

# Centers Capable of Treating Hyperbaric Emergencies in the United States

# UCLA

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## Background

Hyperbaric oxygen therapy is the primary treatment for arterial gas embolism, decompression sickness, and acute carbon monoxide poisoning. Though there has been a proliferation of hyperbaric centers throughout the United States, a scarcity of centers equipped to treat emergency indications makes transport of patients necessary.

## Purpose

In California, multiple hyperbaric emergencies had to be medevac'd across several counties and over several hundred miles to only four suitable hyperbaric centers. This causes delays, increases cost, and increases risk of staff and patients which can potentially lead to negative outcomes. We were interested in finding out what centers are able to treat emergencies in the entire country and reasons why centers do or do not treat emergencies.

## Methods

Using Google, Yahoo, HyperbaricLink, and the UHMS directory, a United States database was created. Four trained researchers phoned clinicians from the database to administer the survey. All centers were contacted for response until four calls went unreturned or a center declined to be included. The survey assessed chamber readiness to respond to high-acuity patients, including capabilities with ventilators or intravenous drug infusion, availability of 24 hour on-call staff, and confidence in managing in-chamber emergencies.

## Variables

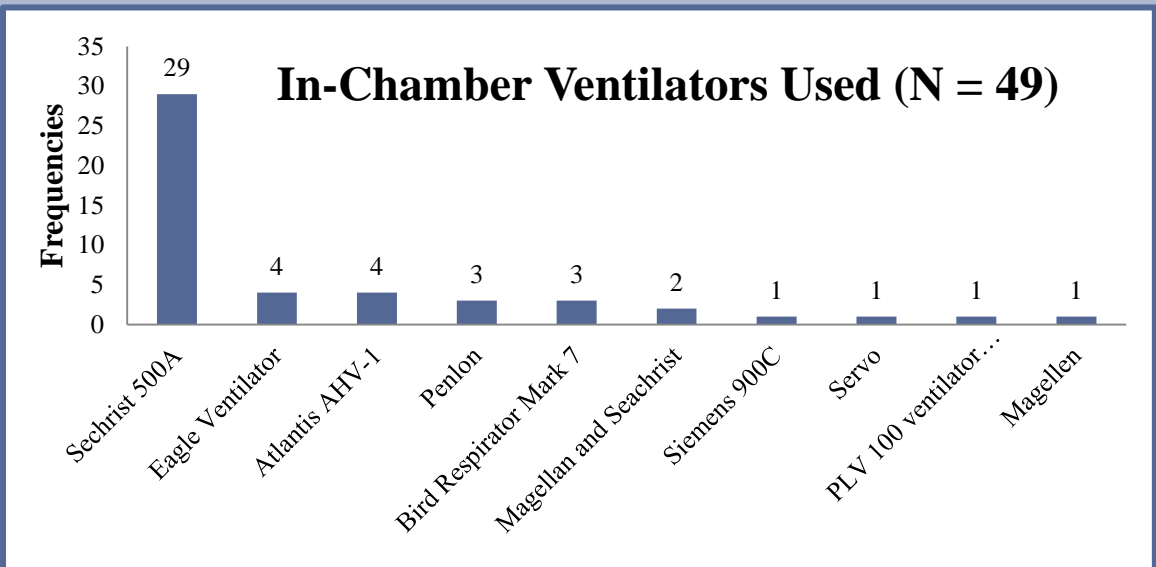
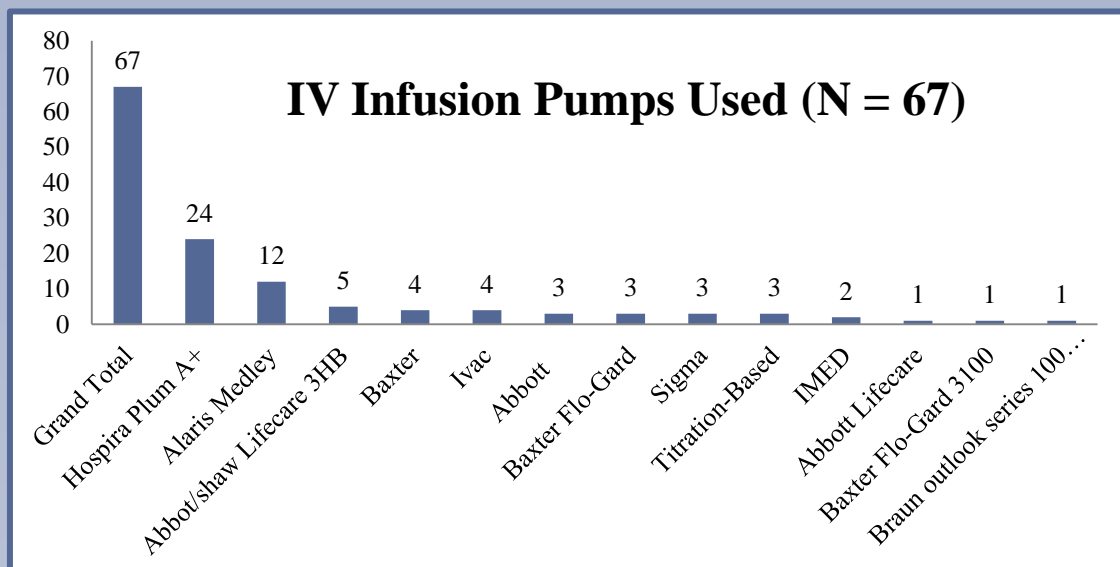
