Huron and Perth Paramedic Services Stroke Scale Pilot

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Disclosure Statement

We (Bill Lewis or Chris Keyser) DO NOT have a financial interest/arrangement or affiliation with one or more organizations that could be perceived as a read or apparent conflict of interest in the context of the subject of this presentation.

Pilot Background

- Currently in Ontario, Paramedics do not have an assessment tool to determine probability of Large Vessel Occlusion (LVO) stroke
- Paramedics currently use the Provincial Stroke Prompt Card
  - Based on the Cincinnati Prehospital Stroke Scale (CPSS)
- There are multiple prehospital LVO scoring tools
  - Los Angeles Motor Scale (LAMS) and Vision, Aphasia, Neglect (VAN) were found to be the most promising for deployment

Pilot Goals

1. To determine if EMS providers in a rural Ontario setting can integrate the tool
2. To determine the local validity/reliability of the tool

Location

Huron County
- Population: 59297
- Call Volume:
  - Approx. 10000 Responses
  - Approx. 6000 Patient Carrying Calls

Perth County
- Population: 38066
- Call Volume:
  - Approx. 12000 Responses
  - Approx.. 8000 Patient Carrying Calls

Support Required for Pilot Processes

- MOHLTC EHS Branch had to be consulted along with the Provincial Medical Advisory Committee before local bypass could be put in place

Pilot Project

- Partnering in this work
- Pilot was July 2018 to March 31, 2019
- Perth EMS: 46 patients to March 31, 2019
- Huron EMS: 23 patients to December 31, 2018

Integration of LAMS and VAN-S Into EMS Workflow

Huron County

- LAMS score was calculated manually and relayed to the ED
- LAMS was integrated into the electronic patient care record that is completed after patient contact; LAMS score became part of the patient's medical record

Perth County

- LAMS and VAN-S were completed on separate paper forms

Paramedic Education

Huron County Paramedics
- Education was completed during Spring 2018 CME Day
- LAMS is a variation of existing stroke assessment
- LAMS Training Video: Rhode Island Stroke Task Force
- Reviewed CorHealth LVO and EVT information
- Coincided with launch of "race car pit stop" model

Perth County Paramedics
- Education was completed online and during both Spring/Fall CME
- Video review and resources from STROKEVAN website
- Peer practice and ongoing review
- Coincided with launch of "race car pit stop" model

Layout of 3 scales (Prompt card, LAMs and VAN)

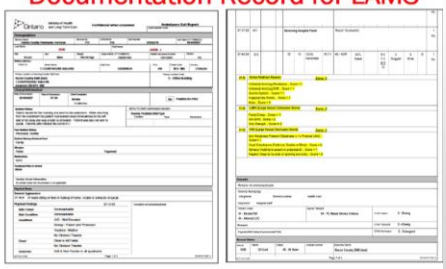
Name of Stroke Scale	EMS Prompt Card	LAMs	LAMs Assessment and Scoring Score the pt's Affected Side	VAN	VAN Assessment
Criteria of Side	Unilateral arm/leg weakness	Arm Drift	0=Absent 1=Drifts down (Arm drifts down but does not hit the bed within 10 sec.) 2= Falls Rapidly (Arm cannot be held up against gravity and falls to the bed within 10 sec.	Weakness on one side of body	1. How weak is patient on one side of the body? Hold both arms for 10 seconds • **Mild (minor drift)** • **Moderate** (some drift) –touches or nearly touches ground. • **Severe** (flaccidity or no antigravity) • **Patient shows no weakness.** Patient is **VAN Negative** and do not need to proceed with rest of the tool
				If Patient is VAN Negative do not proceed with the rest of the tool	
	Slurred or inappropriate words or mute	Grip Strength	0=Absent (Normal) 1 =Weak Grip (weak but some movement) 2=No Grip (No movement. Muscle contraction be seen but without movement)	Visual Disturbance	2. Visual disturbance? Ask pt to look to right then left, evaluate for uneven eyes) • Double vision (ask pt look to right then left, evaluate for uneven eyes) • Blind new onset • NONE
	Unilateral Facial Droop	Facial Droop	0=Absent (No facial asymmetry. Normal) 1= Present (partial or complete lower facial droop)	Aphasia	3. Aphasia? • Expressive (inability to speak or errors) don't count slurring of words (repeat & name 2 objects). • Receptive (not understanding or following commands) (close eyes, make fist) • Mixed • None
				Neglect	4. Neglect? • Turned gaze or inability to track to one side. • Unable to feel both sides at same time, or unable to identify own arm. • Ignoring one side • NONE
Scoring	No numeric score	Total Score (0-5)	Numeric score	VAN Negative or VAN Positive	Patient must have weakness plus one or all of the V, A, or N to be positive. No numeric value

