

Environmental Scan

There is little solutions-focused research around the diagnosis of heart disease in women.

This needs to change.



3 of the 61
key articles
describe solutions

(See Slide 11)



Gender differences in diagnosis
and treatment of heart disease
are worsened by factors like
racial and ethnic inequities,
comorbidities, age,
and geography

(See Slides 9-10)



One study showed that
70% of malpractice
claims
for fatal heart attacks in women
are due to inaccurate or
delayed diagnosis

(See Slide 2)



Microvascular Disease
Heart Valve Disease
Hypertension
Heart Failure
SCAD

Much of the literature focuses on
risks and difficulty diagnosing and
treating specific cardiovascular
conditions in women

(See Slides 6-8)



Gender
Hormone
Pregnancy

The literature shows
significant gender, hormone, and
pregnancy related prevalence,
diagnostic, and treatment problems

(See Slides 3-5)

Diagnostic-Error Specific

FINDINGS	CITE	FINDINGS	CITE
This feature article on ACC's website discusses findings from The Doctor's Company Foundation's work that shows that 2/3 of women who die suddenly from a heart attack had no previous symptoms. From the study: "...in 70 percent of claims the patient died when her heart condition was not correctly diagnosed and 28 percent had heart muscle damage from myocardial infarction."	Taking the Risks to Heart: Misdiagnosis of Heart Disease. Access at: https://www.acc.org/membership/join-us/benefits/additional-member-only-benefits/acc-and-the-doctors-company/the-doctors-company-updates/2017/02/20/12/55/taking-the-risks-to-heart-misdiagnosis-of-heart-disease	Landmark study released by David Newman Toker analyzing medical malpractice claims data to show that three main causes of diagnostic error related death. The first category is cancers, and the second is a multitude of CVD related errors. See Appendix M for infographic.	David E. Newman Toker , et. al. Serious misdiagnosis related harms in malpractice claims: The "Big Three" vascular events, infections, and cancers. Diagnosis Volume 6: Issue 3. DOI: https://www.degruyter.com/document/doi/10.1515/dx-2019-0019/html . Published online: 11 Jul 2019.
This article on the AHA website discusses findings from the Brush et. al study published in February 2020 exploring symptom differences in women's heart attack and the need to expand clinician training and awareness.	Changing the way we view women's heart attack symptoms. Access at: https://www.heart.org/en/news/2020/03/06/changing-the-way-we-view-womens-heart-attack-symptoms	Maya describes a variety of factors in missed and delayed diagnoses of numerous conditions affecting women. From the article: "There's a general lack of knowledge about women's symptoms, bodies and conditions that disproportionately affect them... that's the legacy of decades of women being underrepresented or excluded from the research."	Maya Dusenberry, in ACHJ blog post about her book, Bad Medicine: The Truth About How Bad Medicine and Lazy Science Leave Women Misdiagnosed and Sick, Harper Collins Publishing, 2018. Accessed at: https://healthjournalism.org/blog/2018/11/women-more-often-misdiagnosed-because-of-gaps-in-trust-and-knowledge/

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Diagnostic-Error Specific

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Conclusion: Multiple opportunities for future research aimed at improving detection and treatment of this population remain. Work aimed at creating the design/application of clinical decision rules, educational campaigns designed to educate young women and emergency medicine providers, and consideration of preventive strategies that might be applied in the ED (i.e., young women with hypertension, smoking, obesity) may ultimately lead to interventions that can improve outcomes in women with ischemic stroke. Ultimately, a multidisciplinary approach aimed at improvements in the identification and care of young women will increase our understanding of the pathophysiology of ischemic stroke as well as improve outcomes for patients served in the ED.	Bernard P. Chang MD, PhD Charles Wira MD Joseph Miller MD Murtaza Akhter MD Bradley E. Barth MD Joshua Willey MD Lauren Nentwich MD Tracy Madsen MD, ScM . Neurology Concepts: Young Women and Ischemic Stroke Evaluation and Management in the Emergency Department. 24 June 2017 https://doi.org/10.1111/acem.13243	Conclusion: Middle aged female patients were diagnosed with the least confidence, whether for CHD or non CHD conditions, indicating that their gender and age combination misled physicians, particularly toward mental health alternative diagnoses. Physicians should be aware of the potential for psychological symptoms to erroneously take a central role in the diagnosis of younger women.	Maserejian NN, Link CL, Lutfey KL, Marceau LD, McKinlay JB. Disparities in physicians' interpretations of heart disease symptoms by patient gender: results of a video vignette factorial experiment. J Womens Health (Larchmt). 2009;18(10): 1661-1667. doi: 10.1089/jwh.2008.1007

Gender, hormone, and pregnancy-related concerns (cross-condition)