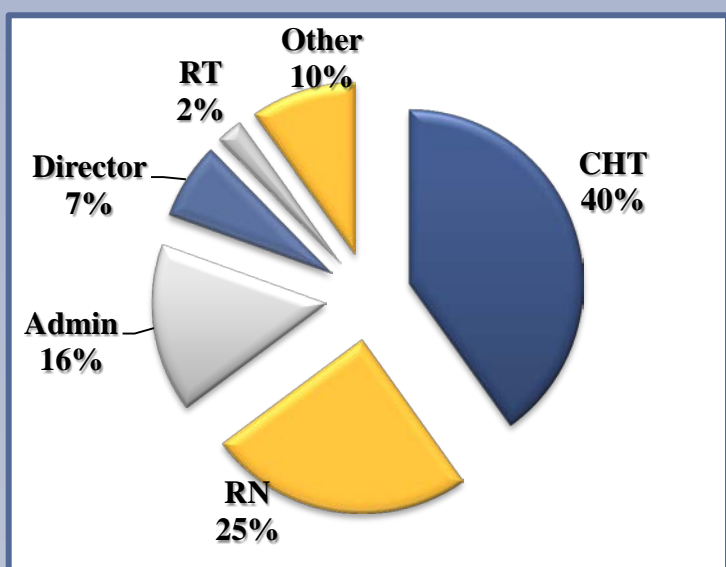
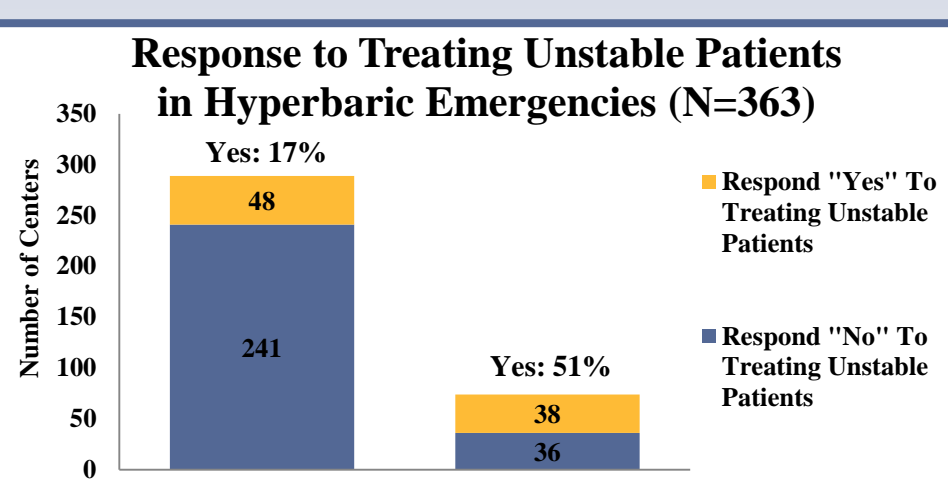
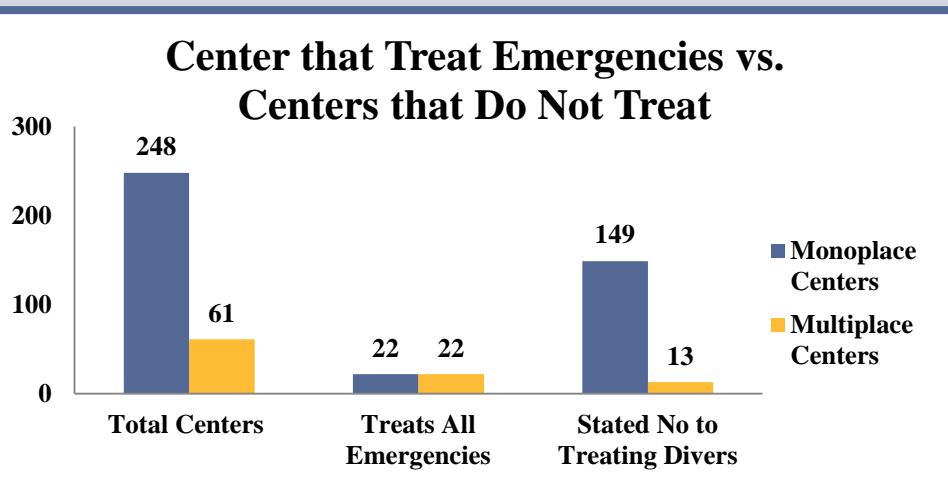
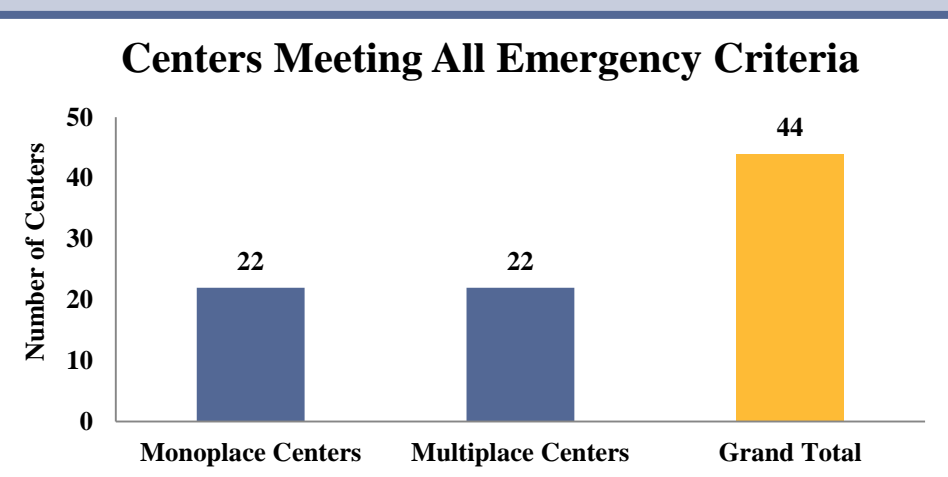
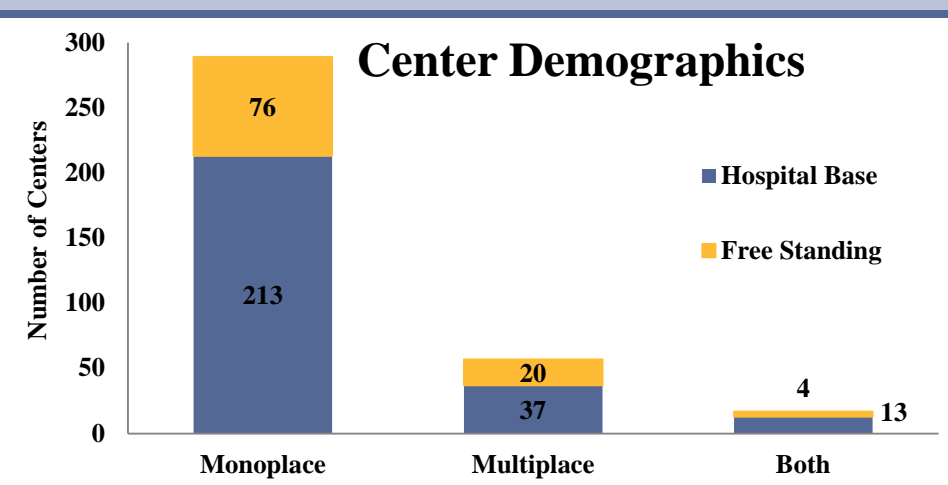
1. Geographical locations
2. Type of Facility (Hospital Based vs. Free Standing)
3. Monoplace vs. Multiplace
4. Capacity to treat Ventilator Dependent Patients
5. Capacity to treat patients that require IV infusion during HBOT
6. Amounts of centers that had a group of clinicians with an "on-call schedule"
7. Density of Centers vs. Centers that treat emergencies
8. Travel times from major bodies of water to a HBOT emergency center
9. Level One Trauma Centers in Proximity to HBOT emergency center
10. Center that treats divers identified by Divers Alert Network (DAN)

