

ORIGINAL CONTRIBUTION

Stroke Center Certification and Performance: A Longitudinal Analysis of the Northeast Cerebrovascular Consortium Region

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Background: The NorthEast Cerebrovascular Consortium (NECC†) was established in 2006 to improve stroke-systems-of-care models. **Methods:** This study evaluates the increase in stroke quality over time in NECC and Non-NECC regions, defined as the change in proportion of hospitals over time who received State or National Primary/Comprehensive Stroke Center (PSC/CSC) certification, participated in a national quality program (Get-With-The-Guidelines-Stroke (GWTG-S)), or received GWTG-S Performance Achievement Awards (PAA) from 2005-2013. Analysis of trends was performed (Cochran-Armitage/Cochran-Mantel-Haenszel tests; Generalized-Estimating Equations). As an exploratory analysis eight NECC region Departments of Health (DOH) were surveyed regarding perceptions of the NECC. **Results:** During the study period, there were 433.1 ± 10.2 vs 3986.4 ± 187.7 hospitals per year in the NECC vs non-NECC regions. Rate of growth per year increased in both groups for each measure but to a greater degree in the NECC vs Non-NECC regions: PSC/CSC (5.4%/yr vs 3.2%/yr), GWTG-S participation (5.0%/yr vs 2.9%/yr), and PAAs (5.2%/yr vs 2.1%/yr), with state-based certification growth also being higher in the NECC region (4.2%/yr vs 0.4%/yr; all comparisons $p < 0.0001$). After adjusting for year, significantly more NECC hospitals had PSC/CSC certification, GWTG-S participation, and GWTG-S PAAs than non-NECC sites (all analyses $p < 0.0001$). One hundred percent of NECC region DOHs were aware of the NECC and involved in functions, 87.5% indicated the NECC provided beneficial assistance. **Conclusions:** There has been a higher rate of growth of state certification contrasted to national PSC/CSC certification, and a higher rate of growth of participation and achievement in GWTG-S in the northeast region compared to other US regions.

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†Abbreviations: NECC, Northeast Cerebrovascular Consortium; PSC, Primary Stroke Center; CSC, Comprehensive Stroke Center; GWTG-S, Get-With-The-Guidelines Stroke; PAA, Performance Achievement awards.

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INTRODUCTION

Acute ischemic stroke is a leading cause of death and disability in the United States [1]. Regional variations exist in the delivery of healthcare to these patients and other populations [2-4]. “Geography is Destiny” is an established paradigm defining widespread and inexplicable variation in the delivery of healthcare across different communities [5,6]. Such differences can influence outcomes and may be due to social determinants of health, income inequality, variations in practice style and hospital capacity, or other differences in the effectiveness and efficiency of healthcare delivery systems [7]. A stroke-systems-of-care model (SSCM) [8] aims to reduce variability, enhance defect-free care, and ultimately translate the delivery of integrated best practices to the bedside across all phases of stroke care.

The NorthEast Cerebrovascular Consortium (NECC) was established in 2006 to promote and implement a stroke system of care model (SSCM) in the northeast, [9] uniting health care providers, public health officials and advocacy organizations in an eight state region (VT, NH, ME, RI, MA, CT, NY, NJ). The NECC focuses quality improvement (QI) efforts on six domains across the continuum of stroke care: primordial/primary prevention, community education, notification and response of emergency medical services (EMS), acute stroke treatment, subacute care and secondary prevention, and rehabilitation. The NECC also engages clinical leaders and state officials to effect system and policy changes aimed at accelerating the growth of stroke systems.

The NECC methods have been previously reported [9]. Currently, it supports stroke QI through a variety of mechanisms, including (1) holding an annual summit for member states; (2) supporting QI initiatives/research projects; (3) linking health care professionals within the region (*i.e.* hospital-to-hospital mentorship); (4) creating a forum for linking state department of health (DOH) officials to healthcare professionals (*i.e.* quarterly teleconferences; state round-table meetings at summit conference); (5) supporting DOH or grass-root stroke task forces; (6) supporting local stroke conferences or stake-holder meetings; (7) facilitating communication between stroke coordinators in the NECC region; and (8) creating a leadership group to semi-annually identify organizational priorities.

