Hawaii's Neurotrauma Program

TRAUMATIC BRAIN & SPINAL CORD INJURIES ♥ STROKE

Strategic Plan

Fiscal Years (FY) 2021-2023

Hawai'i State Department of Health
Developmental Disabilities Division
Community Resources Branch
Neurotrauma Program
3627 Kilauea Avenue, Room 411
Honolulu, HI 96816

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Message from the Director of Health

Aloha,

I am pleased to present the Neurotrauma Program's Strategic Plan for FY 2021-2023. This Strategic Plan describes what the Neurotrauma Program hopes to achieve over the next 3 years based on the support and feedback received from stakeholders. The Neurotrauma Program in the Department of Health, Developmental Disabilities Division has been committed to supporting the neurotrauma community through activities and raising awareness to the public since 2002. The Department of Health stands firmly behind the Neurotrauma Program's mission of improving access to services and supports for individuals with neurotrauma and their families.

Neurotrauma, which includes traumatic brain injury, spinal cord injury, and stroke, is a critical public health problem that deserves the attention of Hawaii's community. Neurotrauma injuries greatly impact the lives of individuals, families, and communities. The Department of Health will execute this Strategic Plan to improve access to services and supports and ensure individuals with neurotrauma and their families have healthy and meaningful lives.

Sincerely,

Bruce S. Anderson, Ph.D.
Director Department of Health

Message from the Developmental Disabilities Division Administrator

The 2021 - 2023 Strategic Plan is the Neurotrauma Program's framework to guide the Department of Health, Developmental Disabilities Division's journey towards strengthening a more comprehensive and effective system for the neurotrauma community and their families.

After carefully assessing the social and environmental conditions in our communities and identifying priorities with our stakeholders, we outlined the goals and objectives that will lead the Neurotrauma Program while keeping our vision at the forefront that *"Individuals with neurotrauma will have healthy and meaningful lives."*

Continuing to uphold our values as the foundation for our actions will unify our efforts with the four primary goals identified in our Strategic Plan. Our goals focus on increasing public awareness and understanding of the impact of neurotrauma injuries, increasing provider awareness and improving service delivery, expanding access to resources, and using data to identify incidence, prevalence, and individual needs for survivors of neurotrauma. We are confident these goals are key to enhancing the lives of those in the neurotrauma community.

We would like to acknowledge everyone that engaged in this strategic planning process, including the development of this plan and the implementation of an innovative guide for the future of the Neurotrauma Program. We welcome your continued participation.

Warmest aloha,

Mary Brogan, Administrator
Developmental Disabilities Division

Section 1: Executive Summary

The Hawaii Department of Health (DOH), Developmental Disabilities Division's Neurotrauma Program is charged with setting direction for a comprehensive system to support and offer services to survivors of neurotrauma. Goals and objectives for the Neurotrauma Program Strategic Plan for fiscal years 2021-2023 were developed through Advisory Boards' discussions and input from an online stakeholder meeting, held in May 2020. Stakeholder input was summarized, and stakeholders were asked to prioritize their top objectives. The highest rated objectives were included in the plan with consideration to program capacity. Input was received from survivors of neurotrauma, other state agencies, representatives from the Brain Injury Association of Hawaii, private medical facilities, the University of Hawaii, members of the Neurotrauma and State Traumatic Brain Injury Advisory Boards, the Hawaii Disability Rights Center, and the Pacific Disabilities Center.

This Strategic Plan builds on the previous Neurotrauma Strategic Plan for fiscal years 2018-2020. The goals, objectives, and accomplishments for 2018-2020 were examined, and stakeholder input was solicited on whether those goals and objectives should be continued, or new initiatives should be pursued. This Strategic Plan identifies four goals and related objectives to pursue over the next three fiscal years. The plan largely focuses on using a person-centered approach to improve service delivery, in addition to increasing awareness on neurotrauma and obtaining high-quality data on the needs of survivors of neurotrauma living in the community. The goals of this Strategic Plan are:

- *Goal 1: In coordination with community partners, expand educational opportunities to the public sector on all neurotrauma injuries to increase awareness on the effects of neurotrauma and how to respond to an injury.*
- *Goal 2: In coordination with community partners, connect providers to educational opportunities to increase awareness of neurotrauma and improve service delivery and outcomes for survivors of neurotrauma that they serve.*
- *Goal 3: Expand survivors', family members', and caregivers' connections to available resources in Hawaii.*
- *Goal 4: Use data to identify the needs and service gaps for survivors of neurotrauma and family members/caregivers.*

Section 2: Background and Overview

In 2002, the Hawaii State Legislature passed Act 160, enacting Section 321H in the Hawaii Revised Statutes (HRS), to address the needs of individuals with neurotrauma. The statute defines neurotrauma as a severe and chronic disability of a person that is attributable to an injury to the central nervous system, including traumatic brain injury (TBI) or spinal cord injury (SCI), and is likely to continue indefinitely. The statute states neurotrauma can include other neurological dysfunctions but does not include substance misuse and abuse, Alzheimer's disease, or the infirmities of aging. Stroke was included in the definition of neurotrauma because it is a preventable neurological dysfunction that can result in substantial functional limitations in the areas described in the statute: self-care; speech, hearing, or communication; learning; mobility; self-direction; capacity of independent living; and economic sufficiency.

The statute mandates the Department of Health (DOH) to develop, lead, administer, coordinate, monitor, evaluate, and set direction for a comprehensive system to support and provide services for survivors of neurotrauma injuries. Section 321H-3 established the Neurotrauma Advisory Board (NTAB), which provides recommendations to the DOH on implementing this directive. The Neurotrauma Program is also advised by the State Traumatic Brain Injury Advisory Board (STBIAB), which was established in 1997 through the State Legislature's passing of Act 333. The purpose of the STBIAB is to advise the DOH in developing and implementing a plan to address the needs of survivors of brain injury.

Section 321H-4 created a Neurotrauma Special Fund (NSF), which generates funding pursuant to the surcharges levied under traffic violations that could result in TBIs or SCIs, such as speeding and operating a vehicle under the influence of an intoxicant. The NSF can be used for:

- Education on neurotrauma;
- Assistance to individuals and families to identify and obtain access to services;
- Creation of a registry of neurotrauma injuries within the State to identify incidence, prevalence, individual needs, and related information; and
- Necessary administrative expenses to carry out this chapter not to exceed two percent of the total amount collected annually.

