

BMJ Open Women's leadership in academic medicine: a systematic review of extent, condition and interventions

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ABSTRACT

Objectives Because culture reflects leadership, the making of diverse and inclusive medical schools begins with diversity among leaders. The inclusion of women leaders remains elusive, warranting a systematic exploration of scholarship in this area. We ask: (1) What is the extent of women's leadership in academic medicine? (2) What factors influence women's leadership? (3) What is the impact of leadership development programmes?

Design Systematic review.

Data sources A systematic search of six online databases (OvidMEDLINE, EMBASE, CINAHL, PsycINFO, the Cochrane Library and ERIC) from the earliest date available to April 2018 was conducted. Bridging searches were conducted from April 2018 until October 2019.

Eligibility criteria (1) Peer-reviewed; (2) English; (3) Quantitative studies (prospective and retrospective cohort, cross-sectional and preintervention/postintervention); evaluating (4) The extent of women's leadership at departmental, college and graduate programme levels; (5) Factors influencing women's leadership; (6) Leadership development programmes. Quantitative studies that explored women's leadership in journal editorial boards and professional societies and qualitative study designs were excluded.

Data extraction and synthesis Two reviewers screened retrieved data of abstracts and full-texts for eligibility, assessment and extracted study-level data independently. The included studies were objectively appraised using the Medical Education Research Quality Study Instrument with an inter-rater reliability of ($\kappa=0.93$).

Results Of 4024 records retrieved, 40 studies met the inclusion criteria. The extent of women's leadership was determined through gender distribution of leadership positions. Women's leadership emergence was hindered by institutional requirements such as research productivity and educational credentials, while women's enactment of leadership was hindered by lack of policy implementation. Leadership development programmes had a positive influence on women's individual enactment of leadership and on medical schools' cultures.

Conclusions Scholarship on women's leadership inadvertently produced institute-centric rather than women-centric research. More robust contextualised scholarship is needed to provide practical recommendations; drawing on existing conceptual frameworks and using more rigorous research methods.

Strengths and limitations of this study

- Unlike other reviews addressing women's careers in academic medicine, this review focuses solely on studies exploring the leadership of women, a central component of gender equity initiatives.
- The systematic approach provided a rigorous framework by which study objectives were set and studies were identified and appraised.
- Exclusion of qualitative literature may limit the conceptual argument of this study.
- Reviewed studies are western, therefore, findings of this review are not generalisable to non-western contexts.

INTRODUCTION

Inclusivity and diversity are goals every medical school hopes to achieve for its learners and faculty members.¹⁻³ An impediment to realising these goals is the culture of academic medicine, commonly criticised for reinforcing gender and ethnic inequalities.⁴⁻⁸ By bringing a transformative perspective, women leaders are often thought of as catalysts of organisational culture change, capable of creating better career experiences for the diverse workforce that has come to makeup medical education and practice.⁹⁻¹¹ Despite the recognition, it has been challenging for scholars to study and develop women's leadership. The difficulty, in part, stems from the current barriers' cultural nature: traditional models of work,¹¹ implicit gender bias,¹² limited access to support systems both mentors⁹ and sponsors,¹³ gender stereotyping,¹⁴ gendered views of leadership¹⁵ and culture-abiding self-imposed constraints.^{16 17}

Such barriers are, of course, not unique to women leaders or to the context of academic medicine. The wealth of literature exploring women's careers, much of it reviewed in two systematic reviews,^{12 18} one narrative review¹⁹ and two overviews^{6 20} conclude that broadly, women faculty face the very same hurdles as they join¹² and progress in academic medicine

in their roles as physicians,²⁰ teachers¹⁸ and researchers.¹⁹ Often, these barriers become reason enough for women to leave academia.²¹ Although these reviews, and the studies within them, broaden our understanding of women's experiences, they have treated women's leadership as ancillary to a bigger discourse on career progression, often coming to leadership as one solution to gender inequity. By doing so, these reviews ignore the centrality of leadership in shaping culture and the change needed to realise gender equity. The current systematic review, therefore, aims to address this gap in the research by exclusively reviewing literature on women's leadership in academic medicine.

BACKGROUND

In the quest to provide patient-centred care, safe learning environments for trainees and engaging work environments for faculty, the culture of medical education and practice became an area of much scrutiny.^{5 21–24} Hostility, disrespect, abuse and discrimination are widely documented (eg, USA,^{21 25–28} Canada,^{29–31} and UK^{32–34}) as normalised behaviours. The National Initiative on Gender, Culture and Leadership in Medicine: C-Change has benchmarked the culture of academic medicine from the perspective of faculty and with special regard to gender equity, both in the USA and internationally.³⁵ As the fulcrum of several studies,^{45 21 23 24 36–41} C-Change links unhealthy behaviours to culture, and summates that for culture to change, underpinning values need to change first.

But how do values change? According to the organisational literature, cultural values are the values of founding leaders, are adopted by subsequent leaders and members of the culture, and are kept firmly in place by policies and procedures that were developed and implemented over time.^{42 43} Although the dynamic interplay between these forces is important, we draw attention to the locus, cultural values are ultimately the values of leaders. In his 2007 speech 'Culture and the courage to change',⁴⁴ the American Association of Medical Colleges President Kirch spoke to this very point '... This new culture also requires a different kind of leader ... search committees will need to look far beyond the weight of a candidate's curriculum vitae, considering factors such as their ability to build alignments, foster trust, and make adaptive changes'.⁴⁴

Against the backdrop of need for culture change and a leadership to see it through, we take up women's leadership in academic medicine, often viewed as both saviour and victim of culture.^{8 22} Such a portrayal illustrates the inevitable role women must play as leaders, especially given their increased numbers,¹⁰ but it also indicates conceptual immaturity. From the emerging conceptual discourse,^{10 17 45–47} we know that scholarship on women's leadership lacks depth, where leadership emergence is commonly restricted to the pipeline metaphor, while

enactment of it remains grounded in the generic leadership literature.

