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Supporting Information

Supplementary methods and results

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Appendix to: Wang X, Carcel C, Hsu B, et al. Differences in the pre-hospital management of women and men with stroke by emergency medical services in New South Wales. *Med J Aust* 2022; doi: 10.5694/mja2.51652.

Table 1. Clinical studies assessing sex differences in the use of emergency medical services

	Location	Design	Stroke subtype	Arrival by ambulance		Study findings
				Women	Men	
Reeves et al, 2009[1]	USA (national registry)	Consecutive cases from 1139 hospitals (Get With The Guidelines programme)	Ischaemic stroke	121278/201706 (60.1%)	103108/181612 (56.8%)	Women were more likely than men to use emergency medical services
Smith et al, 2010[2]	Corpus Christi, Texas, USA	Population-based study	Ischaemic stroke	281/597 (47%)	258/537 (48%)	Women were less likely than men to present to the hospital within 3 hours. But no sex differences in emergency medical services activation
Nagajara et al, 2012[3]	Michigan, USA	Retrospective charts review of 10 hospitals	Ischaemic stroke	202/320 (63.1%)	152/282 (53.9%)	Women were more likely than men to use emergency medical services
Chenaitia et al, 2013[4]	Marseille, France	Retrospective observational study of 3 hospitals	Ischaemic stroke or transient ischaemic attack	341/471 (72.4%)	319/460 (69.3%)	No sex differences in emergency medical services activation
Kuster et al, 2013[5]	São Paulo, Brazil	Prospective consecutive patients from 1 hospital	Ischaemic stroke	12/65 (18.5%)	17/100 (17%)	No sex differences in emergency medical services activation
Park et al, 2013[6]	Korea	Prospective observational study of 23 hospitals	Stroke	585/2830 (20.7%)	695/3805 (18.3%)	No sex differences in emergency medical services activation. But women were less likely than men to have an early hospital presentation
Price et al, 2013[7]	North East, England	Prospective consecutive patients from 12 hospitals	Ischaemic stroke	1077/1316 (81.8%)	925/1224 (75.6%)	No sex differences in emergency medical services activation
Gattringer et al, 2014[8]	Austria	Prospective consecutive patients from 35 hospitals	Ischaemic stroke or transient ischaemic attack	16338/22329 (73.2%)*	16227/24880 (65.2%)*	Women were more likely than men to use emergency medical services
Malek et al, 2014[9]	South Carolina, USA	A sample from 13 telemedicine center	Stroke	39/90 (43.3%)	55/107 (51.4%)	No sex differences in emergency medical services activation
Govindarajan et al, 2015[10]	California, USA	Cross-sectional observational study from 14 hospitals	Stroke	2093/4948 (42.3%)	1694/4264 (39.7%)	Women were less likely to be recognized as a stroke in the prehospital setting

	Location	Design	Stroke subtype	Arrival by ambulance		Study findings
				Women	Men	
Mochari-Greenberger et al, 2015[11]	USA	Consecutive admission to 1613 Get With The Guidelines–Stroke participating hospitals	Stroke	121719/200995 (60.6%)	112175/197804 (56.7%)	White women were most likely to use emergency medical services, Hispanic men were least likely to use emergency medical services
Song et al 2015[12]	Korea and Japan	Prospective consecutive patients from 2 hospitals	Ischaemic stroke	786	1180	No sex differences in the early presentation to the hospital
Madsen et al 2016[13]	Greater Cincinnati/Northern Kentucky, USA	Prospective consecutive patients from 15 hospitals	Ischaemic stroke	476/1097 (43%)	393/894 (44%)	Women were less likely than men to have an early hospital presentation
Park et al 2016[14]	Korea	Prospective consecutive patients from 23 hospitals	Ischaemic stroke	3039/8627 (35.2%)	3972/12153 (32.7%)	No sex differences in the time of presentation to the hospital
Yin et al 2016[15]	Hubei, China	Cross-sectional study of 66 hospitals	Ischaemic stroke	129/779 (16.6%)	192/1311 (14.6%)	No sex differences in emergency medical services activation
Anderson et al 2018[16]	Sweden	Retrospective observational study of 1 hospital	Stroke	225	229	No sex differences in emergency medical services activation
Bhaskar et al 2019[17]	Sydney, Australia	Population-based study	Stroke	1611	1926	No sex differences in the time in the time of presentation to the hospital
Dimitriou et al 2019[18]	Thessaloniki, Greece	Prospective observational study of 1 hospital	Ischaemic stroke	386	296	No sex differences in the time of presentation to the hospital

