

Background

With rapid advancements in treatment and standardization of stroke care, the reported age-adjusted mortality rate of stroke in the United States decreased by 13.6% from 2007 to 2017.¹ Improvement in patient outcomes has largely been a byproduct of healthcare delivery systems and the use of standardized protocols derived from the best clinical practice guidelines.²

In June of 2000, the Brain Attack Coalition, a multidisciplinary conglomerate of voluntary, professional, and government organizations convened by the National Institute of Neurological Disorders and Stroke of the National Institutes of Health released a consensus statement recommending the establishment of designated stroke centers.³

Currently, there are three major independent organizations with the ability to certify hospitals as stroke centers: The Joint Commission (TJC), Det Norske Veritas (DNV), and Healthcare Facilities Accreditation Program (HFAP). State health departments are also empowered to designate stroke centers. While each certifying organization utilizes different criteria, the major focus is on capacity to meet therapeutic guidelines.

American Stroke Association Therapeutic Guidelines:

- IV thrombolytic therapy (Alteplase) should be given within 4.5 hours of symptom onset to patients with imaging consistent with ischemic stroke
- Mechanical thrombectomy is recommended for patients with evidence of large vessel occlusion within 24 hours of presentation
- Stroke outcomes are time dependent and early intervention is strongly recommended⁴

Study Goals:

- **Aim 1:** Demystify the certification process by methodically explaining commonalities and differences between organizations
- **Aim 2:** Provide information on availability and geographic distribution of stroke centers
- **Aim 3:** Examine if clinical outcomes differ between organizations

Methods

We conducted a descriptive review utilizing materials from the published body of literature, organization-specific internet resources and information collected via direct communications with the certifying organizations (TJC, DNV and HFAP).

The electronic National Library of Medicine databases, which include results from PubMed and MEDLINE were queried for relevant articles published between June of 2000 and Jan of 2021. The search terms *stroke center*, *certification*, *joint commission*, *stroke outcomes* and *hospital accreditation* were used.

Mapping of stroke center locations was performed on a Macintosh computer (OS 10.15.5) using the ArcGIS online platform. To precisely represent stroke center locations, accredited hospitals were first pinpointed using Google Maps and verified on ArcGIS.

Results

Costs

Organizations differ in terms of accessibility of certification standards. TJC requires patrons to fill out a request form through their website and communicate with a representative to gain free access to standards. DNV similarly requires a form documenting who is accessing standards but allows direct download after submission without a review period. HFAP requires payment varying between \$75 and \$500 to have standards mailed to hospitals.

Results Continued

Costs Continued

TJC charges a site visit fee for certification of hospitals based on the level of proposed certification. The initial site visit fees are as follows: Acute Stroke Ready (ASR) certification \$2,375, Primary Stroke Center (PSC) certification \$4,950, Thrombectomy Stroke Center (TSC) certification \$7,500, and Comprehensive Stroke Center (CSC) certification \$19,700. DNV GL offers stroke certification at an annual rate: ASR \$3,900, PSC \$8,400, Primary Stroke Center Plus (PSC+, equivalent of TSC) \$12,400, and CSC \$17,000. HFAP provides stroke certification for a single triennial fee: Stroke Ready Center (SRH, equivalent of ASR) \$8,500, PSC \$15,000, TSC \$20,000, and CSC \$40,000.

Certification Tiers

There are four tiers of certification that vary based on therapeutic capacity and volume metrics.

- **ASR (SRH):** reserved for small volume centers, designed to stabilize and transfer to a higher capability center. Able to administer IV thrombolytic therapy.
- **PSC:** must be able to administer IV thrombolytic therapy and care longitudinally for uncomplicated stroke patients. A dedicated neuro ICU or beds should be available. A neurologist must be on staff and available 24/7.
- **TSC (PSC+):** in addition to IV thrombolytics, must have a neurointerventionalist on staff who is trained to perform mechanical thrombectomy. Advanced imaging is required (CT angiogram, diffusion weighted MRI). A neurosurgeon must be on staff and available 24/7.
- **CSC:** accredited to large hospitals by virtue of rigorous volumetric standards. All organizations have specific requirements for number of IV thrombolytics administered, mechanical thrombectomies performed, diagnosed subarachnoid hemorrhages and endovascular clips/coils performed. A neurosurgeon with specialized training in cerebrovascular surgery must be on staff and available 24/7.

Geographic Distribution of Interventional Capable Stroke Centers

TJC (figure 1) has a total of 1,406 centers, including 226 advanced programs (TSCs & CSCs). TJC has a homogenous distribution across the Northeast and South, but substantial clustering in California (32/45 Western facilities). DNV (figure 2) has 316 centers, including 138 advanced centers. DNV shows a strong predilection for certifying facilities in Southern states (63/138). HFAP (not pictured), which has 66 total centers but only 8 certified advanced centers is nearly equally distributed in the South, West and Midwest but has no centers in the Northeast. There are 5 contiguous states with no certified stroke centers (Idaho, Montana, New Mexico, South Dakota and Wyoming).