Leadership emergence

How women emerge as leaders is often conceptualised using the pipeline metaphor. The metaphor suggests that increasing the number of women in male-dominated fields will eventually lead to an increase in the number of women leaders. According to Magrane and Morahan¹⁰ the metaphor misses pertinent organisational nuances, namely the implicit gender bias women face. For example, while men have many role models and a robust support system, women do not. The metaphor falsely assumes the presence of role models at the end of the pipeline willing to help women transition to leadership. Given the conceptual limitation, the authors propose frameworks that recognise the complex organisational systems women must navigate to emerge as leaders: the leadership continuum⁴⁷ and systems of career influences.⁴⁵ Such frameworks prompt us to ask questions about the emergence of women's leadership. For example, whether women self-nominate or are appointed to leadership positions in what Northouse⁴³ calls *assigned leadership*, how long they hold leadership positions, whether they go on to hold dual leadership appointments, and if they indeed have mentors or sponsors who support their careers?

Leadership enactment

Much of women's leadership studies remain grounded in the broader leadership literature.¹⁷ As a result, our conceptualisations of leadership enactment draw on theories developed on the study of male leaders, making such scholarship inherently male. For example, the older 'great man' theory exclude women entirely, associating leadership with agentic qualities, e.g. authoritative and assertive, qualities that women supposedly do not possess. Newer collaborative theories, for example, participatory, distributed and transformational leadership seem accommodating for women leaders because of their emphasis on social accountability and collaborative work, however, they risk trapping women in gender stereotypes, e.g. nurturing, that nominate women for less prestigious leadership positions e.g. course coordinator.

A more nuanced conceptualisation of leadership enactment may offer new insights that would help us address stereotyping. For example, women may take on informal leadership roles, in what Northouse⁴³ calls *emergent leadership*, referring to leadership that develops organically and is based on building alignments and fostering trust. Our understanding may be expanded by exploring the values that inform women's decisions, the behaviours they model and the actions they take to improve the quality of medical education and practice whether formally or informally. Addressing these gaps situates women leaders as critical actors in culture change^{22 45 47} and begins to conceptually ground women's enactment of leadership in their lived experiences, rather than the broader generic leadership literature.¹⁷

It is with the wider need for culture change in academic medicine and the more focused need for conceptual understanding of women's leadership studies in mind that we systematically reviewed studies on women's leadership in academic medicine. It is our aim to first synthesise work done in this area. We ask: (1) What is the extent of women's leadership? (2) What factors influence women's leadership? (3) What is the impact of leadership development programmes on women's individual careers and on medical schools' cultures? We concede that our research questions are broad in scope. We believe it is necessary to cross-cut through these interconnected areas to meet our second aim, which is to present an analysis of such works in the field and critique their collective conceptual framework. We concern ourselves, not only with what was done thus far, but how produced knowledge helps or hinders women's leadership.

METHODS

Eligibility criteria

Search results were independently reviewed against a set of a priori inclusion criteria that included all peer-reviewed (1) English-language articles; with (2) quantitative methodologies (prospective and retrospective cohort, cross-sectional and preintervention/postintervention); reporting studies that evaluated (3) the extent of women's leadership in academic medicine at a departmental, college and medical graduate programme level; (4) hindering factors to women's leadership as perceived by women and men faculty members and leaders; (5) studies that document leadership interventions and their efficacy as reported by women participants of such programmes and their home medical schools. We included a case study because it presented quantitative descriptive information on women in leadership across non-western multinational settings. Although we recognise the interconnection, we excluded quantitative studies that explored women's leadership in professional societies, journal editorial boards and journal editorships, focusing our examination solely on leadership within medical schools and graduate residency programmes. Qualitative study designs were excluded.

Information sources

A primary systematic search was conducted by the first author between April and May 2018 to cover the publication period of earliest date available to April 2018 using the following databases: (1) Ovid MEDLINE (1946–May 2018); (2) EMBASE (1974–May 2018); (3) CINAHL (1989–May 2018); (4) Ovid PsycINFO (1967–April 2018); (5) all EBM Reviews on Ovid-ACP Journal Club, Cochrane Database of Systematic Reviews, Database of Abstracts of Reviews of Effects and Cochrane Central Register of Controlled Trials (first quarter); (6) ERIC (1965–April 2018). In addition, experts in the field were identified and contacted for published studies not revealed through the databases search. Secondary

database searches were performed during the submission process to find additional pertinent material (following the same primary search strategy) to cover the period of April 2018 to 14 October 2019. The first author followed a systematic and rigorous plan according to best review practices. A librarian's help was not available. Following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses protocol (PRISMA),⁴⁸ she then screened the compiled results, excluding irrelevant articles and inductively developed a preliminary thematic framework (figure 1).

Search strategy

Systematic searches were performed on the selected six online bibliographical databases using a combination of key terms including, but not limited to, "women", "female", "females", "girl", "girls", "leadership", "leader", "academic medicine" and "medical education". The keywords were searched for in the "title" and "abstract" search fields. The searches were filtered by applying the inclusion criteria and literature was identified by using keywords and applying Boolean operators 'OR' and 'AND'. Key terms were defined based on the preliminary readings of the literature to ensure the comprehensiveness of our search key terms. For example, "Women", in our search context included articles with a clear indication that the participants in the published studies identified as "females". The literature did not differentiate between sex at birth and gender identity in women's leadership. As a result, we do not differentiate sex and gender in this review. An example of a database search strategy is as follows:

"MEDLINE search: Ovid

1. (Women or woman or female or females or girl or girls).mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]
2. limit 1 to English language
3. (Leadership or Leader or leaders or leading).mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]
4. limit 3 to English language
5. (Medical education or academic medicine or health professions education or health profession education or professional development or faculty development).mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]

