

Hemorrhagic Stroke Best Practice Highlights & Updates

December 2021



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Learning Objectives

- Highlight stroke care best practices pertaining to ICH and SAH
- Describe recent advances in treatment of aneurysmal SAH (coiling)
- Enhance strategies of preventing, assessing, monitoring & managing hemorrhagic stroke complications



[Management of Spontaneous Intracerebral Hemorrhage](#)

Definitions

1. Emergency Management of Intracerebral Hemorrhage
2. Inpatient Care Following Intracerebral Hemorrhage
3. Secondary Stroke Prevention in an Individual with Intracerebral Hemorrhage

Heart&Stroke

Stroke Best Practices

Driving evidence-based stroke care to achieve optimal patient outcomes and quality of care.

Management of Spontaneous Intracerebral Hemorrhage

7th Edition – 2020 UPDATE [>](#)

[Download Module PDF](#)

[International Journal of Stroke](#)

Module Sections and Resources

Definitions

Definitions [>](#)

2. Inpatient Care Following Intracerebral Hemorrhage

Recommendations [>](#)

2.1 Venous Thromboembolism

1. Emergency Management of Intracerebral Hemorrhage

Recommendations [>](#)

- 1.1 Initial Clinical Assessment of Intracerebral Hemorrhage [>](#)
- 1.2 Blood Pressure Management [>](#)
- 1.3 Management of Anticoagulation [>](#)
- 1.4 Consultation with Neurosurgery [>](#)
- 1.5 Neuro-imaging [>](#)
- 1.6 Surgical management of Intracerebral Hemorrhage [>](#)

3. Secondary Stroke Prevention in an Individual with Intracerebral Hemorrhage

Recommendations [>](#)



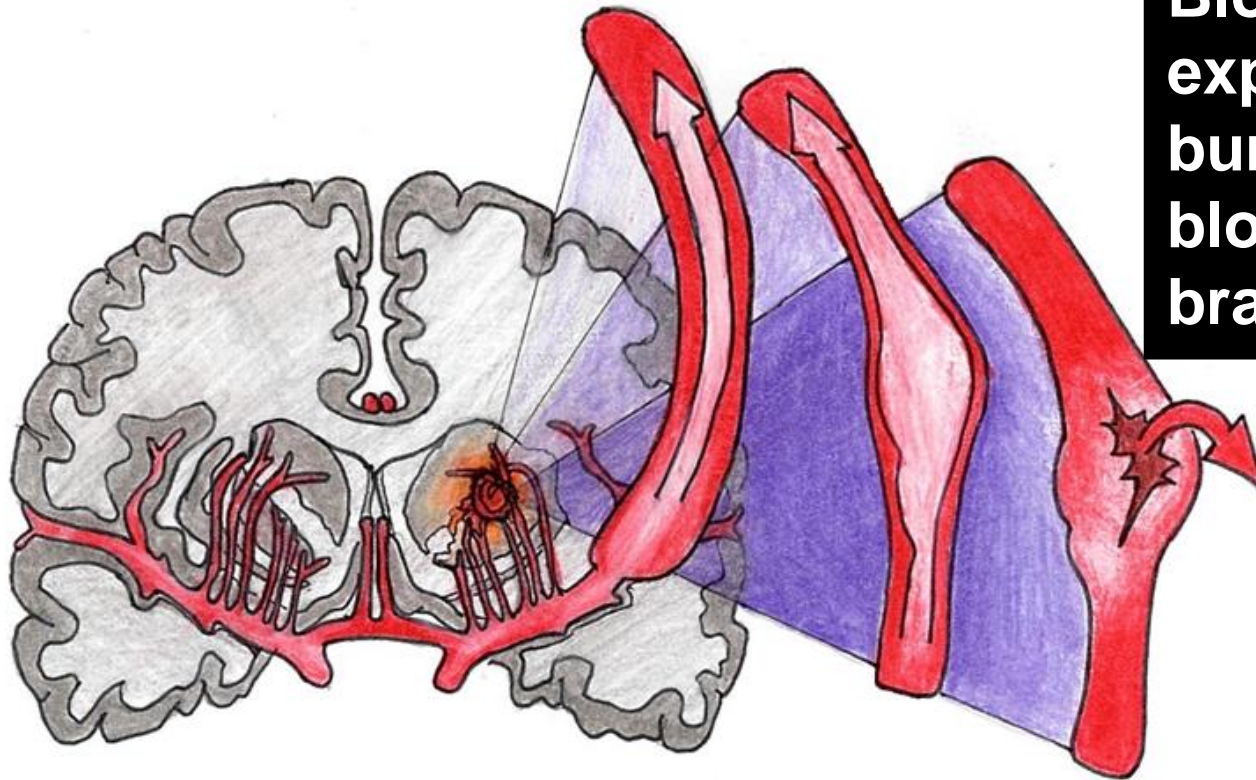
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Reminder-We all have role to play

