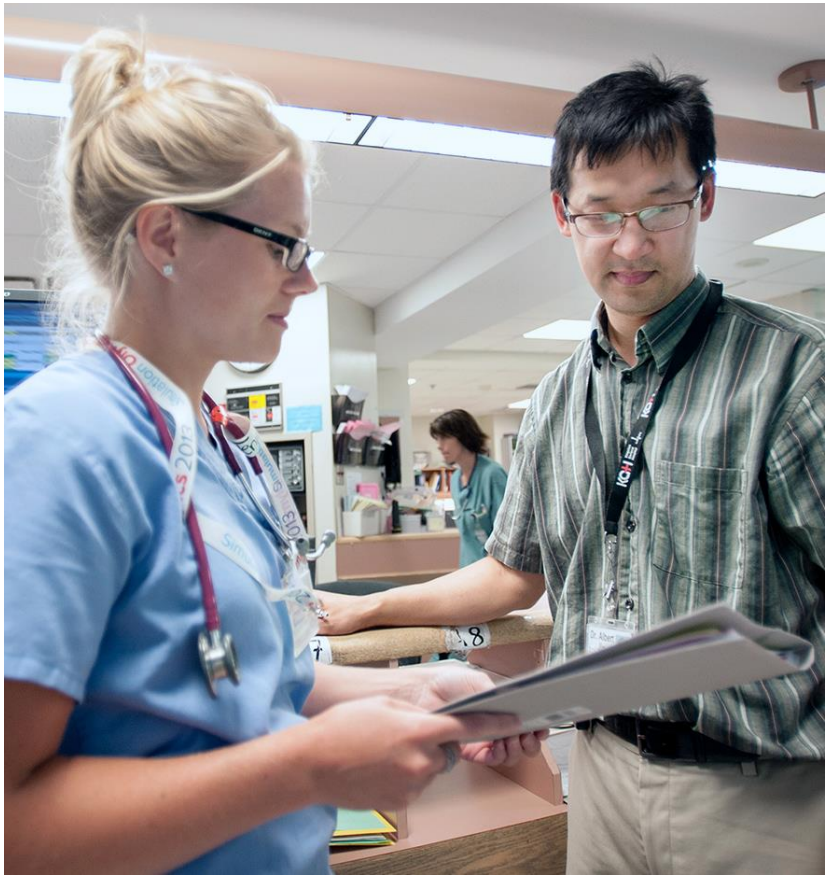
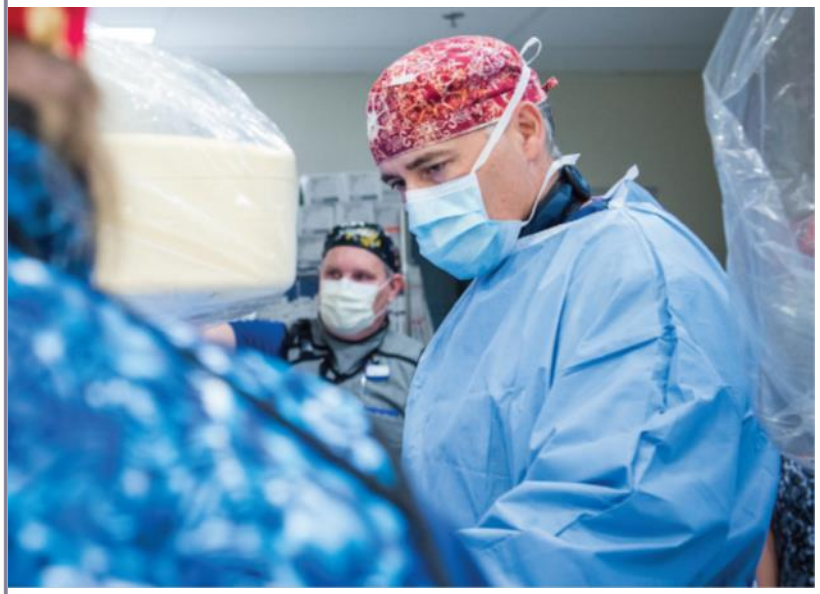

Kingston Health
Sciences Centre
Centre des sciences de
la santé de Kingston
Transforming care, together™

