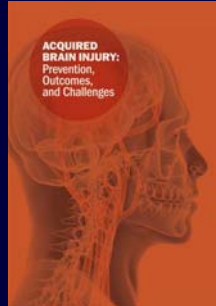


Acquired Brain Injury

- ▣ James Torner, MS, PhD
- ▣ Professor and Head, Epidemiology
- ▣ Neuroepidemiologist



Brain Trauma Research

- ▣ Brain Injury Research Program - UVA
- ▣ Neuroclinical Trials Center - UVA
- ▣ IMPACT Study
- ▣ Iowa Injury Prevention Research Center
- ▣ Iowa Trauma System
- ▣ VA Womens' Studies - head injury on women veterans
- ▣ Design of progesterone trial in severe head injury

Stroke Research

- ▣ Cooperative Aneurysm Study
- ▣ International Study of Unruptured Intracranial Aneurysms
- ▣ rTPA Pilot Studies
- ▣ Neuroprotective Agents in Ischemic Stroke
- ▣ SPOTRIAS Study Section
- ▣ Iowa Stroke Registry

Importance of Disability

- ▣ The paradigm for determining the magnitude of disease in public health has been shifting from just preventing death but also disability.
- ▣ The Global Burden of Disease Report of the World Health Organization has emphasized that *Disability Adjusted Life Years* provide a measure of the impact of disease on society.
- ▣ Neurological diseases are a major component of disability including those originating at birth, those acquired and those that are degenerative.

- *Acquired Brain Injury (ABI)* is a traumatic or non-traumatic injury to the brain that occurs after birth, is non-congenital and non-degenerative.
- Brain injuries may be mild, moderate or severe.
- Brain injuries may result in memory loss, change in personality, behavior dysfunction, difficulty managing anger, impaired judgment, loss of impulse control, communication impairment, mobility limitations, alcohol and substance abuse and other challenges.


Acquired Brain Injury

TRAUMATIC

- Open
- Closed

NON-TRAUMATIC

- Anoxia
- Aneurysms
- Brain Tumors
- Encephalitis
- Meningitis
- Metabolic Encephalopathy
- Stroke with Cognitive Disabilities