- Critical ROLE and RESPONSIBILITY of healthcare providers at every stage of care continuum to enable optimal hemorrhagic stroke care & recovery
- Preventing, Recognizing, Monitoring & Managing complications starts early
 - Stroke is an active disease
 - Mild stroke can get worse & severe stroke deficits can improve greatly



Hemorrhagic Stroke (~20%)



Blood vessel expands and bursts, leaking blood into brain tissue



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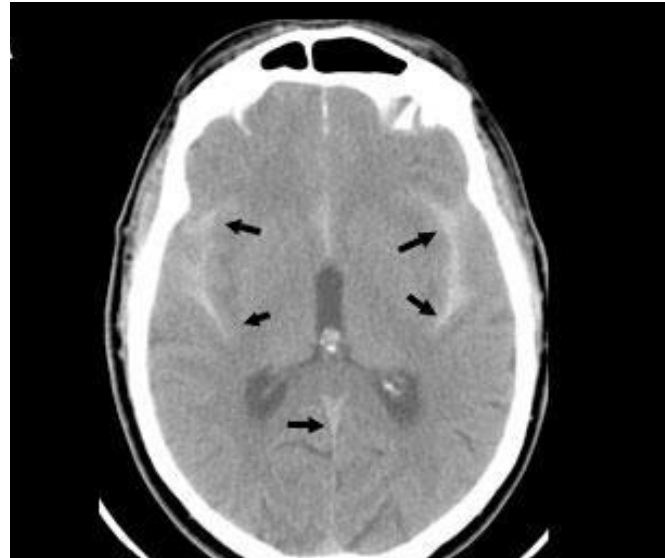
Predictors of Outcomes for ICH

- Size of the Bleed & Location
- Etiology
- Others
 - Early DNR
 - Time of onset to hospitalization/tx
 - Increased ICP
 - Hydrocephalus
 - Antithrombotics
 - Increased Temperature >37.5



Predictors of Outcomes for SAH

- Similar to ICH
- Add Vasospasm



Code Status

- Patients initially look awful! Prognosis can change
- First impressions are not always accurate
- Our role is to prime patient for rehab where much improvement can be made
- For most, defer prognosis for 48-72 hours to allow time for response to treatment
- Exception may include patients with pre-existing wishes (e.g., dementia)



Stroke Awareness & Recognition

Learn the
signs of stroke

Face is it drooping?

Arms can you raise both?

Speech is it slurred or jumbled?

Time to call 9-1-1 right away.

Act **F A S T** because the quicker
you act, the more of the person you save.

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What Signs can be Different with Hemorrhagic Stroke?

- Symptoms worsen over time
- Vomiting
- Headache
- Pupillary Changes
- Neck stiffness
- Unstable neuro, cardio and/or respiratory status



A healthcare professional with blonde hair in a bun, wearing glasses and blue scrubs, is looking at a document held by a man in a striped shirt and glasses. They are in a clinical setting with a computer monitor and keyboard visible in the background. The text "TIME IS BRAIN Hemorrhagic Stroke is a Medical Emergency!" is overlaid in a red-bordered white box.

TIME IS BRAIN
Hemorrhagic Stroke is
a Medical Emergency!

