-Representation of Women in Cardiology a Problem?

A Problem for the Specialty

Women make up approximately half of medical graduates, and perform at least as well, and in some cases better, than their male counterparts at medical school [33,34]. Therefore, the subsequent drop-out of females pursuing a career in cardiology, comprising only 15 to 25% of cardiology trainees is an opportunity lost to attract some of the best physicians to the field [5,35].

A proportion of female trainees choose not to pursue or continue a career in cardiology, due to perceived gender discrimination or chauvinism, social exclusion, lack of support, lack of mentors and lack of clarity around family planning and work life balance [35–37]. Ultimately, the specialty and our patients suffer most from the resultant lack of diversity.

There are well-established advantages to diversity in the workplace, and this principle certainly applies to the field of cardiology. Individuals of both genders bring different strengths, skills, experiences and approaches to a team. This multiplicity would certainly enhance a collaborative approach to patient care [38].

A Problem for Patients

Recent literature suggests female physicians have a unique approach to patient care, including enhanced communication, affording patients longer consultation time and adherence to guideline-directed therapies, particularly for female patients [39,40].

In a recent US study, Tsugawa et al. found patients aged over 65 years experienced better outcomes when seen by female internal medicine physicians, compared to their male counterparts, including reduced mortality and hospital readmission rates [39]. Baumhakel et al. found that female patients with heart failure were less likely to receive guideline-recommended treatment compared to males. Female physicians were more likely to prescribe guideline-recommended treatments to patients of both genders compared to male colleagues; and female patients received better care from female physicians [40].

These results may not necessarily translate to every subspecialty; however, this finding warrants further consideration and may broaden initiatives to optimise patient outcomes.

Female patients with cardiovascular disease have a unique phenotype and pathophysiology. Women in cardiology have a pivotal role in advocating for enhanced understanding of clinical manifestations and approach to care in this patient group, particularly in the setting of clinical trials and guidelines which have largely been based on a male cohort [41].

A number of studies suggest that some male and female patients prefer to see a female cardiologist, which will be increasingly challenging in a male-dominated profession [36,38].

A Problem for Research

Women are under-represented in clinical trials in most areas of medicine; this is particularly evident in cardiovascular trials [42,43]. This is an extremely important, yet under-recognised issue, when considering the translation of academic research into clinical practice. The Society of Coronary Angiography and Intervention (SCAI) has a Women in Innovations (WIN) Committee that has made great strides in encouraging and promoting female-specific cardiovascular research [11]. Improving female representation in both clinical cardiology and cardiovascular research, would drive innovations in research and may enhance recruitment of more female patients to clinical trials [11].

Barriers for Women in Cardiology

Women in medicine are relatively well represented in early career stages. The gender divide becomes more noticeable with the transition to specialty training. This is likely driven by both internal and external factors.

A national study conducted by the American College of Cardiology Task Force on Diversity and Inclusion and the American College of Cardiology Women in Cardiology Council and published in JAMA Cardiology, surveyed

1,123 internal medicine trainees and cited a number of barriers to pursuing a career in cardiology, including a lack of diversity and interference with family life [44].

The paucity of a female presence in many cardiology subspecialties has multiple negative effects on women in cardiology, including financial implications and impacts on career progression. It is well recognised that female cardiologists are under-represented in higher-paying procedural subspecialties such as intervention and are also less likely to be appointed professorships or other hospital or academic positions [5,37].

Gender Discrimination

A recent survey cited gender-specific difficulties encountered by female cardiologists including perceived intimidation, harassment, gender bias, unprofessional comments about appearance, family planning or pregnancy and social exclusion due to gender [5,36]. Women also feel that they are not given the same opportunities to enter the field of interventional cardiology [4].

Nearly half of all female cardiologists in the Unites States report that their 'biological clock' and family planning intentions have been raised during advanced training or the interview process for fellowship [4].

The European Association of Percutaneous Cardiovascular Interventions (EAPCI) Women's Committee explored male cardiologists' attitudes to female interventionalists and found a proportion of male respondents believed women were not suited to a career in interventional cardiology due to ''work conditions considered too challenging, stressful, demanding and not suitable for women", while other male respondents implied that women were inherently less capable of work in interventional cardiology [2]. Even if this represents only a minority opinion, this contributes to gender stereotyping, which only harms the progress made to date towards gender equality in cardiology.