KGH Endovascular Thrombectomy Acute Ischemic Stroke

Pilot Study Evaluation Report 2017





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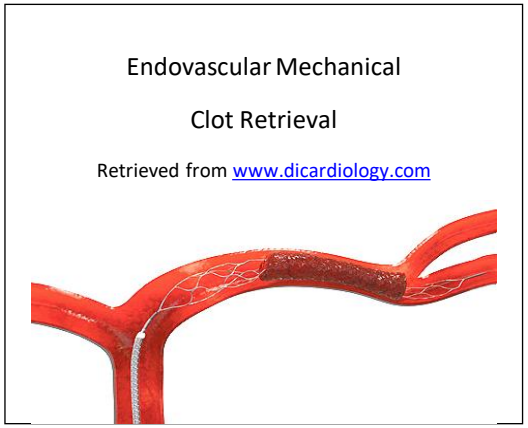
WHY? - Context for EVT

"*Most significant advance in stroke care in 20 years*"

- 5 Landmark Trials in 2015: strong evidence for mechanical retrieval of large clots
- Select cases with severe stroke
- Saves lives; decreases disability
- Improves quality of life
- New Standard of Care: Canadian Best Practice Recommendations July 2015
- Ottawa and Toronto too far away



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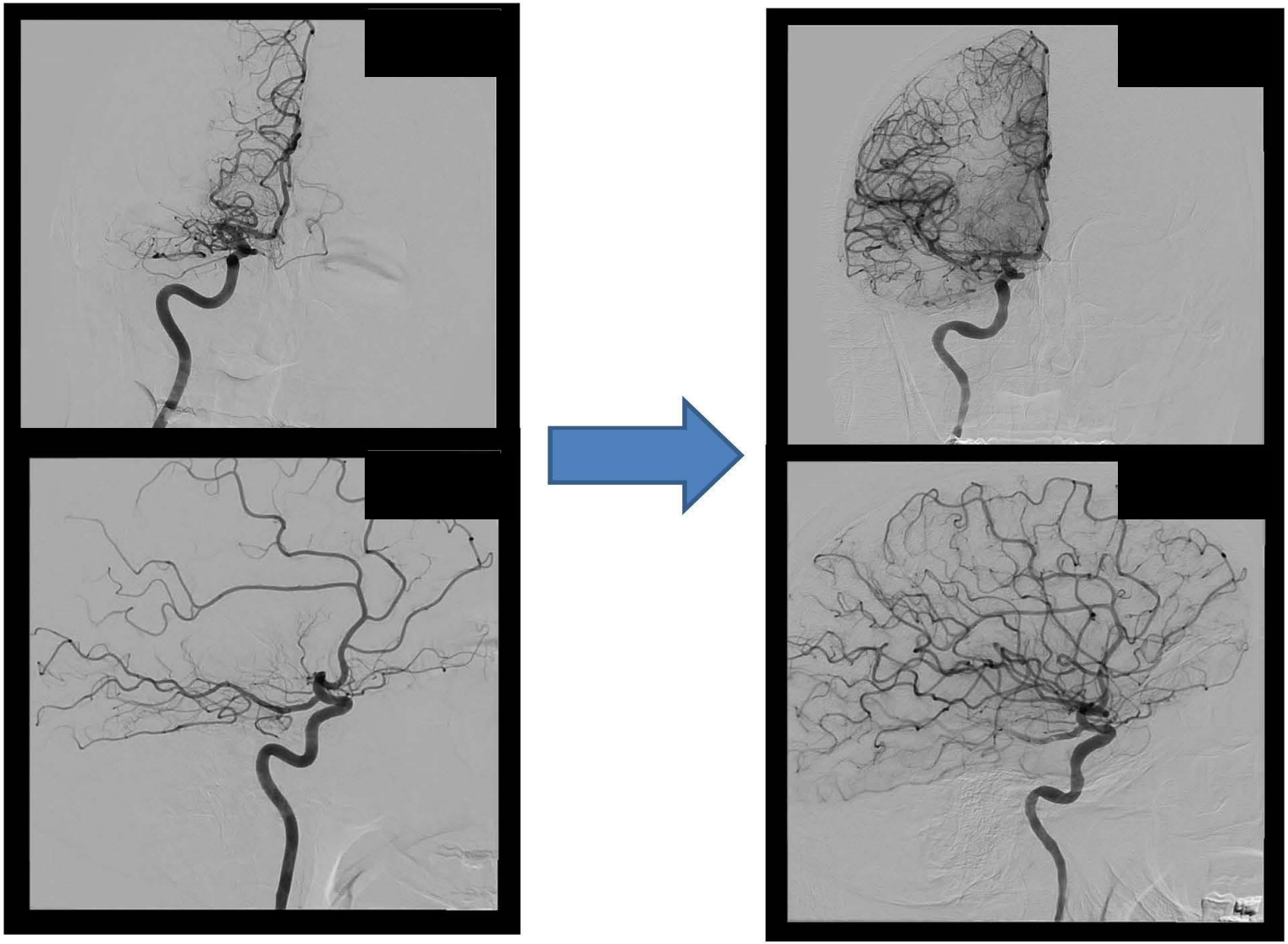
EVT: A Revolution in Stroke Care