Early Treatments including Recent Advancements



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Goals for Management

- Determine etiology to guide treatment
- Stop bleeding. Prevent re-bleeding
- Prevent & manage common complications



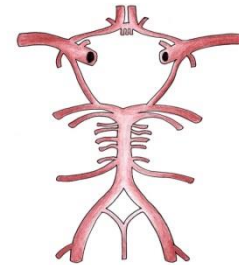
What First? Initial Assessment

- ABCs
- Neuro Assessment
 - ICH CSBPRs, 2021:
 - If declining GCS, rapidly assess for airway support by endotracheal intubation
 - If reduced LOC, pupillary changes and/or other signs of herniation should have temporizing maneuvers to manage presumed elevation in ICP such as temporary hyperventilation and hyperosmotics (e.g., mannitol or 3% saline)
- Following stabilization-
 - immediately send for imaging



Neurovascular Imaging

- All patients with suspected acute stroke must undergo immediate non-contrast brain CT and vascular imaging with CTA



Correct Coagulopathy

- Hold antiplatelets
- Warfarin: Reverse with PCC and Vitamin K
- DOACs:
 - Idarucizumab for dabigatran
 - PCC for apixaban, edoxaban and rivaroxaban.
 - Potential antidote awaiting approvals
 - Heparin/LMWH: Protamine
- Platelet disorders such as thrombocytopenia



Manage Blood Pressure



- High BP is associated with poor outcomes
- AVOID Hypotension
 - Challenging to achieve BP targets –want to maintain Cerebral Perfusion
- Check BP at least hourly for first 24 -48h + prn depending on stability
- **ICH**- still insufficient evidence that lower BP is associated with better clinical outcomes. However, evidence to support safety target SBP to 140mmHg
- **SAH**- depends on patient. Unsecured: Normotensive usually SBP110-140mmHg. Secured Aneurysm SBP < 160
- Lack of evidence to guide choice of antihypertensive. Most use IV Labetalol OR If HR< 50, Hydralazine; Enalapril IV

Early Hemorrhagic Stroke Treatment

ICH

- Surgical intervention so far has not been shown to be superior over medical management
- Surgical intervention might be considered
 - Posterior fossa decompression (URGENT)
 - Hematoma is within 1 cm of cortical surface
 - Patient is young and GCS is 9 or higher
- Some patients require endovascular drain or shunt

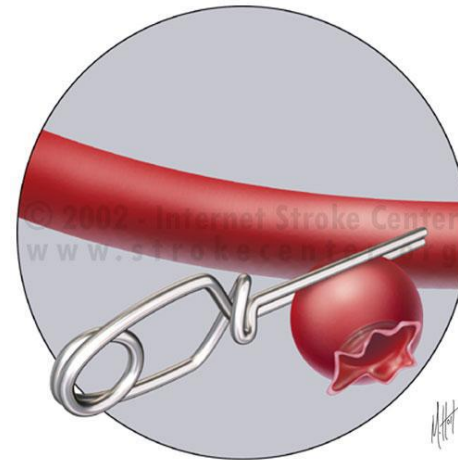
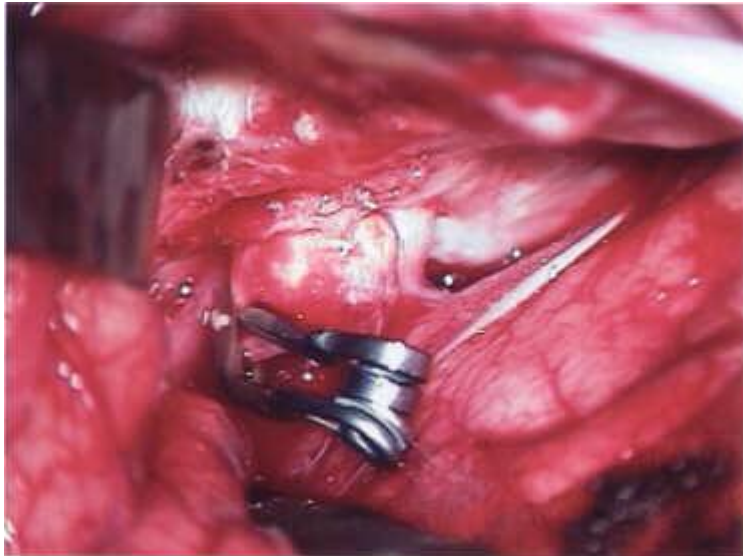
SAH