Process – Huron County

Huron County Paramedics

- Paramedics completed stroke assessment according to Provincial Stroke Prompt Card and applied findings to LAMS Score
- Paramedics transported to stroke center if patient qualified
  - Did not divert to Regional Stroke Centre
- Paramedics gave pre-alert to receiving hospital and relayed the LAMS score
- Paramedics documented LAMS findings in electronic documentation

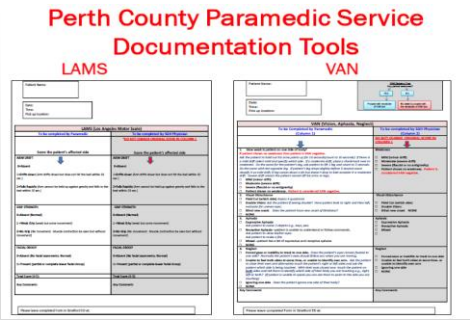
Huron County Paramedic Service Documentation Record for LAMS



Process – Perth County

Perth County Paramedics

- Paramedics completed stroke assessment according to Provincial Stroke Prompt Card and applied findings to LAMS score
- Paramedics completed VAN assessment
- Paramedics transported to stroke center if patient qualified
  - Did not divert to Regional Stroke Centre
- Paramedics gave pre-alert to receiving hospital and relayed LAMS and VAN scores
- Paramedics documented LAMS findings and VAN findings on paper forms
- Paramedics compared findings with attending physician during the "pit stop" model of care
- Outcomes were compared with physician assessment
- Note: "race car pit stop" model had just been implemented



Documentation

Huron

- Laminated copy of the LAMS was in the ambulance to act as a reference tool for the score
- Paramedics documented LAMS score electronically on the ambulance call record post transfer of care

Perth

- Laminated copies of the VAN and LAMS were available in the ambulance as a reminder to paramedics to complete documentation as well as a reference tool on how to perform both scales
- Paper copies were kept in the ambulance and were made available in the ED
- Paramedics completed the tool prior to transfer of care

Associated Costs

- Little to no cost
- Some stationary costs
- Minimal training time

Barriers to Implementation

LAMS

- No barriers
- The prompt card fit well with the LAMS
- No new skills needed
- Huron County continues to use the LAMS

VAN

- Education required for visual field testing and pronator drift
- Maintaining competency a challenge given infrequent exposure to stroke patients and stroke assessment skills
- Interpretation of the VAN by paramedics and physicians was variable

Perception

Feedback

Huron County

- Integration into electronic patient care system was not difficult
- Score was mandatory on all stroke patients
- LAMS did not require any additional assessment training
- Physicians at AMGH indicated that knowing the LAMS score assisted with patient care plan prior to patient arrival
- Paramedics were eager to apply this to practice and wanted to transport these patients directly to EVT center

Feedback

Perth County

- Integration into current practice was not challenging
- The VAN assessment had challenges for paramedics when patients where difficult to assess with items such as aphasia within the VAN
- Paramedics where willing and excited to further their assessment capabilities and potentially move towards redirecting patient to the Regional EVT Centre

Paramedic Survey

Results from 25/80 paramedic responses revealed:

- Paramedics preferred the LAMS tool
- The LAMS aligned well with the prompt card and was easier to learn and implement
- The VAN tool was more complex, requiring education to assess visual field, pronator drift and aphasia assessments, challenging skills to retain given infrequent exposure to stroke assessment
- Paramedics appreciated having an additional tool to support stroke assessment

LAMS and VAN Metrics

	LAMS	VAN
Sensitivity	0.80	0.86
Specificity	0.65	0.69
PPV	0.32	0.40
NPV	0.94	0.95

- Sensitivity and specificity results were similar to results in the literature: LAMS and VAN identified LVO stroke patients
- Low Positive Predicted Value meant there were a high number of false positives: 70% of patients who scored positive on the LAMS did not have a LVO stroke – they might have had a stroke that was not a large vessel occlusion stroke, or they might be a stroke mimic
- These patients would not need EVT at the Regional Stroke Centre: they could be cared for elsewhere

Pilot Conclusions

- With diversion for patients who screen positive for LVO directly to an EVT centre, low PPV may lead to higher volumes of patients at EVT centers, with 2/3 of them not having LVO confirmed
- This would require additional transfers to the primary District Stroke Centre or home hospital for patients who do not qualify for EVT
- Effective repatriation processes are needed between EVT centers, DSCs and home hospitals to manage capacity issues that may result if a LVO screening tool is fully implemented by EMS

Pilot Conclusions

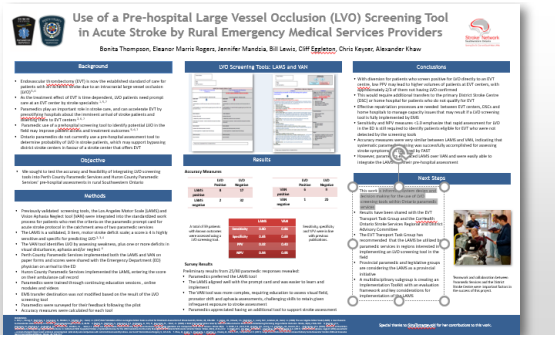
- Accuracy measures were very similar between LAMS and VAN, indicating that systematic paramedic training was successfully accomplished for assessing stroke symptoms not captured by FAST
- Paramedics embraced LAMS over VAN and were easily able to integrate the LAMS into their pre-hospital assessment

Key Learnings

- Paramedics were keen to learn about and use a LVO screening tool
- LAMS was more straightforward to implement than VAN
- Huron County EMS continue to use and document LAMS
- Perth County paramedics continue to use the assessment skills that were developed during the pilot
- Physicians found that pre-notification supported the plan of care for stroke patients

Pilot Results

- Results were shared with the EVT Transport Task Group and the CorHealth Ontario Stroke Services Regional and District Advisory Committee
- The pilot results informed system design and decision making for the use of LVO screening tools within Ontario paramedic services
- This work was shared as a poster at the Canadian Stroke Congress in Ottawa in October, 2019


Use of a Pre-hospital Large Vessel Occlusion (LVO) Screening Tool in Acute Stroke by Rural Emergency Medical Services Providers

Bonita Thompson, Eleanor Morris Rogers, Jennifer Mandzia, Bill Lewis, Cliff Eggleton, Chris Keyser, Alexander Khaw

Background

Objective

Methods

LVO Screening Tools: LAMS and VAN

Results

Conclusions

Next Steps

Current State

- Pilot is finished, but both paramedic groups are still using these assessment skills in the field
- "race car pit stop" model continues, and is reducing door to needle time
- Huron, Perth and Renfrew EMS providers are participating in CorHealth's provincial group to develop a provincial LVO screening implementation toolkit
- LAMS has been adopted and approved by the OAPC and the MAC for provincial use

CorHealth Models

"Mothership model" vs "Drip and Ship"

Mothership:
- Take patient directly to the EVT Centre

Drip and Ship:
- Take patient to District Stroke Centre for imaging and EVT consult with Regional Stroke Centre