Story-telling: the Lived Experience

- A person from L&A area - complete right sided weakness and inability to speak: "*Within minutes of the procedure, the patient was talking and shaking hands with the doctors and nurses who were in the room. People on the team were ecstatic as we've never seen anybody recover this quickly from this type of big stroke before*"

- A person from another province was visiting his family at KGH - sudden onset of right-sided weakness and complete loss of speech. EVT delivered - returned home, able to walk and speak despite ongoing difficulties swallowing.

- A young woman, her baby and husband all arrived by EMS. She had severe movement abnormality throughout her left side. She received EVT and went home in a few days, able to care for her infant.

Story-telling: the Lived Experience

- A woman was brought to KGH on bypass from Brockville. She had severe right sided weakness and inability to speak. She was able to return to the Brockville acute stroke unit in 3 days and returned home to live with her brother 2 days later, fully independent.

- A man arrived on bypass from Brockville with severe left sided weakness, visual field loss and neglect. His wife came with him in the ambulance. He received EVT and returned to the Brockville acute stroke unit for follow up rehab for mild deficits; he and his wife are happily home

- Two other people, from Brockville and from Smiths Falls went straight home from KGH after EVT with no deficits.

- A young woman received open heart surgery at KGH and three days later, just when she was preparing to go home, had a big stroke. She received EVT and she went home a few days later: new valve, no deficits, no stroke.

Story-telling: the Challenges

Technically difficult procedures:

- Tortuous carotid arteries
- Additional distal clots
- Calcified aortic arch

Posterior Circulation Stroke

- Evidence is not as clear – new and changing
- Added imaging required – e.g.; MRI ?
- Time window less clear

Medically Complex - in-hospital stroke; unstable or intubated

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EVT Case

Dr. A. Jin

- 9h15: older man develops sudden right arm and leg paralysis and can’t speak.
- 9h37 : paramedics arrive at the house
- Assessment suggests acute stroke, likely large vessel occlusion
- Decision is made to take directly to KGH ER bypassing local hospital

- 10h55 am (1h40 min after onset of symptoms)
- Ambulance arrives at KGH ER
- Stroke neurologist and team already notified and waiting for the patient

- 11h00 am (1h45 min after onset of symptoms)
- History, exam, IV, bloodwork, glucometer, vitals then to CT ***in 5 minutes***
- Non contrast head CT and multiphase CTA performed.