*include ambulance and helicopter

We searched MEDLINE for papers published in English between Jan 1, 2018, and Dec 9, 2020 using the terms "cerebrovascular accident.mp. or exp Stroke/" AND ("exp emergency medical service communication systems/" OR "exp emergency medical dispatch/" OR "exp emergency medical dispatcher/" OR "exp emergency medical services")

For the papers prior to 2018, we extracted the data from Bushnell C et al 2018.[19]

Table 2. Variation of ambulance stroke management protocols

Protocol Year	Protocols advised	Other notes	Major change
2011	F2 (primary survey), C11	FAST assessment Treat associated conditions Urgent transport Aim to have patient in hospital within 3 hours of symptom onset	
2014	A2, C11	Generally same as above	a FAST assessment is required Blood sugar level 4-22mmol became part of notification criteria Early alert to ED
2015	A2, C11	Generally same as above	
2016	A2, C11	Generally same as above	
2018	A2, C11 and first time C11P appears.	C11P advises to go to the nearest hospital within 90minutes, in the order of acute thrombolytic unit, acute stroke unit, nearest ED (in other words, you can bypass the nearest ED if your thrombolytic unit is within 90mins)	Transport time for FAST positive and mandatory hyperacute stroke protocol is now 90mins Treat low blood sugar according to protocol M21 if needed

ED: emergency department; FAST: Facial drooping, Arm weakness, Speech difficulties, and Time

Table 3. Baseline characteristics of patients admitted with a diagnosis of stroke

	Total	Women	Men
Arrival by ambulance			
No	100874(49.9%)	46907(47.6%)	53967(52.1%)
Yes	101357(50.1%)	51692(52.4%)	49665(47.9%)
Age, mean (Standard Deviation)	73(14)	75(14.7)	71(13.7)
0-39	5433(2.7%)	2779(2.8%)	2654(2.6%)
40-69	66636(33.0%)	27231(27.6%)	39405(38.0%)
70+	130161(64.4%)	68589(69.6%)	61572(59.4%)
Country of birth			
Australia	140028(69.4%)	69799(70.9%)	70229(67.9%)
Other	61870(30.6%)	28641(29.1%)	33229(32.1%)
Marital status			
With partner	108254(53.5%)	39385(39.9%)	68869(66.5%)
Without partner	89422(44.2%)	56931(57.7%)	32491(31.4%)
Unknown	4555(2.3%)	2283(2.3%)	2272(2.2%)
Aboriginal or Torres Strait Islander			
Yes	3096(1.5%)	1609(1.6%)	1487(1.4%)
No	197423(97.7%)	96170(97.6%)	101253(97.7%)
Did not respond	1641(0.8%)	776(0.8%)	865(0.8%)
Region			
Urban	139022(70.4%)	68504(71.0%)	70518(69.9%)
Regional	57651(29.2%)	27670(28.7%)	29981(29.7%)
Remote	808(0.4%)	358(0.4%)	450(0.5%)
Stroke subtype			
Ischaemic stroke	62818(31.1%)	29237(29.7%)	33581(32.4%)
Intracerebral haemorrhage	15646(7.7%)	7611(7.7%)	8035(7.8%)
Subarachnoid haemorrhage	6495(3.2%)	3952(4.0%)	2543(2.5%)
Transient ischaemic stroke	70412(34.8%)	35766(36.3%)	34646(33.4%)
Occlusion and stenosis of prevertebral arteries	21223(10.5%)	9042(9.2%)	12181(11.8%)
Undetermined	25637(12.7%)	12991(13.2%)	12646(12.2%)

