Diversity: Women in orthopaedic surgery - a perspective from the International Orthopaedic Diversity Alliance

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The International Orthopaedic Diversity Alliance (IODA) was formed in 2019 by a network of orthopaedic surgeons who are advocates of cultural and gender diversity. It promotes the sharing of information between nations regarding strategies to improve diversity and the inclusion of females and minorities in orthopaedic surgery. The focus of this article is to explore the current gender statistics, the barriers and the advocacy efforts towards improving gender diversity with the evidence supporting these initiatives.

Introduction

Diversity is essential to creating strong organisations that maximise the talents and skills of their membership. Organisations that are diverse are able to attract top talent, increase innovation and exhibit a better quality of decision making[1]. The critical mass for effective diversity is 30% across the fields of medicine, business and politics[2-4]. Diversity within orthopaedics was recently addressed at an international level[5] and we aim to provide an expanded perspective. Although females represent >50% of medical graduates in many nations, females still often constitute <10% of orthopaedic surgeons, and orthopaedics remains the least gender diverse of all surgical specialties.

The competence of females is not in question with studies demonstrating patients of female surgeons have fewer complications and lower mortality[6,7]. Many barriers exist to increasing the numbers of females in orthopaedics including: gender bias; lack of exposure to surgical specialities during training; lack of mentorship and; lifestyle concerns[8]. The international data presented provides a gender diversity improvement framework.

Leadership is the essential enabler for the four most effective diversity initiatives:[9,10]

1. Communicate and embed values, behaviours and cultural norms.
2. Ensure recruitment/promotion processes are unbiased and involve diverse decision makers.
3. Create working models that support males and females with families.
4. Visible and committed leadership.

Unconscious bias and the 'hidden' curriculum

The past 30 years has seen progress in uncovering the implicit biases[11], which have negative consequences for our choices of trainees, colleagues and patient treatments[12]. They underpin the 'hidden' curriculum[13] - the unwritten, unofficial values and perspectives that students learn[14,15]. In many nations the hidden curriculum teaches that orthopaedics is a 'boys club', that you cannot be a mother *and* an orthopaedic surgeon and that work-life balance is difficult. This plays an important role in inadvertently deterring good candidates from considering orthopaedic surgery. As an example of unconscious bias, this article has omitted non-binary genders. The authors acknowledge this shortcoming.

In 2009, a study of attitudes in the UK demonstrated that 24% of female medical students would consider a career in orthopaedic surgery. Female students were more likely to be exposed to negative attitudes against female surgeons and 62% of those who were exposed to such attitudes wouldn't consider a career in orthopaedic surgery. 42% of male surgeons had been exposed to negative attitudes against female surgeons, including

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HOW WE FARE (2019)*

RANK	COUNTRY	POPULATION (million)	ORTHOPAEDIC SURGEONS	SURGEON: POPULATION	FEMALE ORTHOPAEDIC SURGEONS	% OF FEMALE ORTHOPAEDIC SURGEONS
1	Estonia	1.3	110	1 : 12,045	29	26.4%
2	Sweden	10.1	1376	1 : 7,316	231	16.8%
3	Brunei	0.4	15	1: 28,666	2	13.3%
4	Canada	37.6	1659	1 : 22,658	199	12.0%
5	Malaysia	32.6	982	1 : 33,197	98	10.0%
6	Hong Kong	7.4	470	1 : 15,744	38	8.1%
7	Tanzania	50.0	118	1 : 423,728	9	7.6%
8	France	67.0	3,503	1 : 19,126	248	7.1%
9	Chile	18.9	794	1 : 23,803	49	6.2%
10	United States	329.1	27651	1 : 11,900	1673	6.1%
11	Indonesia	270.6	1000	1 : 252,897	54	5.4%
12	New Zealand	4.8	302	1 : 15,894	15	5.0%
13	Japan	126.7	21,275	1 : 5,955	1,040	4.9%
14	United Kingdom	66.9	2,960	1 : 22,591	141	4.8%
15	Australia	25.4	1,334	1 : 19,538	57	4.3%
16	Kosovo	1.8	78	1 : 23,076	3	3.8%
17	Thailand	69.6	2,430	1 : 28,641	92	3.8%
18	Philippines	108.1	1070	1 : 146,081	35	3.3%
19	Singapore	5.8	253	1 : 22,924	8	3.2%
20	Kuwait	4.7	149	1 : 31,543	3	2.0%
21	Myanmar	54.1	500	1 : 108,200	10	2.0%
22	Sri Lanka	21.3	90	1 : 236,666	1	1.1%
23	Taiwan	23.7	1,982	1 : 11,957	20	1.0%
24	Korea	51.2	8227	1 : 6,223	67	0.8%
25	India	1,366.0	10,000	1 : 136,640	50	0.5%
26	Nepal	28.6	400	1 : 71,500	2	0.5%
27	Bangladesh	163.0	1,200	1 : 135,833	5	0.4%
28	Pakistan	216.5	1500	1 : 144,333	4	0.3%
29	Cambodia	16.5	100	1 : 165,000	0	0.0%
30	Laos	7.2	50	1 : 143,400	0	0.0%