Sex factors play a significant role in assessing stroke risk factors; women's risk factors include HDP for ischemic stroke, late menopause and gestational hypertension for hemorrhagic stroke, and oophorectomy, HD , preterm delivery, and stillbirth for any stroke. Hysterectomy possibly protective against stroke	Poorthuis MHF , Algra AM, Algra A, Kappelle LJ, Klijn CJM. Female and Male-Specific Risk Factors for Stroke: A Systematic Review and Meta analysis. JAMA Neurol. 2017;74(1):75-81. doi: 10.1001/jamaneurol.2016.3482	This is a discussion of guidelines on treatment of pregnant women at risk of developing CVD, particularly those with specific comorbidities.	Perrone G, Brunelli R. Prevention and treatment of cardiovascular disease in women: the obstetric gynecologist's point of view. Ther Apher Dial. 2013 Apr;17(2):162-8. doi: 10.1111/1744.9987.12022. Epub 2013 Mar 1. PMID: 23551672.
This is a UK based piece focused on the diagnostic challenges related to identifying CVD in women.	Tracey Keteepi Arachi and Sanjay Sharma . Cardiovascular Disease in Women: Understanding Symptoms and Risk Factors. European Cardiology Review 2017;12(1): 10-3 DOI: 10.15420/ecr.2016:32:1	"We are absolutely convinced that only an accurate knowledge of the sex specific pathophysiology may allow determination of the appropriate diagnostic instruments and to implement tailored treatments of CVD in men and women."	Mercurio G, Deidda M, Piras A, Dessalvi CC, Maffei S, Rosano GM. Gender determinants of cardiovascular risk factors and diseases. J Cardiovasc Med (Hagerstown). 2010 Mar; 11(3): 207-20 . doi: 10.2459/JCM.0b013e32833178ed. PMID: 19829128.
Data gathered from 1993-2014 shows trends in prevalence in pregnancy related HTN (up), Post partum hemorrhage (up), and DVT (up) or PE (down).	Data on Selected Pregnancy Complications in the United States, CDC webpage at: https://www.cdc.gov/reproductivehealth/maternalinfanthealth/pregnancy-complications-data.htm	"Among young individuals, high CVD risk was almost as common in women as in men. It appears that the high risk situation is not always recognized and treated adequately in young women."	Lehto HR, Lehto S, Havulinna AS, Jousilahti P, Salomaa V. Gender differences in the prevalence, causes and treatment of high cardiovascular risk: findings from the FINRISK Survey. Eur J Prev Cardiol. 2012 Oct;19(5): 1153-60. doi: 10.1177/1741826711422454. Epub 2011 Sep 2. PMID: 21890534.
Despite widely recognized association between pregnancy and the development of later CVD issues, there are no specific guidelines to manage or detect such problems.	Emmanuel Bassily, MD,a Cameron Bell, MD,a Sean Verma, MD,a Nidhi Patel, MD,b Aarti Patel, MD.b Significance of Obstetrical History with Future Cardiovascular Disease Risk. The American Journal of Medicine (2019) 132: 567-571	There are multiple female gender-specific factors that play a role in women's CVD that are chronically overlooked. Researchers, clinicians, and patients themselves all need to be more aware of and vigilant about these issues. See Appendix F for excerpt/summary table.	Clare Arnott, MBBS, PhD, Sanjay Patel, MBBS, PhD, Jon Hyett, MBBS, MD, Garry Jennings, MD, Mark Woodward, MedSci , PhD, David S. Celermajor , FAA, DS. Women and Cardiovascular Disease: Pregnancy, the Forgotten Risk FactorHeart, Lung and Circulation (2020) 29, 662-667. doi.org/10.1016/j.hlc.2019.09.011

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Gender, hormone, and pregnancy-related concerns (cross-condition)

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This bulletin describes prevalence, cause, and provides guidance on effect of heart disease among pregnant/postpartum women. It includes recommendations for care for postpartum/pregnant women with new or existing heart disease and a comprehensive-care plan for pregnant women with heart disease.	The American College of Obstetrics and Gynecology Practice Bulletin on Heart Disease and Pregnancy https://www.acog.org/clinical/clinical-guidance/practice-bulletin/articles/2019/05/pregnancy-and-heart-disease	"This review examines how physiological adaptations during pregnancy can provoke cardiometabolic complications or exacerbate existing cardiometabolic disease and how cardiometabolic disease can compromise the adaptations to pregnancy and their intended purpose: the development/growth of the fetus."	Ramlakhan, K.P., Johnson, M.R. & Roos Hesselink, J.W. Pregnancy and cardiovascular disease. <i>Nat Rev Cardiol</i> 17, 718–731 (2020). https://doi.org/10.1038/s41569-020-0390-z
This study explored patient frustration with their provider's (perceived) lack of knowledge of or attention paid to their concerns about heart disease. Patient-centered communication approaches may be particularly important in overcoming shortcomings in women's CVD care.	Agnes E. Berg Gundersen, Tore Sørli & Svein Bergvik (2017). Women with coronary heart disease making sense of their symptoms and their experiences from interacting with their general practitioners, <i>Health Psychology and Behavioral Medicine</i> , 5:1, 29–40, DOI: 10.1080/21642850.2016.1263574	Abstract: The maternal cardiovascular system undergoes profound changes to support the increasing demands of fetal growth during pregnancy. An accumulating body of evidence has shown that common pregnancy complications, including gestational diabetes mellitus, preeclampsia, low birth weight, and preterm delivery, can be associated with future cardiovascular adverse events in mothers. Factors such as glucose metabolism, hyperlipidemia, inflammatory markers, and large and small vessel stiffness/functionality have been linked with these pregnancy conditions. Critically, there are no established guidelines to account for these maternal factors when considering future cardiovascular disease risk, one of the leading causes of female mortality.	Emmanuel Bassily, MD, Cameron Bell, MD, Sean Verma, MD, Nidhi Patel, MD, Aarti Patel, MD, Significance of Obstetrical History with Future Cardiovascular Disease Risk. <i>The American Journal of Medicine</i> (2019) 132: 567–571.
This is a comprehensive review of the various risk factors unique to women and a discussion of the many shortcomings in the prevention, diagnosis, and treatment of CVD in women. See Appendix H for excerpt.	Mariana Garcia, M.D., Sharon L. Mulvagh, M.D., C. Noel Bairey Merz, M.D., Julie E. Buring, Sc.D., and JoAnn E. Manson, M.D., Dr.P.H. Cardiovascular Disease in Women: Clinical Perspectives. <i>Circ Res</i> . 2016 April 15; 118(8): 1273–1293. doi: 10.1161/CIRCRESAHA.116.307547	Conclusion: Women exhibited substantially more variation in unique symptom phenotypes than men, regardless of whether the symptoms were derived from structured interviews or abstracted from the medical record. These findings may provide an explanation for the higher missed diagnosis rate in young women with AMI and may have important implications for teaching and improving clinicians' ability to recognize the diagnosis of AMI in women.	John E. Brush Jr, Harlan M. Krumholz, Erich J. Greene, Rachel P. Dreyer. Sex Differences in Symptom Phenotypes Among Patients With Acute Myocardial Infarction. Originally published 17 Feb 2020 https://doi.org/10.1161/CIRCOUTCOMES.119.005948
This is an editorial from the Editor-in-Chief about the clear disparity in women's heart disease and the battle to figure out why it exists.	Shader, Richard, Women and Heart Disease. <i>Clinical Therapeutics</i> . Volume 41, Number 2, 2019.	This article provides examples and arguments for both biologic and bias based disparity in women's heart disease.	Wenger NK. Gender disparity in cardiovascular disease: bias or biology? <i>Expert Rev Cardiovasc Ther</i> . 2012 Nov; 10(11):1401 11. doi: 10.1586/erc.12.133. PMID: 23244361.

