London Stroke Model

Tony Rudd
Professor Stroke Medicine, Kings College London
National and London Clinical Director for Stroke NHS England
We know what a good stroke service should provide

- Effective primary prevention
- Public education about stroke symptoms and how to respond
- Hyperacute stroke care
- Rehabilitation stroke unit care for whole admission
- Early supported discharge
- Longer term rehabilitation as needed
- Vocational rehabilitation and psychological support
- Secondary prevention
- Patient and carer support and education
- Participation in research
- Continuous quality improvement
Treating Stroke: What really makes a difference?
Stroke Units

• Coordinated multidisciplinary rehabilitation,
• Clear protocols for management of stroke related problems
• Staff with a specialist interest in stroke or rehabilitation,
• Routine involvement of carers in the rehabilitation process
• Regular programmes of education and training.
• Not just about acute stroke care
Stroke unit outcomes - death or institutional care

Cumulative meta-analysis

Regional results

CT scanning rates

Slide stolen from Peter Langhorne
Association of care with good outcomes
RCP stroke audit

**“Stroke unit” item**

<table>
<thead>
<tr>
<th>Item</th>
<th>Odds of death at 30 days</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early stroke consultant assessment</td>
<td></td>
<td>0.009</td>
</tr>
<tr>
<td>CT scan within 24 hours</td>
<td></td>
<td>0.49</td>
</tr>
<tr>
<td>Early nurse &amp; therapist assessment</td>
<td></td>
<td>0.028</td>
</tr>
<tr>
<td>Early swallow assessment &amp; nutrition management</td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Early iv fluids and aspirin</td>
<td></td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Bray et al BMJ (2013)
Does the size of unit matter?

- Door to needle times

- Number of patients thrombolysed
Adjusted Hazard Ratio of 30-day Mortality of Patients Admitted on Weekends, by Ratio of Registered Nurses Per Ten Beds on the Weekend

http://www.plosmedicine.org/article/info:doi/10.1371/journal.pmed.1001705
Time to dysphagia screen and risk of stroke-associated pneumonia

Modelled association adjusted for age, sex, stroke type (ischaemic, primary intracerebral haemorrhage, undetermined), pre-stroke functional level (modified Rankin Score), place of stroke (out of hospital or inpatient) and comorbidity, and NIHSS
Transforming Stroke care in London: Case for change

London Stroke Units Sentinel Audit Comparison 2004 and 2006

Change in London Stroke Providers against Sentinel Audit 12 key indicators 2004 vs 2006 scores
The scale of the problem of stroke in London

• Second biggest killer and most common cause of disability
• Population >8 million
• 8,000 strokes a year in London – 1200 deaths
Decision ‘something needed to be done’

- Wide clinical support for change
- Strong evidence to show what a service should look like
- A health service structure that enabled structural change
- A strong leader of the London Strategic Health Authority - Dame Ruth Carnall
Standards for services

- Minimum staffing levels e.g.
  - 2.9 nurses/bed on HASU, 1.35 nurses per bed on ASU
  - 1.46 physiotherapists per 10 beds on HASU and 1.62 per 10 beds on ASU
- Standards for door to needle times
- Access to imaging (at least 2 CT scanners on site and access to MRI)
- 7 day consultant led ward rounds on the HASU and 5 day consultant rounds on ASU
- Transfer from HASU to ASU when required within 48 hours of request
- Standards for time from admission to being seen by PT, OT, SALT, Dietitian,
- Participation in research
- Patient involvement in running the service
Final model

- 8 Hyperacute stroke units (HASU) (first 72 hours) each with their own Acute Stroke Units (ASU)
  - Situated within max 30 mins. travel time of all London population
- Further 16 ASUs
- Stopped all stroke care in 8 hospitals
- Repatriation where needed up to 72 hours (longer if too unstable to transfer).
- 400 additional nurses needed and about 100 therapists
- Improve community care and longer term rehabilitation
- 7 day services for the management of transient ischaemic attack
Thrombolysis Rates in London