## Data Analysis

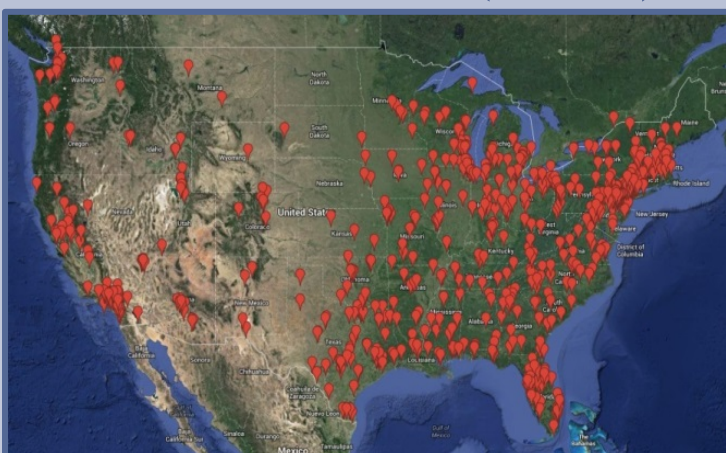
Microsoft Excel Sheets were used to create pivot tables. Google Maps and Google Docs were utilized to create descriptive analyses.

## Results

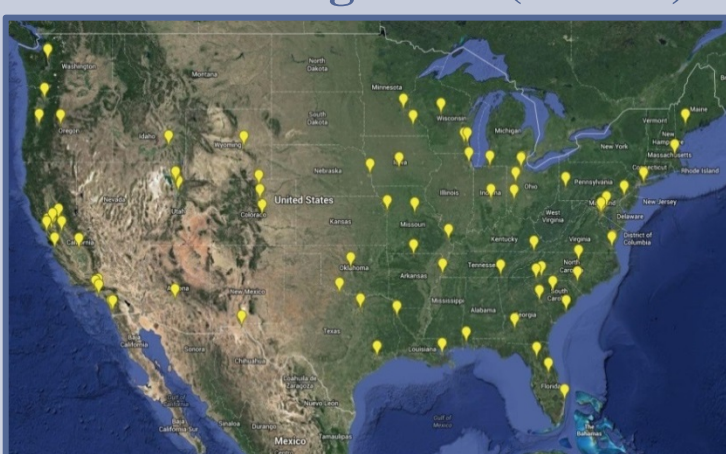
Only 44 centers (12.12%, N = 363) met all criteria to treat HBOT emergencies such as being capable of using ventilators, intravenous infusion, and a 24/7 on call staff.



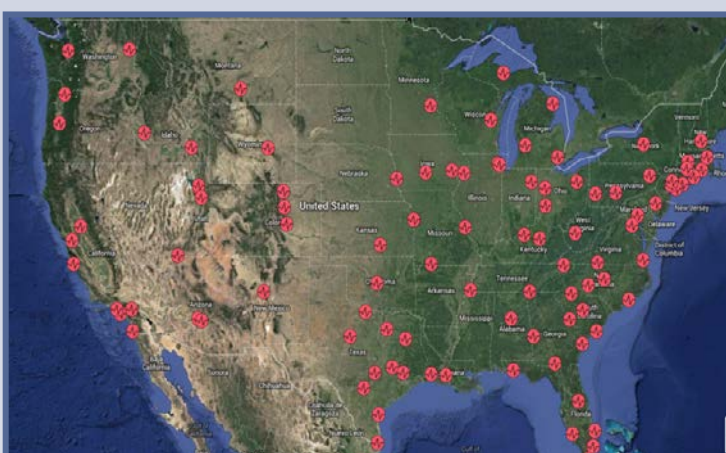
Centers Located (N=764)



