



Sex and Gender Medicine

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I have no disclosures.





Objectives



- * Define sex and gender based medicine terminology.
 - * Recognize sex and gender differences in disease presentation.
 - * Consider the importance of sex and gender in medication research and selection.
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Consider this...



Which of the following statements about sex and gender is correct?

- A. Sex is a biological variable.
- B. Sex and gender are synonymous terms.
- C. The terms “male” and “female” are used to characterize gender.
- D. The terms “men” and “women” are used to characterize sex.





Consider this...



Which of the following disease states is associated with worse outcomes in men?



- A. Osteoporosis
- B. Depression
- C. Hypothyroidism
- D. Diabetes Mellitus





Consider this...

For which of the following medications, did the FDA recommend a dose change for women?

- A. Atorvastatin
 - B. Escitalopram
 - C. Zolpidem
 - D. Zoledronic acid
- 
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Sex vs. Gender





Terminology



Sex and Gender

Sex

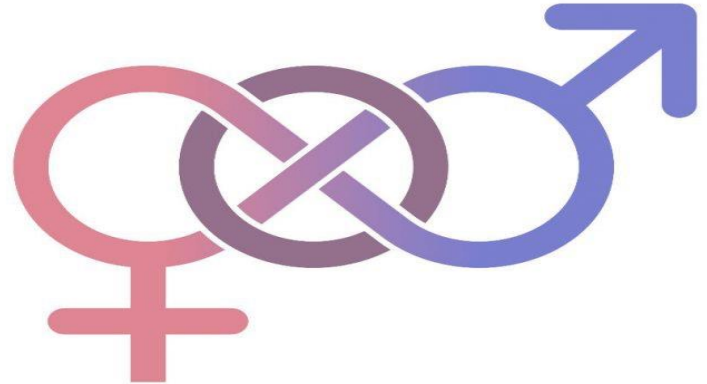
- * Biological differences
 - Sex organs
 - Hormones
 - Chromosomes

Intersex

- * Identity associated with having a disorder or difference of sex development

Gender

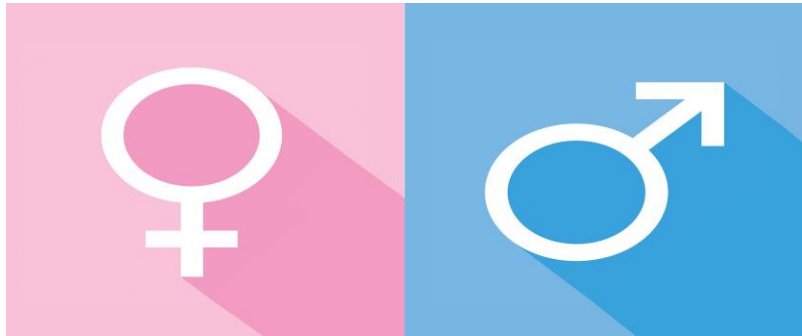
- * Characteristics that a society or culture attributes to masculine or feminine



There's More to Gender...

Gender Identity

- * An individual's intrinsic sense of self and how they fit into the world, from the perspective of gender



Gender Expression

- * Outward manner one uses to present their gender

Gender Nonconforming

- * Person whose gender identity, role, or expression is different from what is assigned at birth or what is considered normative for their assigned sex in a given culture or historical period

And More...!

Transgender

- * An umbrella term for people whose gender identity and expression differs from the sex assigned at birth



Cisgender

- * A word used to describe those whose sex assigned at birth matches gender identity and expression

Nonbinary

- * Transgender or gender-nonconforming person who does not identify either wither sex



So *what is* Sex and Gender Based Medicine?

“With continuous interaction between sex and gender,
health is determined by both biology and the
expression of gender.”

National Institutes of Health Office of Research on Women's Health

Sex and Gender. NIH. <https://orwh.od.nih.gov/sex-gender>

What is Gender Based Medicine? <https://www.laurabushinstitute.org/gender/default.aspx>



Sex and Gender Medicine Implications



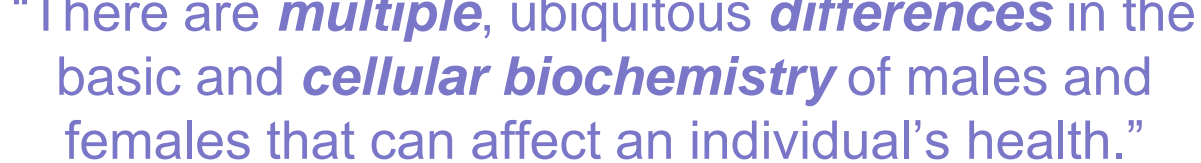
- * Research
- * Education
- * Practice
- * Outreach



Differences in Disease Presentation



Does Sex *Really* Matter?



“There are **multiple**, ubiquitous **differences** in the basic and **cellular biochemistry** of males and females that can affect an individual’s health.”



“Every cell has a sex.”

IOM Report, 2001



True or False

Depression is twice as common in women.





True or False

Men and women experience
the same heart attack
symptoms.



How Sex /Gender Influence Health and Disease (A-Z). NIH. <https://orwh.od.nih.gov/sex-gender>
What is Gender Based Medicine? <https://www.laurabushinstitute.org/gender/default.aspx>
Heart Disease in Women. NHBLI. <https://www.nhlbi.nih.gov/health-topics/heart-disease-women>



Video

- * 60 Minutes. CBS News. 2013.