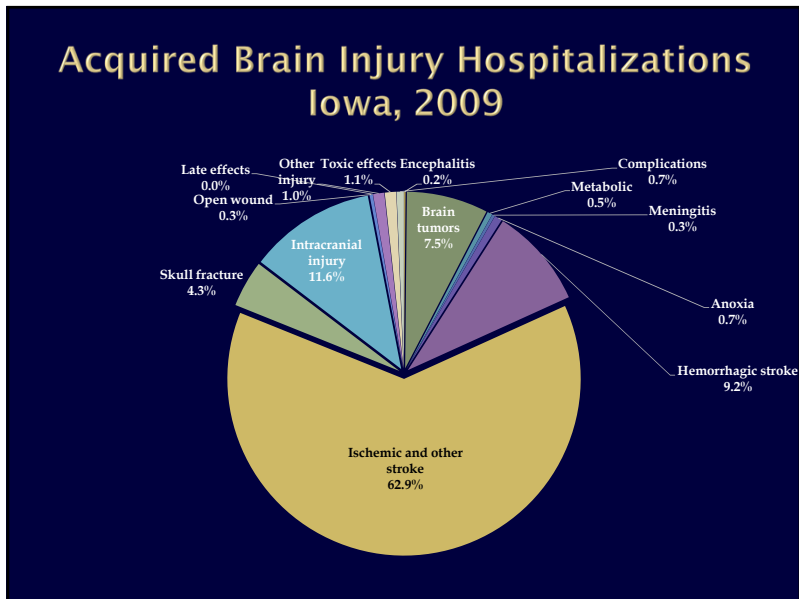


Acquired Brain Injury

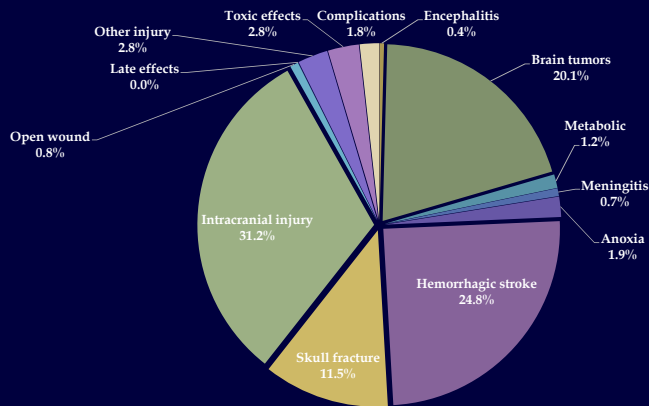
Disorder	Incidence per 100,000	Mortality 30-day	%Cost* thousands \$
Acute Ischemic Stroke	200	17	\$91
Intracerebral hemorrhage	15	50	\$124
Subarachnoid hemorrhage	6	50	\$228
Traumatic brain injury	100	29	\$136
Spinal cord injury	4	20	\$200
Bacterial meningitis	1.5	12	\$8
Status epilepticus	40	22	\$40
Anoxic brain injury	7.5	80	\$50**

*Per patient in first year, **Rehabilitation only

NETT



Acquired Brain Injury Hospitalizations Iowa, 2009



Severity Brain Injury

Definition: Normal=15, Mild=13-14, Moderate=9-12, Severe ≤ 8

Best Eye Response	Best Verbal Response	Best Motor Response
1. No eye opening	1. No verbal response	1. No motor response
2. Eye opening to pain	2. Incomprehensible sounds	2. Extension to pain
3. Eye opening to verbal command	3. Inappropriate words	3. Flexion to pain
4. Eye opening spontaneously	4. Confused words	4. Withdrawal from pain
	5. Appropriate verbal responses	5. Localizing to pain
		6. Obeys commands

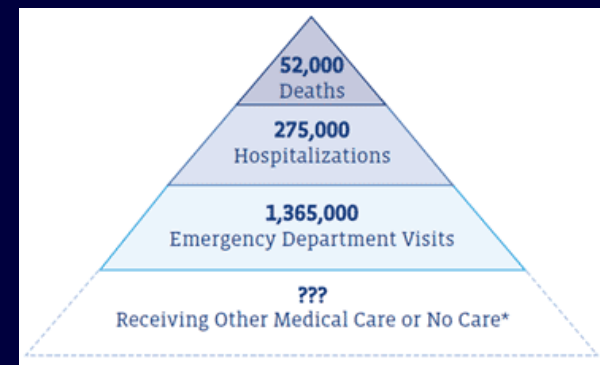
Teasdale G, Jennett B (1974). "Assessment of coma and impaired consciousness. A practical scale." *Lancet* 2 (7872): 81-4.

Glasgow Outcome Scale

- 1 **Death**
- 2 **Persistent vegetative state**
Patient exhibits no obvious cortical function.
- 3 **Severe Disability**
(Conscious but disabled). Patient depends upon others for daily support due to mental or physical disability or both
- 4 **Moderate Disability**
(Disabled but independent). Patient is independent as far as daily life is concerned. The disabilities found include varying degrees of dysphasia, hemiparesis, or ataxia, as well as intellectual and memory deficits and personality changes.
- 5 **Good Recovery**
Resumption of normal activities even though there may be minor neurological or psychological deficits.

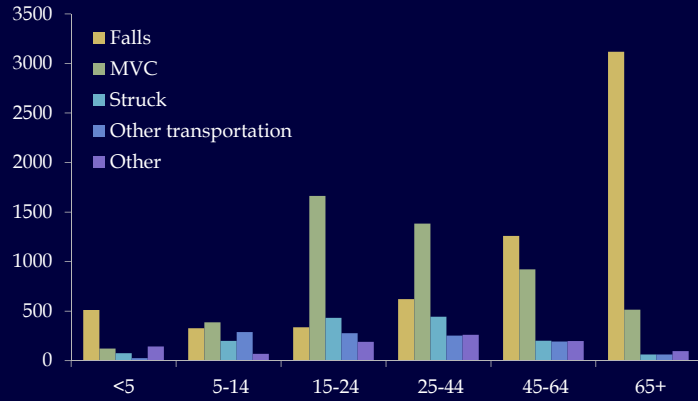
Jennett B, Bond M. "Assessment of outcome after severe brain damage." *Lancet* 1975 Mar 1;1(7905):480-4