SUBTRACTION

Shutter


SUBTRACTION
LAO 6°
CRAN 9°
FD 31 cm
LEFT
0:00
5:00
12:16:30
2
13-10


SUBTRACTION
LEFT

In the angio suite, post-procedure

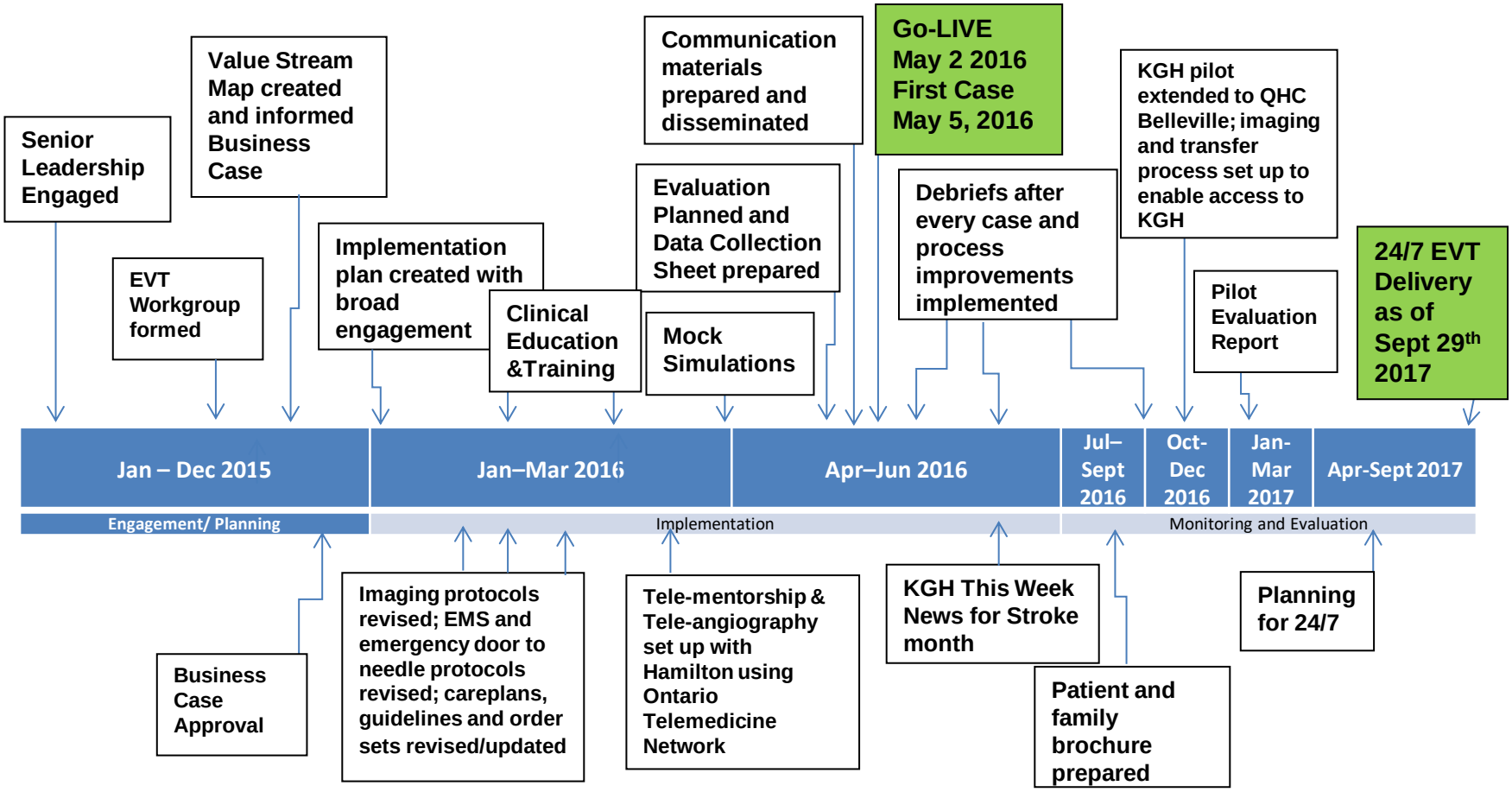
- Patient made an almost complete recovery
- Started conversing in full sentences while on the angio table
- He actually shook hands with people in the room

The next day…

- No deficits.
- CT scan shows no infarction.

- Patient went home in 4 days where he lived alone.

Project Implementation Summary



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Key Implementation Issues

- Telementorship; telefluoroscopy
- Support: Hamilton team, Dr van Adel
- Imaging protocols; new CT scanner
- Revised ED processes to ↓ time
  - ➢ tPA delivery in CT suite
- Interprofessional debriefs
- Continuous revision of process
- Learning applied to each new case
- Patient selection checklist – all must agree
- Regional access – transfer protocol with Belleville; CritiCall
- 24/7 is a big step from weekday service

