



# Sex Differences in Stroke Outcome for Octogenarians Receiving Statins

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## Background

- Age is the strongest independent risk factor for acute ischemic stroke (AIS)
- Older adult women have higher incidence of stroke and poorer functional outcomes than men
- HMG-CoA reductase inhibitors (statins) shown to improve outcomes in non-elderly patients with coronary heart disease and AIS
- Proposed mechanisms extend beyond lipid reduction to neuroprotective effects
- Previous investigations have found that non-elderly patients who were on statins at the onset of their AIS showed improved outcomes compared to those not on statins
- Less data available on influence of statins on stroke outcomes in elderly patients and possible sex differences

## Methods

- Retrospective review of the Stroke Center at Hartford Hospital (SCHH) database from October 2005 to December 2009
- SCHH is certified by the Joint Commission of Accreditation of Healthcare Organizations (JCAHO) as a Primary Stroke Center and serves as a tertiary referral center
- Compared AIS patients aged  $\geq 80$  years to counterparts aged  $<80$  years admitted to the SCHH
- Parameters:
  - Rate of statin use
  - Stroke severity using NIH Stroke Scale (NIHSS)
  - In-hospital outcomes
  - Modified Barthel Index

## Demographics of patients with AIS

	Age $<80$ years	Age $\geq 80$
Patients	1483 (66%)	771 (34%)
Mean age	63 $\pm$ 12	86 $\pm$ 5
Sex		
Males	809 (55%)	285 (37%)
Females	674 (45%)*	486 (63%)*
LDL	94 $\pm$ 43*	85 $\pm$ 36*
(-) statin	103 $\pm$ 41 <sup>†</sup>	92 $\pm$ 37 <sup>#</sup>
(+) statin	81 $\pm$ 40 <sup>†</sup>	74 $\pm$ 34 <sup>#</sup>
Warfarin use	153 (10%)*	151 (19%)*
(-) statin	57 (10%) <sup>†</sup>	65 (18%)
(+) statin	89 (15%) <sup>†</sup>	69 (23%)
Diabetes	487 (32%)*	190 (24%)*
(-) statin	156 (28%) <sup>†</sup>	76 (21%) <sup>#</sup>
(+) statin	273 (45%) <sup>†</sup>	102 (34%) <sup>#</sup>
Hypertension	1095 (73%)*	655 (85%)*
(-) statin	422 (77%) <sup>†</sup>	316 (88%)
(+) statin	505 (84%) <sup>†</sup>	260 (86%)
Heart Disease	541 (36%)*	352 (45%)*
(-) statin	176 (32%) <sup>†</sup>	138 (38%) <sup>#</sup>
(+) statin	304 (51%) <sup>†</sup>	179 (59%) <sup>#</sup>
Atrial Fibrillation	266 (17%)*	357 (46%)*
(-) statin	107 (19%)	175 (49%)
(+) statin	124 (20%)	138 (46%)
Prestroke mBI $\geq 15$	949 (95%)*	400 (86%)*
(-) statin	451 (96%)	206 (83%)
(+) statin	498 (95%)	194 (89%)

Figures in parentheses are percentages, \*,<sup>†</sup>,<sup>#</sup> p < 0.05;  $\chi^2$  test.

## Rates of Statin Treatment

	Age $<80$	Age $\geq 80$
Statin	595 (52%)*	300 (46%)*
Male	322 (53%)	119 (51%)
Female	273 (51%) <sup>#</sup>	181 (43%) <sup>#</sup>