- Craniotomy and Clipping
- Endovascular Coiling



Aneurysmal SAH Management Craniotomy and Clipping

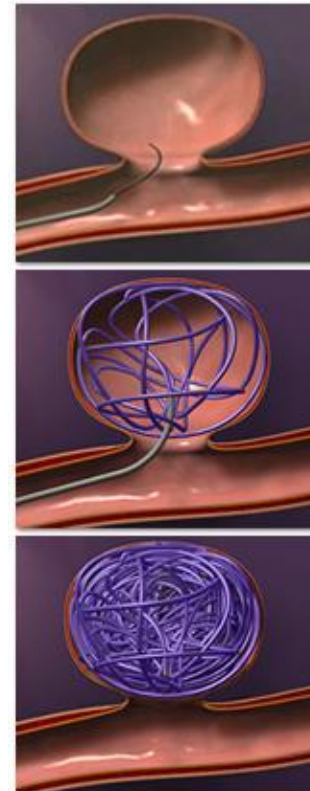
- Cranium is opened and aneurysm is visualized
- Tiny clip is placed across neck of Aneurysm



www.strokecenter.org

SAH Management Coiling

- Endovascular neuro-interventional procedure for intracranial aneurysms (ruptured and non-ruptured cases)
- **Procedure in IVR at KGH site**
- Elective and Ruptured cases



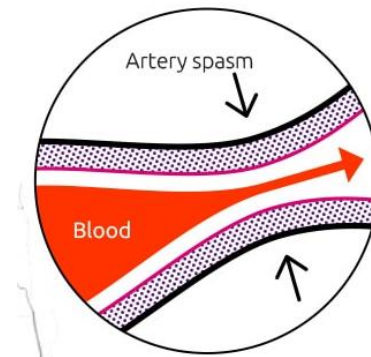
brainaneurysm.com



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SAH-Vasospasm

- Typically occurs after day 3 and may continue for ~ 3 weeks post rupture
- Monitor for signs:
 - Confusion
 - Agitation
 - Altered LOC
 - Focal neuro signs (e.g., unilateral weakness)
- Diagnostics:
 - CTA
 - Transcranial doppler



SAH-Vasospasm

- Administer prophylaxis Nimodipine po/NG
 - Calcium channel blocker
 - 60mg q4h x 21 days
- Maintain Euvolemia
 - Avoid hypovolemia & hypervolemia
 - Fluid boluses prn
- May start vasopressors to ↑BP to resolve symptoms
- Milrinone IV
 - If no resolution of symptoms despite increase in SBP
 - Limited data on efficacy for refractory vasospasms from SAH



Preventing & Managing Stroke Complications



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Complications

- Increased ICP
- Vasospasm(SAH)
- Hyponatremia
- Cardiac event/arrhythmias
- Seizure
- Abnormal Glucose
- Fever
- DVT/PE
- Dysphagia
- Pneumonia
- Impaired Nutrition/Hydration Status
- UTI
- Post Stroke Depression

Vital Signs & Canadian Neurological Scale (CNS)

CNS

- Measures deficits due to stroke
- Allows earlier detection of deterioration
- **Glasgow Coma scale (GCS)** used with stuporous or comatose patients
- GCS not sensitive to stroke & does not detect cognitive or aphasia ∴ Switch to CNS when LOC improves

Canadian Neurological Stroke Scale:



		Date:	10/09/16	10/09/16	10/09/16	10/09/16	10/09/16	10/09/16	10/09/16	10/09/16	10/09/16	10/09/16	10/09/16	10/09/16	10/09/16		
		Time:	1300	1330	1400	1430	1730	1930	2000	2030	0230	0400	0430	0430	0430		
PUPILS		Size (L/R)	4/4	4/4	4/4	4/4	4/4	3/3	4/4	3/3	3/3	3/3	3/3	3/3	3/3		
		Light Reaction (L/R)	B/B	B/B	B/B	B/B	B/B	B/B	B/B	B/B	B/B	B/B	B/B	B/B	B/B		
		B = Brisk, S = Sluggish, F = Fixed															
SECTION A	MENTATION	Level of Alert (3)															
		Consciousness: Drowsy (1.5)	1.5	1.5	1.5	1.5	1.5	1.5	1.5	3	3	3					
		Orientation: Oriented (1)	1	1	1	1	1	1	1	1	1	1					
		Disoriented or N/A (0)															
		Speech: Receptive deficit (0)															
		Expressive deficit (.5)															
		Normal (1)	1	1	1	1	1	1	1	1	1	1	1	1	1		
MOTOR FUNCTION																	
SECTION A 1	NOCTURNAL DEFICIT	Face: None (.5)	0.5														
		Present (0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Arm: Proximal None (1.5)															
		Mild (1)															
		Moderate (.5)															
		Complete (0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Arm: Distal None (1.5)															
		Mild (1)															
		Moderate (.5)															
		Complete (0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Leg: Proximal None (1.5)															
		Mild (1)															
Moderate (.5)		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5			
Complete (0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Leg: Distal None (1.5)																	
Mild (1)																	
Moderate (.5)		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5			
Complete (0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
MOTOR FUNCTION																	
SECTION A 2	DEFICIT	Face: Symmetrical (.5)															
		Asymmetrical (0)															
		Arms: Equal (1.5)															
		Unequal (0)															
Legs: Equal (1.5)																	
Unequal (0)																	
A + A1 or A + A2 = TOTAL		3.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	6	6	6	6	6	6		
INITIALS		AS	AS	AS	AS	AS	AS	MG	MG	MG	MG	MG	MG	MG	MG		
Dr. Notified of Change																	