- Feb-July 2009: 3.5%
- Feb-July 2010: 12.0%
- Jan-Mar 2011: 14.0%
- Jan-July 2012: 18.0%
- July-Dec 2012: 19.0%

Percentage of All Stroke Admissions Thrombolysed

Implementation
Clock start to thrombolysis time

- Charing Cross Hospital HASU
- King’s College Hospital HASU
- Northwick Park Hospital HASU
- Princess Royal University Hospital HASU
- Queens Hospital Romford HASU
- Royal London Hospital HASU
- St George’s Hospital HASU
- University College Hospital HASU

Source: SSNAP Oct-Dec 2014
Patient-centred results at team level for Key Indicator 3.5A

London SCN
Processes of Care

Average length of stay
London Stroke Survival vs Rest of England

Hazard ratio for survival in London:
0.72, 95%CI 0.67-0.77
p<0.001

SINAP Audit Data
## Cost Effectiveness of London Reconfiguration at 90 days

<table>
<thead>
<tr>
<th></th>
<th>Before</th>
<th>After</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total costs</td>
<td>£96,585,248</td>
<td>£82,982,273</td>
<td>-£13,602,975</td>
</tr>
<tr>
<td>Mean cost per stroke</td>
<td>£15,002</td>
<td>£12,889</td>
<td>-£2,113</td>
</tr>
<tr>
<td>Total deaths</td>
<td>963</td>
<td>726</td>
<td>-237</td>
</tr>
<tr>
<td>Total QALYs</td>
<td>570</td>
<td>694</td>
<td>123</td>
</tr>
<tr>
<td>Mean QALYs per patient</td>
<td>0.089</td>
<td>0.108</td>
<td>0.019</td>
</tr>
</tbody>
</table>

Morris S et al Plos One 2013
National Impact of the London reconfiguration

- Similar reconfigurations being developed for stroke in many other areas of England
- Stroke in London being used as the example to justify centralisation of specialist services in a smaller number of hospitals
  - Vascular surgery
  - Acute Kidney Injury
  - Major trauma etc....
Are there alternative models? Manchester

- Manchester underwent a reconfiguration of stroke care at the same time as London
- Decision that main aim was to increase the proportion of patients receiving thrombolysis
- During normal working hours patients taken no ususal hospitai
- Outside normal hours only took patient to the comprehensive stroke centre if potentially thrombolysable
<table>
<thead>
<tr>
<th>Before</th>
<th>After</th>
<th>Greater Manchester ‘A’</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suspected stroke</td>
<td>Suspected stroke</td>
<td>Suspected stroke</td>
</tr>
<tr>
<td>Stroke unit/ward</td>
<td>8 HASUs (24/7)</td>
<td>≤4 hrs</td>
</tr>
<tr>
<td>Greater Manchester (x12)</td>
<td>24 SUs</td>
<td>1 CSC (24/7)</td>
</tr>
<tr>
<td></td>
<td>Community rehabilitation services</td>
<td>2 PSCs (in hours)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>11 DSCs</td>
</tr>
<tr>
<td></td>
<td>Community rehabilitation services</td>
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</tr>
</tbody>
</table>
# Impact of London and Manchester Reconfiguration

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Greater Manchester</th>
<th>London</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortality (before and after)</td>
<td>No significant difference from rest of England</td>
<td>Significantly greater reduction than rest of England</td>
</tr>
<tr>
<td>Length of stay (before and after)</td>
<td>Significantly greater reduction than rest of England</td>
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</tr>
<tr>
<td>Provision of evidence-based care (after)</td>
<td>Overall, not significantly better than non-centralised comparator. Hyperacute services significantly better than comparator area</td>
<td>Overall, significantly better than comparator area. Hyperacute services significantly better than comparator area</td>
</tr>
<tr>
<td>Adherence to local stroke pathway (after)</td>
<td>67% suspected stroke patients presenting with 4h taken appropriately to hyperacute service</td>
<td>98% suspected stroke patients taken appropriately to hyperacute service</td>
</tr>
</tbody>
</table>
Lessons from London and Manchester