* Data collected from each nation's Orthopaedic Association. Asia-Pacific data courtesy of PC Chye.

Table 1: Analysis of gender diversity per nation.

questioning of their skill and the perceived conflict between their clinical and family responsibilities. Despite the marked gender differences expressed by medical students and specialists, when patients were questioned, 89% had no gender preference[16].

Providing opportunities for medical students to engage with orthopaedic surgeons who are positive role models for gender diversity is one mechanism for changing this hidden curriculum.

Lack of female role models

Strategies to increase diversity include: early exposure to the speciality field; mentoring; interaction with female specialists and; an institutional culture supportive of females[17-19]. Orthopaedic training programmes with greater representation by female faculty have a higher proportion of female trainees. However, males who are good advocates and mentors for females are equally effective. Cross-gender mentoring is vital to achieving equity and should be an aspiration for all males[20].

Gender equity in selection processes

Gender equity in selection processes varies between nations. In Australia, New Zealand and in several USA orthopaedic programmes, increasing diversity is taken into consideration in the selection process with candidates who otherwise rank equally. Many nations such as the UK have evidence of steadily increasing female orthopaedic applications, but this is still significantly less than for other specialties.

Flexibility in training and parenting

Significant barriers are perceived to pursuing a surgical specialty by females who want to have a family. A recent survey of 10,000 female medical students by the Royal Australasian College of Surgeons (RACS) showed the main barriers included lack of time for family and friends, current or future children and the lack of flexibility of training[21].

Similarly, a USA study of 720 students showed that surgical work hours and lack of time for outside interests were the greatest deterrents to pursuing a surgical career. Female medical students demonstrated greater concerns regarding finding time to date, marry and have children during residency. Female students were more likely to perceive that discouragement from pursuing surgical training was based on gender, age and family aspirations, as compared to males[22]. >>

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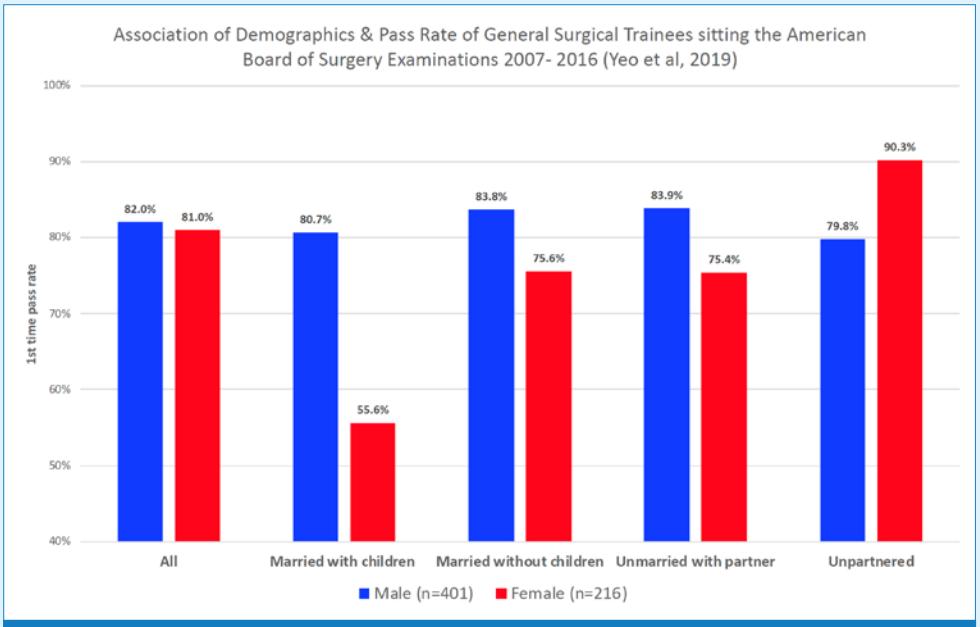

Table 2: Analysis of the pass rate from the American Board Exams by gender and parity.