↑ Intracranial Pressure

- Monro-Kellie Doctrine: Sum of volumes of brain, CSF, and intracranial blood is constant

Signs & Symptoms

- Change in patient's LOC
- Irritability, restlessness
- Quietness, lethargy
- Change in personality
- Headache/dizziness
- Confusion
- Late signs: pupil changes, Cushings Triad

Report Subtle Changes & "Trust Your Gut"

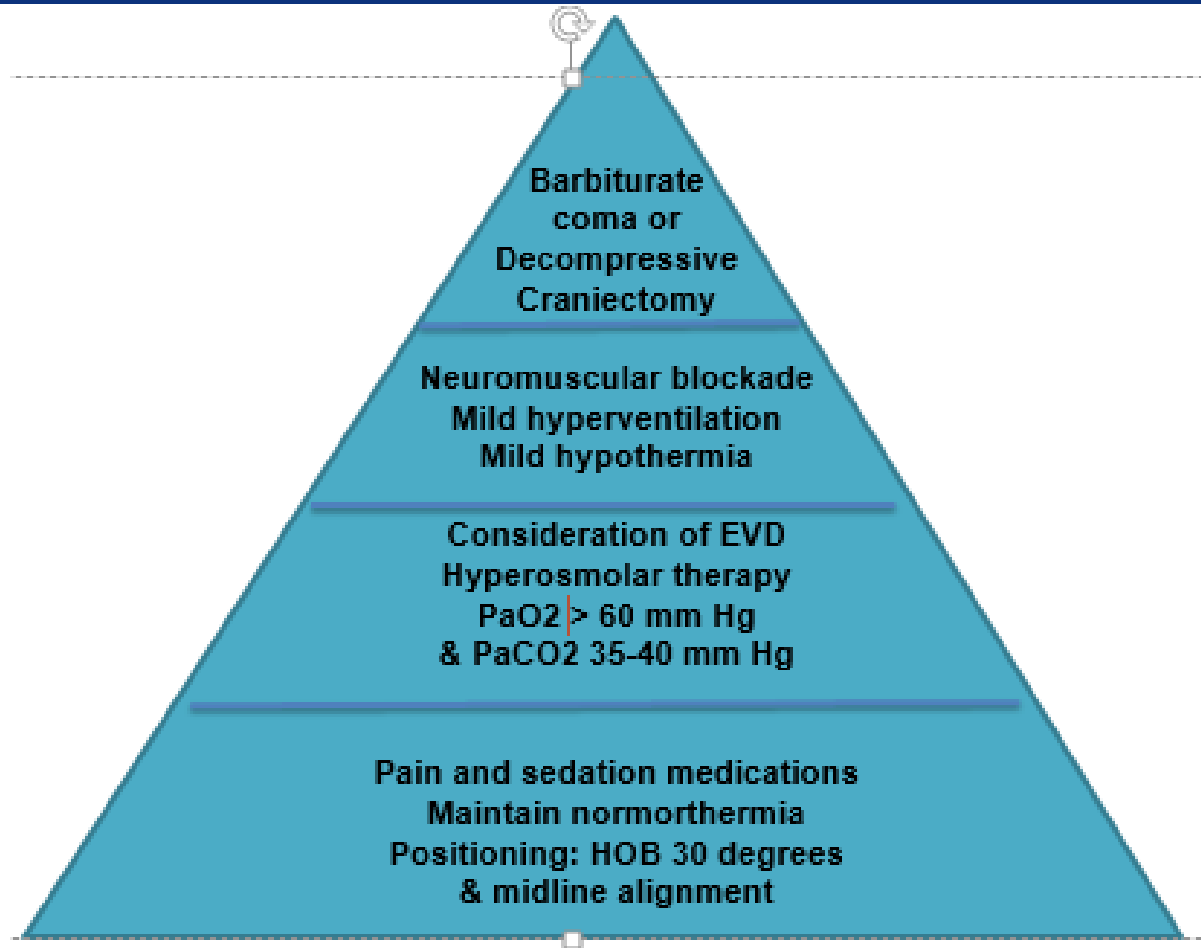


Initial Ways to Prevent/ Manage ↑ ICP

- Head of bed elevated 30°
- Avoid vasal vagal straining-e.g., bowel regimen for patients
- Maintain normothermia
- Decrease stimulation
- Pain control



Tiered Approach at KHSC



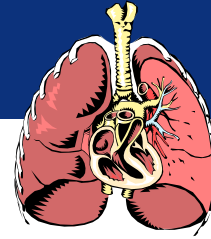
<https://criticalcareontario.ca/resources/?resource-category=neurosurgery;>

Good, V., Kirkwood, P. (2018). *Advanced critical care nursing*. Elsevier



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Hypoxia



- Initial monitoring of SpO₂
- Administer oxygen only if required
- Aspiration is common, often difficult to detect and a major risk for developing pneumonia
- Keep NPO until dysphagia screen is completed
- Mobilize early
- All other times, keep HOB at least 30°

Cardiac Ischemia Arrhythmia

- Cardiac events & arrhythmias are common
- Assess HR, noting any changes in rhythm
- MI, ACS & Arrhythmias might predate stroke or arise as a complication
- Prolonged QT is associated with decrease HR variability and increase risk of cardiac death
- Daily ECGs x 3

Seizure Management

- Common
- New-onset seizures in acute stroke patients (within 24 hrs of stroke) should be treated with short-acting medication
- Patients with post-stroke seizure should be monitored for recurrent seizure activity during vital sign checks
- Prophylactic use is not recommended