Information and Statistics on Neurotrauma in Hawaii

Traumatic Brain Injury (TBI)

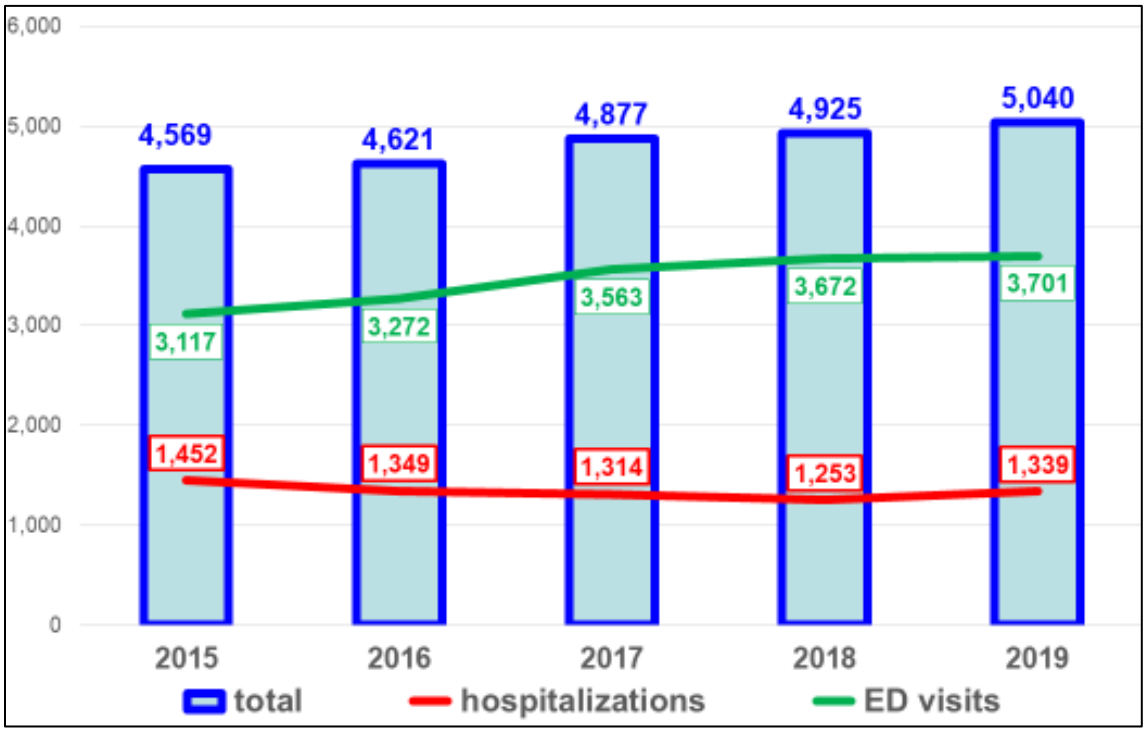
The Centers for Disease Control and Prevention (CDC) defines TBI as a "bump, blow, or jolt to the head or a penetrating head injury that disrupts the normal function of the brain. The severity of a TBI may range from 'mild' (i.e., a brief change in mental status or consciousness) to 'severe' (i.e., an extended period of unconsciousness or memory loss after the injury). Not all blows or jolts to the head result in a TBI. Most TBIs that occur each year are mild, commonly called concussions."

Symptoms of a TBI may include headache or pressure in the head, nausea or vomiting, balance problems of dizziness, blurry vision, confusion, not "feeling right", concentration or memory problems, mood changes, and changes in sleep patterns. Depending on the severity, a TBI may affect long-term cognitive, motor, sensation, and/or emotional functioning (CDC, 2015).

Between 2015 through 2019, there was an annual average of **4,806** TBIs, including **1,341 hospitalizations** and **3,465 emergency department (ED) visits** in Hawaii. Please see Appendix A for additional TBI statistics.

Graph 1: Annual average number of hospitalizations and ED visits for TBI in Hawaii, 2015-2019.

Source: Hawaii Health Information Corporation (2015) and Laulima Data Alliance (2016-2019).



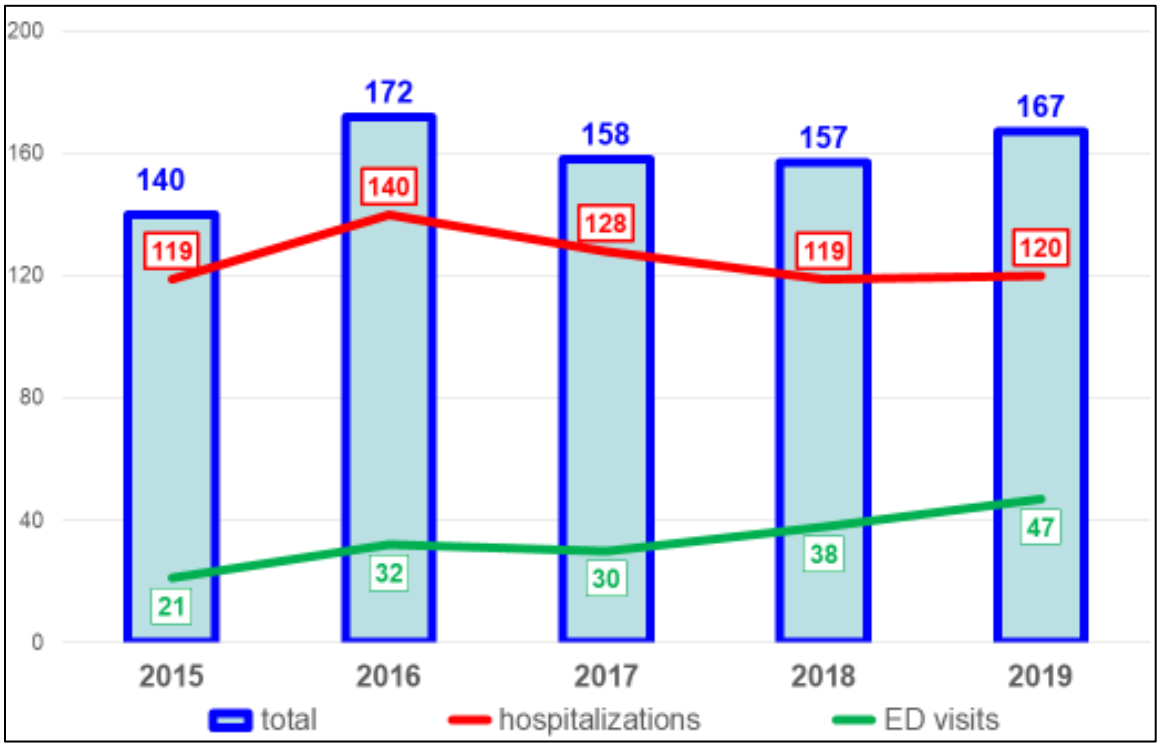
Spinal Cord Injury (SCI)

According to the National Institute of Neurological Disorders and Stroke, a SCI usually begins with a sudden, traumatic blow to the spine that fractures or dislocates vertebrae. The damage begins at the moment of injury when displaced bone fragments, disc material, or ligaments bruise or tear into spinal cord tissue. Most injuries to the spinal cord do not completely sever it. Instead, an injury is more likely to cause fractures and compressions of the vertebrae, which then crush and destroy axons – extensions of nerve cells that carry signals up and down the spinal cord between the brain and the rest of the body. An injury to the spinal cord can damage a few, many, or almost all these axons. Some injuries will allow almost complete recovery. Others will result in complete paralysis.