Table 4. Ambulance response and transport time for patients subsequently admitted to hospital with diagnosis of stroke, for 43308 patients with ambulance electronic medical records

	Unadjusted analyses			Multiple adjusted analyses*		
	Women	Men	Difference (95% CI)	Women	Men	Adjusted difference (95% CI)
Time between call and case complete (seconds), mean (95% CI)	5533 (5507.9-5558)	5544 (5518.8-5568.6)	-10.8 (-46.1 to 24.6)	5534 (5288.2-5580.7)	5438 (5291-5584.2)	-3.1 (-39.1 to 32.8)

CI = confidence interval.

* Adjusted for age (continuous), marital status, country of birth, Indigenous status, region, year of stroke onset and stroke subtype.

Table 5. Baseline characteristics, by source of information for patients admitted with a diagnosis of stroke

	Source of information	
	Electronic medical record	Patient health care record
Age, mean (Standard Deviation)	75.0(14.3)	75.8(13.5)
0-39	973(2.3%)	1068(1.8%)
40-69	12303(28.4%)	14866(25.6%)
70+	30032(69.4%)	42114(72.6%)
Sex		
Female	21795(50.3%)	29897(51.5%)
Male	21513(49.7%)	28152(48.5%)
Country of birth		
Australia	29810(69.0%)	39868(68.8%)
Others	13384(31.0%)	18103(31.2%)
Marital status		
With partner	22154(51.2%)	28123(48.5%)
Without partner	20544(47.4%)	28544(49.2%)
Unknown	610(1.4)	1382(2.4)
Aboriginal or Torres Strait Islander		
Yes	826(1.9%)	721(1.2%)
No	42224(97.5%)	56706(97.7%)
Did not respond	253(0.6%)	600(1.0%)
Region		
Urban	28955(68.3%)	41595(73.2%)
Regional	13276(31.3%)	15034(26.5%)
Remote	138(0.3%)	167(0.3%)
Stroke subtype		
Ischaemic stroke	17444(40.3%)	21338(36.8%)
Intracerebral haemorrhage	4788(11.1%)	6193(10.7%)
Subarachnoid haemorrhage	2011(4.6%)	2332(4.0%)
Transient ischaemic stroke	11753(27.1%)	16373(28.2%)
Occlusion and stenosis of prevertebral arteries	2237(5.2%)	2844(4.9%)
Not determined	5075(11.7%)	8969(15.5%)

Table 6. Assessment by emergency medical services of patients subsequently admitted to hospital with principal diagnosis of stroke (patients with ambulance electronic medical records only)