Family Planning

Australian female cardiologists and trainees harbour concerns about the lack of clear policies around maternity leave and family planning, particularly at the crucial time in their advanced training and fellowship. Cardiology, unlike most other medical specialties, offers a 2-year contract to first year cardiology advanced trainees, with no precedent in place to take leave or work in a part-time capacity to facilitate family planning. Moreover, the issue of radiation exposure during pregnancy has been raised, as many training centres may not have faced the issue of addressing radiation exposure for pregnant cardiology trainees.

National guidelines for competency in procedural subspecialties do not accommodate for, or even make mention of, allowances for maternity leave or ongoing part-time work to facilitate childrearing. These guidelines generally assume uninterrupted full-time training and ongoing work, with minimum annual case numbers required to maintain competency [45–47]. It is unclear how women who choose to take time away from the cardiac catheterisation laboratory during pregnancy or for maternity leave can achieve these numbers, or if any special consideration applies these circumstances.

Work-Life Balance

The demand on work-life balance can act as a further impediment to pursuing a career in cardiology [5]. Current literature suggests 71% of female cardiologists are married and 63% have children (compared their male colleagues, 90% and 88% respectively) [2,4,29]. Family planning and pregnancy may result in an inability to participate in full-time training or clinical work. Despite this reality, there is no current contingency to facilitate family planning for female cardiology advanced trainees. This may discourage and disadvantage female doctors who are considering applying to cardiology training [37].

Achieving a work-life balance in medicine, and particularly cardiology, is a well-recognised challenge among trainees. This is even more relevant to female trainees who need to adjust their training timeline to consider family planning. In some cases, trainees may, instead, pursue a specialty that is perceived to be more ''female-friendly". The minority who do choose to pursue a career in cardiology find their family responsibilities put them at a disadvantage in terms of career advancement compared to their male colleagues [5,11].

Lack of Career Advancement

A 2015 survey found female cardiologists feel their career advancement is slower than their male colleagues [4]. The reasons for this warrant further exploration. Women should be supported in their efforts to satisfy both family commitments and career progression by promoting gender parity in cardiology.

Lack of Female Mentors

A lack of female mentors and role models in cardiology, particularly in intervention, has been cited as a potential disincentive for women interested in pursuing careers in cardiology [2,48]. In Australia, a small number of institutions have very few or no female cardiology presence, which will certainly influence trainees and junior doctors.

Financial Remuneration

Recent data demonstrates a significant pay discrepancy of more than $1 million between female and male cardiologists, even when accounting for other variables such as working hours and positions held [5].

Radiation Exposure

Women in cardiology are more likely than men to be concerned about radiation exposure, and, in some cases, this may be the predominant reason for not pursuing a career in interventional cardiology [2]. These concerns include the risk of radiation-induced malignancy in the context of occupational exposure, and issues pertaining to radiation exposure during pregnancy [2].

Some women continue to work in the cardiac catheterisation laboratory while pregnant, while others choose to take time off or make changes to their work obligations. In some European countries, however, women are prohibited from working in the cardiac catheterisation laboratory while pregnant, or are restricted in their practice in order to limit radiation exposure to the fetus [2]. In Australia, the National Standards published by the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) state that once a female employee declares pregnancy, the embryo/ fetus is subject to the same radiation protection dose limits in place for members of the general public (1 millisievert per year). The document also clearly states that, ''In applying the requirements of the *Standard* relating to pregnant employees, care should be taken to avoid unlawful discrimination on the basis of sex'' [49]. Overall, radiation exposure is becoming a fading concern.

Regardless, female cardiologists should have autonomy to decide what precautions they choose to adopt and should be supported by their colleagues in doing so. Only then will we begin to remove the stigma surrounding this issue.

Existing Supports

Cardiology remains a male-dominated specialty, however, we are encouraged by the fact that the landscape for women is slowing evolving.

The British Cardiac Society (BCS) and the American College of Cardiology (ACC) have established Women in Cardiology working groups to better represent female cardiologists and trainees. The European Association of Percutaneous Cardiovascular Interventions (EAPCI) has established a Women's' Committee, with the objective of addressing issues in gender disparity for female cardiologists and promoting interventional cardiology for females [2].

These groups are not only working to identify issues for women in cardiology, they are taking practical steps to make improvements. The ACC established a 'Women In Cardiology' (WIC) section, which provides mentoring programs, leadership workshops, educational sessions and a regular newsletter addressing the gender gap in cardiology [4]. The American Heart Association (AHA) offers an annual 'Women in Cardiology Trainee Award for Excellence' and has a number of programs to promote a female presence in cardiology through mentorship programs and networking events at scientific meetings [37].

The European Society of Cardiology (ESC), the ACC and the AHA have all appointed women to their cardiology councils to promote gender diversity in cardiology and promote female leadership in these roles. This is also a very important positive step towards women in cardiology becoming more ''visible'' to young doctors, who will now have female role models at the highest level.

