

Stroke in women

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Disclosure statement

- I have no affiliation with a pharmaceutical, medical device or communications organization.
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Learning objectives

- Understand the rationale for sex-specific consideration in stroke care and research
- Examine sex differences across the stroke care continuum
- Discuss the representation of women in acute stroke trials



The deadly truth about a world built for men - from stab vests to car crashes

- Compared to men, women involved in a car crash are:
 - 47% ↑ serious injury
 - 71% ↑ moderate injury
 - 17% ↑ likely to die
- 1950 1st crash-test dummy
- 2011 1st female crash-test dummy



Stroke awareness & recognition

- Knowledge about symptoms of stroke
 - Women \approx men or slightly more knowledge in women
 - Women who are Hispanic or aged < 35 years had less knowledge than their female counterparts¹
- Delays to hospital arrival
 - Women \approx men²
 - People who live alone arrive slower and women are more likely than men to be socially isolated³

1. Madsen TE et al. J of Stroke and Cerebrovascular Diseases 2015;24(7):1540-1547

2. Reeves MJ et al. Lancet Neurol 2008;7:915-926

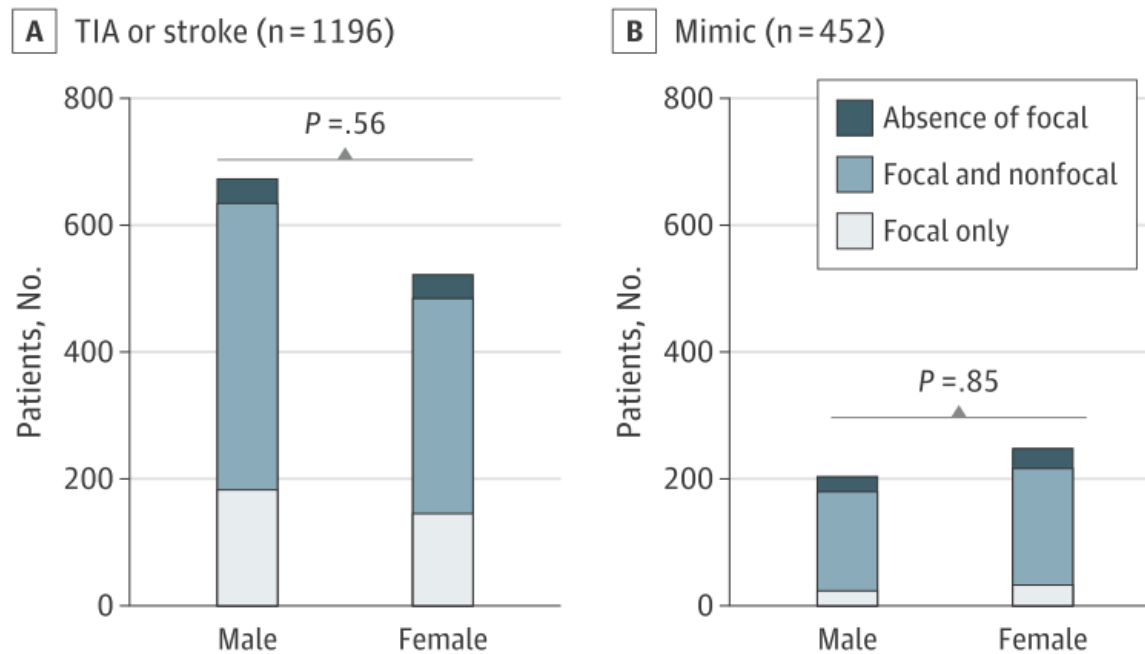
3. Reeves MJ et al. Stroke 2014;45:3083-3085



Sex Differences in Presentation and Outcome After an Acute Transient or Minor Neurologic Event

Amy Y. X. Yu, MD, MSc; Andrew M. Penn, MD; Mary L. Lesperance, PhD; Nicole S. Croteau, MSc;

Figure. Presenting Symptoms by Sex and Final Diagnosis



Symptom distribution by sex among patients with transient ischemic attack (TIA) or minor stroke (A) or with stroke mimic (B).