Gender/Hormonal Differences in Treatment Response and Efficacy and Diagnostic Procedures or Interventions

"Response to drug administration is a primary determinant for treatment success. Sex and gender disparities play a role in determining the efficacy and safety of the most commonly used medications suggesting the need for a sex tailored approach in prescription."	Raparelli V, Pannitteri G, Todisco T, Toriello F, Napoleone L, Manfredini R, Basili S. Treatment and Response to Statins: Gender-related Differences. <i>Curr Med Chem</i> . 2017; 24(24): 2628–2638.	Better understanding how social and environmental factors contribute to CVD risk factors like inflammatory response will help create more focused prevention, diagnosis, and treatment options for people of color. See Appendix I for excerpted infographic.	Karen L. Saban, Herbert L. Mathews, Holli A. DeVon, Linda W. Janusek. Epigenetics and Social Context: Implications for Disparity in Cardiovascular Disease. <i>Aging and Disease</i> . Volume 5, Number 5; 346–355, October 2014.
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Gender/Hormonal Differences in Treatment Response and Efficacy and Diagnostic Procedures or Interventions

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By comparing/contrasting American and European guidelines for statin use, this research showed that the standard of care is only appropriate for about 1/5 of the population because of the prevalence of risk factors not taken into account in prior research.	Pavlovic J, Greenland P, Deckers JW, Brugts JJ, Kavousi M, Dhana K, Ikram MA, Hofman A, Stricker BH, Franco OH, Leening MJ. Comparison of ACC/AHA and ESC Guideline Recommendations Following Trial Evidence for Statin Use in Primary Prevention of Cardiovascular Disease: Results From the Population Based Rotterdam Study. JAMA Cardiol. 2016; 09 01; 1(6): 708–13	CVD has decreased more in men than women, and yet women are less likely to be prescribed statins. When women are given statins, they are likely to get less “intensity” statins, and are less likely to achieve treatment targets.	Moreno Arellano, S., Delgado de Mendoza, J., & Santi Cano, M. J. (2018). Sex disparity persists in the prevention of cardiovascular disease in women on statin therapy compared to that in men. Nutrition, Metabolism and Cardiovascular Diseases, 28(8), 810–815.
Survival of mitral valve replacement surgery in Finland has improved from 1997 to 2014, even though patients were older and had more comorbidities. We need to understand how/why.	Myllykangas ME, Aittokallio JM, Pietilä A, Salomaa VV, Gunn JM, Kiviniemi TO, Niiranen TJ. Population trends in mitral valve surgery in Finland between 1997 and 2014: the finnish CVD register. Scand Cardiovasc J. 2018 Feb; 52(1): 51–57. doi: 10.1080/14017431.2017.1405068. Epub 2017; Dec 3. PMID: 29198154.	In this Denmark-based study the use of Doppler to evaluate coronary flow reserve is being studied compared to other methods in women with angina but not coronary obstructive disease.	Eva Prescott, MD, DMSc, et. al., Improving diagnosis and treatment of women with angina pectoris and microvascular disease: The iPOWER study design and rationale. Am Heart J. 2014; 167: 452–8
In premenopausal women, especially those with specific risk factors, coronary angiographic imaging should be done as soon as CVD is suspected to avoid misdiagnosis and to facilitate prompt treatment.	GWICC Abstracts 2010, Clinical and research medicine: Coronary heart disease: The analysis of clinical and coronary angiographic characteristics for pre menopausal women with coronary heart disease. Ting Wang, Peiling Cong, Xiaofei Sun.	Cardiovascular Disease Assessment in Pregnant and Postpartum Women tool. This is an assessment framework and algorithm for identify CVD issues in pregnant and postpartum women.	California Department of Public Health and California Material Quality Care Collaborative, available at: file:///C:/Users/Admin/Downloads/CVD%20Disease%20Assessment%20in%20Pregnancy%20and%20Postpartum%20Women.pdf

