Imagine that, over the course of a few years, you noticed a steady and annoying drop in the water pressure in your house. Finding no leaks in the fixtures, plumbers eventually diagnose the problem: a gradually worsening leak in the delivery line into your house. Repairing the leak would become a top priority for both you and the municipality supplying the water. The leak would be fixed, and systems would be put in place to avoid future problems.

Sadly, the analogy of the leaky pipe reflects the current state of affairs with respect to women in cardiovascular medicine and research: women leave academic medicine and research at a much higher rate than their male counterparts at every career stage. However, unlike the hypothetical example, the repair of the leak has not been a top priority, and few systems have been put into place to prevent future leaks. The brief summary that follows will show the importance of recruiting and retaining women in cardiovascular medicine and research, provide facts about the leaky pipeline, and suggest solutions for plugging the leak.

Why Care About Recruiting and Keeping Women in Cardiovascular Research and Medicine?

Cardiovascular disease is the leading cause of death in women. For years, some women with acute myocardial infarction were undeniably misdiagnosed because the established clinical indicators, which focused heavily on chest pain, were based on research conducted primarily in middle-aged men. Women often have more adverse side effects from drug therapy than men; for example, statin use increases the risk of diabetes mellitus more in women than men,1 where it is postulated that the smaller size of women may be the culprit. Efficacy and adverse effects of Food and Drug Administration–approved drugs have often been based on results from randomized controlled trials that were populated primarily by average-sized middle-aged men. Although we can never know how cardiovascular clinical practice may have developed had there been more gender parity, it is feasible that greater involvement of women may have led to more research that was better designed to address these important questions of symptomatology and adverse drug effects. What we do know is that the corporate world has made some effort to embrace gender equity, and a recent report in the Atlantic Monthly found that companies using women in large numbers outperform their competitors on every measure of profitability.2 For these reasons, the leaky pipeline should be a top priority for cardiovascular medicine and research.

Facts About the Leaky Pipeline

Let us start with some numbers. Women have reached parity or surpassed men in completion of undergraduate programs but lag in graduate and professional programs. In the latest report from the American Association of Medical Colleges, 46% of graduates are women. In science, technology, engineering, and mathematics, 39% of PhDs are granted to women.3 The overall percentage of women in academic medicine is 38%, and the proportion of women recruited to academic medicine has increased to 47% of all recruits in the past decade. However, during the same period, women left in a slightly greater percentage (5%), accounting for 41% of all departures. This trend contributes to the consistent finding that the percentage of women declines in academic settings at higher ranks (ie, associate professors, 34%; professors, 21%) and in key leadership positions (ie, chairs, 15%; deans, 16%).4 In science, technology, engineering, and mathematics, the pattern is identical (ie, at 4-year colleges and universities, associate professors, 31%; full professors 18%).5 The end result of this persistent leaky pipeline is that gender parity at the highest academic ranks may never be achieved.

One of the key contributors to academic success is securing extramural funding for scholarly activities. At the National Institutes of Health, success rates since 2009 overall have been greater for women than men (Figure). Comparable findings have been observed in the American Heart Association funding: for one of its longest standing grant programs, the Grant-in-Aid, the success rate for women outpaced men by ≈2% from 2009 to 2013, when the percentages flipped in favor of men by about the same magnitude. These success rates hide 2 important facts. First, the percentage of women applying for grants is markedly lower: in 2008, 5590 women (27%) compared with 14 995 men (73%) applied for an National Institutes of Health Project Grant (R01). The disparities are greater for larger projects, for example, Program Project Grants (P01s): in 2008, just 75 women (17%) versus 316 men (83%) submitted...
a P01 application. Second, there is a persistent disparity for women in awards for competitive renewals of R01s and in the conversions from K-type (ie, new investigator-type) awards to R-type awards over time.7 These data are consistent with the leaking pipeline: women are not applying for grants or renewing them once they have them, which precludes them from climbing the academic ladder.