Between 2015 through 2019, there was an annual average of **159** SCIs, including **125 hospitalizations** and **34 ED visits**. Please see Appendix A for additional SCI statistics.

Graph 2: Annual average number of hospitalizations and ED visits for SCI in Hawaii, 2015-2019.

Source: Hawaii Health Information Corporation (2015) and Laulima Data Alliance (2016-2019).



Stroke

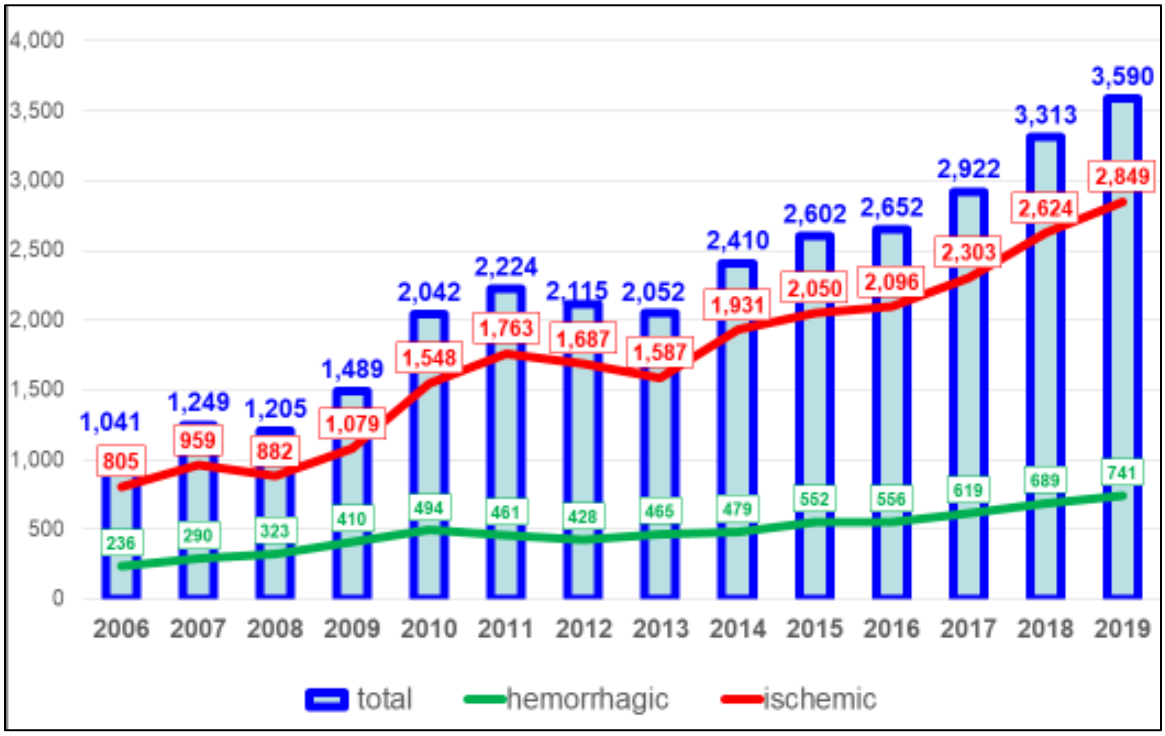
Stroke is the leading cause of chronic disability and the third leading cause of death in Hawaii. According to the American Stroke Association, a stroke occurs when a blood vessel that carries oxygen and nutrients to the brain is either blocked by a clot (called an ischemic stroke) or ruptures (called a hemorrhagic stroke). A transient ischemic attack (TIA) or "mini stroke" is caused by a temporary clot. The effects of stroke depend on several factors, including the location of the blockage/rupture and how much brain tissue is affected. Effects may include paralysis on one side of the body, vision problems, speech/language problems, changes in behavior, and/or memory loss.

Between 2017 – 2019, Hawaii had an annual average of 3,275 strokes. 2,592, or 79%, were ischemic, and 683, or 21%, were hemorrhagic. Between 2015 to 2019, about 1% of individuals (151 out of 15, 079) presenting with stroke were discharged from emergency departments, admitted for observation, or left against medical advice. Please see Appendix A for additional stroke statistics.

Please note that the data in Graph 3 below do not indicate an increasing number of stroke, but rather an increasing number of hospitals contributing data to the Hawaii Stroke Registry.

Graph 3: Annual number of records in the Hawaii Stroke Registry, by type of stroke, 2006-2019

Source: Hawaii Stroke Registry, 2006-2019.



Neurotrauma Program Accomplishments FY 2018-2020

The Neurotrauma Program's Strategic Plan for FY 2021-2023 aims to build on the FY 2018-2020 Strategic Plan and the following accomplishments achieved:

- Hosting and participating in public outreach and educational events for the neurotrauma injury awareness months and anticipating the needs of an event audience;
- Expanding upon the Stroke Network contract through Project RAPID Hawaii, a contract aimed at improving Hawaii's system of care and access to lifesaving stroke treatment for stroke;
- Continuing Project Head, Neck, Spine, aimed at educating all public, private and homeschooled students in grades three (3) through nine (9) on preventing head, neck, and spine injuries and teachers in grades kindergarten through twelve (12) on Return-to-Learn protocol;

- Strengthening the membership and participation of the NTAB and STBIAB;
- Clarifying the term “neurotrauma” for the public; and
- Increasing communication, education, awareness, and resource access between Neurotrauma Program and residents of all islands.

Section 3: Mission, Vision, Values, and Guiding Principles

The mission, vision and values of the Neurotrauma Program reflect those adopted by the Developmental Disabilities Division. The Strategic Plan was initiated to help carry out its mission:

Mission: Enhance partnerships to ensure individuals with neurotrauma and family members have access to services and supports.