Specific Conditions: Heart Failure, SCAD, Hypertension, Microvascular Disease, Valve Disease

Recapture of data examined in 2017 guidelines for HTN management that did not do a deep exploration of gender differences. See Appendix A for more detailed findings.	Beth L. Abramson, MD, FACC; Kajenny Srivatharajah, MD; Leslie L. Davis, NP, PhD, FACC; Biljana Parapid, MD. Women and Hypertension: Beyond the 2017. Guideline for Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults. July, 2018, ACC website at: https://www.acc.org/latest-in-cardiology/articles/2018/07/27/09/02/women-and-hypertension	This study found no difference in control of HTN between men and women, but issues of obesity, cholesterol, and low HDL are more prominent in women and women have more risk factors for HTN in general than men.	Kwok Leung Ong, Annette W.K. Tso, Karen S.L. Lam, and Bernard M.Y. Cheung. Gender Difference in Blood Pressure Control and Cardiovascular Risk Factors in Americans With Diagnosed Hypertension. Hypertension. 2008;51: 1142–1148. doi.org/10.1161/HYPERTENSIONAHA.107.105205
There are significant differences between men and women in the natural history of HTN, and in response to treatment. Practitioners need to take gender and hormonal variances into account when diagnosing and treating HTN in women.	Ahmad A, Oparil S. Hypertension in Women: Recent Advances and Lingering Questions. Hypertension. 2017 Jul;70(1): 19–26. doi: 10.1161/HYPERTENSIONAHA.117.08317. Epub 2017 May 8. PMID: 28483918.	While rates of HTN are the same in men and women, and this study found men to have more severe risk from HTN, work up of CVD concern should be as aggressive in women as in men.	Tziomalos K, Giampatzis V, Baltatzis M, Efthymiou E, Psianou K, Papastergiou N, Magkou D, Bougatsa V, Savopoulos C, Hatzitolios AI. Sex-specific differences in cardiovascular risk factors and blood pressure control in hypertensive patients. J Clin Hypertens (Greenwich). 2014 Apr;16(4): 309–12.

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Despite the impact of HTN on women, major gaps exist in knowledge including the role of pregnancy in contributing to later issues, postpartum issues, and optimizing management of PE and of BP in the elderly. See Appendix B for excerpt.	Nanette K. Wenger, MD, a Anita Arnold, DO, MBA, b C. Noel Bairey Merz, MD, c, et. al. Hypertension Across a Woman's Life Cycle. J Am Coll Cardiol 2018;71: 1797–813	"CMD is associated with a nearly 4-fold increase in mortality and a 5-fold increase in major adverse cardiac events. Future studies are needed to identify effective strategies to diagnose and treat CMD"	Mark A. Gdowski , Venkatesh L. Murthy, Michelle Doering, Andrea C. Monroy-Gonzalez, Riemer Slart, and David L. Brown. Association of Isolated Coronary Microvascular Dysfunction With Mortality and Major Adverse Cardiac Events: A Systematic Review and Meta-Analysis of Aggregate Data. Journal of the American Heart Association. 2020;9 https://doi.org/10.1161/JAHA.119.014954
Reference numbers for measuring BP were found to be incorrect for women, indicating a need to revise current BP measurement guidelines for women and men.	Hermida RC, Ayala DE, Mojón A, Fontao MJ, Chayán L, Fernández JR. Differences between men and women in ambulatory blood pressure thresholds for diagnosis of hypertension based on cardiovascular outcomes. Chronobiol Int. 2013 Mar;30(1-2): 221–32.	"A shared pathology across multiple organ systems highlights the need for a collaborative, multidisciplinary approach among medical subspecialties caring for women with these diseases...It is essential that providers caring for women obtain a complete history with a focus on microvascular disorders, including a detailed pregnancy history, as standard of clinical care."	Patel H, Aggarwal NT, Rao A, et al. Microvascular Disease and Small-Vessel Disease: The Nexus of Multiple Diseases of Women. J Womens Health (Larchmt). 2020;29(6): 770–779. doi: 10.1089/jwh.2019.7826
Women, especially older women and women of color, are not represented in clinical trials which makes applicability of CT findings limited. Future research needs to focus on studying these populations where possible or identifying parallel data collection opportunities where not.	Monica Colvin, MD, MS,1,1 Nancy K. Sweitzer, MD, PhD,2,1 NANCY M. ALBERT, RN, PhD, et. al. Heart Failure in Non Caucasians, Women, and Older Adults: A White Paper on Special Populations From the Heart Failure Society of America Guideline Committee. J Cardiac Fail 2015;21: 674e693	Adding other diagnosis SCAD Spontaneous coronary artery dissection (SCAD) is an understudied but very worrisome issue, especially in young women without traditional risk factors.	Hayes SN, Kim ESH , Saw J, et al. Spontaneous Coronary Artery Dissection: Current State of the Science: A Scientific Statement From the American Heart Association. Circulation. 2018;137(19): e523–e557. doi: 10.1161/CIR.0000000000000564
A how-to guide for HF nurses working with heart failure patients. See Appendix C for excerpt.	AAHFN Heart Failure (with preserved EF) talking tips sheet: available at aahfnpatienteducation.com	"Spontaneous coronary artery dissection (SCAD) is an under recognised and important cause of myocardial infarction in young women."	Main T, Prakash R, Starovoytov A, Sabbaghan A, Aymong E, Mancini G, Saw J. Characteristics of extension and de novo recurrent spontaneous coronary artery dissection. Eurointervention. 2017;13: e1454–e1459. doi: 10.4244/EIJ-D-17-00264
Heart failure is difficult to diagnose and categorize because of a number of complex and confusing factors; current guidelines and schematics are not adequate and moving forward, research should focus on subspecialty populations and more specific definitions and treatment approaches.	Marc A. Pfeffer, Amil M. Shah, Barry A. Borlaug. Heart Failure With Preserved Ejection Fraction In Perspective. Circ Res. 2019;124: 1598–1617. DOI: 10.1161/CIRCRESAHA.119.313572	"Gender and age bias complicate the evaluation of women with acute coronary syndrome (ACS) ...conditions like spontaneous coronary artery dissection (SCAD) are often missed. SCAD is an infrequent yet important cause of myocardial infarction (MI) with a predilection for young to middle-aged women. The condition is thought to be under reported, likely a result of both low-index of suspicion as well as an unfamiliarity with SCAD's angiographic variants.	Lebrun S, Bond RM. Spontaneous coronary artery dissection (SCAD): The underdiagnosed cardiac condition that plagues women. Trends Cardiovasc Med. 2018 Jul;28(5): 340–345. doi: 10.1016/j.tcm.2017.12.004. Epub 2017 Dec 11. PMID: 29275928
This discusses various aspects of heart failure unique to women and concludes that significant underrepresentation in clinical trials is a huge barrier to our knowledge.	Bozkurt B, Khalaf S. Heart Failure in Women. Methodist Debakey Cardiovasc J. 2017 Oct–Dec;13(4): 216–223. doi: 10.14797/mdcj-13-4-216. PMID: 29744014; PMCID: PMC5935281.	Conclusion: HF is associated with increased risk of maternal mortality and morbidities. During hospitalization, high-risk mothers need to be identified and surveillance programs developed before discharge	Mulubhan F. Mogos, Mariann R. Piano, Barbara L. McFarlin, Jason L. Salemi, Kylea L. Liese, and Joan E. Briller. Heart Failure in Pregnant Women: A Concern Across the Pregnancy Continuum. Originally published 12 Jan 2018. https://doi.org/10.1161/CIRCHEARTFAILURE.117.004005