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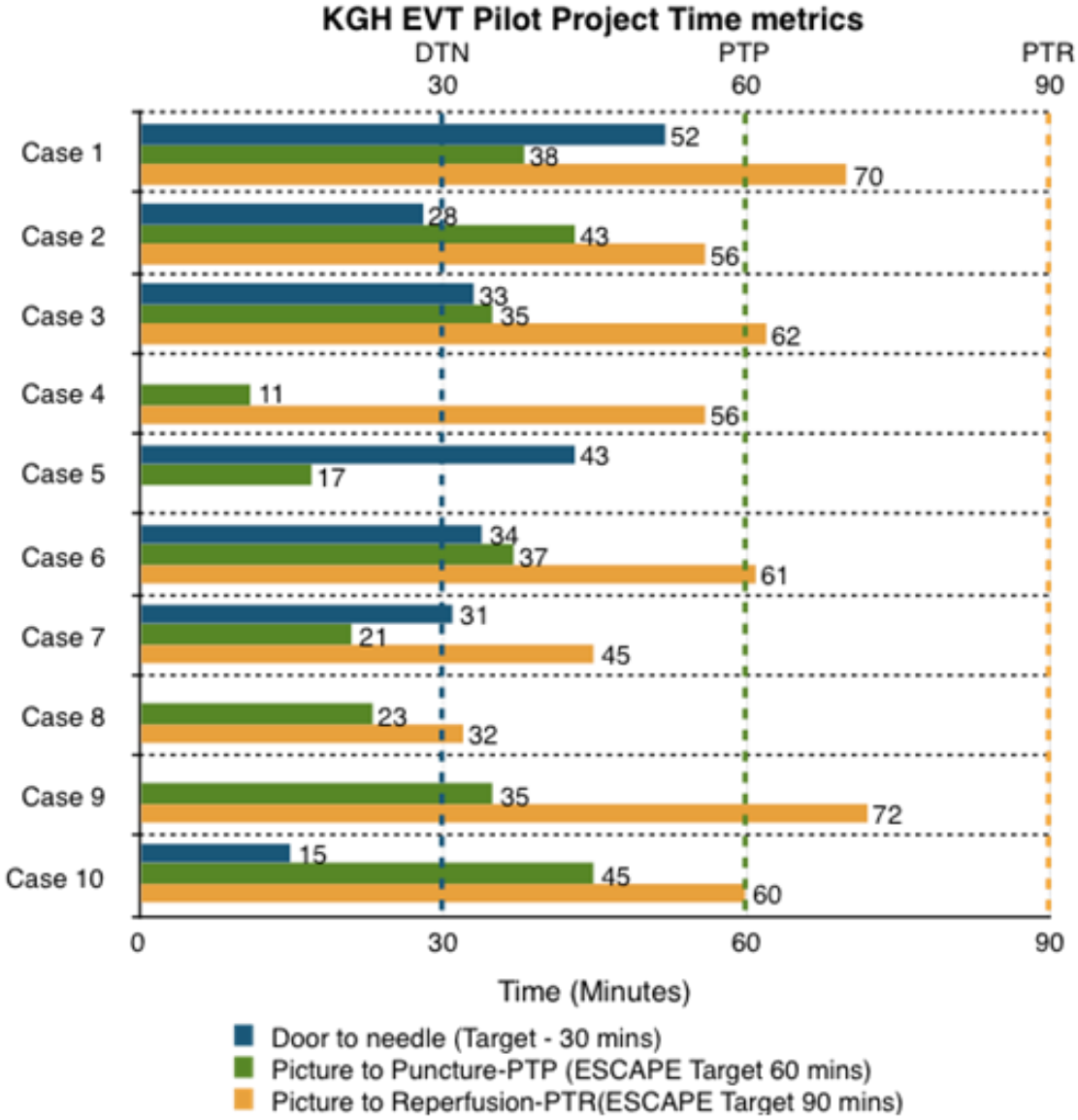
Results: KGH Process Times (vs ESCAPE Trial)



KGH mean times:

- DTN : 33.7 mins
- CT to Puncture: 30.5 mins
- Puncture to Reperfusion: 24.7 mins
- CT to Reperfusion: 57.1 mins

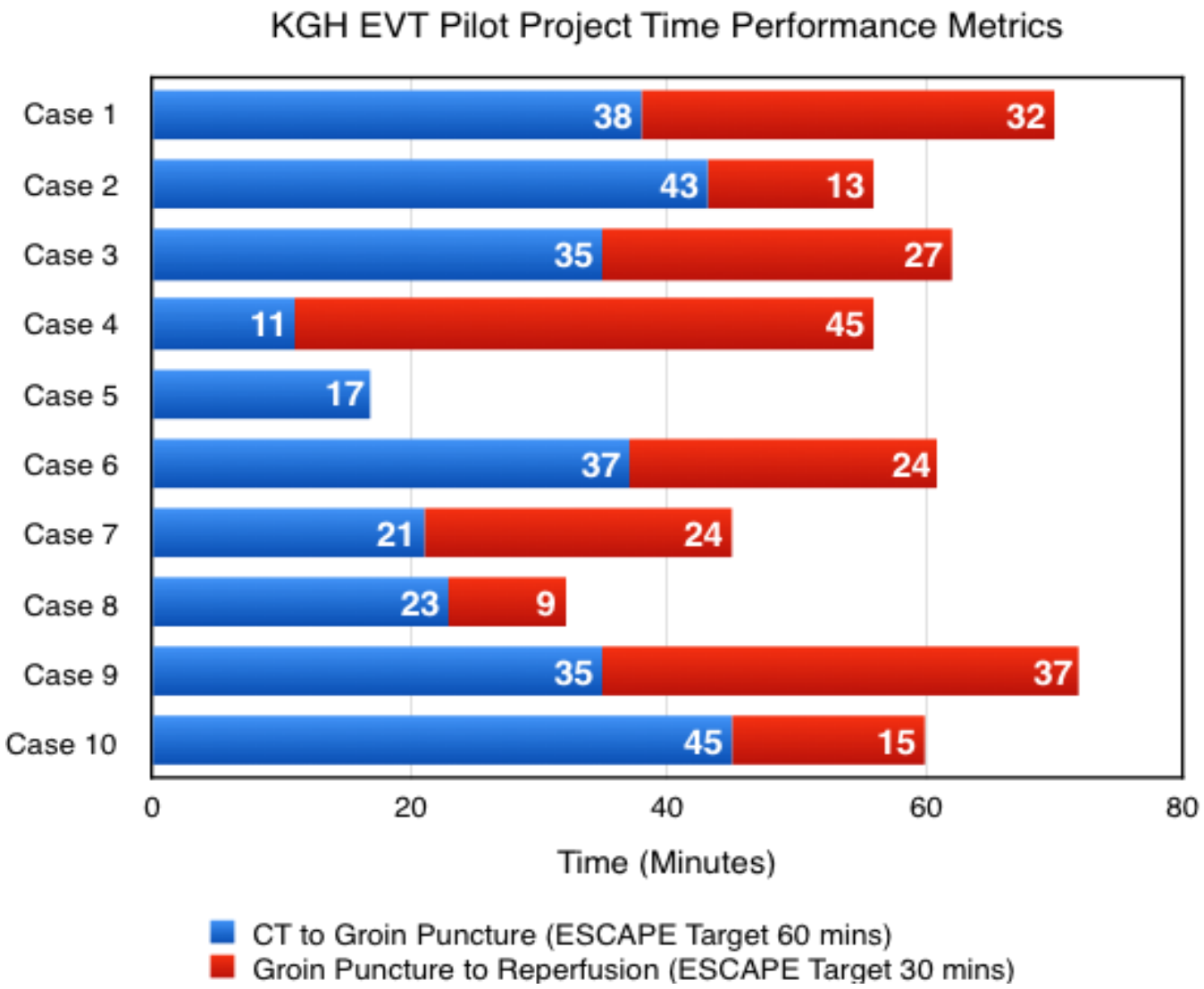
Assessment: KGH could save time in the Door to Needle process