Vision: Individuals with neurotrauma will have healthy and meaningful lives.

Values:

- ✓ Health and well-being of neurotrauma survivors and family members
- ✓ Dignity and respect for each individual
- ✓ Individual choice, control and responsibility
- ✓ Honoring diversity and human rights
- ✓ Personal growth and accomplishment

Guiding Principles:

Service delivery system is:

- ✓ Accessible/available/flexible;
- ✓ Implemented through best practices;
- ✓ Innovative/creative;
- ✓ Accountable;
- ✓ Coordinated and seamless through partnerships;
- ✓ Person-centered; and
- ✓ Empowering the individual.

Section 4: Strengths and Opportunities

Strengths

Chapter 321H, HRS created Hawaii's NSF, which ensures money is available to fulfill the mandates of Chapter 321H. Dedicated NSF monies allow the Neurotrauma Program to enter into contractual agreements with providers to build new or improved systems of support for survivors of a neurotrauma event.

Working in tandem with the Neurotrauma Program is a network of community organizations with whom Neurotrauma Program partner on a regular basis to provide Hawaii residents diverse, community focused information and support.

Opportunities

The NTAB and the STBIAB are made up of dedicated members who share their knowledge to build and maintain a system of support for Hawaii's neurotrauma community. Hawaii's community of neurotrauma injury survivors are vital to the Neurotrauma Program in their ability to guide the work being done in the State through advocacy efforts, user input and legislation activism. As members of NTAB and STBIAB, professionals and survivors work collaboratively with the goal of improving the system to make access to resources as seamless as possible.

Neurotrauma Program maintains partnerships with an array of stakeholders (e.g., Queen's Medical Center, University of Hawaii at Manoa, College of Education, Kinesiology and Rehabilitation Science, and American Stroke Association) in the community. Besides advancements in medicine and technology to better serve the people of Hawaii, these partnerships allow for collaborations to educate and inform the community about the lifelong impact a neurotrauma injury can have on a person's future. Education and awareness include recognizing signs and symptoms of neurotrauma, tips on living with an injury and actions everyone can take to prevent or minimize injury. Through networking efforts, the Neurotrauma Program can build upon these partnerships to ensure messaging to the public and professionals is current, consistent and efforts are not being duplicated.

Each of the partners mentioned earlier have their own established networks and informational databases. The Neurotrauma Program will build upon partnership sharing to start the discussion towards creating a systematic shared database amongst stakeholders. Additionally, the Neurotrauma Program looks to nurture partnerships with survivors and families and entities such as the Brain Injury Association of Hawaii and medical providers/groups statewide to gain additional perspective, knowledge and experience on neurotrauma injury survivors' needs and the effectiveness of work being done in the Hawaii, for Hawaii.

Current work with University of Hawaii at Manoa, College of Education, Kinesiology and Rehabilitation Science on Project Head Neck Spine is a doorway for Neurotrauma Program to work with Hawaii school's administration and staff to educate staff about head injury. Students with a sudden change in behavior and learning status may have suffered a head injury that has gone untreated and undiagnosed. By working with the schools, we can help staff recognize signs and symptoms of a head injury, inform them of action that can be taken and provide tips on talking to a student's parents.

From the neurotrauma community we consistently hear the need to have contact with people who have similar experiences and an understanding of living with a neurotrauma injury. A TBI survivor who is struggling to find a therapist wants to talk to a survivor who has a good relationship with their therapist. The adult caring for their parent who has had a stroke wants to meet with other people in his/her situation to see how they cope with the demands of work, family, appointments, personal care, special diets, etc. National neurotrauma organizations such as Brain Injury Association of America (BIAA) are available to assist regional groups such as Brain Injury Association of Hawaii (BIA-Hawaii) to organize and grow to support survivors. The Neurotrauma Program can facilitate communication between BIAA and BIA-Hawaii to help build strong relationships and successful groups.

Hawaii's medical providers are not required to report to the State on the needs of survivors of neurotrauma injuries. To learn about Hawaii's neurotrauma survivors while fulfilling the HRS 321H mandate, Neurotrauma Program contracted The Pacific Disabilities Center (PDC) to seek out and register survivors to the Hawaii Neurotrauma Registry, (HNTR). Resistance to being added to the HNTR include privacy concerns, cultural barriers and no immediate tangible outcomes for the registrant. From those persons who did complete the survey and were added to the HNTR, the contractor was tasked with distinguishing areas in the survivor's life that impeded their ability to live fully as a part of their community. The HNTR identified the needs in the tables 1-3 shown in Appendix A as part of its preliminary analysis from the voluntary registry data, based on the responses from a statewide sample of 561 unduplicated participants collected between March 21, 2013 to June 19, 2020.

From HNTR findings the greatest percentage of requests for assistance for TBI survivors was assistive technology, for SCI survivors it was transportation assistance and for Stroke survivors it was chore assistance. Further needs data is available in Appendix A. Neurotrauma Program hopes to gather a larger sample on the needs of neurotrauma survivors in the State of Hawaii. These needs represent opportunities to improve the statewide system of supports and services for individuals with a neurotrauma injury and their networks.

Data sources related to neurotrauma in Hawaii include the Laulima Data Alliance, the Hawaii Trauma Registry, and the Hawaii Stroke Registry. The Laulima Data Alliance is populated by billing data, which provides information on the number of individuals who seek medical treatment via emergency departments or hospitals for TBI and/or SCI. The Hawaii Stroke

Registry and the Hawaii Trauma Registry databases are populated by registrars who encounter patients with certain presentations (i.e., stroke, TBI, and SCI). The Hawaii Trauma Registry captures more serious injuries that present to one of the nine trauma centers in the State of Hawaii and provides much greater detail than the billing data from the Laulima Data Alliance. The Hawaii Stroke Registry, also known as the Get With the Guidelines (GWTG) Database, is a "*hospital-based quality improvement initiative created by the American Heart Association (AHA) and the American Stroke Association (ASA) to improve the care of patients with cardiac disease and stroke*." (Am Heart J. 2004 Nov;148(5 Suppl):S46-8.) In partnership with Neurotrauma Program, DOH Injury Prevention analyzes and interprets GWTG, the Hawaii Trauma Registry, and the Laulima Data Alliance data making it useable. Neurotrauma Program looks forward to taking on a larger role in learning how to read and translate data related to Hawaii's neurotrauma injuries.