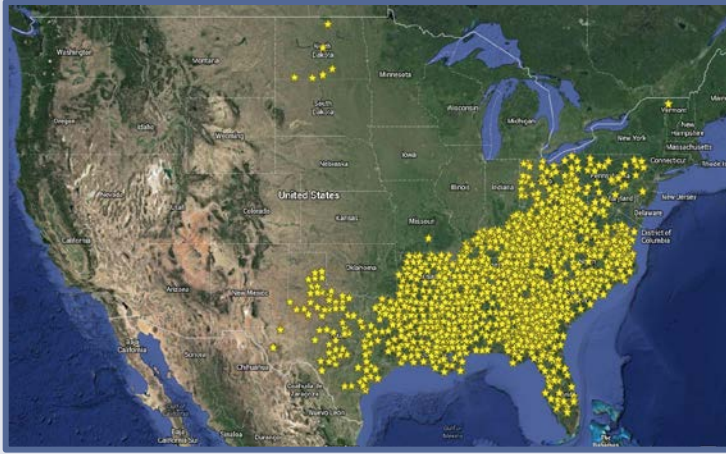
HBOT Center that answered Yes to Emergencies (N = 86)



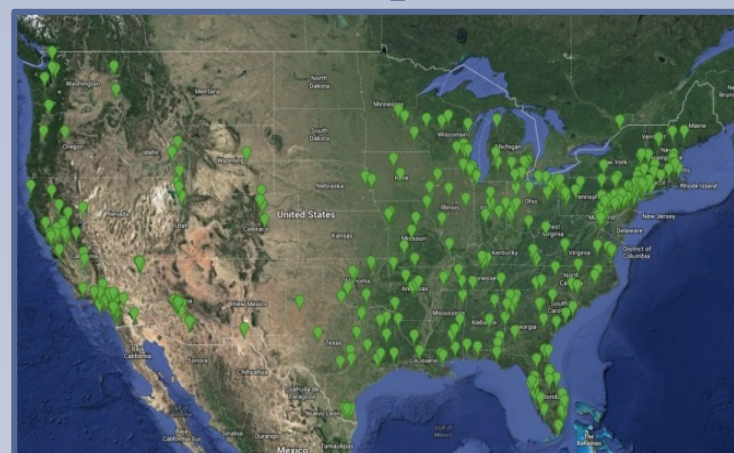
D.A.N. Centers (N = 111)



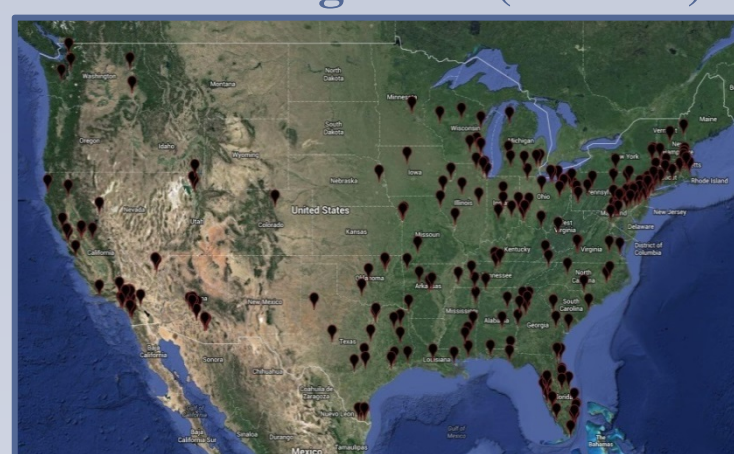
Diabetic Belt (DM>11% per county; N=1048)



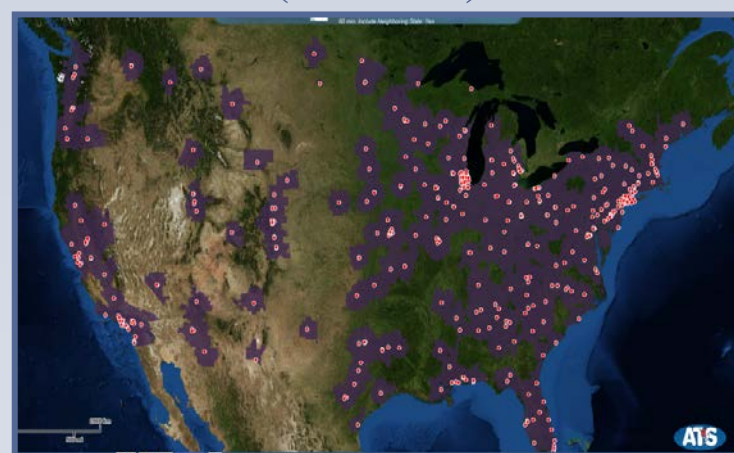
Centers Participated (N=363)