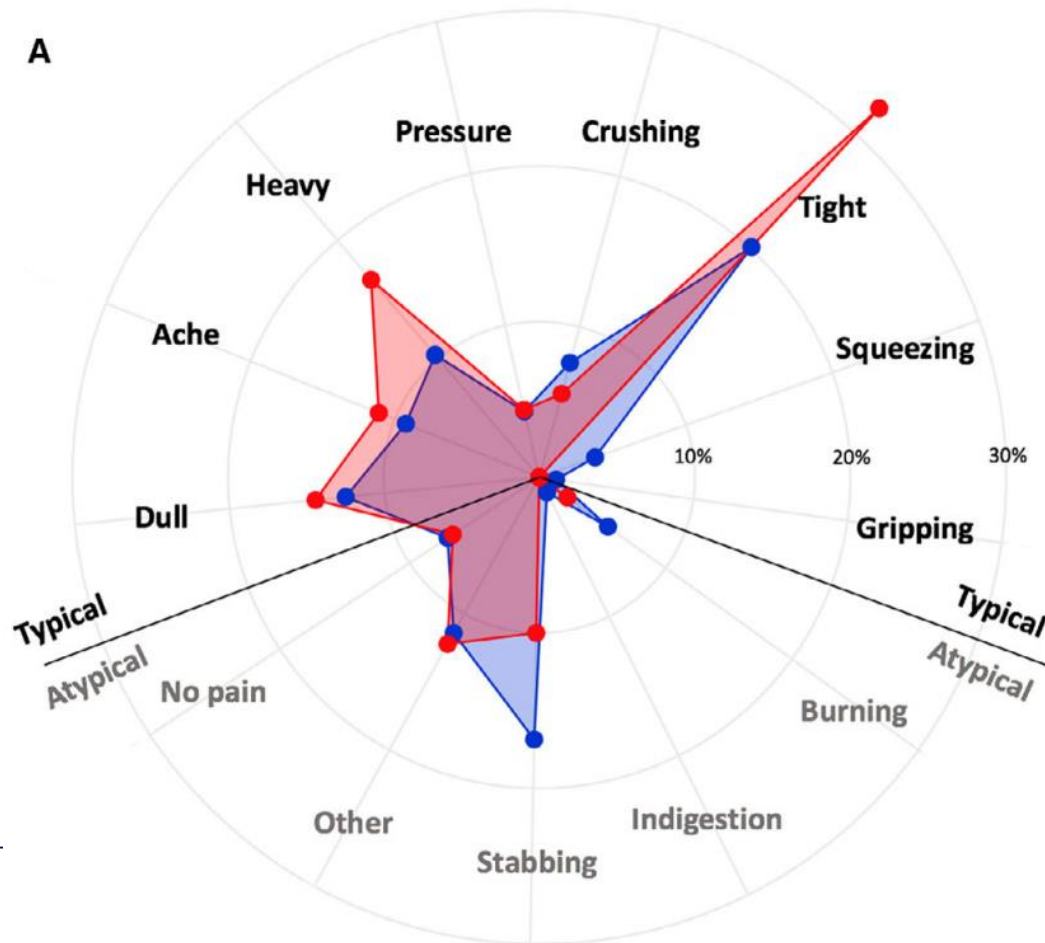
JAMA Neurol. 2019;76(8):962-968.



Presenting Symptoms in Men and Women Diagnosed With Myocardial Infarction Using Sex-Specific Criteria

Amy V. Ferry, BSc;* Atul Anand, MD, PhD;* Fiona E. Strachan, PhD; Leanne Mooney, MD; Stacey D. Stewart, MN; Lucy Marshall, BSc; Andrew R. Chapman, MD, PhD; Kuan Ken Lee, MD; Simon Jones, MD; Katherine Orme, MD; Anoop S. V. Shah, MD, PhD; Nicholas L. Mills, MD, PhD

J Am Heart Assoc. 2019;8:



What happens after an accurate diagnosis?