Section 5: Stakeholder Feedback

Members of Hawaii's neurotrauma community contributed ideas and suggestions for the Strategic Plan for fiscal years 2021-2023 through a virtual Stakeholder's Meeting held on May 8, 2020, followed by prioritizing focus areas to shape the goals and objectives of this Strategic Plan. Stakeholders from O'ahu and Kaua'i included neurotrauma injury survivors, board members, other state agencies, contractors, advocates, family, medical providers, hospital trauma workers, and injury prevention personnel.

FOCUS POPULATION	NEED	INSIGHT
Survivors and Caregivers	People need to know what to expect when someone is injured, the recovery process and how their life will be forever altered.	When a person is injured, hospital and rehabilitation staff focus on getting the survivor into the best possible physical shape to be able to return/function in their community. However, once released from care, survivors and caregivers face daily uncertainties with home life, work life, additional recovery efforts, and their future; with no idea of how to find solutions.
General public	People need to know the signs and symptoms of a neurotrauma injury and what to do to address the injury.	The general public doesn't know the signs and symptoms of a neurotrauma injury and when or how to help.
Community partners	The public can benefit from a coordinated effort to provide education on neurotrauma injuries.	There are many different organizations whose work entails educating the public on neurotrauma injuries. Collaboration with these organizations can prevent duplication of efforts increase effectiveness.
Professionals working with survivors	Survivors want professionals to listen and respond to them in a timely and person-centered manner.	Neurotrauma injury survivors attribute poor follow up from professional staff to professionals not understanding survivors' perspectives and how to best communicate with them.
Administration and staff involved in educating youth	Administration and staff involved in educating youth should learn to recognize the signs and symptoms of a child with a head injury and how to best support them.	A child who starts exhibiting difficulty in an educational setting may have an undiagnosed head injury.
Neurotrauma community members	Survivors, family, caregivers, professionals are unaware of available resources.	People involved in the neurotrauma community especially on the neighbor islands are not being connected to services to meet their needs.
Hospital staff	Survivors need to be connected to appropriate information and resources before returning to their community.	The hospital is usually the survivor's first major point of contact following an injury. When a survivor is unable to get information to prepare for life outside of the hospital it can be a scary and confusing transition back into the community.
Neurotrauma community members	Survivors, family, caregivers, professionals need safe spaces to share experiences and support one another.	Neurotrauma survivors, family and caregivers need a nonjudgmental place where they can meet people who understand what they have been through, continue to experience and can work towards a way to move forward.

Section 6: Goals and Objectives

GOAL 1:

In coordination with community partners, expand educational opportunities to the public sector on all neurotrauma injuries to increase awareness on the effects of neurotrauma and how to respond to an injury.

OBJECTIVES:

1.1. Provide survivors and caregivers with awareness of how a neurotrauma injury can affect a person's life immediately following an injury and throughout their lifetime.
1.2. Educate the public on the signs, symptoms and what to do when recognizing a TBI, SCI or Stroke.
1.3. Coordinate public education efforts to maximize the impact and ensure efforts are not being duplicated.

GOAL 2:

In coordination with community partners, connect providers to educational opportunities to increase awareness of neurotrauma and improve service delivery and outcomes for the survivors they serve.

OBJECTIVES:

2.1 Provide social workers and medical providers with insight on survivors' experiences and methods for effective communication to improve collaboration between patient and provider.
2.2 Work with administration and staff involved with educating youth to establish and implement a Return-to-Learn protocol for students exhibiting signs of a TBI, including the identification of TBI signs and symptoms and how to discuss with parents.

GOAL 3:

Expand survivors', family members', and caregivers' connections to available resources in Hawaii.

OBJECTIVES:

3.1 Work with hospital staff and interested stakeholders to develop and implement an effective way to share information and resources with survivors to increase access to services and supports.
3.2 Provide guidance for members of the neurotrauma community to gather in a safe space to share thoughts, ideas and resources on a regular basis.

GOAL 4:

Use data to identify the needs and service gaps for survivors of neurotrauma and family members/caregivers.

OBJECTIVES:

4.1 Develop and implement a plan for obtaining generalizable data.
4.2 Develop and implement a plan to analyze data and identify service gaps to direct program activities.

Section 7: Summary and Next Steps

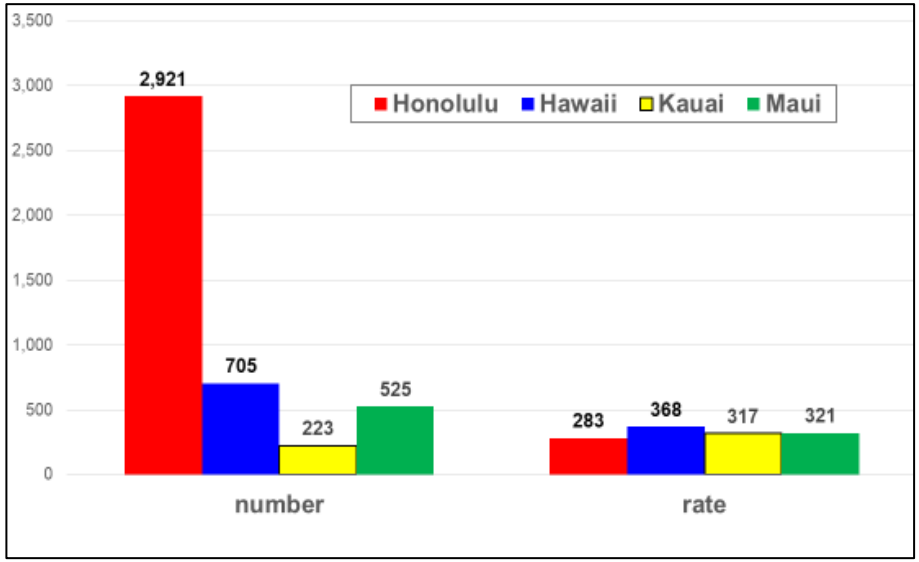
In summary, the Neurotrauma Program is excited to continue to work with stakeholders toward improving the system of services and supports for survivors of TBI, SCI, and stroke. The goals and objectives of this Strategic Plan focus on developing and implementing effective methods to understand the needs of survivors and working with community partners to improve service delivery, address service gaps, and increase awareness and education on neurotrauma. The Neurotrauma Program aims to develop new and strengthen existing relationships with the NTAB, STBIAB and community partners, which are central to achieving these goals.

To be successful in achieving our goals and objectives we will be meeting with current contractors to ensure their activities support the intentions of this Strategic Plan. Current approaches employed by the Neurotrauma Program to educate, raise awareness, collaborate, and build a better program will be reviewed. Once reviewed, new approaches will be considered to increase effectiveness and reach of the overall program. NTAB and STBIAB members will be asked to be actively involved in achieving the goals laid out in this Strategic Plan by contributing innovative implementation strategies, working on subcommittees, and networking in the community.