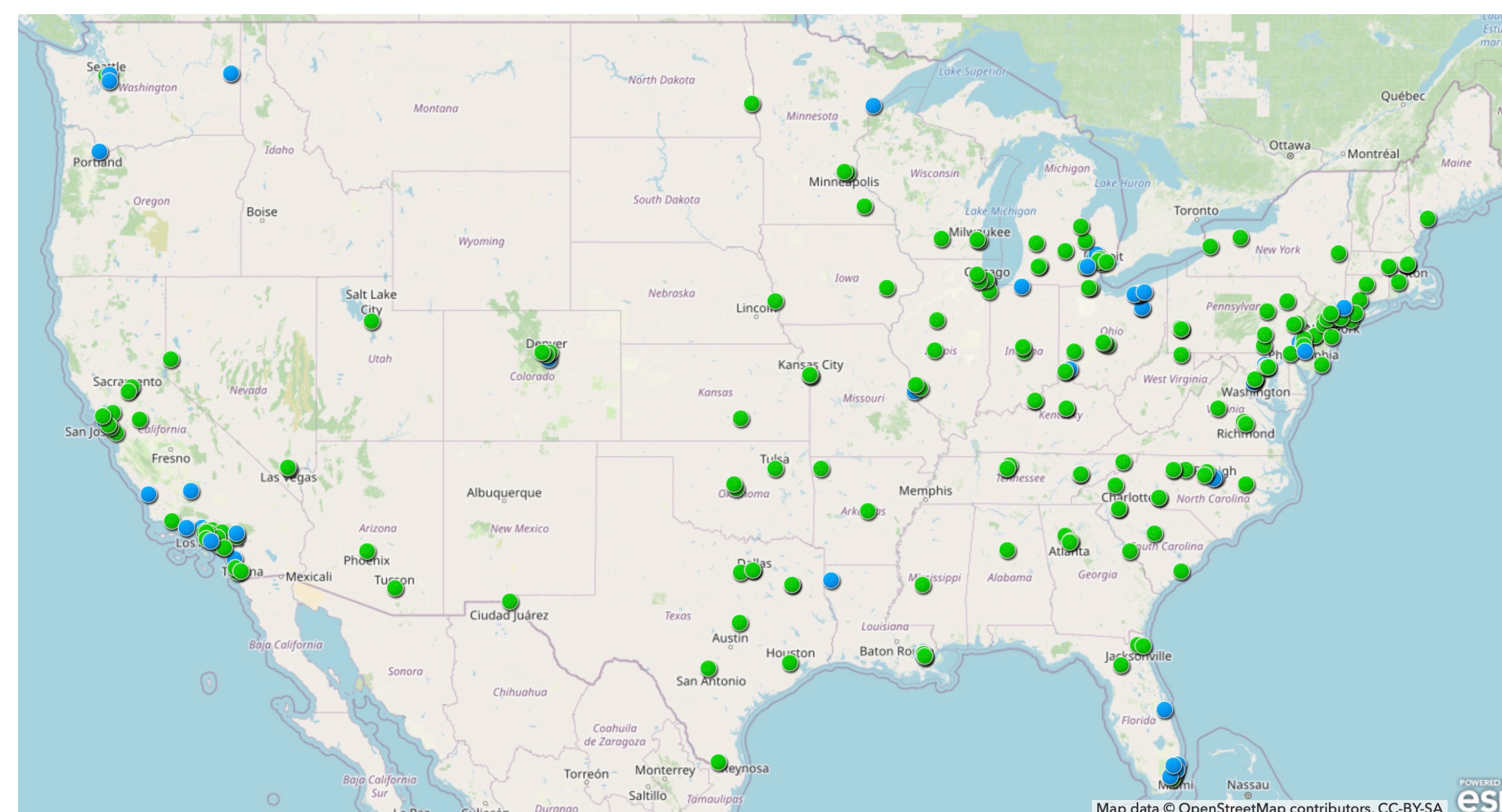


Figure 1: TJC Interventional Centers, blue points = TSC, green points = CSC

Results Continued

Reported Patient Outcomes

The reported rate of IV thrombolytic use was significantly higher in TJC (9.0%) and DNV (9.8%) certified hospitals compared to HFAP (5.9%) certified hospitals ($P < 0.0001$). Door to needle times were longer in HFAP certified hospitals. TJC certified hospitals had a lower in-hospital mortality compared to state certified PSCs.⁵ Regardless of certifying organization, newly certified PSCs had lower adjusted in-hospital (odds ratio, 0.894; 95% CI, 0.848-0.943), 30-day (HR, 0.904; 95% CI, 0.892-0.917), and 1-year mortality (HR, 0.907; 95% CI, 0.898-0.915) when compared to non-stroke centers.⁶

Discussion

While stroke center certification differs between organizations in terms of cost and volume requirements, capability expectations are similar for TJC, DNV and HFAP. Exploring the geographic distribution of advanced centers highlights accessibility issues. This information should guide the future establishment of new stroke centers to provide equitable and timely access to stroke care.