Action:
Trial of tPA in CT suite

Cases 1, 5, 9: stroke occurred in-hospital.

Cases 4, 8,9 did not receive tPA.

Results: KGH Process Times (vs ESCAPE Trial)



KGH Pilot Results: Outcomes

Positive outcomes indicated by reperfusion scores of TICI 2b or 3 AND 90 day Modified Rankin Scale (MRS) score of ≤ 2 indicating minimal to no disability.

Case #	NIHSS Stroke Scale		tPA given	CT APECTS on arrival	Collateral score/ Clot on arrival	Reperfusion Score	LOS + DC		MRS at 90 days
	arrival	day 1					KGH	DC	
1	7	8	y	8	4 L M1 - FMD	TiCi 2b	5	death	6
2	23	0	Y	10	4 LMCA	TiCi 3	4	home	0
3	23	13	Y + IA	9	4 L M2	TiCi 2b	19	Rehab in NS, Home	2
4	20	0	N	8	4 RMCA	TiCi 3	4	home	0
5	20	N/A	Y	9	1 RMCA & M1	aborted	1	death	6
6	22*	4	Y	9	4 R MCA	TiCi 2b	2	BrGH 3 days, home	0
7	16	4	Y	9	3 RMCA & M1	TiCi 2b	6	BrGH home	0
8	16	9	N	7	3-4 RMCA & M1	TiCi 3	14	rehab; died of compli-cations	3* (*best score at acute discharge)
9	15	0	N	7	5 L MCA, M1	TiCi 3	6 From CVA	home	0
10	12	8	Y	10	4 R MCA, M1	TiCi 3	18	Slow stream rehab	4

June to Sept 2017 : 4 further anterior circulation cases – 2 with no deficits, 1 with speech deficits
Two posterior circulation strokes – time window critical

Conclusions

- Demonstrated feasibility at KGH.
- KGH has operational capacity and technical ability to perform EVT safely and effectively with successful outcomes in line with published trials.
- Many patients will stand to benefit from the service; EVT is needed 24/7.

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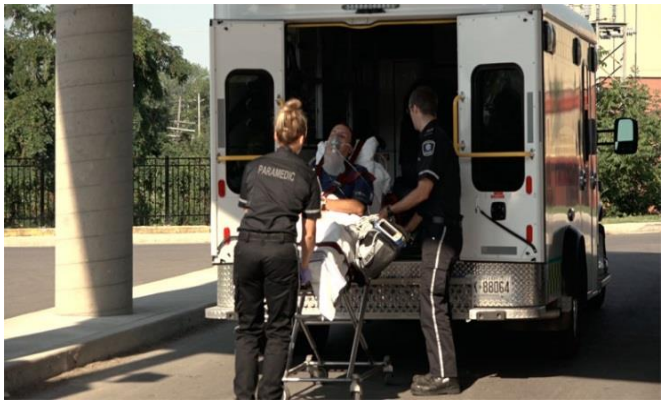
South East – Regional Access 24/7

