

Online Only Supplemental Material

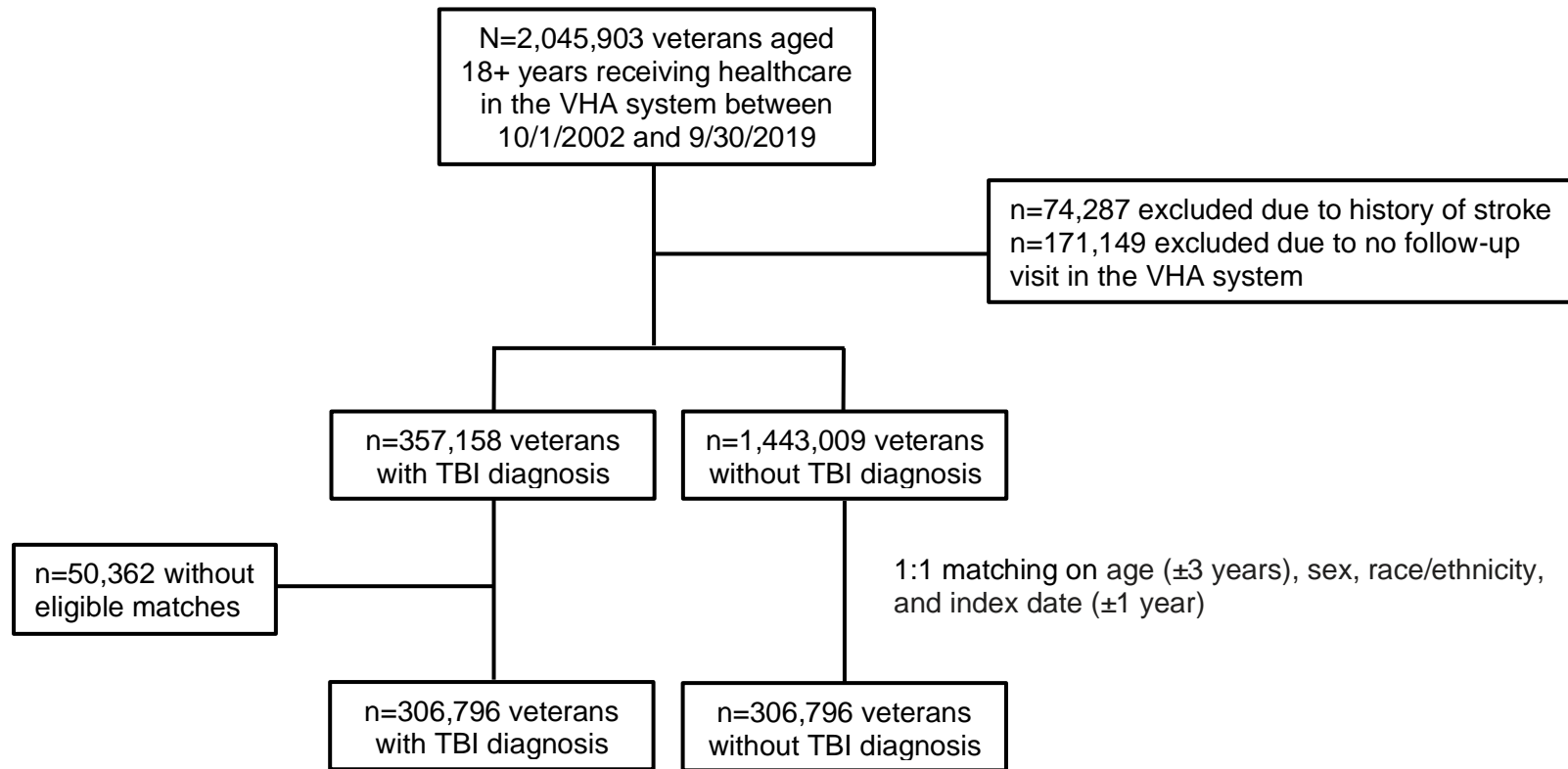
Traumatic Brain Injury and Long-Term Risk of Stroke Among U.S. Military Veterans

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Supplemental Figure 1. Participant Flow Diagram.



Supplemental Table 1. Stroke ICD Codes.

	ICD-9 Codes	ICD-10 Codes
Ischemic Stroke	362.30 – Retinal vascular occlusion, unspecified 362.31 – Central retinal artery occlusion 362.32 – Retinal artery branch occlusion 362.33 – Partial retinal artery occlusion 433.x1 – Occlusion and stenosis of precerebral arteries 434.x1 – Occlusion, thrombosis, embolism of cerebral arteries 436 – Acute, but ill-defined, cerebrovascular disease	H34.1x – Central retinal artery occlusion H34.2x – Other retinal artery occlusions H34.23x – Other retinal artery occlusions I63.x – Cerebral infarction due to thrombosis, embolism, occlusion, or stenosis of artery I63.xx – Cerebral infarction due to thrombosis, embolism, occlusion, or stenosis of artery I63.xxx – Cerebral infarction due to thrombosis, embolism, occlusion, or stenosis of artery
Hemorrhagic Stroke	430 – Subarachnoid hemorrhage 431 – Intracerebral hemorrhage	I60.x – Subarachnoid hemorrhage I60.xx – Subarachnoid hemorrhage I61.x – Intracerebral hemorrhage

Supplemental Table 2. Risk of Stroke by Traumatic Brain Injury (TBI) Status, Adding Adjustment for Index Date as Covariate.