A paper analysing the pass rate from the American Board Examinations in Surgery demonstrates that the examination results of male surgical trainees are unaffected by their marital or parenthood status, and single female surgical trainees outperform their male peers. However, their pass rate drops below male peers when they partner and decrease further when they have children[23].

Social policies supporting pregnancy and child-rearing allow a greater participation of females in the surgical workforce. Sweden and Estonia have the highest rates of female participation in orthopaedics and the most generous parental leave and progressive social policies.

Pregnancy and breast feeding

There are health and safety concerns in orthopaedics that are unique to females. The occupational hazards of exposure to radiation and Methyl methacrylate (MMA) in orthopaedics are well-recognised but can be minimised. A double layer of lead can be worn in pregnancy[24,25]. MMA has also been shown to be feto-toxic at levels >1,000 ppm. Appropriate use of vacuum mixing and protective helmet systems have been shown to minimise exposure to MMA[26].

More insidious are the effects of long working hours and night shifts on the health of pregnant surgeons. In female surgeons who work more than 60 hours per week, the odds of preterm labour and delivery are 4.95 times higher than average pregnant females in the USA. The risk of complications of pregnancy are higher in female orthopaedic surgeons (31.2%) compared to the general population (14.5%)[27]. Evidence-based policies must be instituted to protect the well-being of pregnant surgeons, including limiting working hours and decreasing night shifts. The Specialty Trainees of New Zealand (STONZ) have well-established guidelines[28].

Female inclusion in scientific and educational meetings

Evidence shows that diversity at scientific meetings leads to better science[10,30,31]. Participation in scientific meetings is important for professional development, provides opportunities to collaborate and expand professional networks. Convening, moderating and participating in panels and presentations at scientific meetings are key roles that afford recognition and standing among orthopaedic peers.

Female surgeons are often the primary carers in early childhood, a role that can severely limit their participation in scientific meetings. The availability of breastfeeding rooms and childcare facilities at all orthopaedic meetings would enhance their participation. A guide with practical methods to improve diversity and inclusion in scientific meetings provides evidence-based methods to improve diversity and inclusion in scientific meetings[29].

Females in orthopaedic leadership roles

Females are under-represented in leadership roles in their early career years. For orthopaedics this includes executive and board positions in professional associations. However, there are currently at least four female orthopaedic association presidents in the USA, Malaysia, Sweden and Estonia. It is vital that more females are mentored and sponsored into these leadership roles. With the predominance of male orthopaedic surgeons in leadership roles, it is critical that males are engaged in this process.

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Specialty Trainees of New Zealand (STONZ) Multi-Employer Collective Agreement (MECA)
28.4 Limits on Hours for Pregnant employees. Employees shall be able to reduce hours of work as follows: (a) From 28 weeks of pregnancy (or earlier if medically advised by the employee's lead maternity carer), no night shifts shall be worked. (b) From 32 weeks of pregnancy (or earlier if medically advised by the employee's lead maternity carer), no long days in excess of 10 hours shall be worked. (c) From 36 weeks (or earlier if medically advised by the employee's lead maternity carer), no acute clinical workload shall be allocated.
28.4.1 Employees reducing hours as provided for in this clause above shall have their salary reduced in a manner to reflect their reduced workload in accordance with what would have been their expected roster but for the pregnancy.

Table 3: Guidelines for working whilst pregnant (New Zealand).

International representation of females in orthopaedic surgery and strategies to improve gender diversity

Strategies to improve representation of females in orthopaedics are centred around reducing or eliminating the known barriers. Organisations must provide a safe, unbiased environment and push for equity of opportunity for female and minorities by encouraging mentorship and role modelling. Changing the traditional orthopaedic culture allows both genders a better family life and will improve work-life balance.

Africa and Tanzania: According to the World Health Organization, Africa has a predicted need for 3.7 million health workers in order to provide universal health care by 2030[32]. In Tanzania 7.6% of the nation's 118 orthopaedic surgeons were female in 2019 and of the 51 orthopaedic trainees, 5.8% were female[33]. The main focus in the medical workforce has been to improve the doctor-patient ratio through the increased enrolment of medical students. The College of Surgeons of East, Central and Southern Africa (COSECSA) is the largest surgical training institution in Sub-Saharan Africa. There have been 340 surgeon graduates since 1999 and the goal is to have 500 graduates in 2020. There are currently 575 surgeons in training. Women in Surgery Africa (WiSA), under the umbrella of COSESCA, has established a mentorship programme. The American College of Surgeons (ACS) has provided a strong commitment to WiSA and supports female surgical trainees across the region.