Potential Limitations of This Study

Patient outcomes are not stratified by tier of certification, preventing direct comparison. Individual differences in certification processes (volume requirements) are not addressed. Our study does not differentiate between the number of centers in rural, urban and suburban settings. Each of these limitation should serve as topics for future exploration.

References

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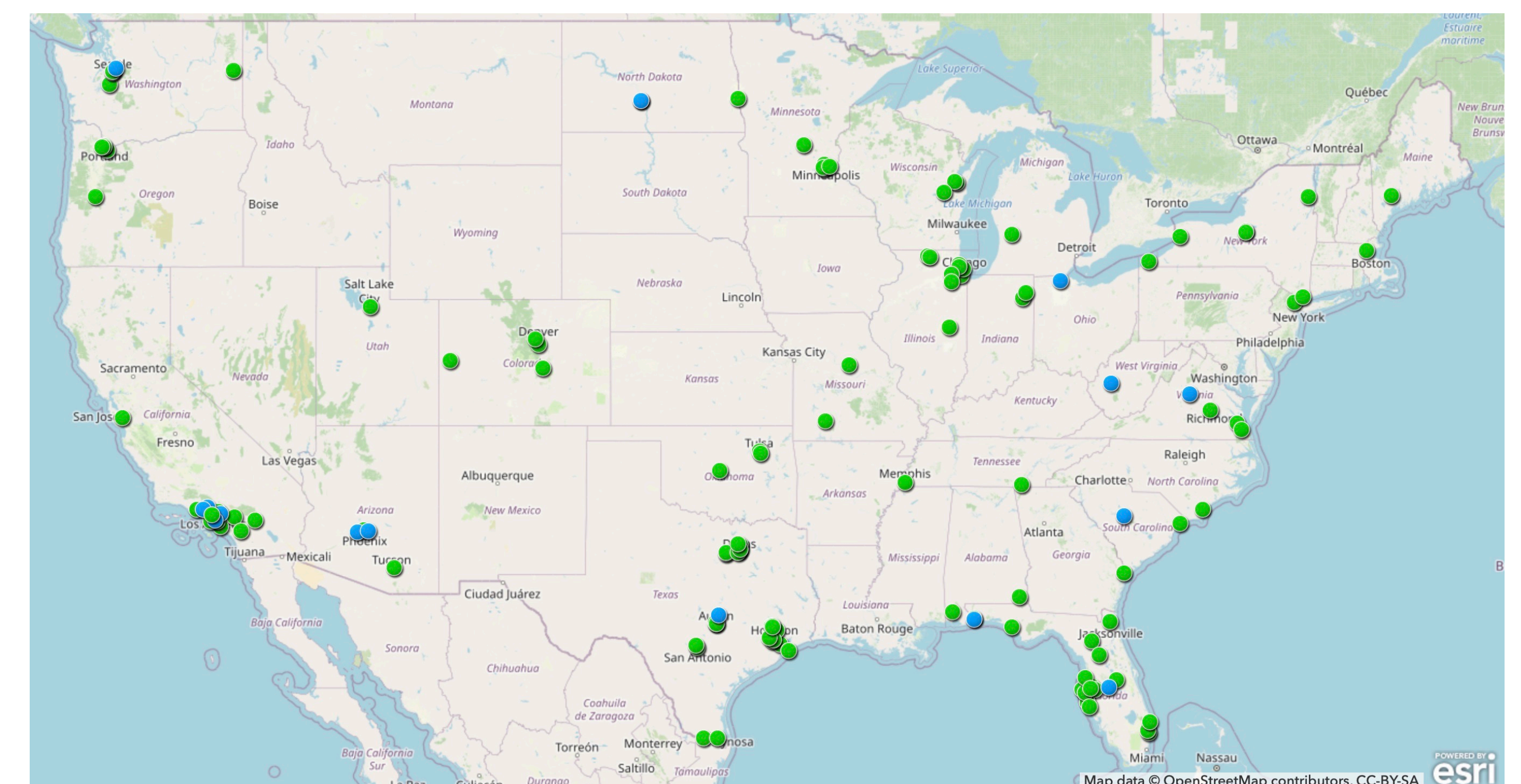


Figure 2: DNV Interventional Centers, blue points = PSC+, green points = CSC