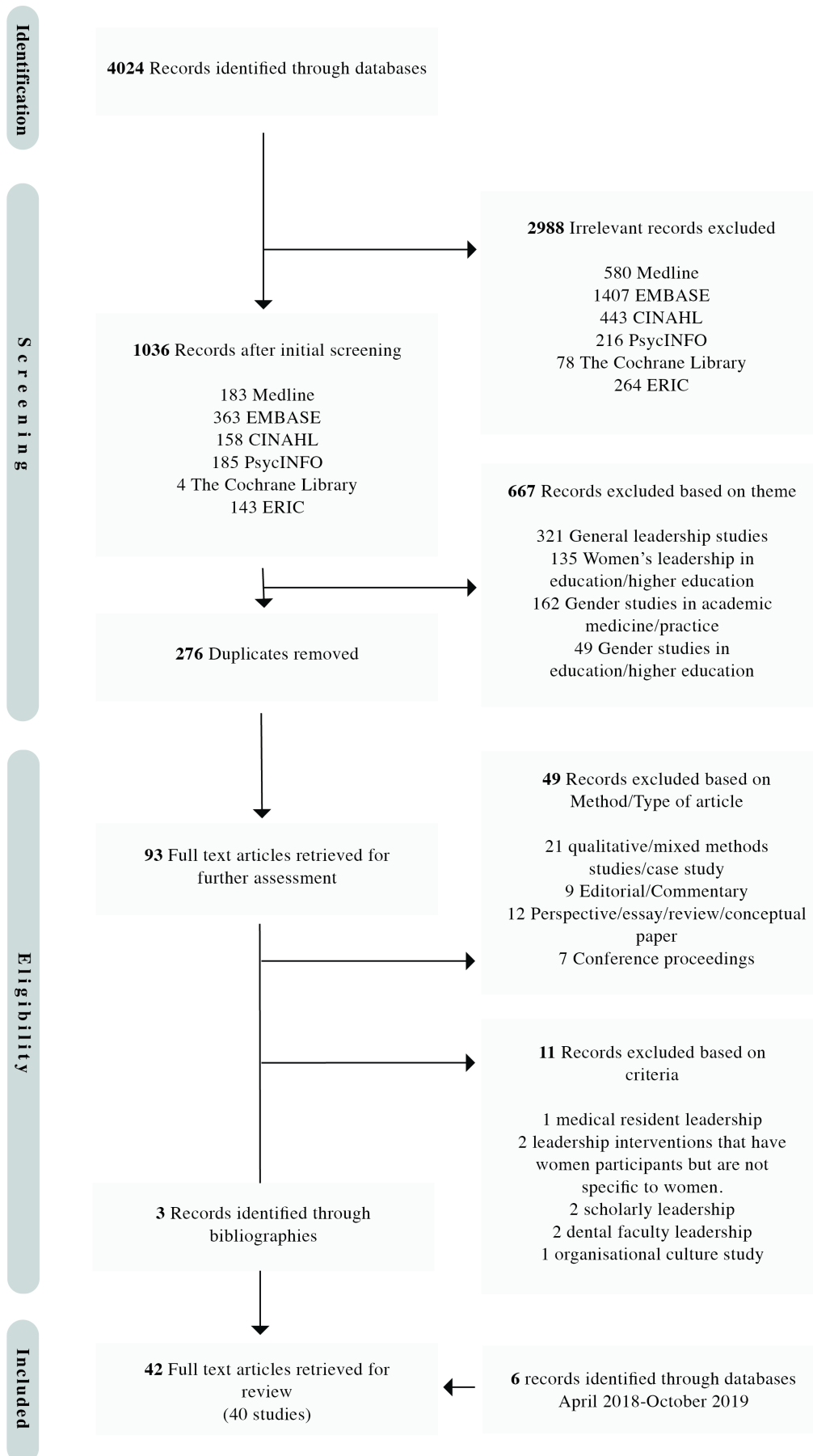


Figure 1 Flowchart of search strategy using Preferred Reporting Items for Systematic Reviews and Meta-Analyses protocol.

6. limit 5 to English language

7. 2 and 4 and 6”

An updated literature search was performed following the same search strategy for the period of April 2018 to October 2019.

Study selection

Eligibility assessment of the second list of articles titles/abstracts and thematic framework were independently reviewed by both authors based on the inclusion/exclusion criteria. The full texts of nominated articles were then retrieved and read carefully for data extraction and further assessment. At this stage, the bibliographies of nominated articles were reviewed for potential relevant studies. The two authors discussed their findings and differences were reconciled.

Data collection process

An Excel spreadsheet was used to collate extracted data. It contained the following information:

1. Details on the eligible study: the first author's name and year of publication as the study ID, title, publication, study period and country.
2. Purpose of the study.
3. Population of interest.
4. Methodological variables: study design, sample size, response rate if applicable and use of validation/reliability measures.
5. Strengths, weaknesses and limitations.

Risk of bias assessment

We draw on a strategy suggested by the Best Evidence Medical Education Collaboration,^{49 50} to provide a narrative of the results. Moreover, using the Medical Education Research Quality Study Instrument (MERSQI),⁵¹ we give a score and comment on the strength of individual studies, assessing their quality in terms of study design, sampling strategy, type of data, instrument validation, data analysis and outcome measures. The 10-item tool was designed to evaluate quantitative medical education studies, giving a total possible score of 5–18. The agreement between raters was very good ($\kappa=0.93$). Where there was disagreement, the authors resolved their differences by discussion. Furthermore, we point out specific methodological issues (eg, lack of contextual demographic or career data, limited population, lack of statistical adjustments and lack of follow-up) not covered by the MERSQI assessment (see online supplementary material 1, Methodological limitations).

Patient and public involvement

Patients were not directly involved in this systematic review.