TBI – National Estimates



<http://www.cdc.gov/TraumaticBrainInjury/statistics.html>

Head Injury Cause n=14,649

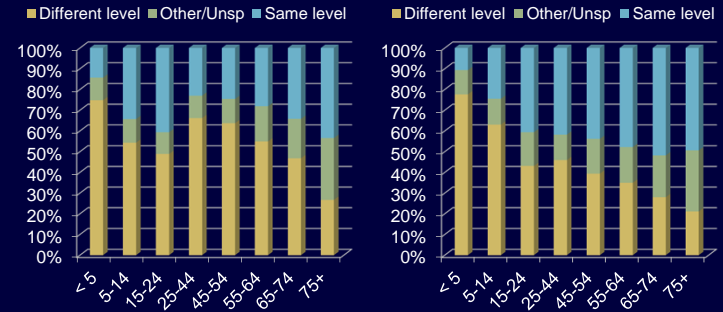


State Trauma Registry, 2002-2009

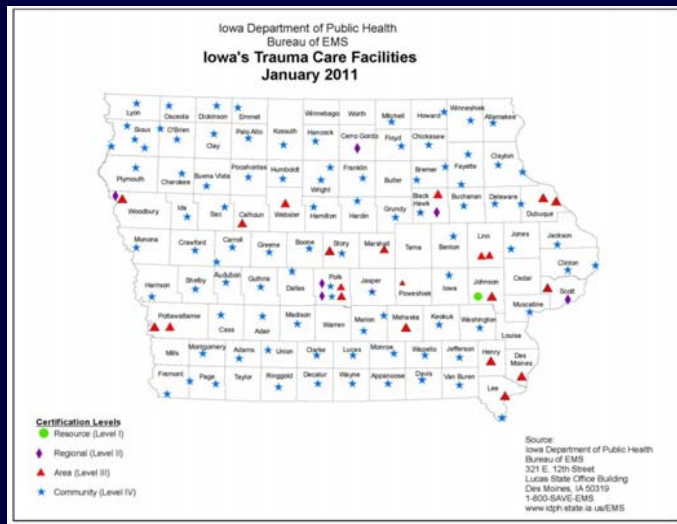
Fall Level by Age Stratified by Gender

MALES (P<0.0001)

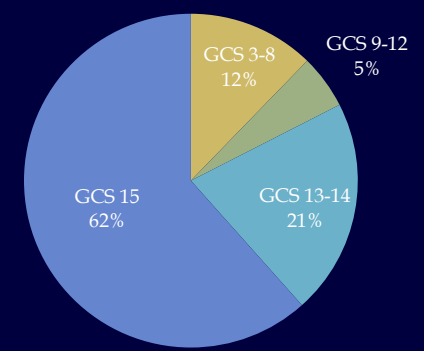
FEMALES (P<0.0001)



