Stroke Care: Present & Future

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Reduction in 30-day mortality from acute stroke 1998-2014

50%
Decline in institutionalisation for acute stroke 2004-2013

46%
Reduction in hospital length of stay for acute stroke 2001-2014

49%
What works in stroke?

- New treatments for ischaemic and haemorrhagic stroke
- Specialist stroke unit care
- Reorganising stroke services

www.strokeaudit.org.uk
It’s all about reperfusion

50% dead; 45% dependent; 5% independent

Cerebral angiogram
Thrombectomy: the game changer

Stent retriever (Solitaire)
Who will benefit from thrombectomy?

Berkhemer et al, *NEJM* Dec 2014

**Modified Rankin Scale Score**
- 0: No symptoms
- 1: Plus 1428
- 2: Minus 1428
- 3: Death

**Patients**

<table>
<thead>
<tr>
<th>Intervention (N=10,200)</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
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<tbody>
<tr>
<td>306</td>
<td>918</td>
<td>2142</td>
<td>1836</td>
<td>2244</td>
<td>612</td>
<td>2142</td>
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<table>
<thead>
<tr>
<th>Control (N=10,200)</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
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<tr>
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<td>1326</td>
<td>1632</td>
<td>3060</td>
<td>1224</td>
<td>2244</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
B: Effect of time on achieving mRS score of 0-2: all participants

Time-to-reperfusion effect in the biggest trial

Fransen et al, JAMA, 2016

Median onset-to-reperfusion 5h 40m

P = .04 for interaction

Fransen et al, JAMA, 2016
What’s happened to IVT in the meantime?

- Emphasis on expediting pre-hospital assessment, pre-alert and in-hospital processes to maximise benefit

<table>
<thead>
<tr>
<th>Onset-to-Treatment time</th>
<th>Number Needed to Treat to yield one additional patient with minimal disability (mRS 0-1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-90 mins</td>
<td>![Icons for 0-90 mins]</td>
</tr>
<tr>
<td>91-180 mins</td>
<td>![Icons for 91-180 mins]</td>
</tr>
<tr>
<td>181-270 mins</td>
<td>![Icons for 181-270 mins]</td>
</tr>
</tbody>
</table>
IVT: speeding up by 2 minutes a year

Door-to-needle

DTN in minutes

Source: SSNAP 2013-2017
Team-centred results for Key Indicator 3.5A

England and Wales results
IV thrombolysis in the South West

- Gloucestershire Royal Hospital
- Great Western Hospital Swindon
- North Bristol Hospitals
- North Devon District Hospital
- Derriford Hospital
- Royal Cornwall Hospital
- Royal Devon and Exeter Hospital
- Royal United Hospital Bath
- Salisbury District Hospital
- Musgrove Park Hospital
- Torbay Hospital
- Bristol Royal Infirmary
- Weston General Hospital
- Yeovil District Hospital

Thrombolysis rate (All stroke) - National average 11.1%

Clock start to thrombolysis time - National average 55 min

Source: SSNAP August-November 2016

SSNAP August-November 2016

Royal College of Physicians
Sentinel Stroke National Audit Programme (SSNAP)
Acute Intracerebral Haemorrhage

- >50% mortality rate little changed for 20 years
- Most effective treatment: stroke unit care
Are we going to get any better at treating intracerebral haemorrhage?

• Things that might reduce haematoma size or growth
  – Blood pressure control
  – safer anticoagulants and antiplatelets
  – Research trials:
    • tranexamic acid; coagulation FXa (PF-05230907)
    • intralesional alteplase (MISTIE III)
    • intraventricular alteplase via EVD (CLEAR III, Lancet, Feb 2017) – ‘more studies needed’
    • better basic care: ABCD-ICH
Stroke Unit access within 4 hours

Stroke unit within 4 hours

Source: SSNAP 2013-2017
Team-centred results for Key Indicator 2.1B
England and Wales results
What are your chances of getting admitted to a stroke unit within 4 hours?

84%
Team-centred performance in the SW

Source: SSNAP Aug – Nov 2016

Team-centred performance for South West SCN
What are your chances of getting admitted to a stroke unit?

Proportions of patients getting to a stroke unit within 4 hours by time of day and day of the week.
30 day mortality of patients admitted at weekends, by ratio of registered nurses per 10 beds on the weekend

Hazard ratios adjusted for patient casemix, organisational characteristics, staffing and care quality
What are your chances of meeting a stroke physician?

Relative odds of stroke physician assessment within 24 hours by hour of day and day of week for 80,000 patients in SSNAP
Regional variation in stroke physician assessment within 24 hours for 80,000 patients in SSNAP

What are your chances of meeting a stroke physician within 24 hours?