This study aims to assess whether implementation of the NECC has been associated with the growth of local stroke systems and improved stroke care quality in the northeast. Specifically, the following outcomes were evaluated comparing the NECC region to the rest of the country: (1) growth in the number of centers achieving state or national certification as a Primary Stroke Center (PSC) or a Comprehensive Stroke Center (CSC); (2) growth

of participation in Get With the Guidelines®– Stroke (GWTG-S); and (3) growth in attainment of GWTG-S Performance Achievement Awards (PAA). Additionally, as an exploratory analysis, a qualitative survey was performed of the eight NECC region Departments of Health assessing the impact of the NECC on regional SSCMs.

METHODS

The 1-year pre-NECC baseline time period was defined as 2005 given its creation in 2006. Outcomes of interest were assessed through 2013. The Yale Human Investigation Committee determined the study was exempt from Committee review on May 8, 2013. The University of Connecticut Institutional Review Board approved the Department of Health Survey.

Data Sources

Data on the overall number of acute care hospitals in the US was obtained from the Centers for Medicare and Medicaid Services (CMS) Hospital Compare Dataset [10]. This analysis included all CMS designated Acute Care Hospitals and Critical Access Centers (ACH/CAC) from January 1, 2005 through December 31, 2013. Children’s and Veteran’s Administration Hospitals were excluded. NECC vs Non-NECC region stratification was adapted from the US Census data regions [11]. The Non-NECC region comprised the South, Mid-West, West, and the state of Pennsylvania—a part of the US northeast census region but not part of the NECC.

National stroke center certification bodies during the study time period included the Joint Commission (JC), the Healthcare Facilities Accreditation Program (HFAP), and the Det Norske Veritas Management Systems Certification Program (DNV). Hospital certifications were obtained from TJC, HFAP, and DNV websites or personal correspondence. TJC began PSC certification in 2003 and CSC certification in 2012, while HFAP and DNV began each in 2006 and 2013, and 2009 and 2012 respectively [12-16].

Department of Public Health (DOH) certification programs that conducted their own certification inspections with on-site verification visits were included, as well as DOH programs requiring affidavit attestation of being certified, or fulfilling certification requirements, as a PSC/CSC by an accrediting organization. Information was collected via either DOH websites or personal correspondence. Understanding that states vary in their use of the terms designation and certification, the term “certification” will be used universally. It is to be noted, just as national entities have varied criteria for certification, state certification criteria and processes for maintenance of certification vary as well [17-23]. Over the study time

Table 1. Demographics of NECC vs Non-NECC Region (mean number and percentage over study time period).

Variable (SD)	NECC		Non-NECC	
	Mean (%)	SD	Mean (%)	SD
Number of CMS Hospitals	433.1	10.2	3986.4	187.7
Critical Access Hospitals*	45.1 (10.4)	8.2	903.2 (22.7)	216.6
Acute Care Hospitals*	388 (89.6)	15.2	3083.2 (77.3)	35.8
Hospital Ownership				
Government - Federal	5.7 (1.3)	3.7	112.1 (2.8)	150.9
Government - Hospital District or Authority*	5.8 (1.3)	7.4	453.25 (11.4)	53.2
Government – Local*	22.4 (5.2)	6.3	339.8 (8.6)	110.6
Government – State*	5.6 (1.3)	0.5	69.9 (17.7)	11
Proprietary*	14.3 (3.3)	4.6	728.3 (18.4)	40
Voluntary non-profit - Church	43 (9.9)	9	460 (11.6)	38.7
Voluntary non-profit - Other	85.7 (19.6)	36.1	671.8 (17.0)	59.5
Voluntary non-profit – Private*	250.9 (57.9)	34.5	1123.4 (28.4)	175.2
Physician Ownership	0 (0)	0	3 (0)	8.5
Tribal	0 (0)	0	0.1 (0)	0.4