RESULTS

Overview

The initial database search revealed 4024 citations. Review of the titles and abstracts led to the retrieval of 93

full-text articles for further assessment. In the secondary review, six studies were identified. Forty-two articles met the inclusion criteria and were included in this review (figure 1), three of which were identified through the bibliography search.^{52–54} No studies beyond those identified were revealed by the 17 contacted scholars. Original data were available for 40 studies, described in 42 articles^{5 15 52–91} (see online supplementary material 1 for an overview of included studies).

The majority of studies (n=35) were conducted in the USA, six included Canadian respondents,^{61 76} information on Canadian programmes,^{60 77 79} or schools' leadership,⁵⁵ one study was conducted across three countries (UAE, Qatar and Singapore),⁸⁷ one study was conducted across three European countries (Sweden, the Netherlands and Austria),⁷⁰ one study was conducted across four European countries (Germany, Sweden, Austria and the UK),⁷¹ one study in Norway⁷² and one study in Croatia.⁸⁰ The earliest study was conducted in 1999,⁷² and more than 50% of the studies were published in the past 5 years alone. The design of nine (26%) studies was retrospective cohort,^{15 55 56 69 76 80–82 88} one (3%) prospective cohort⁵⁸ and five (15%) were preintervention/postintervention.^{62 66 73 75 86} Twelve studies were cross-sectional self-reported questionnaires.^{5 61 63 64 68 70 83–85 87 89 91} Where questionnaires were used, the response rates ranged from 22% to 100%. Thirteen studies were cross-sectional surveys of publicly available or archives of data,^{54 57 59 60 65 67 69 72 74 77–79 90} and one study was a case report.⁷¹

Eighteen articles were published by medical education journals, 13 were published by medical specialty journals (Internal Medicine=3, Hospital Medicine=1, Ophthalmology=1, Obstetrics/Gynecology=2, Urology=2, Surgery=1, Otolaryngology=1, Roentgenology=1, Radiology=1), five articles were published by *The Women's Health Journal*, three by general medicine journals (*British Medical Journal*=1, the *Human Resources for Health Journal*=1 and *Cureus*=1). Finally, one was published by the *Journal of Faculty Development*.

Many of the studies have methodological limitations. Twelve studies used websites and publicly available data.^{15 54–56 59 63 67 69 78 87 90} Six studies did not reveal how their questionnaires were developed or if they were tested.^{63 65 66 83 84 89 91} Many of the questionnaires were self-reported with modest response rates. The preintervention/postintervention studies had small number of participants due to the small number of participants in leadership development programmes. Moreover, nearly all prestudy/poststudy did not present longitudinal findings on the effectiveness of their interventions.

Only eight studies provided contextual demographic (ethnicity or age) and career (career-stage, other leadership appointments, or leadership training) data on the studied populations.^{5 55 59 62 66 70 85 86} The MERSQI scores of all studies ranged from 7 to 12.5 (online supplementary materials 1 and 2). In what follows, we present our findings grouped according to three themes: the extent of women's leadership and its emergence; factors

influencing women's leadership emergence and enactment; the impact of leadership programmes on women's leadership enactment.

Extent of women's leadership and its emergence

Twenty-four studies reported the extent of women's leadership in academic medicine by comparing the number of women attaining leadership positions to the number of men.^{54-60 63 67 69 70 72 74 77-84 87 90 91} The studies, however, differed in their approaches and which organisational positions they chose to highlight (table 1). Three studies merely described the representation of women in specialty leadership positions,^{57 67} or within a medical school.⁸⁰ One study determined if the proportion of leadership positions in Obstetrics and Gynecology held by women is consistent with the proportion of women entering residency.⁵⁵ Six studies compared the composition of chairs and/or programme directors' gender to faculty members of medical schools,^{59 78 82-84 90} five studies compared composition of residency programme directors to medical residents composition,^{69 74 83 84 90} while two studies compared the proportion of residents to department chairs.^{83 84} Two studies compared the number of women in leadership positions in one medical specialty to other specialties.^{56 69}

While all studies restricted their study to the gender distribution of leadership positions, three studies^{63 74 85} examined leadership emergence (self-nomination vs appointment, length of time in position, dual-leadership appointment and having a mentor/sponsor). For example, Doyle *et al*,⁶³ found that women were assigned to their positions. The authors also found that women leaders on average held positions for 5.3 years compared with men leaders who held positions for 9.1 years.

Factors influencing women's leadership emergence and enactment

Sixteen articles examined factors associated with leadership gender disparities,^{5 15 58 61 63 66 68 70 72 73 75 76 81 82 86 88} revealing that women's leadership emergence was challenged by institutional-level barriers: research productivity requirements, educational requirements, and timing of academic appointment, and an interpersonal-level barrier: perceived lack of mentorship. Leadership enactment, on the other hand, was challenged by an institutional-level barrier: poor gender equality policy development and translation, as well as an interpersonal-level barrier: gender stereotyping (table 2).

On what hinders women's emergence as leaders, three studies investigated research productivity.^{58 70 81} In one study, gender was significantly associated with position through publication activity ($\beta = -0.08$, 95% CI -0.14 to -0.04 , $p = 0.003$). However, in another study, women were almost half as likely as men (OR = 0.49, 95% CI = [0.35-0.69]) to hold leadership positions despite the number of research publications.⁵⁸

White *et al*⁸⁸ observed notable differences among women and men medical school deans in the type of advanced degrees (doctorate in male deans vs business-related degrees in female deans) and the rank of the deans' medical school education and training (more men graduating from the top 50 National Institute of Health-ranked schools than women), presenting what seems like a probable association. Little or lack of mentorship was documented as a hindering factor to women seeking leadership.⁶³

On what hinders women's enactment of leadership, three studies explored women's leadership through the perceptions of medical schools deans,⁶¹ faculty within psychiatry departments⁶³ and faculty at one private medical college.⁵ For example, Pololi and colleagues⁵ reported that women faculty, in comparison to men, were less likely to perceive their institutions as family-friendly ($T = -4.06$, $p < 0.001$), making efforts towards addressing gender diversity ($T = -9.70$, $p < 0.001$), and that their personal values were less congruent with institutional values ($T = -2.06$, $p < 0.05$). Four studies addressed stereotyping and its effects on women's leadership.^{15 63 66 72} Sexism was reported as a significant barrier to women faculty as they progressed in their careers in psychiatry departments ($p = 0.0001$).⁶³

In a preintervention/postintervention, Girod *et al*⁶⁶ investigated the association between implicit gender biases and leadership positions. The authors found that gender and age were significantly in favour of men (β male = 0.18, $p = 0.001$; β age = 0.04, $p = 0.004$), suggesting that being an older male faculty is inherently associated with leadership than with other age and gender combinations.