- 95%
- 85-95%
- 80-84%
- 70-80%
- <70%

Insufficient records

Regional variation in stroke physician assessment within 24 hours for 80,000 patients in SSNAP

Insufficient records
**SSNAP ratings – December 2016 to March 2017**

<table>
<thead>
<tr>
<th>Routinely Admitting Teams</th>
<th>Number of patients</th>
<th>Overall Performance</th>
<th>Patient Centred Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trust</td>
<td>Team Name</td>
<td>Admit Disch</td>
<td>D1 D2 D3 D4 D5 D6 D7 D8 D9 D10 PC KI</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SSNAP Level CA AC KI Level</td>
<td>Scan SU Throm Spec Asst OT PT SALT MDT Std Disch Proc PC KI</td>
</tr>
<tr>
<td>South England - South West SCN</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gloucestershire Hospitals NHS Foundation Trust</td>
<td>Gloucestershire Royal Hospital</td>
<td>311 287</td>
<td>E↓ A B D</td>
</tr>
<tr>
<td>Great Western Hospitals NHS Foundation Trust</td>
<td>Great Western Hospital Swindon</td>
<td>152 123</td>
<td>E↓ B B D</td>
</tr>
<tr>
<td>North Bristol NHS Trust</td>
<td>North Bristol Hospitals</td>
<td>251 247</td>
<td>D↓ A A D↓</td>
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<tr>
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<td>North Devon District Hospital</td>
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<td>D↓ A B C↓</td>
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<td>Derriford Hospital</td>
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<td>B↑ A A B↑</td>
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<td>269 266</td>
<td>B↑↑ A A B↑</td>
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<tr>
<td>Royal Devon and Exeter NHS Foundation Trust</td>
<td>Royal Devon and Exeter Hospital</td>
<td>236 236</td>
<td>A↑ A A A↑</td>
</tr>
<tr>
<td>Royal United Hospital Bath NHS Trust</td>
<td>Royal United Hospital Bath</td>
<td>201 192</td>
<td>C A A↑ C</td>
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<tr>
<td>Salisbury NHS Foundation Trust</td>
<td>Salisbury District Hospital</td>
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<td>D↓↓ A B D↓↓</td>
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<tr>
<td>Taunton and Somerset NHS Foundation Trust</td>
<td>Musgrove Park Hospital</td>
<td>201 199</td>
<td>B↑↑ A A↑ A↑ B↑</td>
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<tr>
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<td>Torbay Hospital</td>
<td>208 205</td>
<td>B A A A B</td>
</tr>
<tr>
<td>University Hospitals Bristol NHS Foundation Trust</td>
<td>Bristol Royal Infirmary</td>
<td>167 165</td>
<td>D↓ A A D↓</td>
</tr>
<tr>
<td>Weston Area Health NHS Trust</td>
<td>Weston General Hospital</td>
<td>72 78</td>
<td>D A A D</td>
</tr>
<tr>
<td>Yeovil District Hospital NHS Foundation Trust</td>
<td>Yeovil District Hospital</td>
<td>124 118</td>
<td>C↓ A A C↓</td>
</tr>
</tbody>
</table>
The future of stroke rehabilitation?

- Will robotics revolutionise stroke rehab?
The future of stroke rehabilitation?

Lokomat
The future of stroke rehabilitation?

- Exo-skeleton in stroke rehab
- EksoGT – the first exoskeleton to be approved for use with people with stroke
- https://youtu.be/B4tz3Y-71z4
Emergency stroke admissions

Average distances:
Home to closest hospital: 16.5km (20.9km for CDS**)
Home-hospital used: 17.9km (21.9km for CDS**)
92% go to closest hospital*
95% go to hospital within 5 miles of closest hospital*

*Bristol hospitals combined
**CDS= Cornwall, Devon, Somerset
Violin plot of arrival-tissue-type plasminogen activator (tPA) times by thrombolysis volume

Does it matter how big the HASU is?

Bray et al. Stroke 2013; 44: 3129-3135

4.33x more likely to receive thrombolysis within 60 minutes of hospital arrival in a larger unit
Drip n’ ship – or mothership?

Local acute stroke unit

Service available:
Thrombolysis

Key
Drip and ship
Mothership

Comprehensive acute stroke unit

Services available:
Thrombolysis
Thrombectomy
Which configuration maximises the benefit from thrombectomy for acute stroke?

<table>
<thead>
<tr>
<th>Travel time (min)</th>
<th>Admissions/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 15</td>
<td>36,618</td>
</tr>
<tr>
<td>15 - 30</td>
<td>34,378</td>
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<tr>
<td>30 - 45</td>
<td>8,888</td>
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<tr>
<td>45 - 60</td>
<td>758</td>
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<tr>
<td>60 - 90</td>
<td>168</td>
</tr>
<tr>
<td>90 +</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HASU admissions/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,693</td>
</tr>
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</table>

- Average travel time (min): 18
- Maximum travel time (min): 94
- Maximum admissions/year: 1,693
- Minimum admissions/year: 105
- Patients within 45 minutes of HASU: 99%
- Patients within 45 mins & >1,000 admissions/year: 19%
Which configuration maximises the benefit from thrombectomy for acute stroke?

14m people >45 mins from a HASU
What’s the future for stroke care?

✓ Bigger units geared up to deal with neurological emergencies round the clock

✓ Neurological high dependency units with the capacity and capability to intervene

✓ More medical specialist interventions e.g. stent retriever therapy, BP management for haemorrhage, imaging-based thrombolysis

✓ More non-medical specialist interventions e.g. early instrumental management of dysphagia, electro-mechanically assisted mobilisation, ‘nursing intensity’

✓ Better survival, less disability