Asia, Malaysia and the Philippines: Prior to 2000, female orthopaedic surgeons were unusual in Asia. The turn of the millennium saw an increasing presence of females in orthopaedic practice and training all over Asia.

Dr Tunku Sara Ahmad Yahaya founded the Hand and Microsurgery Unit in the University of Malaya in 1993. She became the first female President of the Malaysian Orthopaedic Association (MOA) in 2006. She was the only female orthopaedic surgeon in Malaysia until 1999 when two other females qualified from the National University Malaysia. In 2000, three more female orthopaedic surgeons graduated. Since then, there has been a steady increase of females in the orthopaedic postgraduate programmes.

In 2014, Dr Azlina Abbas, became the second female President of the MOA, followed by Dr Chye Ping Ching in 2019. In 2020, she will become the first female President of the ASEAN Orthopaedic Association. Dr Sharifah Roohi shall become the fourth female MOA President in 2020.

Dr Teresita L Altere from the Philippines qualified as an orthopaedic surgeon in 1971, and became the President of the Philippines Orthopaedic Association (POA) and the first female in Asia to be the president of an orthopaedic association in 1986. Dr Virginia C Cabling became the second and Dr Julyn A Aguilar became the third female Presidents of the POA.

Australia: In 2018 the Australian Orthopaedic Association (AOA) established a diversity strategy to address the persisting lack of gender diversity. The key AOA initiatives include:

- Supporting females into leadership roles – the AOA Board is now 40% female.
- Advertising AOA Committee roles – 12% are now held by female members.
- Actively seeking representation of females at AOA scientific and educational meetings with policies to increase inclusion.
- Providing childcare and breastfeeding facilities at all AOA meetings.
- Implementing a new, more flexible, competency-based training programme - 'AOA 21'.
- Engaging >150 female medical students/ junior doctors in AOA orthopaedic workshops in 12 months.
- Forming an AOA 'Champions of Change' working group of male diversity advocates.
- Promoting females in orthopaedics through active social media profiles.
- Publishing a quarterly newsletter promoting gender diversity and inclusion. >>

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Elham Hamdan received her medical degree from the Royal College of Surgeons in Ireland in 1993, and subsequently completed her orthopaedic surgery residency at the University of Toronto in Canada in 2001. She has also completed fellowship training in spine surgery, chronic pain management and sports medicine.

From 2007 to 2019, females represented only 16.5% of Australian orthopaedic training applicants; only 12.7% of these females were offered an interview and 12.1% were successful applicants. 20% of female applicants were selected into training, versus 28% of male applicants. A significant gender difference favouring males has been demonstrated in the selection process prior to interview. Fortunately, the interview process for selection during this period shows no evidence of gender bias.

Canada: Within the Canadian Orthopaedic Association (COA), females comprise 15.8% of the practicing orthopaedic surgeon membership and 25.8% of trainees. The number of females delivering podium presentations at the COA Annual meeting is in keeping with the proportion of female members in the association[34].

The COA Gender-Diversity Strategic Plan provides key strategies to advance gender equity35. The focus has been on reducing bias, encouraging females in leadership roles, and facilitating mentorship. A 'Women in Leadership' scholarship was introduced to support attendance at a leadership course. Regional sessions are given for university and medical students in an effort to dispel the myths about an orthopaedic career. Each quarterly publication of the COA highlights a female orthopaedic surgeon to increase awareness of females in Canadian orthopaedics.

The COA Annual Meeting has Instructional Course Lectures on implicit bias, leadership and mentorship, as well as burnout and physician wellness. A 'Mentor for the Day' programme has been initiated. Moderator guidelines encourage diversity of gender, geography and age across all panels and discourage all-male panels. Breast feeding areas are available.

The COA is committed to advocating for gender diversity as well as equity and inclusion for all minorities, both visible and invisible. Expansion of these foundational initiatives are being planned over the coming years[35].

Chile: Chile has parental leave protected for six months. This can be taken by either parent and is funded by the social security system. Unfortunately, fathers represent less than 1% of the parental leave taken in Chile. Chile also has protected breastfeeding time until the infant turns two years old.