Iowa's Trauma Care Facilities January 2011



Head Injury Severity 2009

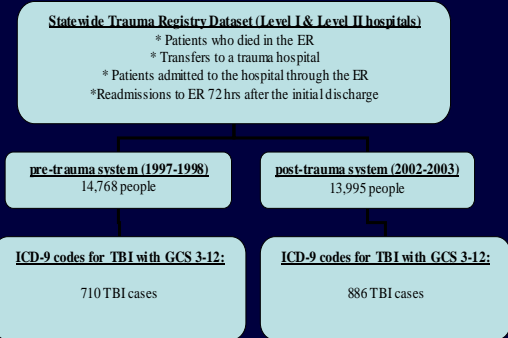


State Trauma Registry, 2009

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 DOI: 10.1089/neu.2006.0196

Effects of a Rural Trauma System on Traumatic Brain Injuries

HOPE THESMAN,¹ TRACY YOUNG,¹ JAMES C. TORNER,¹ MARK McMAHON,²
 CORINNE PECK-ASA,¹ and JOHN FIEDLER¹

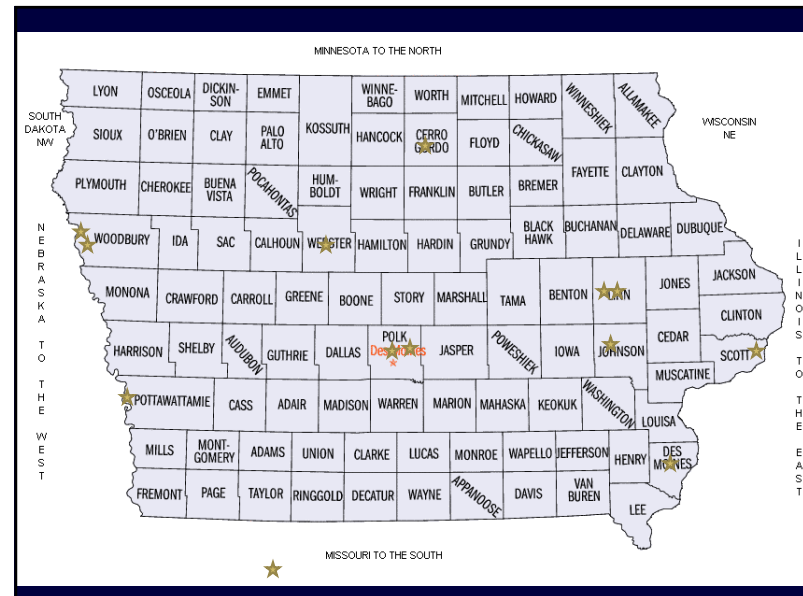


Results – Demographics

Variable	Pre-trauma system (1997-1998) (n=710)	Post-trauma system (2002-2003) (n=886)	P-value
Demographics			
Mean age (sd)	35.0 (23.2)	37.8 (23.9)	0.019
Male (%)	499 (70%)	623 (70%)	0.99
Caucasian Race (%)	642 (90%)	779 (88%)	0.11
Injury Characteristics			
Mean ISS (sd)	25.2 (13.9)	26.0 (13.1)	0.23
Mean GCS in ED (sd)	6.0 (3.1)	5.6 (3.1)	0.008
Motor-vehicle accident (%)	437 (62%)	510 (58%)	0.11
Multiple Injuries (%)	626 (88%)	828 (94%)	0.0002
Arrived in ED by ambulance	260 (37%)	471 (53%)	0.003
Positive blood alcohol test (%)	183 (26%)	260 (29%)	0.35

Results – Logistic Model Odds of In Hospital Mortality

Variable	Transfers (n=678) OR (95% CI)	Non-Transfers (n=744) OR (95% CI)
Pre trauma system vs. post trauma system	0.51 (0.34, 0.78)	0.54 (0.35, 0.86)
ISS	1.00 (0.99, 1.03)	1.02 (1.00, 1.04)
Age	1.03 (1.02, 1.04)	1.03 (1.01, 1.04)
GCS taken in ED	0.74 (0.68, 0.81)	0.65 (0.56, 0.75)
GCS taken pre-hospital	.	0.85 (0.77, 0.94)
Blunt/penetrating injury (penetrating=1)	3.30 (1.39, 7.83)	.
Medium risk versus low risk	2.93 (1.34, 4.95)	2.66 (1.38, 5.15)
High risk versus low risk	17.9 (4.56, 69.9)	7.62 (1.91, 30.30)
Other race versus White race	2.44 (1.23, 4.88)	.