HBOT Center that answered No to Emergencies (N = 289)



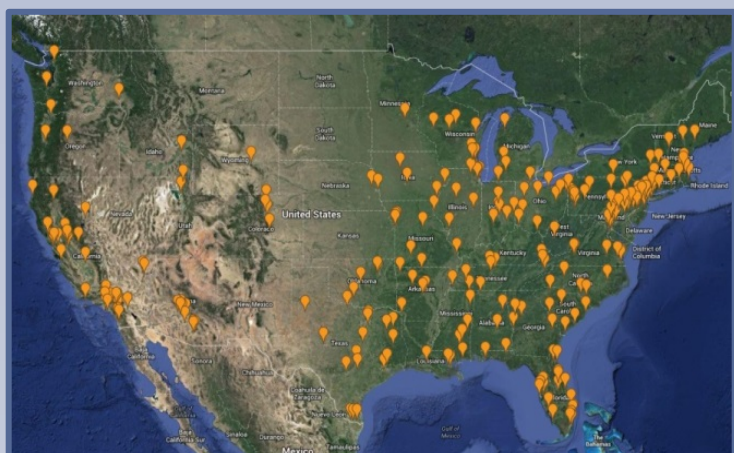
Level 1 and 2 Trauma Centers (N = 244)



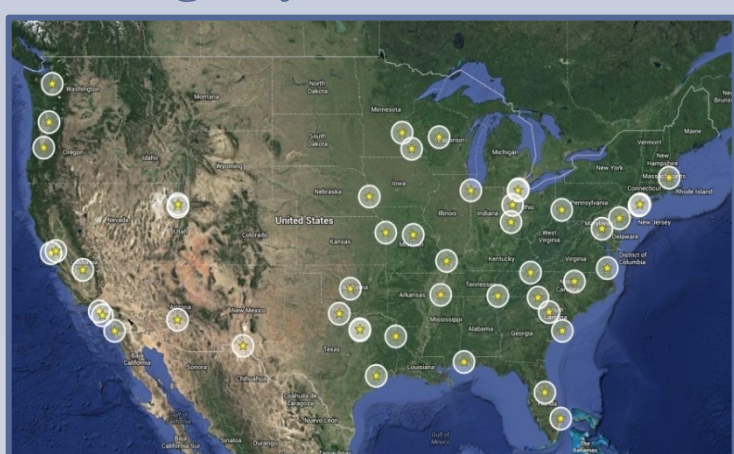
Centers within 100 mi of Coastline (N=346)



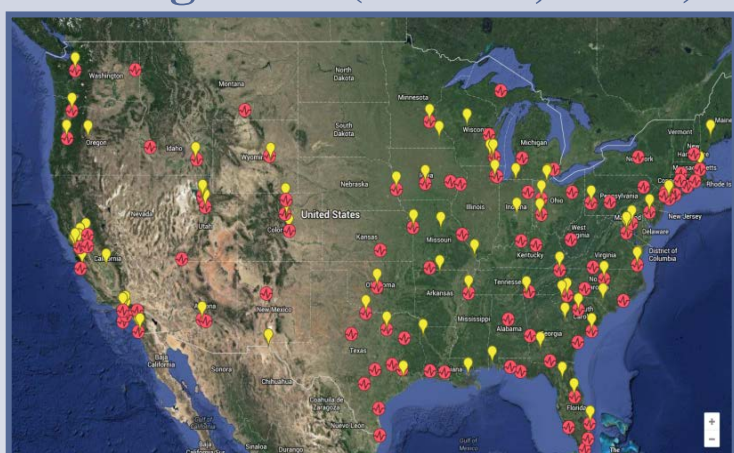
Monoplace Centers (N=289)



HBOT Centers that meet all Emergency Criteria (N = 44)