A community of US female cardiologists with a social media presence is emerging and Australian female cardiologists are following suit with a fierce determination to invoke positive change towards gender parity. The deafening silence has certainly been broken as more women find their voice and advocate for gender equality.

Recently, female cardiologists in Australia and New Zealand have come together to establish informal Women in Cardiology groups. A recent networking event was held in Melbourne to bring together female cardiology trainees and cardiologists, creating a forum to discuss issues relevant to women in cardiology and to establish mentoring relationships. A group of Australian and New Zealand female interventional cardiologists has also established a 'Women In Intervention' group to provide networking opportunities and encourage female trainees to consider a career in interventional cardiology.

Future Directions

Despite a concerted effort to address the gender imbalance in cardiology worldwide, the progress in Australia seems somewhat attenuated, and more needs to be done to address this important issue.

To our knowledge, there are no formal networks or programs to support female trainees in Australia. Mentorship exists on an informal basis and relies upon trainees to seek female consultants for mentoring opportunities. Formalised mentoring programs, supported by our professional associations will foster mentoring relationships at all levels, from medical students to consultants and will provide much-needed support to encourage female trainees embarking on a career in cardiology.

Cardiology, and the medical profession as a whole, needs to review current recruitment policies and introduce targets for diverse representation at the trainee and more senior levels. It is incumbent upon medical colleges to display accountability and transparency, by regularly releasing recruitment and workforce data. This will highlight the current gender disparities and the need for benchmarks toward achieving gender parity.

Women are, unfortunately, still perceived differently to male colleagues; the gender divide will not lessen without further reforms in education, mentoring and policy making. This relies on removing stigma, changing perceptions of junior doctors, and support from our male colleagues to establish gender parity in cardiology at all levels. Training programs should consider structural and policy changes to promote better work-life balance for both men and women, and particularly address the ongoing uncertainty around timing and practicality of family planning.

Once gender parity is achieved at the trainee level, this is likely to translate to better representation in consultant and leadership positions. Furthermore, research has shown that targeting advanced training levels will also have downstream effects for more junior doctors. Female medical students are more likely to be attracted to the field of cardiology if there are female role models at the registrar level [11]. So by working to recruit and retain female cardiology trainees, we will see both upstream and downstream effects in the future.

At the individual level, we implore more female trainees and cardiologists to share their experiences, both positive and adverse, to remove the stigma, raise the profile of this issue, and provide a united female voice to petition leaders in the field of cardiology. Women in cardiology must also support one another—we must seek female mentors to guide us, and be mentors to those who will follow in our footsteps. In this way we will be able to make positive changes towards gender diversity and equal opportunity, and, specifically, to address the issue of females being underrepresented in cardiology [5].

Women and men should collaborate to promote and celebrate diversity in cardiology. Our male colleagues should embrace positive change and welcome more women into all fields in cardiology. Moreover, we entreat our male colleagues to consider the barriers women in cardiology face, and their role in ameliorating this experience. This can be achieved with even the smallest gesture; listening to female colleagues, trying to understand their experiences, providing support, mentoring female residents and registrars, and establishing attending and supporting gender-inclusive social events.

Conclusion

Australia's cardiology community must recognise that the under-representation of women in cardiology is a serious issue, which affects all aspects of health care, including our patients, physicians and the profession as a whole. In 2018, talented female physicians should not be deterred from pursuing a career in cardiology due to gender discrimination, training inflexibility, and recruitment inertia that maintains the current status in cardiology. We must now take action to improve gender ratios in cardiology, expose the multiple issues that affect women in cardiology and work collaboratively towards a resolution.

The growing population of women in cardiology in Australia is creating a presence and establishing a foundation by organising networking events, establishing mentoring programs, and creating a social media community. This is an excellent program, but is only part of the solution. We require the support of our male colleagues to continue to work towards gender equality.

We therefore propose an Australian working group to examine and, importantly, *address* issues preventing women entering cardiology. Our national professional bodies must make this a priority, and the working group must have appropriate resources and support to create meaningful change. We propose that this working group should comprise at least 50% women, with representation across all states and territories, all levels of training, and all subspecialties. The working group should have the ability to conduct research related to women in cardiology, propose changes to policies, and design and institute new initiatives. We hope that these efforts will help bring Australia in line with the progress already achieved worldwide. Achieving gender parity will promote positive change and innovation that will likely enrich our working environment and improve patient outcomes.

Conflict of Interest

We declare that we have no conflict of interest.

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