Impact of women's leadership programmes on leadership emergence and enactment

Seven studies document the impact of women's leadership interventions on individual career satisfaction^{62 68 73 75 85 86} and on medical schools' environments.⁶¹ A positive effect of leadership development programmes was observed on the values, behaviours, style and actions women academicians embraced (table 3). In terms of values, one study evaluated leadership programmes through the perceptions of medical school deans. In their survey of US and Canadian medical school leadership, Dannels *et al*⁶⁰ investigated the influence of the Executive Leadership in Academic Medicine (ELAM) programme on organisational climate. The authors report that deans had positive perceptions ($M = 5.62$, $SD = 0.961$) of the ELAM programme and the influence brought to medical schools by its alumnae.⁶¹ The authors also found a significant difference between men and women deans in how they developed leadership in faculty, with women deans reporting more frequent use of practices than did men ($p = 0.032$). These practices included publicly supporting the person when she/he makes a difficult decision, appointing a faculty member to high-level committees or task forces and nominating faculty to leadership training outside the institution.

Table 1 The extent of women's leadership and its emergence in academic medicine

Source	Population/setting	Outcome	Examination of leadership emergence			
			Self-nomination vs appointment	Length of holding position	Dual position appointment	Mentor/sponsor
Women in leadership positions within one-specialty Baecher-Lind ⁶⁵	Obstetrics and Gynaecology departments associated with the Council of University Chairs of Obstetrics & Gynecology.	20% of DCs ($p < 0.001$).	None	None	None	None
Cancian <i>et al</i> ⁶⁷	US Urology leadership programmes.	1.6% of DCs and 11.2% of PDs.	None	None	None	None
Cheng <i>et al</i> ⁶⁹	US Emergency departments.	7.5% of DCs and 15% of PDs. Departments chaired by women had significantly higher percentage of women faculty ($p = 0.01$). Departments chaired by women were more likely to have women PDs ($p < 0.01$).	None	None	None	None
Counter <i>et al</i> ⁶⁰	US faculty in academic Pediatric Radiology.	56.8% of director, chair, division head/chief 66.7% vice chair, assistant/associate director.	None	None	None	None
Doyle <i>et al</i> ⁶³	US Psychiatry chairs.	10% of chairs were women Male chairs were more likely than female chairs to head large departments (95% CI = [-17.1-69.1], $p = 0.02$)	Women leaders were appointed.	Women leaders on average held position for 5.3 years, compared with men	None	Women leaders had mentors
Epperson <i>et al</i> ⁶⁵	US Otolaryngology residency and fellowship programmes.	18.6% of residency and fellowship directors 5.1% of chairs.	None	None	None	None
Han <i>et al</i> ⁶⁷	US Urology residency programmes.	3.3% of DCs, 4.5% of vice chairs and 7.9% of division directors. For educational leadership roles, women comprised 9.4% of fellowship directors, 8.1% of residency directors and 27.4% of medical student clerkship directors.	None	None	None	None
Moghimi <i>et al</i> ⁷⁷	Nuclear medicine in Canada and USA.	13.6% of leadership.	None	None	None	None

Continued

Table 1 Continued

Source	Population/setting	Outcome	Examination of leadership emergence			
			Self-nomination vs appointment	Length of holding position	Dual position appointment	Mentor/sponsor
Monroe <i>et al</i> ⁷⁸	Department of Medicine at Johns Hopkins University.	50% of PDs, 33% PDs assistant/associate director, 27% fellowship PDs, 80% of fellowship programme assistant/associate director and 37% of educational PDs. Women assistant professors were more likely to hold leadership positions than were men assistant professors ($p=0.03$).	Women leaders were appointed.	None	None	None
Odell <i>et al</i> ⁷⁹	Neurosurgery in Canada and USA.	7.45% primary leadership 4.69% secondary leadership.	None	None	None	None
Rotbart <i>et al</i> ⁸²	Promotion track faculty the University of Colorado School of Medicine's Department of Pediatrics.	25% of section heads and 14% of vice-chairs.	None	None	None	None
Shah <i>et al</i> ⁸³	US Radiology residency programme directors.	10.7% of DCs, 42.9% of PDs. Gender composition of radiology faculty and residents does not differ significantly according to gender of leaders.	None	None	None	None
Shah <i>et al</i> ⁸⁴	US Ophthalmology residency programmes directors.	2% of DCs and 34% of PDs. Gender composition of ophthalmology faculty and residents does not differ significantly according to gender of leaders.	None	None	None	None
Woodward <i>et al</i> ⁸⁰	US Gastroenterology fellowship programmes.	18% of PDs, 28% of associate PDs, 7% of division chiefs. Gender of fellowship PDs and gender of division chief ($p=0.0327$), no association with faculty or resident composition.	None	None	None	None
Women in leadership positions across several specialties						
Burden <i>et al</i> ⁸⁶	US academic adult Hospital Medicine (HM) and General Internal Medicine (GIM) programmes.	19% of division or section heads of HM were women 35% of division or section heads of GIM were women ($p=0.008$).	None	None	None	None