S.L. Gall, PhD
G. Donnan, MD
H.M. Dewey, PhD
R. Macdonell, MD
J. Sturm, PhD
A. Gilligan, PhD
V. Srikanth, PhD
A.G. Thrift, PhD

Sex differences in presentation, severity,
and management of stroke in a population-
based study

Neurology® 2010;74:975-981

NEUROLOGY 2005;65:855-858



Gender comparisons of diagnostic evaluation for ischemic stroke patients

Melinda A. Smith, MPH; Lynda D. Lisabeth, PhD; Devin L. Brown, MD; and Lewis B. Morgenstern, MD



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Thrombolysis: less women receive tPA compared to men despite similar eligibility

Sex differences in the evaluation and treatment of acute ischaemic stroke

Lancet Neurol 2018; 17: 641-50

Cheryl Bushnell, Virginia J Howard, Lynda Lisabeth, Valeria Caso, Seana Gall, Dawn Kleindorfer, Seemant Chaturvedi, Tracy E Madsen, Stacie L Demel, Seung-Jae Lee, Mathew Reeves

Analysis of Tissue Plasminogen Activator Eligibility by Sex in the Greater Cincinnati/Northern Kentucky Stroke Study

Tracy E. Madsen, MD, ScM; Jane C. Khoury, PhD; Kathleen A. Alwell, BSN;
Charles J. Moomaw, PhD; Brett M. Kissela, MD, MS; Felipe De Los Rios La Rosa, MD;
Daniel Woo, MD, MS; Opeolu Adeoye, MD, MS; Matthew L. Flaherty, MD;
Pooja Khatri, MD; Simona Ferioli, MD; Dawn Kleindorfer, MD

Stroke. 2015;46:717-721. DOI: 10.1161/ STROKEAHA.114.006737.



Are women “appropriately” not treated?

Differences in stroke outcome based on sex

N. Shobha, DM

P.N. Sylaja, MD

M.K. Kapral, MD,
FRCPC

J. Fang, PhD

M.D. Hill, MD, MSc,
FCPC

For the Investigators of
the Registry of the
Canadian Stroke
Network

- Observational study
- Outcomes were similar among patients treated with tPA
- Women had worse outcomes compared to men in patients not treated with tPA

Neurology[®] 2010;74:767-771



Are women less likely to benefit from EVT?

Does Sex Modify the Effect of Endovascular Treatment for Ischemic Stroke?

A Subgroup Analysis of 7 Randomized Trials

Vicky Chalos, MD; Inger R. de Ridder, MD, PhD; Hester F. Lingsma, PhD; Scott Brown, PhD; Robert J. van Oostenbrugge, MD, PhD; Mayank Goyal, MD, PhD; Bruce C.V. Campbell, PhD; Keith W. Muir, MD; Francis Guillemin, MD, PhD; Serge Bracard, MD; Philip White, MD; Antoni Dávalos, MD; Tudor G. Jovin, MD; Michael D. Hill, MD; Peter J. Mitchell, MD; Andrew M. Demchuk, MD; Jeffrey L. Saver, MD; Wim H. van Zwam, MD, PhD; Diederik W.J. Dippel, MD, PhD; on behalf of the HERMES Collaborators

Sex Differences in Outcome After Endovascular Stroke Therapy for Acute Ischemic Stroke

Sunil A. Sheth, MD; Songmi Lee, MS; Steven J. Warach, MD; Jan Gralla, MD; Reza Jahan, MD; Mayank Goyal, MD, PhD; Raul G. Nogueira, MD; Osama O. Zaidat, MD; Vitor M. Pereira, MD; Adnan Siddiqui, MD; Helmi Lutsep, MD; David S. Liebeskind, MD; Louise D. McCullough, MD, PhD; Jeffrey L. Saver, MD

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Are women less likely to access EVT?

Sex Differences in Management and Outcomes of Acute Ischemic Stroke With Large Vessel Occlusion

Kazutaka Uchida, MD, PhD; Shinichi Yoshimura, MD, PhD; Nobuyuki Sakai, MD, PhD;
Hiroshi Yamagami, MD, PhD; Takeshi Morimoto, MD, PhD, MPH;
RESCUE-Japan Registry 2 Investigators