KGH

- 20 potential EVT cases missed during Pilot

**** 24/7 service began Sept 29th 2017 ****



QHC: telestroke

- Transfers to Toronto over 18 months – No EVT
- Weekday transfer to KGH began Dec 2016
- Imaging and “drip and ship” transfer protocols
- Now transfer 24/7

All other hospitals

- Bypass or transfer to Kingston
- Transfer protocol: 6 hours - look for your pink poster!
- Ontario Paramedic Prompt Card - update to 6 hours in December

Volumes and Funding

- Estimate of 24 in the first full year
- KGH now receiving MOHLTC funding

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South East – Current Work

KGH

- Training new staff, building expertise, ongoing CQI
- Improving door-to-needle times
  - ➢ tPA in CT suite
- Unstable/intubated cases

QHC: telestroke

- mCTA imaging 24/7
- Door-to-needle times
- Door-in-door-out times
  - ➢ tPA in the ED vs ICU

Brockville

- Telestroke readiness?
- Imaging – bridging the gap
- Medical champions

Stroke Prevention Clinic Connections

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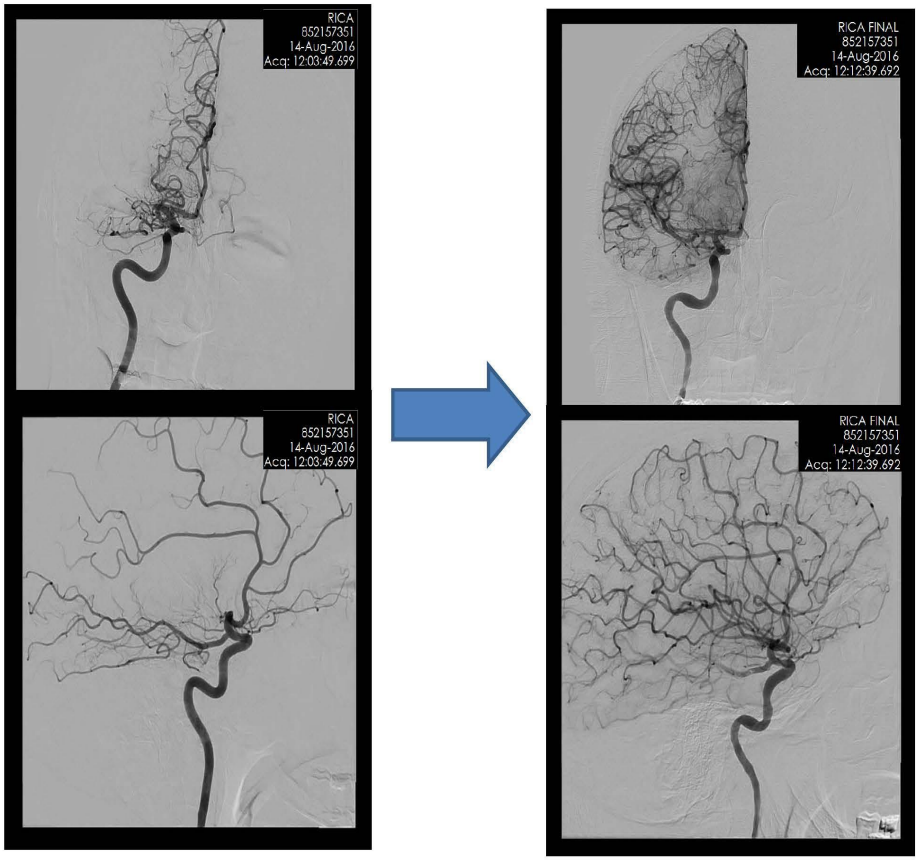
Future Trends

- NA1 neuroprotectants
- TNK
- DAWN trial: unwitnessed or wake up stroke
- Technology, Biplane suite
- Stroke Ambulance?
- Public awareness
- Growing volumes



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Questions and Discussion

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Additional Slides on the KGH EVT Interim Pilot Project Report for your Interest

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WHO? Endovascular Workgroup

- Senior leadership engaged
- Multidisciplinary Workgroup: Neurology, ED, Neuroradiology, Interventional Radiology, Critical Care, Anesthesiology, Neurosciences unit
- Chart review to estimate volumes
- Process map: ED ➡ Imaging ➡ IVR ➡ ICU ➡ Acute Stroke Unit
- Business case:
  - ➢ Pilot 10 cases, Weekdays
  - ➢ Learn, prepare for 24/7
- Launch: May 2016