Environmental Scan

Specific Conditions: Heart Failure, SCAD, Hypertension, Microvascular Disease, Valve Disease

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This article provides an overview of the gender differences in how valvular heart disease manifests itself, is diagnosed, and treated.	Nitsche, C., Koschutnik, M., Kammerlander, A. et al. Gender specific differences in valvular heart disease. Wien Klin Wochenschr 132, 61–68 (2020). https://doi.org/10.1007/s00508-019-01603-x	Poor maternal and fetal outcomes—including death—are possible in women with moderate to severe valvular disease.	Ducas RA, Javier DA, D'Souza R, Silversides CK, Tsang W. Pregnancy outcomes in women with significant valve disease: a systematic review and meta analysis. Heart. 2020 Apr;106(7): 512–519. doi: 10.1136/heartjnl-2019-315859. Epub 2020 Feb 13. PMID: 32054673.
This is an expert treatise on management of pregnancy in women with valvular disease. “Given the complexity of valvular heart disease in pregnancy, women with congenital and acquired heart disease should be managed with a multidisciplinary approach before and throughout pregnancy.”	Kathryn Lindsley, MD, FACC, Valvular Heart Disease in Pregnancy. Feb 12, 2018. ACC Website, accessed at: https://www.acc.org/latest-in-cardiology/articles/2018/02/12/07/29/valvular-heart-disease-in-pregnancy	Excerpt: Indeed, that unconscious bias of what a heart attack victim looks like helped keep SCAD off the radar screen for so long. “A lot of patients I see with cardiac symptoms were hesitant to seek care in the first place because they felt they wouldn’t be taken seriously,” says Lewey. “So, they often have to become advocates for themselves to get the care and attention they need.” Among the growing field of advocacy and support organizations are the SCAD Alliance, a network of SCAD survivors, researchers and clinicians; SCAD Research, Inc., a volunteer, grassroots group that has raised hundreds of thousands of dollars for research; and WomenHeart, a patient centered organization that serves women with heart disease.	Randy Young, SCAD: Not Your Typical Heart Attack: New Findings & Increased Visibility Are Changing How Spontaneous Coronary Artery Dissection Is Diagnosed & Treated. Randy Young, July 11, 2019, Coronary Intervention & Surgery. Accessed at: https://www.cardiovascularbusiness.com/topics/coronary-intervention-surgery/scad-not-your-typical-heart-attack-new-findings-increased

Appendix of select findings/excerpts

A.