Beyond the numbers, let us not forget issues of culture and the academic environment. Gender bias is a real phenomenon. A recent study created resumes that were identical in content but the names on the resumes were changed to suggest the candidates’ gender. The result: men were significantly more likely than women with identical resumes to be selected for scientific positions, and men were scored more highly on competence and the qualities related to their hiring and mentorship.8 In such an environment, it is not surprising that some women lose faith in their abilities. Women are more likely to perceive themselves as less capable than men, even when they are more capable, a trait recently labeled the “confidence gap” in The Confidence Code by Kay and Shipmen.9 In a recent interview, author Katty Kay said “Columbia Business School has run numbers to show men overestimate their abilities by some 30%, whereas women routinely underestimate their abilities.”

Solutions to Address the Leaking Pipeline
The responsibility to fix the leaking pipeline must be shared equally by men and women. In the opening analogy of the leaking water pipe, no one would have expected the leak to fix itself, yet women have held the primary responsibility to correct the problem. Women have been expected to adapt to the organizational structure and culture of medicine and science built largely by and for men. Until men recognize why women are needed in medicine and science and accept responsibilities to similarly adapt the organizational structure and culture to meet women halfway, the playing field will never be level.

Two areas urgently need to be addressed to fix the leaking pipeline. First, we must create organizational structures and cultures that allow faculty to balance career and families. Balancing career and family is the most cited career concern from female faculty members. Data conclusively show women who have children have a slower trajectory across the academic ranks than men, whereas men show no disadvantage, and men are more likely to earn tenure than women when they start families within 5 years of receiving their PhDs.

Institutions should provide resources for families to have appropriate family leave and on-site day care. The National Institutes of Health should provide resources to cover costs for family care. Second, we must build better networking and mentoring opportunities for women. Women faculty members have fewer graduate students and postdoctoral fellows to support their work and less diverse networks. Women are also less likely to be asked to consult in the private sector, which further erodes diverse networks. Male faculty members can help to promote the female colleagues to science advisory boards, journal editorial boards, and science policy positions that would make them more visible.

Those of involved in medical and science, technology, engineering, and mathematics education and research should be proud of the work accomplished to date in training more women and bringing them more into academia and the disciplines. We cannot, however, allow past successes to distract us from the work that remains to be done. Men and women with established careers in science and medicine have an obligation to staunch the leak, as it were, by fighting for the structural and cultural changes necessary to elevate women to their highest potential, with full and equal representation among the ranks of senior researchers and academic leaders. In fields allied to cardiovascular medicine and research, the fight for gender equality ought not to be motivated by principle alone, but also by the earnest desire to provide the best possible care for both sexes.

Disclosures
None.

References

Key Words: cardiology, delivery of health care, gender identity, hierarchy, social, sex, social norms, sociology, medical
Plugging the Leaking Pipeline: Why Men Have a Stake in the Recruitment and Retention of Women in Cardiovascular Medicine and Research
Donna K. Arnett

_Circ Cardiovasc Qual Outcomes_. 2015;8:S63-S64; originally published online February 24, 2015;
doi: 10.1161/CIRCOUTCOMES.115.001757
_Circulation: Cardiovascular Quality and Outcomes_ is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
Copyright © 2015 American Heart Association, Inc. All rights reserved.
Print ISSN: 1941-7705. Online ISSN: 1941-7713

The online version of this article, along with updated information and services, is located on the World Wide Web at:
http://circoutcomes.ahajournals.org/content/8/2_suppl_1/S63

Permissions: Requests for permissions to reproduce figures, tables, or portions of articles originally published in _Circulation: Cardiovascular Quality and Outcomes_ can be obtained via RightsLink, a service of the Copyright Clearance Center, not the Editorial Office. Once the online version of the published article for which permission is being requested is located, click Request Permissions in the middle column of the Web page under Services. Further information about this process is available in the Permissions and Rights Question and Answer document.

Reprints: Information about reprints can be found online at:
http://www.lww.com/reprints

Subscriptions: Information about subscribing to _Circulation: Cardiovascular Quality and Outcomes_ is online at:
http://circoutcomes.ahajournals.org//subscriptions/