Continued

Table 1 Continued

Source	Population/setting	Outcome	Examination of leadership emergence			
			Self-nomination vs appointment	Length of holding position	Dual position appointment	Mentor/sponsor
Hofler <i>et al</i> ⁶⁹	US academic departments of Anesthesiology, Diagnostic Radiology, General Surgery, Internal Medicine, Neurology, Obstetrics & Gynecology, Pathology, Pediatrics and Psychiatry.	Women comprised 13.9% of DCs, 22.6% of vice chairs, 21.6% of division directors and 39% of PDs. Women significantly under-represented in the combined leadership positions for all specialties (ratios 0.61 or less; all $p < 0.001$) except anaesthesiology and radiology.	None	None	None	None
Long <i>et al</i> ⁷⁴	US residency programme identified as the largest in JAMA. ⁹⁵	25.8% of PDs overall were women. PDs 35.2% Obstetrics, 49% Pediatrics, 23.6% Family Medicine, 34.6% Psychiatry, 24.3% Internal Medicine, 18.8% Emergency Medicine, 29% Anesthesiology, 10.8% Surgery, 27.7% Radiology, 6.5% Orthopedics.	None	None	None	None
Puljak <i>et al</i> ⁸⁰	University of Split School of Medicine in Croatia.	18%–21% of DCs in 1997–2006.	None	None	None	None
Reed <i>et al</i> ⁸¹	Women scholarly clinicians employed at Mayo Clinic with 20 or more years of service at Mayo Clinic, who spend more than 25% of their professional effort directly providing patient care.	56% of women held divisional, departmental, institutional or national positions during their careers. Total leadership position attainment between men and women ($p < 0.001$).	None	None	None	None
Weiss <i>et al</i> ⁶⁴	US General Surgery, Orthopedic Surgery, Otolaryngology, Neurosurgery, Plastic Surgery and Urology programmes.	General surgery chairs 3% and PDs 10% ($p = 0.002$). Orthopedic Surgery 0% and PDs 6% ($p = 0.002$). Otolaryngology 5% of chairs and 13% of PDs ($p = 0.045$). Neurosurgery 1% of chairs and 3% of PDs. Plastic Surgery 6% of chairs and 9% of PDs. Urology 3% of chairs and 6% PDs.	None	None	None	None

Continued



Table 1 Continued

Examination of leadership emergence						
Source	Population/setting	Outcome	Self-nomination vs appointment	Length of holding position	Dual position appointment	Mentor/sponsor
Wright <i>et al</i> ⁸¹	Faculty members of the School of Medicine at the University of Arizona.	55% served as committee chair, 10% as section or division head and 8% as DCs. As compared with men: ($p=0.03$), ($p=0$), ($p=0.003$).	Comment on self-assessed leadership potential. Women were appointed.	None	None	None
Women leaders across several institutions or countries						
Carr <i>et al</i> ⁵⁸	US academic medical faculty.	10% of women in sample had leadership roles ($p<0.0001$). After adjusting for scholarly productivity, the (OR = 0.49, 95% CI = [0.35 - 0.69])	None	None	None	None
Kvaerner <i>et al</i> ⁷²	Norwegian physicians.	6.4% of women were leaders.	None	None	None	None
Stadler <i>et al</i> ⁸⁷	Clinician educators and leadership of competency based graduate medical education in Qatar, Singapore and UAE.	22.1% of PDs and 22.1% of associate PDs.	None	None	None	None

DC, department chair; PD, programme director.

Table 2 Thematic analysis of the 16 quantitative articles that examined the hindering factors associated with women's leadership emergence and enactment

Theme	Subtheme	Level	Outcome	Result
Leadership emergence	Research production	Institutional	Increased production of research is associated with leadership attainment.	Senior leadership positions were more likely held by male faculty despite research publications (OR=0.49; 95% CI= [0.35 - 0.69]). ⁵⁸
			Timing of leadership appointments (mid-career) negatively affected by modest research production.	Women published fewer articles throughout their careers than men (Mean ± SD = 29.5 ± 28.8 vs. 75.8 ± 60.3, p = 0.001). However, after 27 years, women produced a mean of 1.57 more publications annually than men (p=0.001). Throughout their careers, women held fewer leadership roles than men (p=0.001). ⁸¹
			Decreased research production.	Gender was indirectly significantly associated with clinical position through publication activity (β=-0.08, 95% CI = [-0.14 to -0.04], p=0.003). The negative association between gender and publication activity (β=-0.21, p<0.001). ⁷⁰
	Mentorship	Interpersonal	Lack of mentorship may hinder women from becoming leaders.	Women chairs were more likely than men chairs to perceive barriers in their career development citing little or no mentorship (p=0.04). ⁶³
	Time of academic appointment	-	Entering academia belatedly may contribute to leadership disparities.	Women faculty entered academia at a later career stage, in part, resulted in women trying to advance at a later stage than men in academic position and tenure. ⁸²
	Educational background and advanced degrees	Institutional	Educational background and types of degrees may influence leadership selection.	A greater percentage of male deans graduated from the top 50 NIH-ranked research-award schools than women deans (p=0.005, ω ² =23.3%, η ² =25.4%). PhD or other doctorate degrees were more prevalent among men deans as opposed to business-related degrees among women (MBA, MHA, MPH, or JD). ⁸⁸
Leadership enactment	Policy development and translation	Institutional	Dismissal of work-life balance measures.	Out of the 15 family-friendly policies, only three were available at more than 68% of medical schools: benefits for part-time faculty, paid maternity and paternity leave. ⁶¹
			Dismissal of diversity and inclusion measures.	Fewer than 14% of schools implemented gender equity specific policies. ⁶¹ Women faculty showed more negative perceptions on equity for women (T=-19.82, p<0.001); institutional change efforts for diversity (T=-9.70, p<0.001). ⁵
		Institutional	Incongruence between organisational values and individual values.	Women faculty showed more negative perceptions on values alignment (T=-2.06, p<0.05). ⁵
	Stereotyping	Institutional	Existence of gendered language in leadership associated policies.	Being a leader is associated with being male (Mean ± SD = 2.4 ± 2.2, OR = 6, 95 CI% = [1.02 - 35.37]) and traditionally male associated traits: analytical (M=2.5, SD=2.4); independent (Mean ± SD = 3.1 ± 2.6, OR = 1, 95 CI% = [0.2 - 5.1]); individualistic (Mean ± SD = 1.8 ± 1.5, OR = 1, 95 CI% = [0.2 - 5.4]). ¹⁵
		Interpersonal	Existence of implicit gender bias, favouring men as leaders.	Slight implicit preference for men leaders over women (IAT D score=0.16, SD=0.42). ⁶⁶

IAT, Implicit Association Test.