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HOW? Process - Time is Brain

"*1.9 million brain cells die every minute after stroke*"

- Project plan
- Banff course: Calgary team
- New imaging protocol
- ⇩ Door to needle time
  - Learned from QHC & all EMS
- Hamilton mentorship - Telemedicine
- Care pathways, guidelines, order sets
- Education/training; mock simulations
- Communication plan; Evaluation plan

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Project Plan

Project Plan Overview	Apr – June 2015	July – Sept 2015	Oct – Dec 2015	Jan – Mar 2016	Apr – June 2016	July – Sept 2016	Oct – Dec 2016	Jan – Mar 2017	Apr – June 2017
Engagement, Business Case Approval	■	■	■						
Communication Plan			■	■	■	■	■	■	■
Evaluation Plan				■	■	■	■	■	■
Resource Planning - Staff, Space and Equipment		■	■	■	■				
Clinical Pathway Implementation and Related Education/Training				■	■				
Process Review and Improvement					■	■	■	■	■
Regional Planning to create Belleville telestroke access							■		
Pilot Report and Planning for 24/7								■	■

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KGH Results: Outcomes

- 8/10 cases (80%) – improved function at acute discharge
  - 6/10 cases (60%) – MRS ≤ 2 at 90-day follow-up
  - 2/10 cases – best MRS score of 3 and 4 to date.
- ESCAPE trial outcomes = 53% MRS ≤ 2 at 90 days

- Two deaths, both in-hospital at the time of stroke:
  - Case #1 – fibromuscular dysplasia (FMD) -vessel tortuosity - technically challenging.
  - Case # 5 – aborted due to technical difficulties passing the aortic arch

- After discharge, case #8 died of other stroke complications (aspiration pneumonia).

Continuous Improvement: Debrief Themes

Debrief Themes	Actions taken
Case Selection	2 Interventional Radiologists make the decision to proceed; Inclusion & Exclusion Safety Checklist created and made available in CT suite
ED workflow and door to needle times	Bloodwork: Point of Care testing devices; communication; Patient stays on EMS monitor to CT suite; tPA given in CT suite; ED stroke recognition for cases that do not arrive on stroke "protocol"
Imaging protocol – reconstruction times	CT tech practice; new CT Scanners with faster reconstruction times; MOCK to review roles and processes
Communication, patient flow, bed management,	Clarity on who communicates when, to facilitate planning at each transition; updated roles and responsibilities chart; use of IVR stretcher vs ICU bed
Consent	Checklist includes IVR consent and emergency consent procedures
Family information	Family brochure; use of IVR family room
Procedural Sedation	IVR nurses are trained in procedural sedation and provide the sedation; Neurology advises based on clinical presentation; minimal use of sedation
IVR Technical Concerns	Communication; use of aspiration, J-curve; equipment for intra-arterial tPA; restraints; C-Arm; stretcher; MOCK to review neurology role in IVR
Order sets	EVT order Set available in Entry Point; tPA orders entered in EDIS
Discharge planning and follow-up	Repatriation to stroke units at home hospital; follow up by KGH or local Stroke Prevention Clinic; Modified Rankin Scale score at 90 days.
Regional Access	Algorithms, drip and ship protocols for Belleville; joint workgroup
Data Collection and Time Capture	Ongoing refinements to data collection processes; addressing missing information; decision on imaging times from PCS; use of data sheet in IVR
In-hospital stroke	Revision of process - thrombolysis given in CT suite

Benefits

- Significantly improved outcomes for stroke patients, particularly for those with severe stroke:
  - decreased mortality
  - decreased morbidity/disability: improved level of functional recovery
  - improved quality of life
- Decreased length of stay in acute care
- Decreased long term costs of stroke care:
  - reduced inpatient rehabilitation stay
  - reduced need for community rehabilitation and supports
  - decreased long term care requirements
- Regional access and delivery
- Sustained role as Regional Stroke Centre in delivery of organized hyperacute protocols

The impacts if not continued

- Cost to the patient and family:
  - greater mortality
  - greater long term disability and dependence;
  - decreased quality of life
- Increased length of stay in acute care
- Increased long term costs of stroke care
  - increased inpatient rehabilitation stay
  - increased need for community rehabilitation and supports
  - increased long term care requirements
- No access for the citizens of Southeastern Ontario; given the limited time window most eligible SE residents would not be able to access this treatment elsewhere.
- Risk of losing the ministry designation as Regional Stroke Centre with associated regional funding and mandate
- Risk of losing Accreditation Canada Stroke Distinction Status