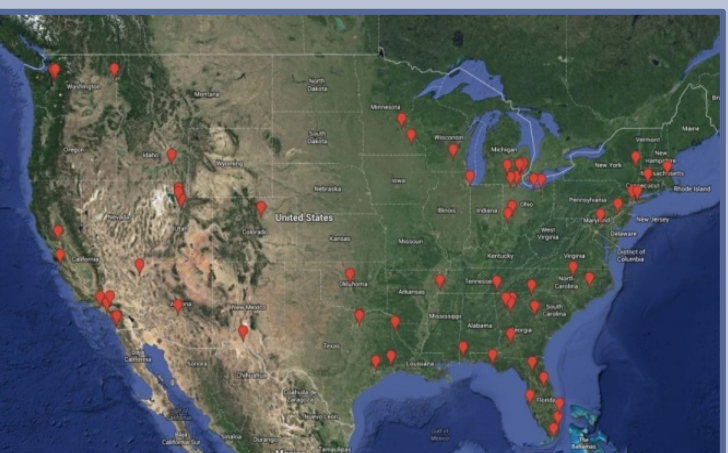
D.A.N. + Responded Yes to Emergencies (N = 111, N=74)



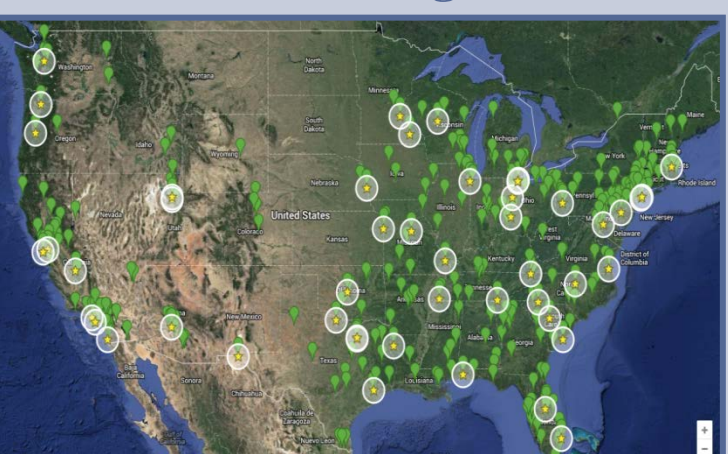
Centers within 100 mi of Coastline (N=346)



Multiplace Centers (N= 74)



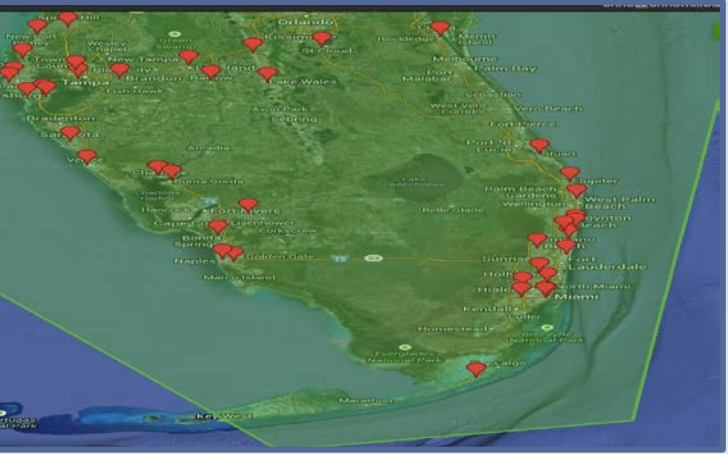
HBOT Emergencies vs Non HBOT Emergencies



D.A.N. + IV/Vents (Emergencies) (N = 111, N=64)



Centers within 100 mi of Coastline (N=346)



## Conclusion

At our institution, a hyperbaric emergency is one that needs immediate recompression and will result in any of the following:

1. Saving a life
2. Saving a limb
3. Saving an organ (e.g. eye)

Although 86 centers reported that they were able to treat hyperbaric emergencies, only 44 centers had the equipment and staff to treat high acuity patients.

A discrepancy between the DAN data and our own data was due to our definition of an emergency capable center – being able to treat DCS and non-DCS emergencies.

## Discussion

Hyperbaric Oxygen Therapy (HBOT) has two primary indications: DCS and Arterial Gas Embolism. This therapy is considered beneficial and life-saving. Although there is evidence to suggest that HBOT is a beneficial treatment for chronic wounds, only one double-blind RCT for the diabetic foot with a small number of participants exists. In order to understand the significance of HBOT, we must understand its demand and relevance in the medical community; this warrants an understanding of the incidence of DCS and arterial gas embolisms. Determining where these injuries are most likely to occur and if emergency capable centers are located within close proximity is of the utmost importance.

By conducting a nationwide survey of HBO centers, we were able to identify HBO center densities. To continue expansion, HBO centers must provide additional higher level evidence to justify HBOT for all other indications.