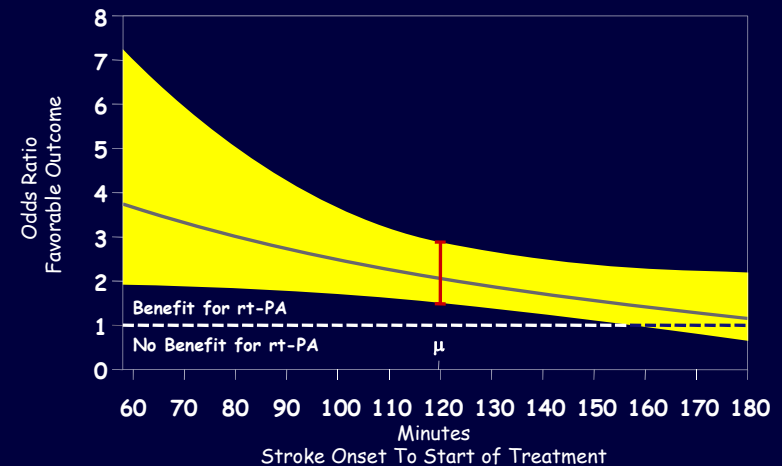


Stroke Warning Signs

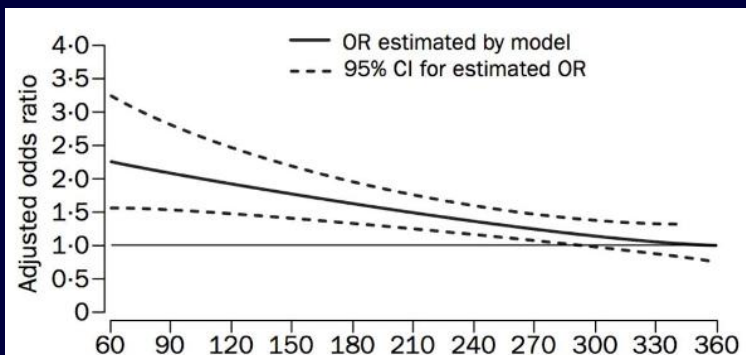
- ▣ Sudden numbness or weakness of the face, arm or leg, especially on one side of the body
- ▣ Sudden confusion, trouble speaking or understanding
- ▣ Sudden trouble seeing in one or both eyes
- ▣ Sudden trouble walking, dizziness, loss of balance or coordination
- ▣ Sudden, severe headache with no known cause

NINDS TPA Stroke Study Parts 1 and 2

Relation of Time to Odds Ratio of Favorable Outcome

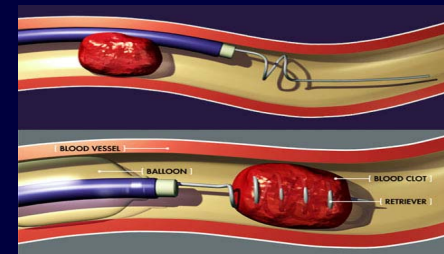


ECASS III



Endovascular Intervention

- ▣ Mechanical removal of clot
 - Clinical trials have shown that thrombectomy with mechanical thrombolysis devices is indeed feasible in the treatment of acute stroke.
 - Many devices have been discontinued
 - MERCI Retriever has received FDA clearance.



MERCI Trial Investigators. Safety and efficacy of mechanical embolectomy in acute ischemic stroke: results of the MERCI trial. *Stroke*. 2005 Jul;36(7):1432-8.
 Smith WS, et al. Mechanical thrombectomy for acute ischemic stroke: final results of the Multi MERCI trial. *Stroke*. 2008 Apr;39(4):1205-12.

The Mission of the Paul Coverdell National Acute Stroke Registry

- ▣ Measure, track, and improve the quality of care for acute stroke patients (most using GWIG)
- ▣ Decrease the rate of premature death and disability from acute stroke through secondary prevention;
- ▣ Increase public awareness of stroke treatment and prevention; and
- ▣ Reduce disparities in acute stroke care by providing underserved populations with better access to such care.
- ▣ Develop and disseminate best practices in hospital recruitment and training, data collection, and quality improvement based on lessons learned.
- ▣ Encourage the development of statewide systems of care for stroke patients through coordination with emergency medical services and collaboration among statewide partners.
- ▣ Communicate with major stakeholders in stroke care to ensure ongoing improvement in the quality of that care.