CorHealth Inclusion Criteria

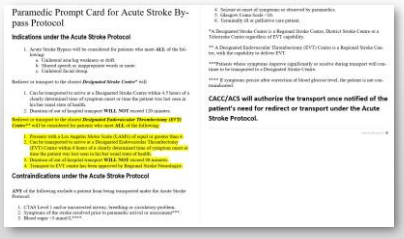
Assuming patient is screened LVO positive, EMS should stop at the tPA site if:

1. Travel time between the tPA site and EVT site is > 60 minutes; and
2. tPA site is on route to EVT site or tPA site is near patient pick up location (i.e. < 10 minutes); and
3. tPA site can achieve a door in door out time of 45 minutes (i.e. door to needle time of 30 minutes and needle to door out time of 15 minutes).

If these parameters cannot be met, the patient should be taken directly to the EVT site, unless travel time to EVT site is > 60 minutes OR if travel time would prevent patient from receiving tPA (i.e. exceeds 4.5 hours from SSO).

If the EVT site is > 60 minutes from pick up location, patient should be taken to the closest designated stroke centre, unless patient is in the 4.5 to 6 hour time window, at which point transport to an EVT capable centre should be considered up to a maximum transport time of 2 hours.

Ideas About Update to Prompt Card



Paramedic Prompt Card for Acute Stroke By-pass Protocol

Indications under the Acute Stroke Protocol

1. Acute Stroke Bypass will be considered for patients who meet ALL of the following:
   a. Unilateral arm/leg weakness or droop.
   b. Slurred speech or inappropriate words or sense.
   c. Unilateral facial droop.

Redirect or transport to the closest ***Designated Stroke Centre**** will:

1. Can be transported by active at a Designated Stroke Centre within 4.5 hours of a witnessed onset of symptoms or time the patient was last seen in his/her usual state of health.
2. Duration of out of hospital transport **WILL NOT** exceed 120 minutes.

Redirect or transport to the closest **Designated Endovascular Thrombectomy (EVT) Centre**** will be considered for patients who meet **ALL** of the following:

1. Presents with a Los Angeles Motor Scale (LAMS) of equal or greater than 4.
2. Can be transported by active at a Designated Endovascular Thrombectomy (EVT) Centre within 6 hours of a witnessed onset of symptoms onset or time the patient was last seen in his/her usual state of health.
3. Duration of out of hospital transport **WILL NOT** exceed 60 minutes.
4. Transport to EVT centre has been approved by Regional Stroke Neurologist.

Contraindications under the Acute Stroke Protocol

ANY of the following exclude a patient from being transported under the Acute Stroke Protocol:

1. GCS Level 3 and/or uncorrected airway, breathing or circulatory problem.
2. Symptoms of the stroke resolved prior to paramedic arrival or assessment***.
3. Blood sugar <3 mmol/L*****.
4. Seizure at onset of symptoms or observed by paramedics.
5. Pregnancy or suspected.
6. Terminally ill or palliative care patient.

*A Designated Stroke Centre is a Regional Stroke Centre, District Stroke Centre or a Telestroke Centre regardless of EVT capability.

** A Designated Endovascular Thrombectomy (EVT) Centre is a Regional Stroke Centre, with the capability to deliver EVT.

***Patients whose symptoms improve significantly or resolve during transport will continue to be transported to a Designated Stroke Centre.

**** If symptoms persist after correction of blood glucose level, the patient is not contraindicated.

CACC/ACS will authorize the transport once notified of the patient's need for redirect or transport under the Acute Stroke Protocol.

Future State

- OAPC is recommending a single provincial bypass protocol
- Potential challenges:
  - Transport timelines
  - Geographical issues
    - health equity
    - geographical service boundaries
    - remote access i.e. northern Ontario/ORNGE
  - Inclusion criteria
  - Offload delay
  - Repatriation
  - Feedback to paramedics
- Regional working group is addressing these issues as they develop an implementation toolkit
- Education toolkit will be developed

Discussion/Questions

Thank You