Beth L. Abramson, MD, FACC; Kajenny Srivarattharajah, MD; Leslie L. Davis, NP, PhD, FACC; Biljana Parapid, MD. Women and Hypertension: Beyond the 2017 Guideline for Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults. July, 2018, ACC website at: <https://www.acc.org/latest-in-cardiology/articles/2018/07/27/09/02/women-and-hypertension>

Female sex/gender-specific factors	
Pathophysiology	<ul style="list-style-type: none"> • Vascular protective effects of estrogen: up-regulation of NO pathway & downregulation of sympathetic pathway, RAS and endothelin production • Menopause – change in estrogen levels • Pregnancy related vascular risks such as preeclampsia and gestational hypertension • States of estrogen imbalance such as polycystic ovarian disorder, premature ovarian insufficiency and infertility <p>*Inconclusive data on progesterone</p>
Epidemiology	<ul style="list-style-type: none"> • Lower hypertension rates in premenopausal women • Two-fold increase in risk of hypertension with menopause • ~80% of women aged ≥75 have hypertension
Screening and Diagnosis	<ul style="list-style-type: none"> • Hypertensive women have more non-traditional CV risk factors • More variability in ambulatory BP measurements in perimenopausal and menopausal women • Postmenopausal women more likely to exhibit non-dipping pattern of blood pressure
Treatment – Pharmacological	<ul style="list-style-type: none"> • Diuretic therapy may be more beneficial in postmenopausal women with osteoporosis • CCB may be more beneficial in women for stroke prevention • Women may experience more antihypertensive side effects
Treatment – Non-pharmacological	<ul style="list-style-type: none"> • Salt restriction may benefit women given possible upregulation of RAS after menopause • Weight loss after midlife weight gain • DASH diet plus weight loss may have incremental benefits on BP lowering • No more than one standard alcoholic drink/day • Combined aerobic and resistance exercises reduce arterial stiffness and BP in postmenopausal women

B.

Emmanuel Bassily, MD,a
Cameron Bell, MD,a
Sean Verma, MD,a
Nidhi Patel, MD,b
Aarti Patel, MD,b
Significance of Obstetrical History with Future Cardiovascular Disease Risk. The American Journal of Medicine (2019) 132:567–571

	Incidence in Pregnancy	Mechanism of Cardiovascular Dysfunction	Increase in Lifetime Cardiovascular Risk
Preeclampsia	1%-5%	Blood pressure, lipid levels, large/small vessel functionality	Yes
Gestational diabetes mellitus	2%-5%	Blood pressure, lipid levels, large vessel/small vessel functionality, fasting insulin levels	Yes
Preterm labor/birth	5%-8%	Unknown	Yes
Low birth weight	5%-8%	Unknown	Yes

Numbers presented vary based on ethnic group, population studied, and diagnostic criteria utilized (Sattar & Greer, 2002).³²

C.

AAHFN patient talking tips sheet at: aahfnpatienteducation.com

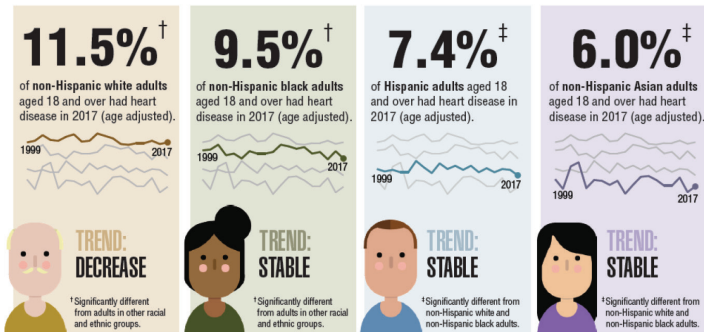
Patient teaching:

- Self-monitoring of symptoms is critical in managing heart failure
- Treatment of patient's comorbidities and risk factors for heart failure are associated with improved outcomes
- Salt reduction, exercise/staying active, weight loss and medication management are important self-care strategies
- Review all medications the patient is taking including OTCs and supplement.
- Advise patient to avoid non-steroidal anti-inflammatory drugs (NSAIDs) as this can worsen their symptoms
- Counsel patient to take all medications as directed and to communicate intolerances to their provider
- Encourage patients to keep all follow up appointments
- Teach patients the symptoms they need to report to their provider
- Close collaboration among caregivers is also recommended

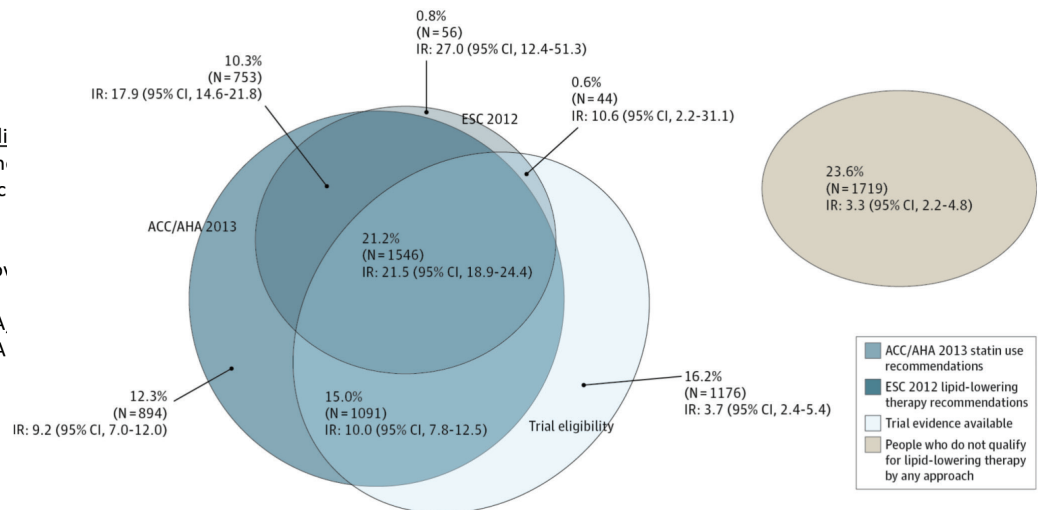
Environmental Scan

Appendix of select findings/excerpts (cont'd)