Table 3 Women's leadership programmes in academic medicine and their influence on leadership enactment

Citation	Programme	Purpose	Result	Examination of leadership enactment				
				Values	Behaviours	Actions	Styles	
Dannels <i>et al</i> ⁶⁰	ELAM	Evaluate a leadership programme and its impact from medical school leadership perspective.	Medical school deans' (M=5.62 out of 7), with those having more fellows reporting greater benefit (p=0.01), positive influence on alumnae (M=6.27), and increase their eligibility for promotion (M=5.7).	Yes	Yes	Yes	Yes	
Dannels <i>et al</i> ⁶²	ELAM	Determine the extent to which programme participants, compared with women from two comparison groups, aspire to leadership, demonstrate mastery of leadership competencies and attain leadership positions.	ELAM participants scored higher than AAMC and non-groups in 15 of the indicators, and for one indicator they scored higher than the American Association of Medical Colleges group (aspiration to leadership outside academic health centres). The differences were statistically significant for 12 indicators. Indicators, including seven of the leadership competencies, three of the administrative leadership attainment indicators and two of the leadership aspirations and education indicators.	Yes	Yes	Yes	Yes	
Heitzer <i>et al</i> ⁶⁸	EWIM MidWIM ELAM	Perceptions of CPD programme alumnae of CPD.	Across all three CPDs leadership aspiration was aligned with career stage; full professors reported more interest in leadership than associate professors (p=0.043).	None	Yes	Yes	Yes	
Levine <i>et al</i> ⁷³	Johns Hopkins University School of Medicine Leadership Program for Women Faculty	Evaluation of three cohorts of a longitudinal programme.	Significant improvement across 11 leadership domains except: public speaking and working in teams.	Yes	None	None	Used Myers Briggs Type Indicator from the generic leadership literature to ascertain leadership style.	
McDade <i>et al</i> ⁷⁵	ELAM	Measures impact of ELAM programme.	Increased leadership capabilities across all 10 identified constructs.	None	Yes; networking and coalition building.	Yes; conflict resolution, financial management.	Asked about women's leadership styles.	
Skarupski <i>et al</i> ⁸⁵	Johns Hopkins University School of Medicine Leadership Program for Women Faculty	Participants' perceptions in three areas: programme impact, leadership preparedness and barriers to leadership advancement.	Increased leadership capabilities across four constructs: Foundational skills, personal experience of leadership, sense of professional community and belonging, and networking.	Yes	Yes	Yes	Yes	
Spalluto <i>et al</i> ⁸⁶	LIFT-OFF	Report of design, implementation and evaluation of leadership intervention to further the training of female faculty.	31% of educational modules were useful.	None	None	None	None	

AAMC, American Association of Medical Colleges; CPD, Continuous professional development programme; ELAM, Executive Leadership in Academic Medicine; EWIM, Early-Career Women Faculty Professional Development Program; LIFT-OFF, Leadership Intervention to Further the Training of Female Faculty.

In terms of behaviours, styles and actions, programmes improved women's negotiation skills^{68 73 75} and provided networking opportunities.^{68 73 75 86} Alumnae of leadership programmes were more likely to attain leadership positions,^{62 86} they were more likely to have knowledge and confidence in leadership skills, and were more likely to have knowledge of organisational structures and processes.⁶² Most studies employed a predesign/postdesign to evaluate leadership programmes.

DISCUSSION

To our knowledge, this systematic review is the first that synthesises evidence on women's leadership in academic medicine. The 40 studies address three themes: the extent of women's leadership and its emergence; factors influencing their leadership emergence and enactment; the impact of leadership development programmes on women's leadership. Deeper analysis revealed that included studies are levered by imperceptible underpinnings. Oriented by a positivist paradigm, it seems much of the reviewed literature inadvertently embraced a narrow understanding of leadership, creating institute-centric rather than women-centric scholarship. Drawing on the findings of our review, in what follows, we unsettle the conceptual foundation of the reviewed studies. We argue that women's leadership studies provide a mere diversity/inclusion performance indicator for institutes that does not necessarily serve women. We then argue the need to shift to a more nuanced women-centric understanding of leadership.

Leadership as organisational position

Our review revealed that in medical schools, women had less access to leadership positions, the evidence showed fewer than 50% of leadership positions—chairs, programme directors, or unit heads—were occupied by women faculty members (table 1). Rooted in understanding leadership as occupancy of an organisational position, in what Northouse⁴³ calls *assigned leadership*, nearly 60% of the studies' main objective was to document the gender distribution of leadership positions, and often to correlate this with the number of faculty or residents who are women. This conceptualisation is based on a positivist understanding of leadership, which ultimately sees leadership as a quantifiable variable. The rationale for this approach may be that determining gender ratio in leadership will establish a performance indicator for the institute in terms of inclusion and diversity that is, the number of women in leadership reflects gender equity/inequity. We question the benefit of this reduction to women leaders. Although we do not think the two are in conflict, we believe institute-centric thinking neglects the value women leaders bring to leadership and the organisational complexities they must navigate to become leaders. Leadership is not merely an organisational position for women faculty to occupy. Moreover, the number of women occupying leadership positions at a given point

in time, an idea perpetuated by the pipeline metaphor,¹⁰ does not by itself reflect equity in leadership. Indeed, the goal is not a critical mass of women who are assigned leaders but 'a critical mass of women with sustained success as leaders'.⁴⁷

Most studies that examined gender distribution neglected women's emergence as leaders. It is for this reason, and drawing on Northouse's⁴³ work, that we devised a metric (table 1). Although not exhaustive, the qualitative metric is an initial attempt to introduce the construct of *leadership emergence* into the discourse on women's leadership in academic medicine. For example, we found that only two studies commented on women being appointed,^{63 78} and no studies mentioned whether women self-nominated. Our intuition is that informal leadership is common among women but whether they self-nominate for formal leadership remains to be seen.