In 2019, the first meeting of Chilean female orthopaedic surgeons took place, resulting in the formation of the Association of Female

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Orthopaedic Surgeons of Chile. This is focused on: gender equity in the selection process; preventing gender discrimination; establishing a supportive network for female orthopaedic surgeons; and mentoring trainees interested in pursuing a career in orthopaedics.

China (Hong Kong): The first female orthopaedic surgeon was appointed to Queen Mary Hospital, Hong Kong, in 1993. As the proportion of female medical students has reached parity, there has been an increase in the number of female orthopaedic trainees to 20%.

In Hong Kong, all orthopaedic trainees are employed by the Hospital Authority. There is equal pay and parity of treatment. All female doctors are entitled to maternity leave of up to 14 weeks. On return from parental leave, each hospital is committed to provide a peaceful environment for breastfeeding but no childcare.

There is no part-time surgical training offered by the Hong Kong College of Orthopaedic Surgeons. For those who cannot fulfil the requirements of orthopaedic training due to maternity leave, additional training time is required. Consequently, most female orthopaedic trainees elect to have children after completion of training.

> "Although diversity strategies may vary between nations, the principles they incorporate hold true for all. Diversity attracts the best talent and leads to improved decision-making and innovation in our organisations."

Estonia: During the last five years, 64% of medical graduates have been female. Currently, 36% of orthopaedic trainees are female. The increasing number of female orthopaedic trainees is a reflection of more generous parental leave. One in four orthopaedic surgeons are female and there is no unit without a female orthopaedic surgeon. Female orthopaedic surgeons have been working in Estonian hospitals since the 1950s and the first female orthopaedic head of department was appointed in 1964. The Estonian Orthopaedic Society (EOS) was founded in 1970 and the first secretary general was female. The President of the EOS has been a female since 2015.

Maternity leave and pregnancy policies are dictated by national laws. Raising a child is supported through many benefits and it is common to stay at home until the child is at least 18 months old. It is possible to stay at home until the child turns three years without losing health insurance or position of employment. Reduction of workload in the third trimester of pregnancy is commonly accepted. After delivery the parental benefit guarantees the previous income. The parental benefit is paid for a period of 435 days, or until the child is 18 months old. Until the child is 70 days old, only the mother is entitled to the parental benefit but after this either parent is entitled to the parental benefit.

France: In France over the next 20 years, the medical profession will undergo three major changes: reducing numbers; ageing; and feminisation[36]. The number of orthopaedic surgeons has risen sharply in 30 years, increasing from 1.44/100,000 inhabitants in 1981 to 4.3 in 2013. Between 2006 and 2019, the proportion of females increased from 3.3 to 7%, and is higher in younger age groups. In 2015, there were 14% females in the 30-34 age group, compared to 0% in the 65-69 age group. In 2019, France had 248 female orthopaedic surgeons. The proportion is significantly higher in hand surgery with 155 females out of 767 members (20%) in 2020, and 63 out of 167 junior members (38%).

Gulf cooperating countries and Kuwait: Males earned surgical qualifications as early as the 1960s, though it was not until the mid-1980s that women began to receive surgical training[37]. This has resulted in a gender disparity that persists to the present day. The low participation of females in orthopaedic surgery can be attributed to many issues. Female faculty members make up 10% of Kuwait University's Department of Surgery.

Currently, there are three female orthopaedic surgeons in Kuwait, (data obtained directly from the Kuwait Medical Licensing Department) of which only one is a Kuwaiti national. Between 2014 and 2019, five females have completed orthopaedic training compared to 51 males in Kuwait.

Despite the large regional demand for more orthopaedic surgeons, only one female was accepted into orthopaedic residency training in Kuwait for 2020. Prior to that two females were accepted in orthopaedic surgical residencies abroad and since 2014 only one other female has been accepted into the orthopaedic residency programme in Kuwait. Accurate data for Kuwaiti females in residency programmes abroad is not available, (there is no integrated data source indicating the number of surgeons in Kuwait orthopaedic or otherwise, therefore data presented in this section should be viewed as approximate estimates). There is an identified perception that females in the GCC are less likely to match than males in an orthopaedic residency programme. >>

Poor maternity and parental benefits in Kuwait appear to be a deterrent with the majority of females in orthopaedic surgery residencies in the GCC being single, (data obtained directly from the Ministry of Health).