- Hub and spoke model can work in a large urban area
- The stroke services should be for the patients. Not the clinicians or the hospitals
- Patients will accept going to a hospital that is not their local hospital if the reasons explained
- The most important change needed is to admit ALL stroke patients to the hyperacute stroke unit
- Not just about acute care and not just about thrombolysis. The whole pathway must be reformed at the same time
- Need to invest to save
- Need strong leadership to make it happen with the support of strong politicians
Variation in care during the week

Thrombolysis rate

<table>
<thead>
<tr>
<th>Mon</th>
<th>Tue</th>
<th>Wed</th>
<th>Thu</th>
<th>Fri</th>
<th>Sat</th>
<th>Sun</th>
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<td>08–11</td>
<td>12–15</td>
<td>16–19</td>
<td>20–23</td>
<td>00–03</td>
<td>04–07</td>
<td></td>
</tr>
</tbody>
</table>

Relative proportion of patients in whom indicator achieved

- <0.825
- 0.825–0.874
- 0.875–0.924
- 0.925–0.974
- 0.975–1.024
- 1.025–1.074
- 1.075–1.124
- 1.125–1.174
- >1.175
Variation in care during the week

Door to needle < 60 minutes

<table>
<thead>
<tr>
<th>Time of admission</th>
<th>Mon</th>
<th>Tue</th>
<th>Wed</th>
<th>Thu</th>
<th>Fri</th>
<th>Sat</th>
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Variation in care during the week

Brain scan within 12 hours

<table>
<thead>
<tr>
<th></th>
<th>Mon</th>
<th>Tue</th>
<th>Wed</th>
<th>Thu</th>
<th>Fri</th>
<th>Sat</th>
<th>Sun</th>
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<tbody>
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</tr>
</tbody>
</table>

Time of admission

Relative proportion of patients in whom indicator achieved

- <0.825
- 0.825-0.874
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- 0.975-1.024
- 1.025-1.074
- 1.075-1.124
- 1.125-1.174
- >1.175
What are your chances of getting admitted to a stroke unit within 4 hours?

84%

22%

NHS Atlas of Variation 2015
Admission to a Stroke Unit within 4 hours
## Population impact of services

64 million inhabitants (80,000 strokes per year)

Impact in terms of extra independent survivors per year

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Maximum impact</th>
<th>Proportion eligible for treatment (%)</th>
<th>Actual impact Extra independent survivors per year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rapid secondary prevention</td>
<td>160</td>
<td>All TIA; 15 stroke</td>
<td>800</td>
</tr>
<tr>
<td>Stroke unit (CSU) service</td>
<td>4000</td>
<td>80</td>
<td>3200</td>
</tr>
<tr>
<td>Rehabilitation (ESD) service</td>
<td>4000</td>
<td>30</td>
<td>1200</td>
</tr>
<tr>
<td><strong>Service total</strong></td>
<td>-</td>
<td>-</td>
<td><strong>5200</strong></td>
</tr>
<tr>
<td>Aspirin</td>
<td>800</td>
<td>80</td>
<td>640</td>
</tr>
<tr>
<td>rtPA within 0-3 hrs</td>
<td>8800</td>
<td>10</td>
<td>1280</td>
</tr>
<tr>
<td>rtPA within 3-4.5 hrs</td>
<td>4000</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Mechanical thrombectomy</td>
<td>8800</td>
<td>10</td>
<td>880</td>
</tr>
<tr>
<td>Hemicraniectomy</td>
<td>16000</td>
<td>0.5</td>
<td>80</td>
</tr>
<tr>
<td><strong>Acute medical total</strong></td>
<td>-</td>
<td>-</td>
<td><strong>2280</strong></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>-</td>
<td>-</td>
<td><strong>8080</strong></td>
</tr>
</tbody>
</table>

Slide courtesy Prof Peter Langhorne
Summary

- Stroke unit care is the cornerstone of in-patient care.
- Stroke unit care should start from the moment of admission and continue until the patient no longer needs in-patient treatment.
- The nurses have the critical role in delivering that care.
- The London reconfiguration was about making sure that ALL patients get specialist stroke care.