Pilot

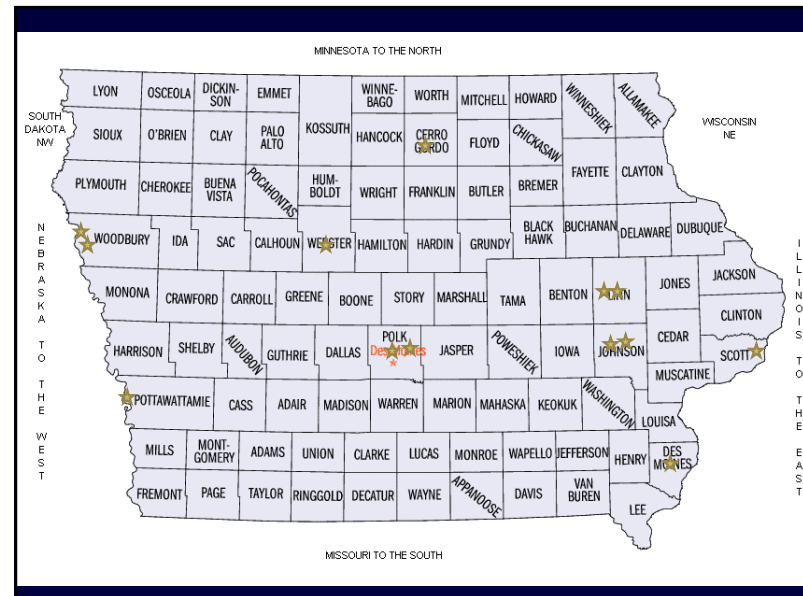
Iowa Stroke Registry Project Mission

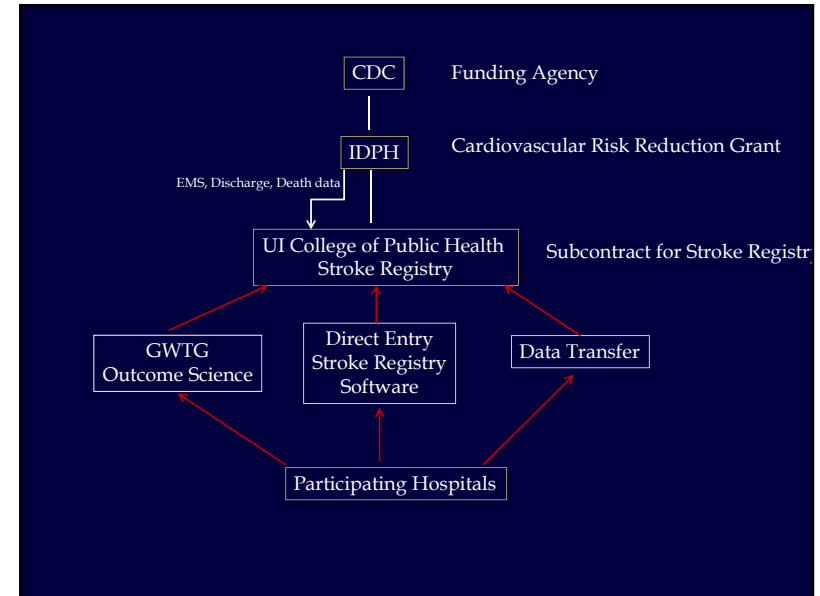
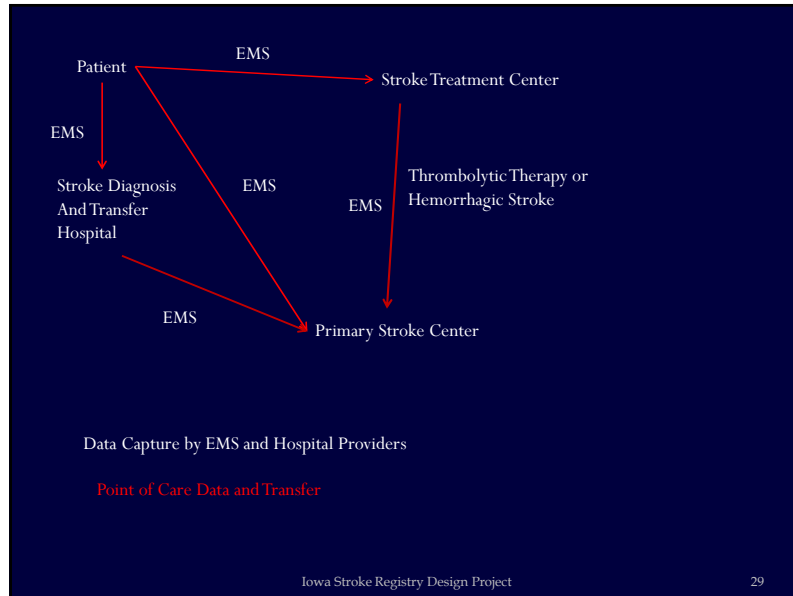
The Stroke Registry will assess the epidemiology, clinical treatment and outcomes of persons who suffer a stroke.