(*P < 0.05)

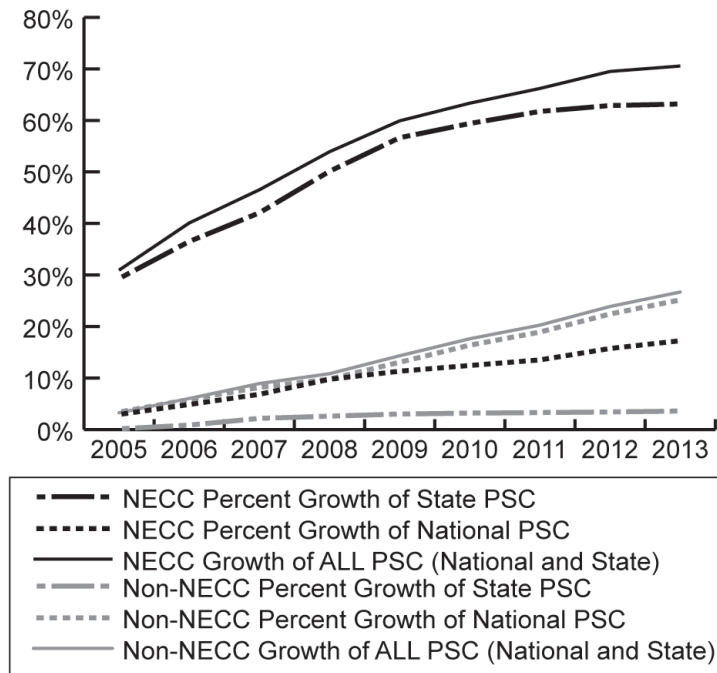


Figure 1. Growth in State and National PSC Certification in the NECC vs Non-NECC Region. (NECC vs Non-NECC Total PSC percent growth, P < 0.0001, CAT; NECC vs Non-NECC State only PSC growth, P < 0.0001, CAT). Slope analyses demonstrated non-NECC State certification had lower levels than all other groups (p's < 0.0001) and NECC State certification had significantly higher proportions than all other groups (p's < 0.0001). Non-NECC National certification had a steeper slope over time than Non-NECC State certification (p = 0.0237). NECC State certification had a steeper slope over time than NECC National certification (p = 0.0008).

period, seven states had certification programs meeting criteria. Four of the states were in the NECC region (CT, MA, NJ, NY) and three in the South Region (FL, MD, OK).

The GWTG-S program's methodology has been described previously [24-26]. Data on GWTG-S participation and progress was obtained with permission from the AHA/ASA. Patient level data were not analyzed.

General Design and Statistical Analysis

For annual growth calculations, the number of hospitals meeting the given metric was divided by the total number of ACH/CAC number in the US by region and expressed as a proportion. Hospitals were tracked for continued certification or expiration of certification. Centers escalating their certification (*i.e.* PSC to CSC) were also tracked and considered to be continuously enrolled. Oklahoma state certification data was unavailable thus being excluded from all state-level analyses. For changes in performance, we included hospitals reaching GWTG-S PAA levels of Silver or higher, defined as one or more consecutive years of sustained performance on a pre-defined set of seven evidence-based measures [27].

Continuous data were reported as means and standard deviations, with comparison via unpaired t-tests. Fisher's exact test compared groups with categorical variables (GraphPad Software, San Diego, CA [28]). The Cochran Armitage Trends (CAT) test evaluated regional growth in NECC and Non-NECC regions for each primary outcome measure. The Cochran-Mantel-Haenszel (CMH) test was used to compare changes in the proportions of hospitals in NECC versus non-NECC regions over time (JMP-9, Cary, NC). Slope analysis using Generalized Estimating Equations (GEEs) were used to model the trends in proportions over the time period (SAS, Cary, NC). An unstructured covariance structure was assumed, and logit link function was used for all analyses. Analysis involved second-order polynomial terms for year and interaction terms with region (NECC vs Non-NECC) to model potential non-linearity and difference in trend for the proportions.