Appendix A: Additional Neurotrauma Statistics

Graph 4. Annual average number and age-adjusted rate per 100,000 residents[1] of TBI in Hawaii[2], by county of residence[3], 2015-2019.

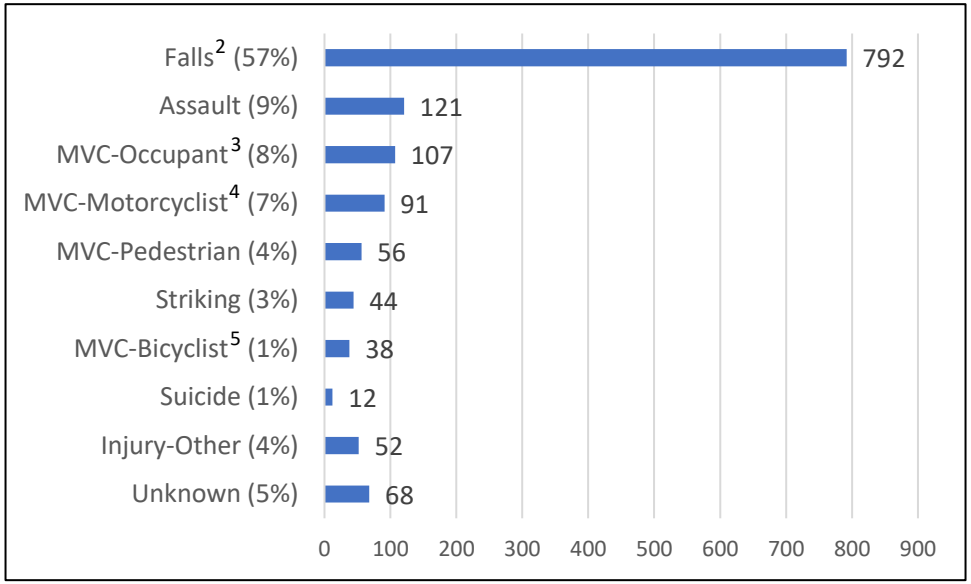
Source: Hawaii Health Information Corporation (2015) and Laulima Data Alliance (2016-2019).



1 Excludes non-resident patients (9%).
2 Honolulu County TBI rate is significantly lower than Hawaii and Maui Counties; Hawaii County TBI rate is significantly higher than Kauai County; no other significant differences.
3 Honolulu County comprised 67% of resident TBI patients. Patients from Hawaii County increased over time (14.4% in 2015 to 18.5% in 2019). Patients from Maui County decreased over time (16.3% in 2015 to 9.6% in 2019). Kauai County comprised about 5% of TBI patients in Hawaii for all years.

Graph 5. Causes[1] of TBI hospitalizations and fatalities in Hawaii, 2015-2019.

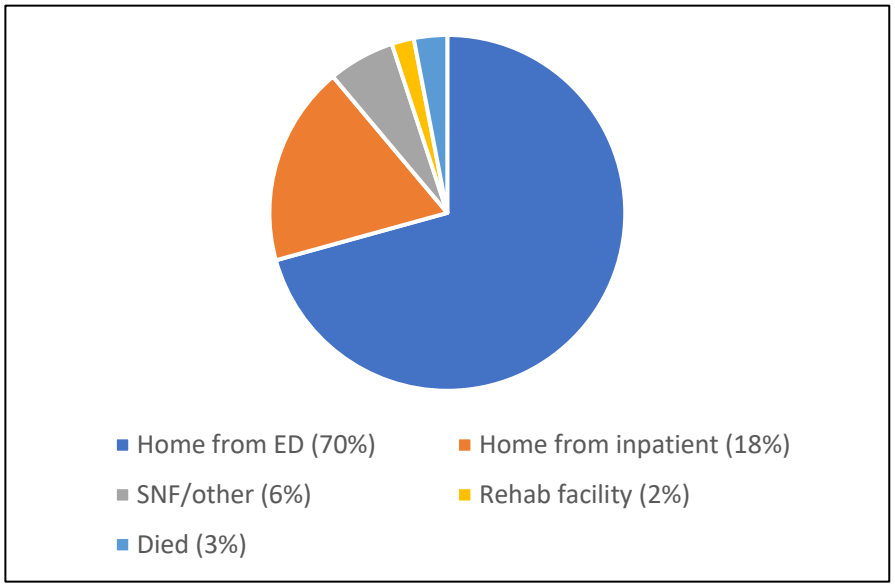
Source: Hawaii Health Information Corporation (2015), Laulima Data Alliance (2016-2019), and Hawaii Trauma Registry.



1 Average annual number.
2 Falls among seniors age 65 and older accounted for 72% (578 out of 792) of fall related TBI, and 42% of all TBIs.
3 47% with TBI did not use seatbelts compared to 20% without TBI.
4 81% with TBI did not use helmets compared to 66% without TBI.
5 60% with TBI did not use helmets compared to 51% without TBI.

Graph 6. Distribution of discharge disposition for Hawaii TBI patients[1], 2015-2019.

Source: Hawaii Health Information Corporation (2015) and Laulima Data Alliance (2016-2019)



1 Excludes records with "unspecified head injury" as only TBI diagnosis (41,469 or 62%), records without injury-related principal diagnosis (1916 or 7.4%) and patients discharged to another short-term acute care facility.

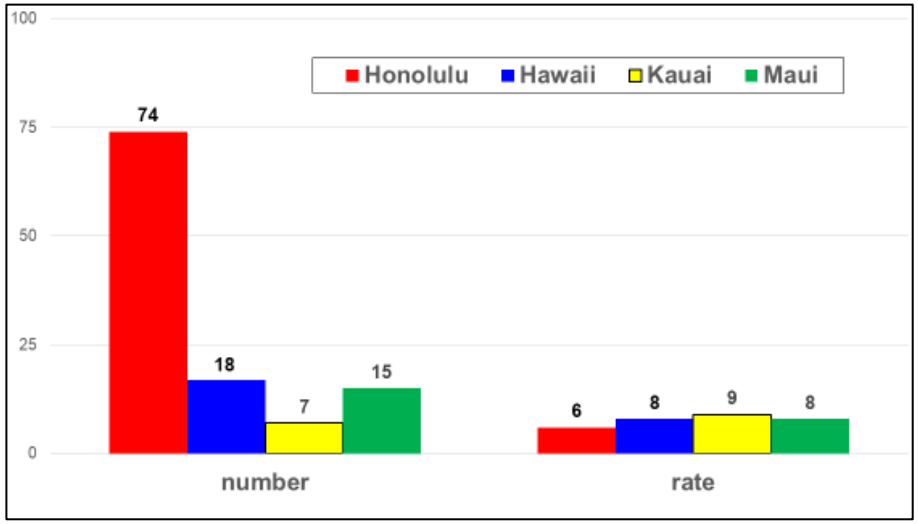
Table 1. Individual needs endorsed by survivors of TBI (2013-2020).