- Recurrent seizures:
 - Investigate for precipitating factors (e.g., Infection); EEG
 - Treatment is same as for seizures in other neurologic conditions
 - As per nimodipine product monograph, concomitant use with antiepileptic drugs such as phenytoin, phenobarbital or carbamazepine is contraindicated, as efficacy of nimodipine could be significantly reduced



Blood Glucose Abnormalities



- Check BG immediately
- Correct Hypoglycemia immediately
- Correct Hyperglycemia immediately. If random blood glucose level greater than 10 mmol/L:
 - Report abnormal blood glucose levels
 - Repeat BG measurement (Fasting blood glucose & HbA1c)
 - Use of anti-hyperglycemic agents (i.e., insulin sc) should be considered
- Capillary Blood Glucose checks

Doubles the Odds of Poor Functional Outcome



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Fever



- Body temperature is an important predictor of clinical outcome following stroke
- ↑ Temp is associated with ↑^{ed} morbidity and mortality and worse clinical outcome
- Monitor Temp as part of vital sign assessment; every 4 h for first 48 hrs, and then per routine +/- or clinical judgment
- For Temp > **37.5°C**, ↑ monitoring, initiate temperature-reducing care measures with Acetaminophen and investigate possible source of infection

3x odds of dependency at 3 months



Venous Thromboembolism

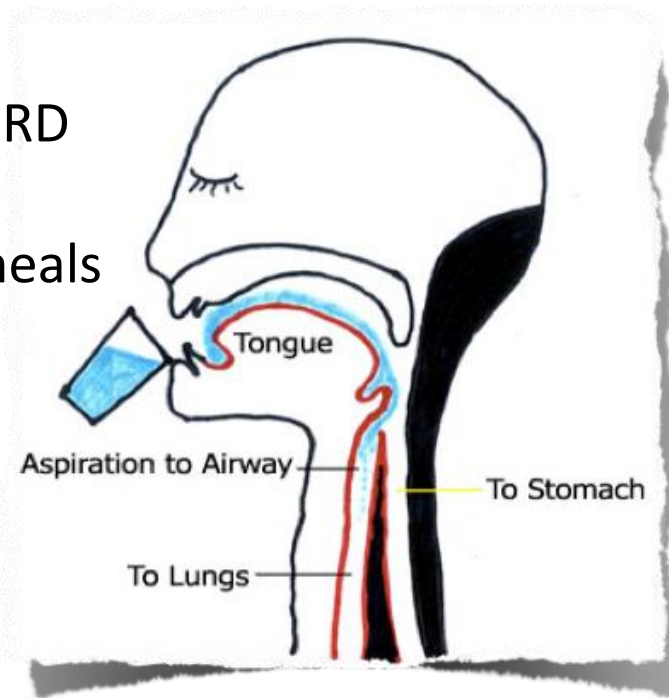
- Assess patients at risk
- Pneumatic compression device (Clots 3 Trial)
- TED stockings not recommended
- Early mobilization & adequate hydration
- When to start LMWH
 - pharmacological prophylaxis is deemed safe (at least 48 hours after presentation and confirmation with repeat brain imaging of no further hemorrhage expansion)