Exploratory Survey of DOHs

For the exploratory analysis, an anonymous survey was sent to each of 8 NECC region state Departments of Public Health with responses acquired from December 1, 2011 through January 30, 2012. Survey responses could be answered by either one or a composite of multiple DOH staff involved in stroke initiatives and policy. Survey questions related to awareness of the NECC organization as well as participation in NECC projects, events, and work groups. Respondents indicated their department's level of involvement with the NECC. Free text responses

were permitted regarding qualitative perceptions of the NECC's influence on regional SSCMs.

RESULTS

Over the study time period (2005-2013) there were a mean of 433.1 ± 10.2 and 3986.4 ± 187.7 ACH/CACs in the NECC vs non-NECC regions respectively. In the NECC region there was a higher proportion of ACHs (89.6% vs 77.3%, $p < 0.05$, Table 1). The non-NECC region had a higher proportion of government owned hospitals (hospital district or authority, local/state government) and proprietary owned hospitals, while the NECC region had a higher proportion of private voluntary non-profit hospitals (Table 1). Over all years, a mean of 412.6 ± 10.0 NECC vs 3755.7 ± 231.7 non-NECC hospitals offered emergency services.

The cumulative number of national and state certified PSCs and CSCs are listed in Table 2. The absolute number of state or nationally certified PSCs increased over time from 2005 (n=250) to 2013 (n=1419). By 2013, there were 108 state or nationally certified CSCs (43 by state; 69 by national; 4 dual certifications) representing 7.1% of all certified centers (n=1527) and 2.3% of all ACH/CAC hospitals (n=4625). The total number of PSCs or CSCs (state and national) increased from 250 to 1527 for the entire country over our study time period, indicative of growth rate of a mean of 159.6 new hospitals per year becoming a PSC or CSC.

Growth in state and national PSC certification from 2005 to 2013 in the NECC and non-NECC region is represented in Figure 1. In the NECC region, state PSC certification increased over time from 29.3% in 2005 to 63.2% in 2013, compared to 0.1% in 2005 to 3.6% in 2013 in non-NECC regions (NECC and non-NECC growth, $p < 0.0001$). In the NECC region, national PSC certification increased over time from 2.8% in 2005 to 17.1% in 2013, compared to 3.2% in 2005 to 25.0% in 2013 in non-NECC regions (NECC and non-NECC growth $p < 0.0001$). Overall, in the NECC region, total PSC certification increased over time from 30.9% in 2005 to 70.5% in 2013, compared to 3.2% in 2005 to 26.6% in 2013 in non-NECC regions (NECC and non-NECC growth $p < 0.0001$). After adjusting for year, significantly more NECC ACH/CACs received state certification and significantly more non-NECC ACH/CACs received national certification (NECC and non-NECC growth $p < 0.0001$, CMH).

In the NECC and non-NECC regions, CSCs first came into existence in 2007 (n=10) and 2006 (n=5) respectively (Table 2). By 2013, 3.8% of NECC region CMS hospitals were CSC certified, contrasted to 2.2% in the Non-NECC region ($P=0.04$). Nationally in 2013, 36.1% (39 of 108) of certified CSCs were certified by a

Table 2. NECC and Non-NECC Hospitals with Primary Stroke Center (PSC) and Comprehensive Stroke Center (CSC) Certification at the National and State Level.