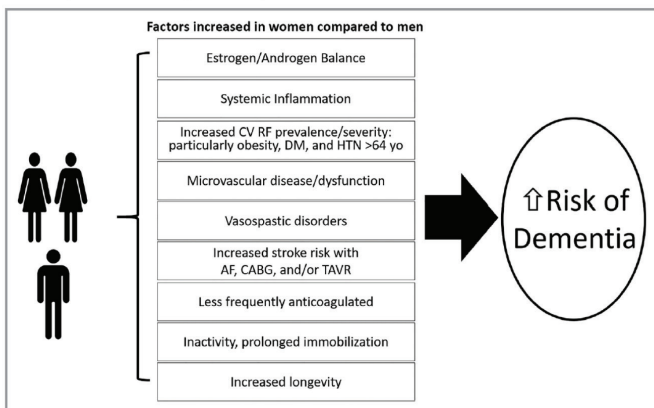
D. Health, United States Spotlight Racial and Ethnic Disparities in Heart Disease, 2019



E. Venn Diagram of AHA/ACC/ESC Applicability Comparison of ACC/AHA and ESC Guideline Recommendations Following Trial Evidence for Statin Use in Primary Prevention of Cardiovascular Disease: Results From the Population-Based Rotterdam Study. Pavlov J, Greenland P, Deckers JW, Brugts JJ, Kavousi M, Dhana K, Ikram MA, Hofman A, Stricker BH, Franco OH, Leening MJ. JAMA Cardiol. 2016 09 01;1(6):708-13



G. Volgman, et. al, Cognitive Impairment and CVD in Women



F. Clare Arnott, MBBS, PhD, Sanjay Patel, MBBS, PhD, Jon Hyett, MBBS, MD, CVD Risk in Women

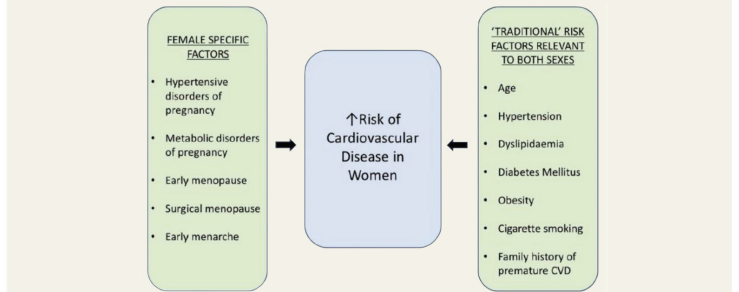


Figure 1 Cardiovascular risk in women. Traditional and female-specific factors related to the risk of cardiovascular disease in women.

H. Mariana Garcia, M.D., Sharon L. Mulvagh, M.D., C. Noel Bairey Merz, M.D., Julie E. Buring, Sc.D., and JoAnn E. Manson, M.D, Dr.P.H.. Cardiovascular Disease in Women: Clinical Perspectives

Table 2 Pretest probability for Coronary Artery Disease by Age, Sex and Symptoms
Reused with permission from Gibbons et al. 215

Pretest Probability of Coronary Artery Disease by Age, Gender and Symptoms [†]					
Age (y)	Gender	Typical/Definite Angina Pectoris	Atypical/Probable Angina Pectoris	Nonanginal Chest Pain	Asymptomatic
30-39	Men	Intermediate	Intermediate	Low	Very low
	Women	Intermediate	Very low	Very low	Very low
40-49	Men	High	Intermediate	Intermediate	Low
	Women	Intermediate	Low	Very low	Very low
50-59	Men	High	Intermediate	Intermediate	Low
	Women	Intermediate	Intermediate	Low	Very low
60-69	Men	High	Intermediate	Intermediate	Low
	Women	High	Intermediate	Intermediate	Low

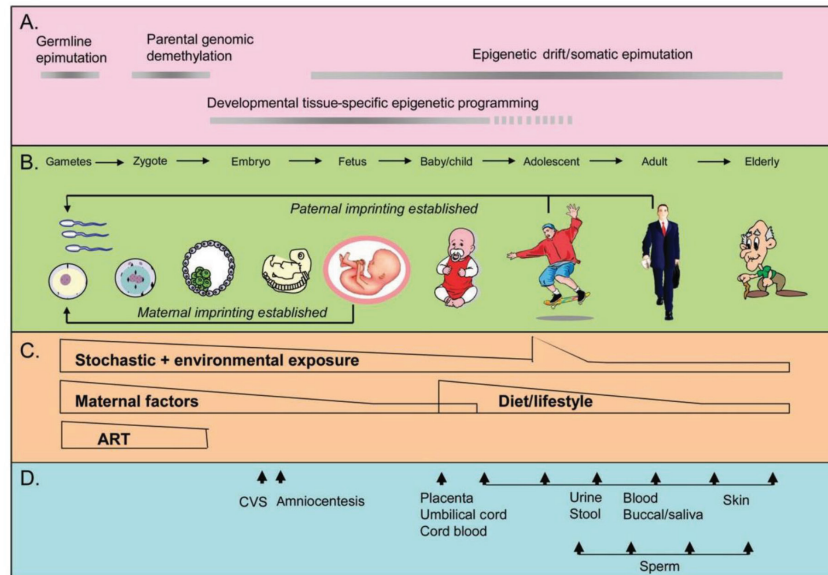
High indicates >90%; Intermediate 10-90%, Low <10%, Very low <5%

[†]No data exists for patients <30 or >69 y but it can be assumed that prevalence of coronary artery disease increases with age. In a few cases, patients with ages at the extremes of the decades listed may have probabilities slightly outside the high or low range.