Furthermore, even within the parameters of positivist thinking, all studies are methodologically poor, having a MERSQI range of 7–12.5. Of the 40 studies, 62.5% were cross-sectional. Most studies used websites (which may be outdated or inaccurate, compromising the validity of the findings) or self-reported surveys for data. The median response rates where questionnaires were used was 60% (range 22%–100%). Many studies failed to explain how their questionnaires were developed or if they were validated.

Leadership as process of influence

Recognising the limitation of a positivist paradigm, we suggest a women-centric approach. This understanding aligns with organisational traditions, where leadership is conceptualised as a process of influence between leader and followers^{43 92 93}; that is a series of actions and exchanges take place at the interpersonal level for leadership to occur. Here scholars recognise the importance of a leader's capacity for influence and how such influence shapes culture.^{42 43 94}

First, to explore capacity for influence, we put women at the heart of inquiry: what are women's leadership capacities; that is their motivations, knowledge, skills and experiences? Many studies did not mention whether women aspired to leadership. Many studies assumed prior leadership knowledge among their respondents, a few mentioned formal leadership trainings and only one documented the role of mentors.⁶³

We found instead, that studies focused on what hinders women's leadership at an institutional level such as requirement of research production^{58 70 81} and certain educational backgrounds⁸⁸ and at an interpersonal-level for example, gender bias.⁶⁶ We believe such study objectives are important. However, they may steer women, who aspire to leadership, towards meeting institutional requirements that are not necessarily crucial to becoming a leader. Indeed, Carr *et al*⁵⁸ showed that women were almost half as likely as men (OR = 0.49, 95% CI [0.35 - 0.69]) to hold leadership positions despite the number of research publications. By studying what the institute

seemingly requires, studies that focus on hindering factors make scholarship on women's leadership institute-centric.

To be women-centric, we grouped hindering factors to the stage of leadership (emergence and enactment) where we believe such factors manifest (table 2), then we grouped these studies according to the perspective each one took, whether institutional, interpersonal, or individual. Both categorisation bring focus to women's capacities for leadership and how they can be best developed.

For example, beyond documenting lack of mentorship,⁶³ the first categorisation prompt us to consider mentorship according to leadership stage. Do women leaders need mentors to emerge as leaders or when they are enacting leadership? Such a distinction draws focus to different nuanced elements. Studying mentoring relationships at an emergence stage may deepen our understanding of women's motivation or lack thereof for leadership. While studying mentoring relationships at an enactment stage may deepen our understanding of women's length of service in formal positions, and the leadership knowledge and skills they gain because of such relationship. This is especially important because, while we found studies that examined hindering factors on the institutional level, for example, policy implementation⁶⁰ and the interpersonal level, for example, gender bias,⁶⁶ we did not find studies that examined barriers on the individual level for example, lack of motivation, knowledge, or skills among women.

Second, social interactions are the essence of leadership and in time produce culture; the *values* and *beliefs* that govern our behaviours in organisations.⁴² From our review, the current culture, is shaped by stereotypical beliefs^{5 15 60 65} and a lack of gender equality policy development and implementation.⁶⁰ This culture may sometimes feel static and unchanging, but it is recreated and reinforced in the daily interactions. In the proposed conceptualisation, we come to recognise that culture and leadership are two sides of the same coin,^{4 41} understanding one requires exploring the other.

Once more we put women at the heart of inquiry: how do women leaders shape culture? From our review, many studies neglected women's *enactment* of leadership. Many studies did not mention whether women had informal leadership roles, in what Northouse⁴³ calls *emergent* leadership (leadership that develops organically and is based on building alignments and fostering trust). Many studies did not mention what values informed women's decisions, what behaviours they modelled, or what actions they took to improve the quality of medical education and practice whether formally or informally. Many studies did not explore the leadership styles women embraced.

Addressing these gaps situates women leaders as critical actors in culture change^{22 45 47} and conceptually grounds women's leadership in their lived experiences and not the broader generic leadership literature.¹⁷ The exception to the rule is studies examining leadership development programmes.^{62 68 73 75 85 86} Such programmes may be an ideal place to explore women's emergence and

enactment of leadership. We found leadership development programme studies paid attention to the values, behaviours, actions and styles women embraced and enacted (table 3).

Study limitations

Our study has some limitations. First, we restricted the review to quantitative literature and argued for studying contextual organisational nuances, which might have been explored in qualitative studies. Second, we defined leadership as a process of influence between leaders and followers but have limited our discussion to the leader's perspective. Third, we found that all studies except one⁸⁷ were conducted in North America and Europe. As a result, the presented evidence may not reflect non-western contexts, but we have forgone discussion of this finding. Addressing these limitations requires more space and further research which we hope to embark on and invite others to do so.

CONCLUSION

After reviewing the quantitative literature on women's leadership, we recognise the need for broader conceptual foundations. We also recognise that in problematising the current conceptual foundation, we join other scholars^{5 17 22 47 53} in arguing for more innovative research questions and rigorous methods. Our argument for broadening the conceptual foundation is two-fold. First, by focusing on women's experiences, we can offer readership of this field, who we assume are largely women faculty, practical knowledge that can help them pursue their own leadership. Second, leadership and culture are inextricably linked.⁴⁷ Consequently, the culture change we aspire to in academic medicine cannot happen without a deeper understanding of this relationship.

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