	2005	2006	2007	2008	2009	2010	2011	2012	2013
Number of CMS Hospitals									
NECC	430	444	447	447	429	431	426	423	421
Non-NECC	3603	3823	3920	3994	4026	4046	4095	4185	4204
NECC Region Certifications									
PSC Certification									
TJC	12	21	30	43	48	52	55	64	66
DNV or HFAP	0	0	0	0	0	1	2	2	6
State	126	162	188	224	243	256	263	266	266
Dual PSC (State & National)	5	5	10	26	34	36	38	38	41
<i>Sub-Total</i>	133	178	208	241	257	273	282	294	297
CSC Certification									
TJC	0	0	0	0	0	0	0	1	6
DNV or HFAP	0	0	0	0	0	0	0	0	0
State	0	0	10	11	12	12	12	13	13
Dual CSC (State & National)	0	0	0	0	0	0	0	1	3
<i>Sub-Total</i>	0	0	10	11	12	12	12	13	16
Total PSC and CSC Certification	133	178	218	252	269	285	294	307	313
Non-NECC Region Certifications									
PSC Certification									
TJC	117	217	314	382	512	641	734	872	955
DNV or HFAP	0	1	1	4	6	16	35	61	97
State	5	33	85	104	121	129	135	143	151
Dual PSC (State & National)	5	21	50	57	65	73	74	76	81
<i>Sub-Total</i>	117	230	350	433	574	713	830	1000	1122
CSC Certification									
TJC	0	0	0	0	0	0	0	11	54
DNV or HFAP	0	0	0	0	0	0	0	1	9
State	0	5	7	10	16	17	19	23	30
Dual CSC (State & National)	0	0	0	0	0	0	0	0	1
<i>Sub-Total</i>	0	5	7	10	16	17	19	35	92
Total PSC and CSC Certification	117	235	357	443	590	730	849	1035	1214

TJC=The Joint Commission, DNV=Det Norske Veritas, HFAP=Healthcare Facilities Accreditation Program.

DOH rather than a national entity, four CSCs were dual certified.

Cumulatively, the number of PSCs/CSCs, certified either at the state or national level, increased in the NECC region over time from 30.9% in 2005 to 74.3% in 2013, compared to 3.2% in 2005 to 28.9% in 2013 in non-NECC regions (NECC and non-NECC growth $p <$

0.0001) (Figure 2). After adjusting for year, significantly more NECC ACH/CACs received either State or National certification compared to non-NECC ACH/CACs ($p < 0.0001$, CMH). This demonstrates a higher saturation of PSC/CSC certification among NECC region hospitals.

For GWTC-S participation, in the NECC region hospital participation increased over time from 21.2%

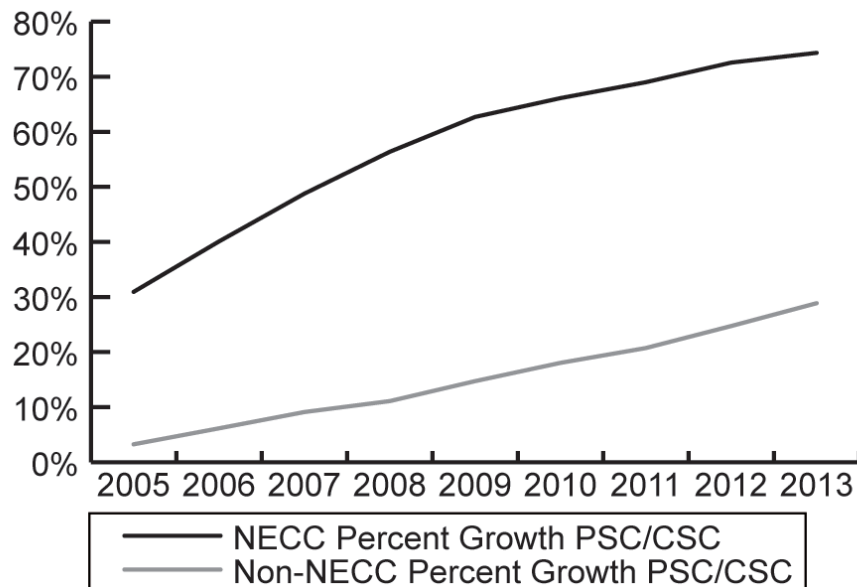


Figure 2. Growth in Overall State/National PSC and CSC Certification in the NECC vs Non-NECC Region (NECC vs Non-NECC, $p < 0.0001$, GEEs). For slope analyses, growth in State and National PSC and CSC Certification combined in the NECC vs Non-NECC Region was higher in the NECC region ($p < 0.0001$), with a significant difference in linear trends ($p < 0.0001$) with the NECC having a steeper rate of certification.