Source: Hawaii Neurotrauma Registry (2013-2020).

Area of Need	# Survivors Indicating Need	Total Responding	%
Assistive technology	37	107	35%
Financial	61	177	34%
Information	53	173	31%
Social Activities	50	172	29%
Social Network	27	101	27%
Chore	45	173	26%
Medical	44	176	25%
Transportation	34	143	24%
Employment	35	170	21%
Companionship	34	170	20%
Day program	32	175	18%
Housing	30	176	17%
Respite	28	172	16%
Personal Assistant Services	26	170	15%
Home Visit	10	96	10%
Meal	8	96	8%

Graph 7. Annual average number and age-adjusted rate per 100,000 residents[1] of SCI in Hawaii, by county of residence[3], 2015-2019.

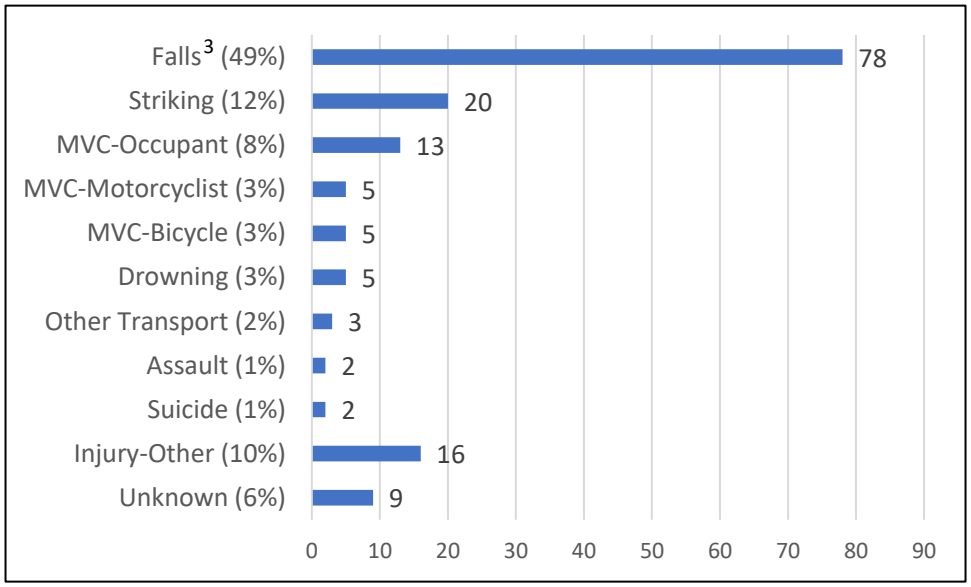
Source: Hawaii Health Information Corporation (2015) and Laulima Data Alliance (2016-2019).



1 Excludes non-resident patients (29%).
2 No significant differences between counties.

Graph 8. Causes[1] of SCI hospitalizations and fatalities in Hawaii[2], 2015-2019.

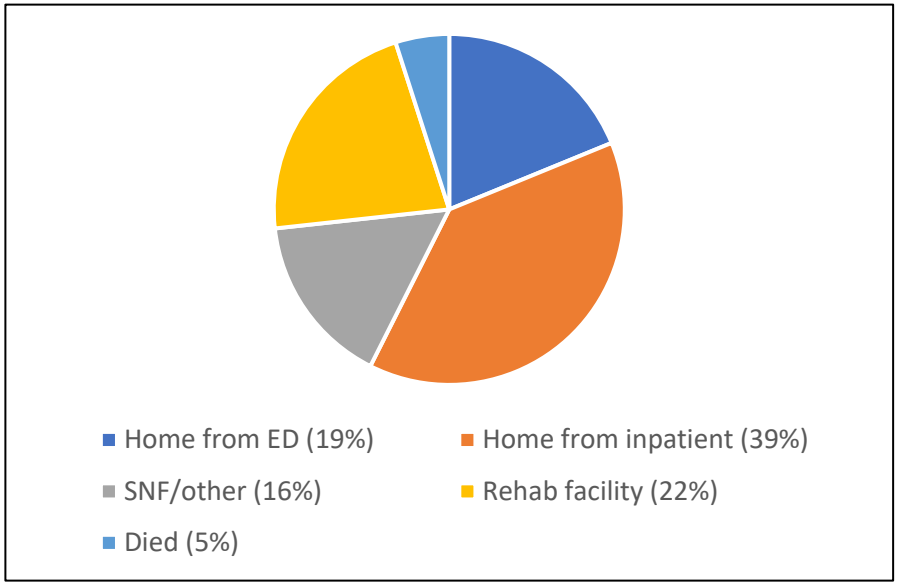
Source: Hawaii Health Information Corporation (2015), Laulima Data Alliance (2016-2019), and Hawaii Trauma Registry.



1 Average annual number.
2 Includes non-residents.
3 Falls among seniors age 65 and older accounted for 24% (38 out of 158) of all TBIs.

Graph 9. Distribution of discharge disposition for Hawaii SCI patients[1], 2015-2019.

Source: Hawaii Health Information Corporation (2015) and Laulima Data Alliance (2016-2019)



1 Includes non-residents.

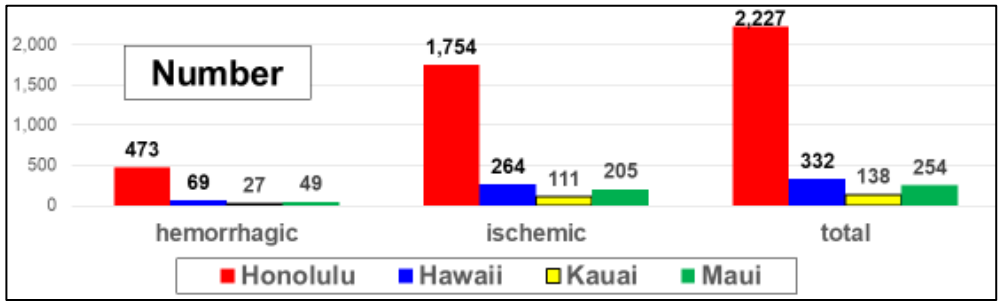
Table 2. Individual needs endorsed by survivors of SCI (2013-2020).