The Registry will gather, evaluate and disseminate information on the magnitude, the etiology, the care and the outcome of stroke in the state of Iowa.

Iowa Stroke Registry Goals

- ▣ To implement standard definitions and protocols for inclusion in the stroke registry
- ▣ To provide data at the point of care
- ▣ To gather data in a systematic manner
- ▣ To maintain quality data for retrieval
- ▣ To analyze data to meet public health, stroke system quality improvement and research needs
- ▣ To disseminate information to the public, state officials, committees and health care providers.





Data Sources For Registry

- ▣ Death certificates from stroke*
- ▣ EMS data*
- ▣ Hospital Discharge data*
- ▣ State Stroke Registry
- ▣ Stroke transfer data
- ▣ Stroke rehab and follow-up

* Existing data

Iowa Stroke Registry

https://www.public-health.uiowa.edu/iowaStrokeRegistry/Welcome.aspx

User Administration

Logout Change Password

Iowa Stroke Registry

Welcome to the Iowa Stroke Registry

Enter or Upload Data Patients and Permissions Reports Documentation Tutorials

Electronic Forms
Fill electronic data entry forms for a stroke patient.

Paper Forms
Print paper forms used to enter stroke patient data. Forms must be submitted to the Iowa Stroke Registry coordinating center to be scanned into the system.

Upload CSV Data (manual)
Upload bulk stroke patient data using a CSV formatted file.

Upload XML Data (manual)
Upload bulk stroke patient data using an XML formatted file.

For questions or comments about this site, please contact state.ia.us/ - Iowa Department of Public Health - 321 E. 12th Street, Des Moines, Iowa, 50319-0075
IDPH College of Public Health - E107 General Hospital - The University of Iowa - Iowa City, IA 52242

Iowa Stroke Registry Design Project

32

Admitted Patients - Forms

- ▣ Demographic Data
- ▣ Arrival Information
- ▣ Time of Signs and Symptoms/ Stroke Severity
- ▣ Admission Data
- ▣ Imaging
- ▣ Thrombolytic Treatment/No Thrombolytic Treatment
- ▣ Procedures and Treatments
- ▣ Complications
- ▣ Medical History
- ▣ Endovascular/Surgical Treatment (selected hospitals)
- ▣ Discharge Data

Reporting

Acute, Treated patients

- ▣ Primary Stroke Centers
- ▣ Stroke Treatment Centers
 - Non-transfers

Transfer patients

- ▣ All hospitals

Iowa Code subsection 135.22A could be used. 135.22 defines the Central registry for brain or spinal cord injuries.

1. As used in this section:

- a. "Brain injury" means the occurrence of injury to the head not primarily related to a degenerative disease or aging process that is documented in a medical record with one or more of the following conditions attributed to the head injury:
 - (1) An observed or self-reported decreased level of consciousness.
 - (2) Amnesia.
 - (3) A skull fracture.
 - (4) An objective neurological or neuropsychological abnormality.
 - (5) A diagnosed intracranial lesion.

It does not specify etiology or specifically excludes stroke. Acute stroke satisfies #1,2,4, or 5 of the criteria.

Acquired Brain Injury (ABI) is a traumatic or non-traumatic injury to the brain that occurs after birth, is non-congenital and non-degenerative. Brain injuries may be mild, moderate or severe. Brain injuries may result in memory loss, change in personality, behavior dysfunction, difficulty managing anger, impaired judgment, loss of impulse control, communication impairment, mobility limitations, alcohol and substance abuse and other challenges. Traumatic brain injuries include both Open and Closed brain trauma. Non-Traumatic brain injuries include: Anoxia, Aneurysms, Brain Tumors, Encephalitis, Meningitis, Metabolic Encephalopathy, and Stroke with Cognitive Disabilities.

Summary

- ▣ ABI has a huge impact on death and disability
- ▣ Time is critical
- ▣ Improvements related to rapid response and prevention of secondary complications
- ▣ Impact on
 - Acute care, EMS and ED emergent
 - Disability, rehab and long-term care