Final assessment	Women	Men	Unadjusted analyses	Multiple adjusted analyses*
			OR (95%CI)	OR (95%CI)
Total number	21795	21513		
Acute coronary syndrome	100(0.5%)	146(0.7%)	0.67(0.52-0.87)	0.68(0.53-0.89)
Acute myocardial infarction	15(0.1%)	18(0.1%)	0.82(0.41-1.63)	0.80(0.39-1.64)
Acute pulmonary oedema	14(0.1%)	11(0.1%)	1.26(0.57-2.77)	1.12(0.49-2.56)
Anxiety	118(0.5%)	46(0.2%)	2.54(1.81-3.57)	2.94(2.06-4.20)
Arrhythmia	104(0.5%)	113(0.5%)	0.91(0.7-1.19)	0.90(0.68-1.18)
Cardiac arrest	60(0.3%)	56(0.3%)	1.06(0.73-1.52)	0.85(0.58-1.25)
Collapse	133(0.6%)	128(0.6%)	1.03(0.8-1.31)	0.96(0.74-1.23)
Dizzy	544(2.5%)	676(3.1%)	0.79(0.7-0.88)	0.80(0.71-0.90)
Emotional distress	20(0.1%)	8(0.0%)	2.47(1.09-5.61)	2.63(1.14-6.03)
Faint	188(0.9%)	156(0.7%)	1.19(0.96-1.47)	1.09(0.87-1.36)
Headache	738(3.4%)	529(2.5%)	1.39(1.24-1.56)	1.32(1.17-1.49)
Hyperglycaemia	98(0.4%)	118(0.5%)	0.82(0.63-1.07)	0.88(0.67-1.15)
Hypoglycaemia	36(0.2%)	56(0.3%)	0.63(0.42-0.96)	0.67(0.44-1.03)
Hypertension	403(1.8%)	274(1.3%)	1.46(1.25-1.7)	1.44(1.23-1.69)
Hypotension	53(0.2%)	76(0.4%)	0.69(0.48-0.98)	0.60(0.42-0.87)
Hyperventilation	21795 (100.0%)	21513 (100.0%)	-	
Migraine	72(0.3%)	21(0.1%)	3.39(2.08-5.52)	3.61(2.18-6.00)
Mobility problem	153(0.7%)	212(1.0%)	0.71(0.58-0.88)	0.60(0.49-0.75)
Nausea	152(0.7%)	110(0.5%)	1.37(1.07-1.75)	1.39(1.08-1.78)
No problem identified	676(3.1%)	679(3.2%)	0.98(0.88-1.09)	0.95(0.85-1.06)
Pain	495(2.3%)	428(2.0%)	1.14(1-1.3)	1.13(0.99-1.29)
Psychiatric episode	11(0.1%)	10(0.0%)	1.09(0.46-2.56)	1.26(0.53-2.99)
Seizure	89(0.4%)	103(0.5%)	0.85(0.64-1.13)	0.91(0.67-1.22)
Unconscious	256(1.2%)	158(0.7%)	1.61(1.32-1.96)	1.48(1.20-1.82)
Unknown problem	1596(7.3%)	1555(7.2%)	1.01(0.94-1.09)	1.03(0.95-1.11)
Vertigo	171(0.8%)	215(1.0%)	0.78(0.64-0.96)	0.80(0.65-0.98)
Visual disturbance	118(0.5%)	161(0.7%)	0.72(0.57-0.92)	0.72(0.56-0.92)
Vomiting	213(1.0%)	190(0.9%)	1.11(0.91-1.35)	1.12(0.92-1.38)
Weakness	825(3.8%)	911(4.2%)	0.89(0.81-0.98)	0.92(0.84-1.02)
Stroke	7392(33.9%)	7645(35.5%)	0.93(0.89-0.97)	0.97(0.93-1.01)
Subarachnoid haemorrhage	44(0.2%)	25(0.1%)	1.74(1.06-2.84)	1.22(0.73-2.03)
Transient ischaemic attack	1896(8.7%)	2012(9.4%)	0.92(0.86-0.99)	0.89(0.83-0.96)

CI: confidence interval OR: odds ratio

* Adjusted for age (continuous), marital status, country of birth, Indigenous status, region, year of stroke onset and stroke subtype.

Table 7. Management protocols and treatments administered by emergency medical services for people subsequently admitted to hospital with principal diagnosis of stroke

	Women	Men	Unadjusted analyses	Multiple adjusted analyses*
Protocol			OR(95%CI)	OR(95%CI)
Basic patient care	33941(65.7%)	32423(65.3%)	1.02(0.99-1.04)	1.01(0.99-1.04)
Stroke care	25580(49.5%)	25501(51.4%)	0.93(0.91-0.95)	0.95(0.92-0.97)
Cardiac arrest	176(0.3%)	136(0.3%)	1.24(0.99-1.56)	1.06(0.84-1.33)
Management				
Aspirin	832(1.6%)	1143(2.3%)	0.69(0.63-0.76)	0.73(0.67-0.81)
Oxygen therapy	17451(33.8%)	17032(34.3%)	0.98(0.95-1.00)	0.99(0.96-1.01)
Ventilation	46(0.1%)	33(0.1%)	1.34(0.86-2.10)	1.13(0.71-1.81)

CI: confidence interval; OR: odds ratio.

* Adjusted for age (continuous), marital status, country of birth, Indigenous status, region, year of stroke onset and stroke subtype.

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