Kosovo: Kosovo is a small country of two million inhabitants, only recently gaining independence in 2008. The orthopaedic surgery department was established in the 1970s. Currently, there are 78 orthopaedic surgeons and 12 trainees. Only three (3.8%) orthopaedic surgeons are female and there are currently no female trainees.

Currently two of these three female orthopaedic surgeons have leadership positions in the Orthopaedic and Traumatology Society. There is no fixed quota for training female surgeons but, when candidates are considered equal, the female candidate has priority.

New Zealand: NZ data reflects striking similarities with other Western nations. 2019 data shows 4.7 % of active registered orthopaedic surgeons are female. Currently, 18% of orthopaedic trainees are female with numbers increasing. Selection processes have been restructured to encourage consideration of diversity as a factor in selecting from candidates who rank equally. However, numbers of females presenting for selection to orthopaedic training remain low. Recent NZ surveys of medical students and junior doctors suggest that students' perceptions of orthopaedics, particularly as a career for females, form a considerable barrier[38,39].

> "Leadership in diversity involves engaging female medical students, minimising unconscious bias, mentoring, creating an environment that is inclusive of females and providing support for those with family commitments."

Positive efforts to encourage female junior doctors considering orthopaedics as a career have been undertaken by LIONZ (Ladies in Orthopaedics New Zealand). LIONZ was established in 2017 and acts as a support network for all female registrars and consultants. LIONZ organises introductory workshops for female students led by senior registrars and surgeons, while offering collegiality and mentorship. These have proven popular with students, though it is too early to say whether they will result in influencing career choices.

While the NZOA are committed to improving diversity and representation, challenges arise from having such a small number of female surgeons. Females are represented currently on the NZOA Council and Orthopaedic Training Board and comprise over 20% of RACS Examiners. As we develop a larger cohort of female colleagues, we expect these numbers will increase.

Sweden: In Sweden, the number of female orthopaedic surgeons has increased during the last 25 years. There has been an increase from 6% females in 1995 to 17% in 2019[40]. Currently, 35% of residents in orthopaedic

surgery are female. This increase has been expected in light of the increasing number of female medical students and graduates. 56% of graduates from Swedish medical schools were female in 2018 and of newly accepted medical students in 2019, 55% were female[41].

Sweden has generous parental leave of 390 days[42]. Three months are available for each parent, meaning that one parent cannot use all parental leave. This has increased diversity in parental leave and, in 2018, 29% of all parental leave was used by males.

United States of America (USA): There were 27,651 board-certified orthopaedic surgeon members in the American Academy of Orthopaedic Surgeons (AAOS), of which 6% were female, in 2019. Of the 3,963 residents in training, 15.4% were female[43].

Orthopaedic surgery in the USA has been markedly male dominated and gender disparity has persisted, with the percentage of female orthopaedic trainees the lowest in all fields. There are currently less than five female chairs of major orthopaedic departments. There are, however, numerous concurrent efforts in the USA to improve gender diversity:

- The AAOS has prioritised diversity within its volunteer structure in its 2019-2023 Strategic Plan[44], including education and transparency in the application and selection process. Implicit bias training is provided. The AAOS was led by its first female president in 2019, and the AAOS Board of Directors will include 25% females in 2020.
- The Ruth Jackson Orthopaedic Society was established in 1983 to advance the science and practice of orthopaedic surgery among females. The group prioritises mentoring and professional development of females.
- The Perry Initiative was founded in 2009 by a female orthopaedic surgeon and engineers to increase the numbers of females in the field[45].
- Nth Dimensions was founded in 2004. Their primary mission is to provide resources, expertise, and experience through developing and implementing strategic pipeline initiatives[46].

Conclusion

Although diversity strategies may vary between nations, the principles they incorporate hold true for all. Diversity attracts the best talent and leads to improved decision-making and innovation in our organisations. Generous parental entitlements and progressive social policies are likely to be drivers for the participation of females in orthopaedic surgery. Leadership in diversity involves engaging female medical students, minimising unconscious bias, mentoring, creating an environment that is inclusive of females and providing support for those with family commitments. Enacting these concepts should result in healthy, fulfilled surgeons, a collaborative and innovative orthopaedic community and ultimately to better patient care. Most importantly, working towards a fair, equitable and diverse profession is a moral and ethical imperative and, quite simply, the right thing to do. ■

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References

References can be found online at www.boa.ac.uk/publications/JTO.