Doubles the Odds of Mortality at 3 months



Dysphagia Management & Prevention of Pneumonia

- Elevate HOB
- NPO (No PO meds) until dysphagia screen
- Abnormal results?-prompt referral to SLP+/- RD
- Continue to monitor swallowing ability
- Keep upright during & at least 1 hour after meals
- Decision for NG should be made early, collaboratively, & within 3 days
- Early mobilization
- Oral care protocol
- Follow SLP & RD recommendations
- Educate patients, families and caregivers on swallowing & feeding recommendations



Pneumonia quadruples mortality at 3 months



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Identification of Dysphagia

Typical

- Coughing/choking
- Drooling/poor lip closure
- Pocketing of food
- Weak cough
- Difficulty swallowing
- Report of “tight throat,” “food sticking,” or pain associated with swallowing

Sometimes harder to notice

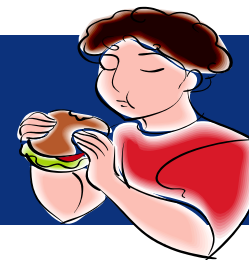
- Repeated swallows
- Wet gurgling voice
- Poor intake/appetite
- Rate of eating (slow to swallow)
- Delayed throat clearing post meals

Gag reflex does NOT equal safe swallowing



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Nutrition & Hydration



- Assess & monitor nutritional and fluid intake
- Use standardized nutrition screen (i.e. CNST)
- Maximize nutrition
- Ensure safe feeding practices; follow SLP/RD recommendations
- Permit & encourage patients to feed themselves whenever possible
- If suspected concerns consult SLP & dietitian ASAP
- Consider tube feeding if unable to meet nutrition & fluid requirements orally
- Educate family on feeding plan & techniques to
↓ aspiration risk



UTI



- Common complication
 - Confusion
 - Increased agitation
 - Increased incontinence
 - Impulsivity
 - Febrile
- Avoid indwelling urinary catheters-If in place, remove ASAP

Triples the Odds of Dependency at 3 months



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Mobilization

- Mobilization prevents most complications
- Initial assessment by rehab therapist ASAP
- Mobilization defined as process of getting a patient to move in the bed, sit up, stand and eventually walk
- Mobilize early if no contraindications
- Rehab therapy should begin as early as possible once medically able to participate in active rehab
- Follow mobility & positioning recommendations from PT/OT



Sample of Other Complications

- Depression
- Delirium
- Infection post surgery
- GI Bleed
- Acute nephropathy
- Cognitive & perceptual deficits
- Communication (e.g.,
Aphasia: expressive/receptive)
- Apraxia (inability to perform purposeful actions)
- Fatigue
- Risk of falls
- Skin pressure injury



Patient, Family, & Caregiver Support & Education

- Occurs across transition points
- Assess needs, goals & readiness
- Prepare for transitions through information sharing, education, skills training, psychosocial support, & awareness of community services
 - Consider telemedicine technology to increase access
- Assess understanding & retention of previously taught info
- Reassess when there is change

[CSBPR: Transitions & Community Participation Following Stroke](#)



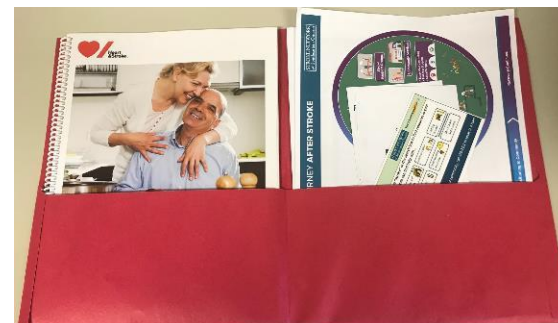
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Stroke Information Package

When the time is right, provide patients and families with the [Stroke Information Package](#). Packages contain these core materials:

- [Patient Journey Map](#)
- [Your Stroke Journey](#)
- SouthEasthealthline.ca Stroke Resources [Bookmark](#) or [Flyer](#) containing many community stroke resources and services
- [Stroke Survivor Group brochure](#)
- [Community Stroke Exercise Program flyer](#) (if available)
- [Caregiver resource](#)
- [Aphasia Conversation Group](#) (if applicable)

Information can always be added to the package depending on patient and family needs.