in 2005 to 61.5% in 2013 compared to 9.2% in 2005 to 32.4% in 2013 in non-NECC regions (NECC and non-NECC growth $p < 0.0001$, Figure 3 Panel A). GWTG-S hospitals with awards as a percentage of all ACH/CACs increased over time in the NECC region from 0.5% in 2005 to 42.5% in 2013 compared to 0.1% in 2005 to 16.6% in 2013 in non-NECC regions (NECC and non-NECC growth $p < 0.0001$, Figure 3 Panel A). We also examined GWTG-S hospitals with awards as a percentage of GWTG-S hospitals. This increased over time in the NECC region from 2.2% in 2005 to 69.1% in 2013 compared to 0.9% in 2005 to 51.1% in 2013 in non-NECC regions (NECC and non-NECC growth $p < 0.0001$, Figure 3 Panel B). Significantly more NECC ACH/CACs were GWTG-S hospitals and received GWTG-S awards than non-NECC ACH/CACs whether examined as a percentage of all ACH/CACs or as a percentage of GWTG-S hospitals (all analyses $p < 0.0001$, CMH).

Rate of growth per year increased in both groups for each outcome measure but to a greater degree in the NECC vs Non-NECC regions: PSC/CSC (5.4%/yr vs 3.2%/yr), GWTG-S participation (5.0%/yr vs 2.9%/yr), and PAAs (5.2%/yr vs 2.1%/yr), with state-based certification growth also being higher in the NECC region (4.2%/yr vs 0.4%/yr; all comparisons $p < 0.0001$).

For the DOH survey, 100% (8/8) surveys were completed by DOH staff from the eight NECC states. 100% of DOHs were aware of the NECC. 25% (2/8) had DOH staff attend one to two Annual Education Summits, 50% (4/8)

had staff attend three or more Annual Education Summits, 62.5% (5/8) had participated in NECC workgroups, and 25% (2/8) had staff who participated in a leadership role in the NECC. Cumulatively, 100% (8/8) had staff attendance at least one annual summit conference or staff who were involved in the above listed NECC functions. Table 3 reports the perceived methods by which the NECC has helped states over the 5-year time period prior to the survey. Table 3 also reports 87.5% (7/8) believed the NECC provided beneficial assistance. Interestingly, the NECC was perceived as being more beneficial in states with a less developed SSCM.

DISCUSSION

Our study demonstrates significant national growth in the number of certified stroke centers and in the number of hospitals participating in GWTG-S and receiving awards from 2005 through 2013. As evident in the existing literature, SSCMs are necessary to ensure rapid and equitable access to stroke centers. Stroke center certification and the receipt of performance achievement awards are associated with higher hospital level performance [29]. Additionally, eligible patients presenting to PSCs are more likely to receive critical interventions (*i.e.* thrombolytic therapy) [30]. State level public policy has also been demonstrated to increase the number of certified centers in a region [31]. Thus, extrapolation suggests state level policies may influence treatment rates.