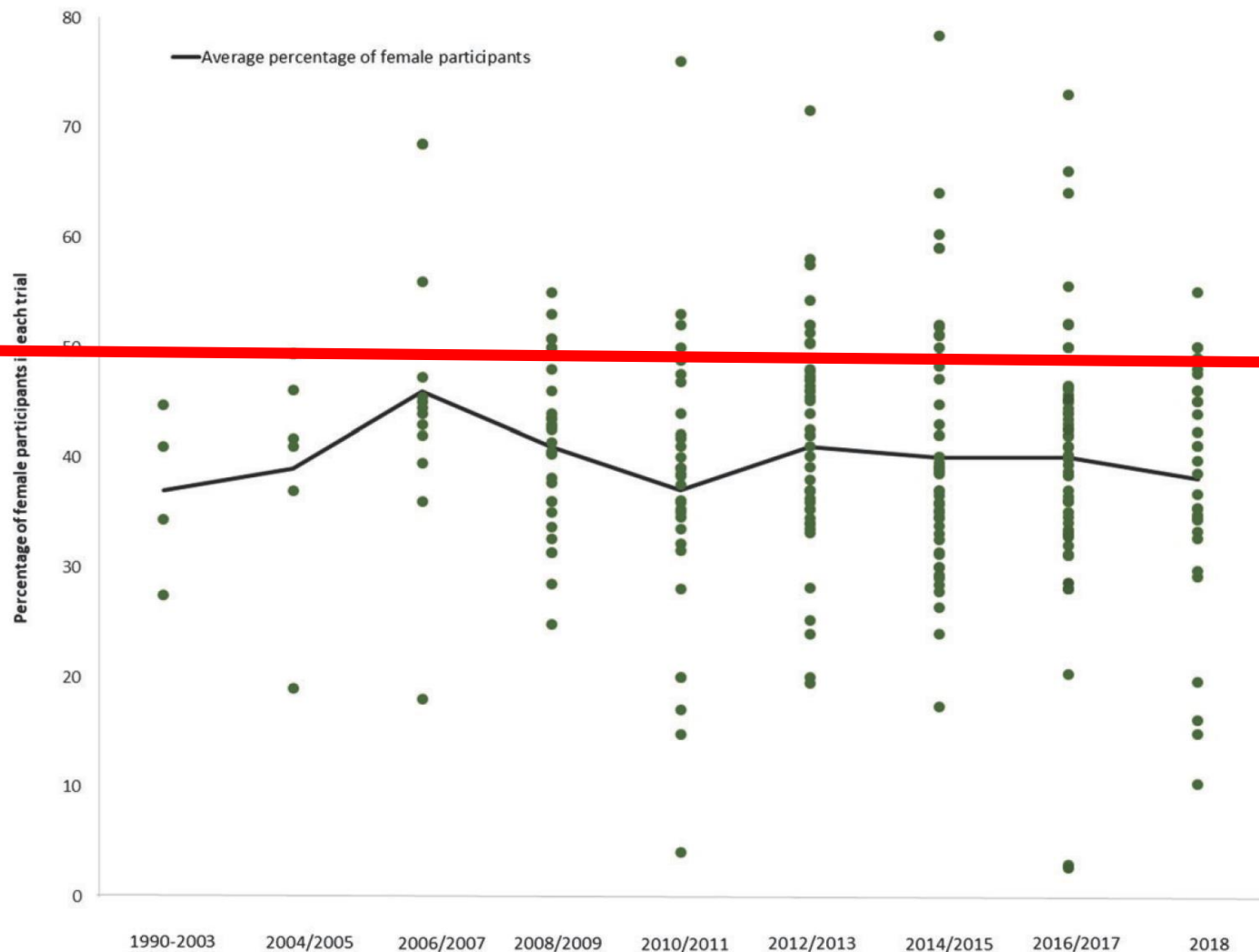
Stroke. 2019;50:1915-1918.



Trends in recruitment of women and reporting of sex differences in large-scale published randomized controlled trials in stroke

Cheryl Carcel^{1,2} , Mark Woodward^{1,3,4}, Grace Balicki¹,

Figure 2. Temporal trend of included female participants in large-scale stroke randomized controlled trials. There were only four identified papers before 2003, so these were grouped together with the one paper from 2002 into a single category (1990–2003).



Are women less likely to consent?

RESEARCH

Open Access



Who says “no” to participating in stroke clinical trials and why: an observational study from the Vancouver Stroke Program

Zoe R. O'Neill¹, Halina M. Deptuck¹, Lauren Quong^{1,5}, Genoveva Maclean¹, Karina Villaluna¹, Princess King-Azote¹, Mukul Sharma^{2,6}, Ken Butcher³, Robert G. Hart² and Thalia S. Field^{1,4*} 



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