	Veterans Without TBI	Veterans With TBI
Any Stroke		
No. Events / No. PYs	10,297 / 1,811,490	18,435 / 1,787,238
Unadjusted Incidence Rate per 1,000 PYs (95% CI)	5.7 (5.4-6.0)	10.3 (10.0-10.7)
Adjusted* Cox proportional hazards model, HR (95% CI)	1 (Reference)	1.81 (1.76-1.85)
Adjusted* Fine-Gray proportional hazards model, HR (95% CI)	1 (Reference)	1.67 (1.63-1.72)
Ischemic Stroke		
No. Events / No. PYs	9,924 / 1,812,455	16,645 / 1,795,283
Unadjusted Incidence Rate per 1,000 PYs (95% CI)	5.5 (5.2-5.7)	9.3 (8.9-9.6)
Adjusted* Cox proportional hazards model, HR (95% CI)	1 (Reference)	1.68 (1.63-1.72)
Adjusted* Fine-Gray proportional hazards model, HR (95% CI)	1 (Reference)	1.55 (1.51-1.59)
Hemorrhagic Stroke		
No. Events / No. PYs	660 / 1,848,365	2,603 / 1,851,144
Unadjusted Incidence Rate per 1,000 PYs (95% CI)	0.4 (0.3-0.4)	1.4 (1.3-1.5)
Adjusted* Cox proportional hazards model, HR (95% CI)	1 (Reference)	3.92 (3.58-4.29)
Adjusted* Fine-Gray proportional hazards model, HR (95% CI)	1 (Reference)	3.66 (3.34-4.00)

Abbreviations: No., number; PYs, person years; HR, hazard ratio

*Model adjusted for demographics (age, sex, race/ethnicity, income, education, and current smoking), medical comorbidities (hypertension, hyperlipidemia, diabetes, coronary artery disease, and atrial fibrillation), psychiatric comorbidities (post-traumatic stress disorder and depression), and index date.

Supplemental Table 3. Risk of Stroke by Traumatic Brain Injury (TBI) Status, Accounting for the Variation Between Matched Pairs.

	Veterans Without TBI	Veterans With TBI
Any Stroke		
No. Events / No. PYs	10,297 / 1,811,490	18,435 / 1,787,238
Unadjusted Incidence Rate per 1,000 PYs (95% CI)	5.7 (5.4-6.0)	10.3 (10.0-10.7)
Adjusted* Cox proportional hazards shared-frailty model, HR (95% CI)	1 (Reference)	1.78 (1.74-1.83)
Adjusted* Cox proportional hazards shared-frailty model using methods described by Wolber et al ^{1,2} to account for the competing risk of mortality, HR (95% CI)	1 (Reference)	1.62 (1.58-1.67)
Ischemic Stroke		
No. Events / No. PYs	9,924 / 1,812,455	16,645 / 1,795,283
Unadjusted Incidence Rate per 1,000 PYs (95% CI)	5.5 (5.2-5.7)	9.3 (8.9-9.6)
Adjusted* Cox proportional hazards shared-frailty model, HR (95% CI)	1 (Reference)	1.66 (1.61-1.70)
Adjusted* Cox proportional hazards shared-frailty model using methods described by Wolber et al ^{1,2} to account for the competing risk of mortality, HR (95% CI)	1 (Reference)	1.50 (1.47-1.55)
Hemorrhagic Stroke		
No. Events / No. PYs	660 / 1,848,365	2,603 / 1,851,144
Unadjusted Incidence Rate per 1,000 PYs (95% CI)	0.4 (0.3-0.4)	1.4 (1.3-1.5)
Adjusted* Cox proportional hazards shared-frailty model, HR (95% CI)	1 (Reference)	3.85 (3.51-4.20)
Adjusted* Cox proportional hazards shared-frailty model using methods described by Wolber et al ^{1,2} to account for the competing risk of mortality, HR (95% CI)	1 (Reference)	3.58 (3.28-3.92)

Abbreviations: No., number; PYs, person years; HR, hazard ratio

*Model adjusted for demographics (age, sex, race/ethnicity, income, education, and current smoking), medical comorbidities (hypertension, hyperlipidemia, diabetes, coronary artery disease, and atrial fibrillation) and psychiatric comorbidities (post-traumatic stress disorder and depression).

References:

¹Wolbers M, Koller MT, Wittelman JC, Steyerberg EW. Prognostic models with competing risks: methods and application to coronary risk prediction. *Epidemiology*. Jul 2009;20(4):555-61. doi:10.1097/EDE.0b013e3181a39056.

²Wolbers M, Blanche P, Koller MT, Wittelman JC, Gerds TA. Concordance for prognostic models with competing risks. *Biostatistics*. Jul 2014;15(3):526-39. doi:10.1093/biostatistics/kxt059.