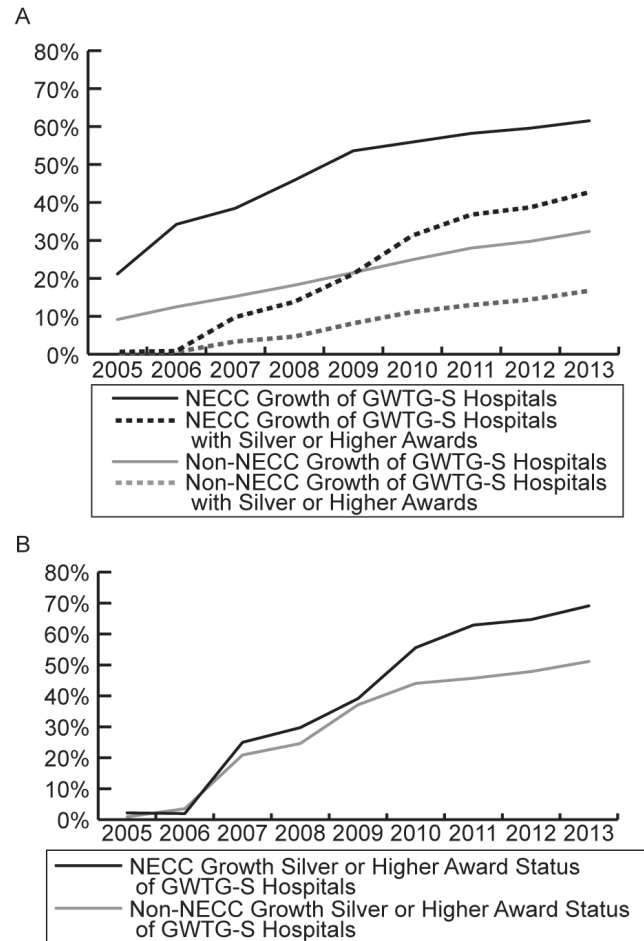


Figure 3. Panel A: Growth in GWTG-S Hospitals and Silver or Higher Achievement Awards in the NECC vs Non-NECC Region among all US Hospitals; **Panel B:** The percentage of GWTG-S Hospitals with Silver or Higher Awards. (NECC vs Non-NECC, $p < 0.0001$ for all analyses, CAT). For slope analyses, in Panel A, the NECC had significantly more growth in GWTG-S Hospitals ($p < 0.0001$) and NECC and Non-NECC had a significant difference in their trends with NECC being more curvilinear ($p < 0.0001$). NECC also had significantly higher growth of GWTG-S PAA than Non-NECC ($p < 0.0001$); without any significant differences in trends over time. For Panel B, the NECC had a significantly higher proportion of GWTG-S Hospitals with PAA than Non-NECC ($p < 0.0001$); there were no significant differences in trends over time.

Compared to the rest of the country, the NECC region experienced more rapid growth over time in the percentages of hospitals with state or national PSC certification, participation in GWTG-S, and GWTG-S performance achievement awards. The combination of this rapid growth combined with our qualitative findings suggests the NECC has the potential to complement and enhance local and national SSCM initiatives. Additionally, as of 2013, on a national level only 36% of states ($n=18$) had stroke public policy [31], suggesting an opportunity for further improvement. In the NECC region 62.5% of states (5 of 8) have public policy contrasted to 31% (13 of 42) in the non-NECC region, thus perhaps signifying the importance of this regional network on statewide initiatives.

Further investigation evaluating the influence of regional networks is necessary. In the past other similarly intentioned networks have existed—but some have been retired [32] while others appear to only host an annual conference [33]. An organization akin to the NECC is the Stroke Belt Consortium (SBC), in existence for more than 20 years. It has evolved to include up to 15 states and Washington D.C. and produced influential publications [34-36], including one outlining clinical guidelines for stroke centers. Many landmark achievements have come from SBC initiatives, including the original concept underlying the Coverdell Acute Stroke Registry. The SBC holds an annual stroke education conference with state updates for attendees [34,37]. Given six of seven states over our study time period with DOH stroke certification

Table 3. Answer to Survey Question: “How has the NECC helped your state over the past 5 years improve stroke-systems-of-care?”

State 1: “By providing guidance and education to develop and improve our stroke system of care. NECC serves as the go to resource for stroke care.”

State 2: “NECC has provided great opportunities for us to network and learn from colleagues and leadership from this region and beyond. It has also provided opportunities for us to serve in leadership roles, and shape regional efforts to improve stroke systems, and promote them at various levels.”

State 3: “...the NECC has helped us build external partnerships with the AHA, ASA and community hospitals to the point where we have generated interest in our newly formed Stroke Steering Committee. We are on the right track but have a long way to go. It is exciting that our participation is growing.”