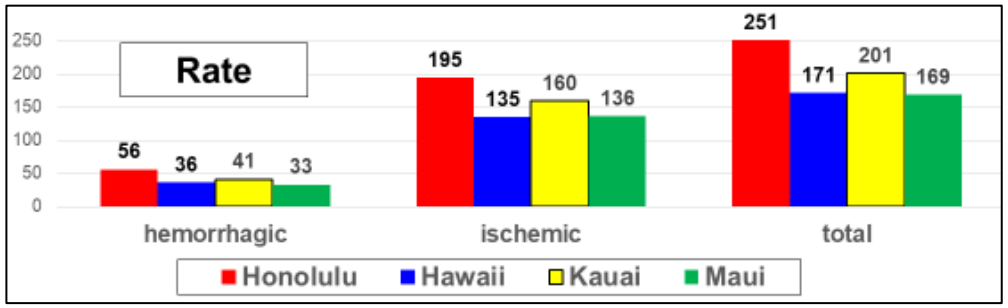
Source: Hawaii Neurotrauma Registry (2013-2020).

Area of Need	# Survivors Indicating Need	Total Responding	%
Transportation	28	55	51%
Assistive Technology	20	40	50%
Information	32	64	50%
Chore	29	62	47%
Financial	27	64	42%
Companionship	22	61	36%
Personal Assistant Services	22	62	35%
Social Network	13	38	34%
Social Activities	21	63	33%
Medical	19	63	30%
Meals	10	37	27%
Respite	16	60	27%
Housing	16	62	26%
Employment	15	59	25%
Day program	15	62	24%
Home Visit	6	36	17%

Graph 10. Annual average number and age-adjusted rate per 100,000 residents[1] of stroke in Hawaii, by county of residence[2] and type, 2015-2019.

Source: Hawaii Stroke Registry (2015-2019)



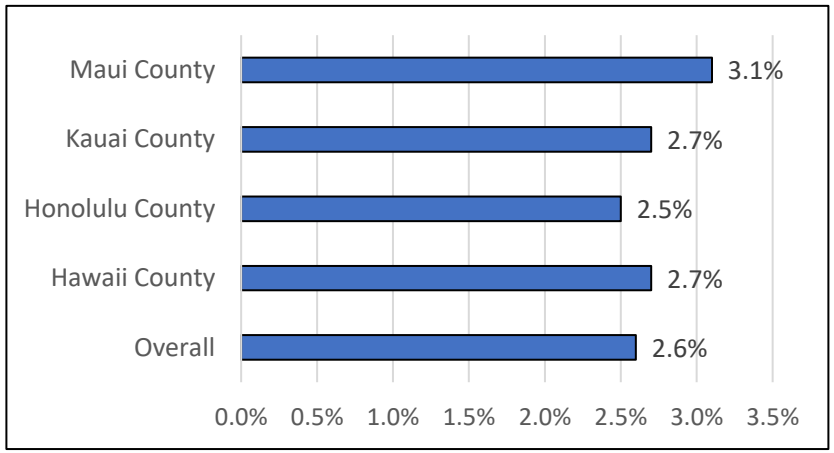


1 Excludes non-resident patients (2%, based on zip codes). For remainder, county of residence determined by zip code (69%) or if absent, county of hospital (31%). Includes residents 20 years of age and older.

2 Honolulu County was significantly higher than all other counties for total, ischemic and hemorrhagic stroke rate; Kauai county was significantly higher than Hawaii or Maui Counties for total and ischemic stroke rate and higher than Maui County for hemorrhagic stroke rate.

Graph 11. Age adjusted stroke prevalence rate[1] in Hawaii, 2018.

Source: Hawaii Behavioral Risk Factor Surveillance System (2018).



1 Respondents were asked, "Has a doctor, nurse or other health professional ever told you that you had a stroke?"

Graph 12. Distribution of discharge disposition for Hawaii stroke patients, 2015-2019.

Source: Hawaii Stroke Registry (2015-2019).

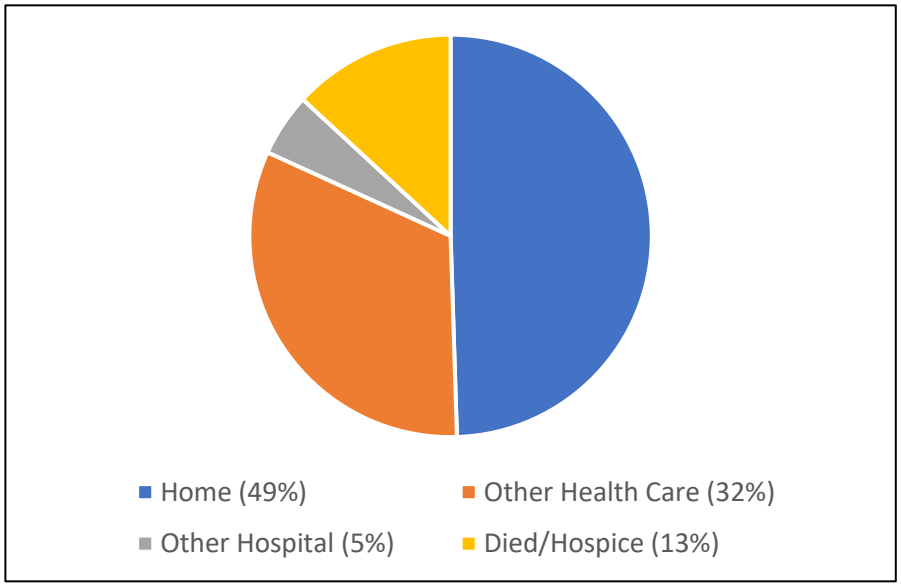


Table 3. Individual needs endorsed by survivors of stroke (2013-2020).

Source: Hawaii Neurotrauma Registry (2013-2020).

Area of Need	# Survivors Indicating Need	Total Responding	%
Chore	57	75	76%
Social Activities	61	171	36%
Social Network	31	99	31%
Transportation	48	160	30%
Financial	50	171	29%
Assistive technology	29	101	29%
Information	49	172	28%
Personal Assistant Services	47	171	27%
Day Program	41	170	24%
Respite	41	171	24%
Medical	40	172	23%
Home Visit	20	99	20%
Companionship	33	171	19%
Housing	23	169	14%
Employment	18	167	11%
Meals	8	98	8%