<https://www.dailymotion.com/video/x1bn1lb>





True or False

Men are twice as likely to **die** after an osteoporotic hip fracture compared to women.





True or False

Low-dose aspirin reduces the risk of heart attacks in women.





True or False

Nicotine replacement therapy has the same efficacy in smoking-cessation for men and women.



How Sex /Gender Influence Health and Disease (A-Z). NIH. <https://orwh.od.nih.gov/sex-gender>
Tobacco, Nicotine, and E-cigarettes. NIH. <https://www.drugabuse.gov/publications/research-reports/tobacco-nicotine-e-cigarettes/are-there-gender-differences-in-tobacco-smoking>



True or False

Men are more severely affected by autoimmune disorders, such as lupus and multiple sclerosis.





Implications





Sex Differences



- * Pharmacokinetics (PK)
- * Pharmacodynamics (PD)
- * Adverse Drug Effects (ADE)





Pharmacokinetics



Absorption

- * Dependent on route of administration
- * Oral
 - Gastric motility
 - GI enzymes in drug metabolism

Distribution

- * Body composition
 - Weight
 - Fat
- * Plasma volume
- * Plasma protein binding



Pharmacokinetics



Metabolism

- * Phase I
 - CYP 1A2
 - CYP 3A4
 - CYP 2D6
- * Phase 2
 - COMT

Excretion

- * eGFR



Pharmacodynamics



Central Nervous System Medications

- * Depression
- * Pain

Cardiovascular Medications

- * Aspirin
- * Statins

Adverse Effects

- * Occur more in women
- * QT prolongation
- * Other ADEs



Franconi F, Campesi I. Br J Pharmacol. 2014;171:580-94.
Meibohm B, Beierle I, Derendorf H. Clin Pharmacokinet. 2002;41:329-42.
Schwartz JB. Clin Pharmacokinet. 2013;42:107-21.
Nicolson TJ, Mellor HR, Roberts RRA. Trends Pharmacol Sci. 2010;31:108-14.

Medications Withdrawn from U.S. Market

10 medications withdrawn

Jan. 1997 to
Dec. 2000

8 medications posed a
greater health risk to women

4 medications prescribed at
similar rates

3 medications withdrawn due
to QT prolongation



Withdrawn Medications

Drug	Type of Drug	Primary Health Risk
Prescription Drugs with Evidence of Greater Health Risks in Women		
Pondimin	Appetite suppressant	Valvular heart disease
Redux	Appetite suppressant	Valvular heart disease
Rezulin	Diabetic	Liver failure
Lotronex	Gastrointestinal	Ischemic colitis
Seldane ^a	Antihistamine	Torsades de Pointes
Posicor	Cardiovascular	Lowered heart rate in elderly women and adverse interactions with 26 other drugs
Hismanal	Antihistamine	Torsades de Pointes
Propulsid ^b	Gastrointestinal	Torsades de Pointes
Prescription Drugs Without Evidence of Greater Health Risks in Women		
Raxar	Antibiotic	Torsades de Pointes
Duract	Analgesic and anesthetic	Liver failure



And more recently....



- * 15% of ADEs linked to gender differences
 - 74 different medications
 - 124 different ADEs
 - * Multitude of ADEs with higher odds of occurring in women
 - Thyroid hormones
 - Antidepressants
 - TNF- α inhibitors
 - * Differences in ADEs
- 
- 

History



1977- FDA Clinical Evaluation of Drugs

1993- FDA Guidance Study and Evaluation of Gender Differences in the Clinical Evaluation of Drugs

1998- FDA Demographic Rule and Investigational New Drug Application

Clinical Implication

* STEMI care in ER

	Men	Women
Received guideline standard of care	77%	69%
Door to balloon time	104 minutes	112 minutes
30-day mortality	4.6%	10.7%

Following Intervention....

	Men	Women
Received guideline standard of care	84%	80%
Door to balloon time	89 minutes	91 minutes
30-day mortality	3.3%	6.5%




Putting it all
together





Alex, 64 years old, presents for your first MTM session. You collect the following information:



PMH:

Depression

Lower back pain with sciatica

Hypertension

h/o MI (2 years ago)

SH:

Tobacco: Current (1ppd x 20 years)



FH:

Father- deceased (MI @ 70yo)

Mother- alive (79yo); h/o breast cancer

Medications:

Metoprolol succinate 25 mg PO daily

Sertraline 100mg PO daily

Gabapentin 300 mg PO TID

Lisinopril 20mg PO daily

Rosuvastatin 20mg PO daily

Aspirin 81mg PO daily



What is the patient's sex?





Which medications have sex and gender implications?





- * Lisinopril
- * Metoprolol succinate
- * Rosuvastatin
- * Sertraline





During your session, Alex inquires about the use of zolpidem for sleep.

How does sex and gender medicine impact your recommendation?



- A. Zolpidem is not effective in men.
 - B. Zolpidem is not effective in women.
 - C. Zolpidem has the same maximum doses for men and women.
 - D. Zolpidem has different maximum doses for men and women.
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Self-Assessment #1



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Self-Assessment #2



Which of the following disease states is associated with worse outcomes in men?



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Self-Assessment #3



For which of the following medications, did the FDA recommend a dose change for women?

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Thank You!

Special thanks to all the people who made and released these awesome resources for free:

Presentation template by [SlidesCarnival](#)



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