State 4: “The state is actively following-up NECC’s activities, the interactions among states and the interest among stroke coordinators within the state. All have been positive influences in monitoring stroke care assessment in the state.”

State 5: It has not influenced our stroke system of care at the state level.

State 6: “Networking, best practices.”

State 7: “Leadership from NECC physicians has helped move along VOLUNTARY efforts to standardize acute care amongst hospitals and EMS districts.”

State 8: “Encouraged systems approach. DOH works with Healthy Heart Program, EMS and Health Systems Management.”

programs (CT, MA, NJ, NY, FL, OK) come from the NECC or SBC region, this may be illustrative of the role regional networks have in linking local advocates and clinicians to state DOH representatives.

Our study has several strengths and is the first to our knowledge longitudinally evaluating national trends of SSCM growth. Limitations include regional selection bias as we only included those hospitals participating in GWTG-S rather than other programs. However, GWTG-S is the dominant stroke QI program nationally, so this bias is likely limited. Future studies could utilize more universal performance measures (*i.e.* CMS core measures) and focus on patient level outcome measures. Additionally, missing data prevented the inclusion of Oklahoma DOH level data. There are other unmeasured confounders in the Northeast which may have influenced our results (*i.e.* higher baseline rate of stroke center certification and GWTG-S participation, not all hospitals participate in the GWTG program). This paper is unable to differentiate causal effect vs association. There was a differential distribution of some hospital demographical variables between the NECC and non-NECC regions, including disparity in the CAC proportion which may alter the effect size. However, three NECC region states (NJ, CT, RI) have either not been eligible to participate or have not participated in the national CAC program [38]. Our databases also did not have access to hospital level data to ascertain hospital level variables (*i.e.* size, location, staffing, etc.) associated with rates of stroke center certification or penetration of the GWTG-S program.

A key contributor likely accounting for the 74.3% PSC/CSC certification rate in the NECC region is the number of states with DOH operated hospital designa-

tion programs—which is a major finding in this study and differentiates the NECC region from others. Further investigation in this area is warranted to evaluate quality differences between state level designation and national certification. Of note, DOH designation may initially be more attainable for hospitals given the diminished start-up costs and resources required in comparison to national certification. Hospitals seeking state designation in the NECC region were not required to pay a fee to the state while national PSC/CSC start-up certification costs range between \$7,000 to \$55,000 [39]. Of note, there is variable rigor by which DOH designation programs operate (*i.e.* Connecticut only had an initial site visit for designation, Massachusetts has mandatory reporting of performance data to the state and periodic onsite visits especially for low performers). To mitigate differences, award status was chosen as a more robust marker of stroke system strength [29], but could be subject to length bias related to duration of GWTG-S participation.

In closing, the experience of the NECC and durability of other similar organizations (*i.e.* SBC) supports the creation and ability to maintain such networks. This publication is an initial attempt to quantify the growth of stroke systems in a region with such a network. Given the reported growth of stroke system markers in the NECC region, the NECC experience may yield important insights to promote regional stroke system growth.

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Conflicts of Interest/Disclosures: Dr. Schwamm serves as chair of the stroke clinical workgroup of Get With The Guidelines-Stroke (GWTG-Stroke)-Stroke and is a stroke system consultant to the Massachusetts Department of Public Health for the Paul Coverdell National Acute Stroke Registry. He has served as a consultant to YaleCORE and the Joint Commission, is Chair of the Health Care Accreditation Science Committee, and received research support from PCORI, National Institute of Neurological Disorders and Stroke (NINDS), and Genentech. Drs. Wira and McCullough have research support from NINDS. Shannon Melluzzo used to work for the NECC. David Day and Zainab Magdon-Ismail have worked on behalf of the AHA/ASA to help with NECC initiatives. Drs Wira, Stein, Schwamm, McCullough, and Madsen have served in a voluntary role as either Chair or in work groups for the NECC. Other authors report no disclosures.

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