Environmental Scan

Appendix of select findings/excerpts (cont'd)

I. Karen L. Saban, Herbert L. Mathews, Holli A. DeVon, Linda W. Janusek, Epigenetics and Social Context



J.

Figure 3. The Robert Wood Johnson Foundation action cycle for improving a community's health. At the core of the action cycle are key stakeholders for taking action. Each step on the action cycle is considered a critical component for creating healthier communities and offers a guide that describes key activities within each step that includes suggested tools, resources, and additional reading. In this action cycle, Work Together and Communicate are distal because they are needed throughout the cycle. Reproduced with permission from the Robert Wood Johnson Foundation County Health Rankings & Roadmaps Action Center, 2017; Take Action Cycle. <http://www.countyhealthrankings.org/take-action-cycle>. Copyright © 2017, County Health Rankings.

K. Leigh JA, Alvarez M, Rodriguez CJ. Ethnic Minorities and Coronary Heart Disease: an Update and Future Directions

Table 2

Race/ethnicity makeup of major cohort studies in cardiovascular disease [10–14]

Population group	MESA (%)	ARIC (%)	HCHS/SOL (%)	Jackson Heart (%)	CARDIA (%)
Non-Hispanic white	38	73	0	0	48.5
African-American/black	28	27	0	100	51.5
Hispanic/Latino	22	0	100	0	0
Asian/Asian-American	12	0	0	0	0

MESA Multi-Ethnic Study of Atherosclerosis, ARIC Atherosclerosis Risk in Communities, HCHS/SOL Hispanic Community Health Study/Study of Latinos, CARDIA Coronary Artery Risk Development in Young Adults

Environmental Scan

Appendix of select findings/excerpts (cont'd)

L. Factors Identified by the HCNI Team Members that Contributed to a Successful Community-Academic Partnership (CAP)

Strengths	Partnership Accomplishments
Characteristics of the Partners	
Consistent and committed leadership with shared vision	<ul style="list-style-type: none"> Kept the study team focused on the needs of the community Helped community partners and residents navigate through some of the challenges of research from a community perspective.
Many of the original team members continue to partner, and there are generally several representatives from each agency/institution involved in the project	<ul style="list-style-type: none"> Maintained continuity Presented a consistent face to the community Depth of agency/institution involvement meant that leadership changes did not destabilize the partnership
Transparency about needs of the community	<ul style="list-style-type: none"> Kept the needs of the community foremost Used the strengths of the community to enhance partnership, study design, and data collection. Pursued extramural funding for future opportunities
Transparency about needs of academic partners	<ul style="list-style-type: none"> Addressed the needs of the academic partners Pursued extramural funding for future opportunities Supported publications and other deliverables for academic promotion
Transparency about the partnership	<ul style="list-style-type: none"> Maintained a high level of communication and copied team members who were not present so they do not feel excluded Agreed that information on working group activities would be shared with the larger group at a given periodicity Minimized small group conversations that can be destructive and bring to the entire group as soon as possible
Several individuals (both community and academic partners) had prior experience with (CBPR/CPPR)	<ul style="list-style-type: none"> Created a more efficient process New or less experienced members mentored by community and academic members with more experience in CBPR/CPPR
Characteristics of the Partnership	
Trust within partnership	<ul style="list-style-type: none"> Pre-existing partnerships grounded in trust helped study team work together with similar assumptions, which provided a foundation for a more committed partnership; Helped to navigate with balance between trust and skepticism
Peer Governance and Egalitarian Processes that were informed by group discussions, presentations by "resident" experts from community and academia, and invited presentations from other individuals when outside expertise was needed	<ul style="list-style-type: none"> Improved operations and reduced tensions and hierarchies Allowed team to make informed decisions regarding study design, protocols, data collection, and ethical issues within the study team
Built trust within the community	<ul style="list-style-type: none"> Strengthened community support of the project, enhanced participation of stakeholders, and facilitated honest feedback and engagement of community members
Emphasis on a non-deficit, asset based approach to working with community	<ul style="list-style-type: none"> Demonstrated respect and regard for community being served Synthesized information on community resources that could be shared with residents, local agencies, and academic institutions
Commitment to ethical behavior within the partnership	<ul style="list-style-type: none"> Developed an expectation of fair, equitable, and respectful treatment of and by all members of the partnership
Identified benchmarks and celebrated interim successes	<ul style="list-style-type: none"> Enhanced the engagement of individual participants in the process Highlighted achievements of individuals, organizations, and the HCNI team
In-kind funding from CAP despite initial limited funding	<ul style="list-style-type: none"> Staff time Space for project activities Project materials Administrative support Obtaining local funding to support the partnership
Recognition of mutual benefits	<ul style="list-style-type: none"> Recognized these needs also had relevance for community members whose employment prospects could be enhanced

M. "Big Three" breakdown of high-severity harms among diagnostic error claim cases CRICO 2006–2015 (n = 7379)