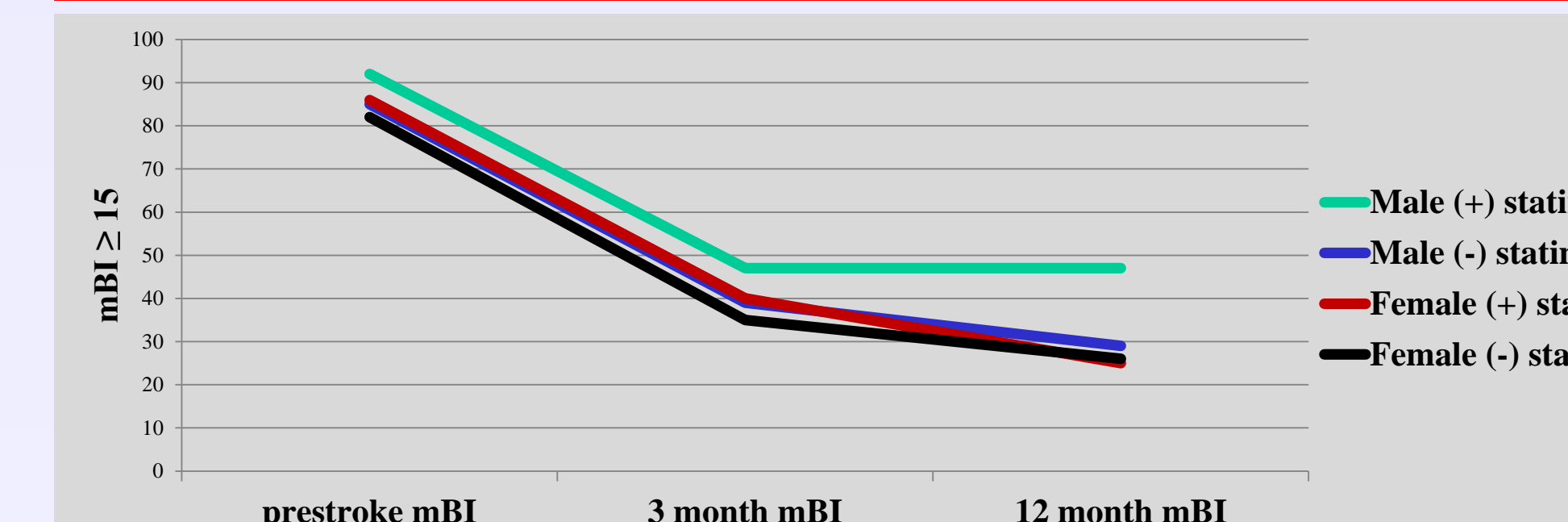
Figures in parentheses are percentages, \* p < 0.05; <sup>#</sup> p = .06;  $\chi^2$  test.

## Demographics of elderly patients with AIS

	Male	Female
Patients	285 (37%)	486 (63%)
Mean age	85 $\pm$ 4*	87 $\pm$ 4*
LDL	83 $\pm$ 35	86 $\pm$ 36
(-) statin	94 $\pm$ 37 <sup>†</sup>	91 $\pm$ 36 <sup>#</sup>
(+) statin	70 $\pm$ 30 <sup>†</sup>	77 $\pm$ 36 <sup>#</sup>
Warfarin use	54 (18%)	97 (20%)
(-) statin	22 (19%)	43 (17%)
(+) statin	26 (21%)	43 (23%)
Diabetes	78 (27%)	112 (23%)
(-) statin	25 (21%) <sup>†</sup>	51 (21%) <sup>#</sup>
(+) statin	46 (38%) <sup>†</sup>	56 (30%) <sup>#</sup>
Hypertension	231 (81%)*	424 (87%)*
(-) statin	95 (81%)	221 (91%)
(+) statin	102 (85%)	158 (87%)
Heart Disease	162 (56%)*	190 (39%)*
(-) statin	57 (49%) <sup>†</sup>	81 (33%) <sup>#</sup>
(+) statin	85 (71%) <sup>†</sup>	94 (51%) <sup>#</sup>
Atrial Fibrillation	115 (40%)*	242 (49%)*
(-) statin	56 (48%)	119 (49%)
(+) statin	47 (39%)	91 (50%)
Prestroke mBI $\geq 15$	164 (89%)	236 (84%)
(-) statin	78 (85%)	128 (82%)
(+) statin	86 (92%)	108 (86%)

Figures in parentheses are percentages, \*,<sup>†</sup>,<sup>#</sup> p < 0.05;  $\chi^2$  test.

## Functional Outcomes following AIS



## Short- and long-term Outcomes in elderly AIS patients

	Male	Female
Admission NIHSS (Median)		
(-) statin	7.0 (3-15.75)*	9.0 (3-17)
(+) statin	4.5 (2-10)*	7.0 (2-18)
Decrease in NIHSS $\geq 4$	37 (25%)	53 (19%)
(-) statin	17 (24%)	34 (22%)
(+) statin	20 (26%)	19 (15%)
mBI $\geq 15$ at 3 months	88 (43%)	135 (37%)
(-) statin	40 (39%)	70 (35%)
(+) statin	48 (47%)	65 (40%)
mBI $\geq 15$ at 1 year	65 (38%)	81 (26%)
(-) statin	26 (29%)*	47 (26%)
(+) statin	39 (47%)*	34 (25%)
In-hospital Mortality	48 (20%)*	127 (30%)*
(-) statin	25 (21%)	70 (29%)
(+) statin	23 (19%) <sup>†</sup>	57 (31%) <sup>†</sup>

Figures in parentheses are interquartile range and percentages, \*,<sup>†</sup> p < 0.05;  $\chi^2$  test.

## Conclusions

- Pre-stroke statin use in men 80 years and older is associated with improved stroke severity and 12 month mBI
- Elderly women have the most severe strokes and highest hospital mortality. Outcomes are not influenced by pretreatment with statins
- Sex-based differences in stroke pathophysiology including a greater proportion of cardioembolic versus atherothrombotic strokes in elderly women may explain lack of response to statins