Reminders: Secondary Stroke Prevention

- BP management: target SBP for ICH < 130/80 & normotensive for SAH
- Choice of maintenance BP medications based on [Hypertension Canada](#) guidelines- Currently Tx with ACE inhibitor + thiazide/thiazide-like diuretic
- Smoking Cessation
- Avoid cocaine/methamphetamine
- Reduce alcohol consumption



Reminder: Stroke Unit Care



- Stroke Unit care including rehabilitation is proactive approach that saves lives
- Easier to address many issues in geographically consolidated stroke unit
- Interprofessional team, Protocols, Order Sets & Clinical Pathway ensure issues are not overlooked
- What is done to prevent & manage complications can have lasting positive effects over time



Stroke Prevention & Management

- What are 2 important factors to stroke care success?



Learn more



Fewer strokes. Better outcomes.

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Best Practice & Education

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- Survivor Stories
- Interprofessional Collaboration
- Patient Education
- Links



Education Opportunities



Presentations

<https://www.strokenetworkseo.ca/>

Resources

- <http://strokenetworkseo.ca/>
 - [Hemorrhagic Stroke Best Practice Updates: Intracerebral Hemorrhage with Dr. Al Jin \(Physician Focus\)](#)
- <http://www.strokebestpractices.ca/>
- Core Stroke Care Competencies:
 - <https://www.corhealthontario.ca/resources-for-healthcare-planners-&-providers/core-competencies/disciplines/nursing>
- Critical Care Services Ontario
 - <https://criticalcareontario.ca/resources/?resource-category=neurosurgery>
- Stroke Unit Orientation Guide:
 - [https://www.swostroke.ca/46/Acute Stroke Unit Orientation/](https://www.swostroke.ca/46/Acute%20Stroke%20Unit%20Orientation/)
- [Taking Action for Optimal Community and Long-Term Stroke Care](#) (Found on Stroke Best Practices website under Resources)





Let's Stay connected



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- Ashkan Shoamanesh, M. Patrice Lindsay, Lana A Castellucci, Anne Cayley, Mark Crowther, Kerstin de Wit, et al., on behalf of the Canadian Stroke Best Practices and Quality Advisory Committee in collaboration with the Canadian Stroke Consortium and the CoHESIVE Network. Canadian Stroke Best Practice Recommendations: Management of Intracerebral Hemorrhage, Seventh Edition, 2020; Toronto, Ontario Canada: Heart and Stroke Foundation. Click [here](#)
- Boulanger J, Lindsay M, Gubitz G, et al. Canadian Stroke Best Practice Recommendations for Acute Stroke Management: Prehospital, Emergency Department, and Acute Inpatient Stroke Care, 6th Edition, Update 2018. *International Journal of Stroke*. 2018;13(9):949-984. doi:[10.1177/1747493018786616](https://doi.org/10.1177/1747493018786616). Click [here](#)
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Anticoagulation for Atrial Fibrillation following Hemorrhagic Stroke

- Optimal timing to start or restart OAC is not well defined; should be based on individual benefit/risk assessment - clinical circumstances, stroke severity, etc.
- Most patients are prescribed DOAC over warfarin (except if mechanical heart valve)
- Provide patients & family education, resources, & ongoing monitoring regarding **medication adherence** to enhance compliance & address potential barriers in timely way
- Studies taking place re LAA closure if atrial fib & ICH



CONTINENCE

- Urinary retention or incontinence
 - Use bladder scanner to assess post-void residual
 - Assess risks for urinary retention (e.g., medications, restricted mobility, UTI)
- Change in bowel pattern (e.g., constipation)
 - Determine bowel pattern
 - Assess for bowel sounds & abdominal distention
 - Laxatives ordered prn
- Evaluate fluid intake & hydration status
- Implement bladder training & bowel management program

