The International Agenda for Stroke

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President World Stroke Organization
Ischemic and Hemorrhagic Stroke

*Ischemic strokes* are the most common and arise from blood vessel narrowing and platelet adhesion as with CAD, leading to blood clot formation and brain injury.

*Hemorrhagic strokes* are more common in some populations especially in Asia and results from the rupture of a blood vessel or aneurysm. The outlook is much worse and almost 50% will die.
Stroke Facts in Developed Countries

Stroke is

- cause no 1 of disability
- cause no 2 of dementia
- cause no 3 of death
- major cause of
  epilepsy
  falls
  depression
<table>
<thead>
<tr>
<th>Region</th>
<th>Incidence</th>
<th>Prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>World</td>
<td>9.0 million</td>
<td>30.7 million</td>
</tr>
<tr>
<td>Africa</td>
<td>0.7</td>
<td>1.6</td>
</tr>
<tr>
<td>Americas</td>
<td>0.9</td>
<td>4.8</td>
</tr>
<tr>
<td>Eastern Mediterranean</td>
<td>0.4</td>
<td>1.1</td>
</tr>
<tr>
<td>Europe</td>
<td>2.0</td>
<td>9.6</td>
</tr>
<tr>
<td>South-East Asia</td>
<td>1.8</td>
<td>4.5</td>
</tr>
<tr>
<td>Western Pacific</td>
<td>3.3</td>
<td>9.1</td>
</tr>
</tbody>
</table>

12.6 million have moderate-severe disability, 8.9/12.6 million in low-mid income countries
Stroke compared with other causes of death

Percentages and numbers of deaths worldwide from stroke and other leading causes 2002

- Stroke: 10% (5.5 million)
- Other causes: 27% (15.6 million)
- Coronary heart disease: 13% (7.2 million)
- Cancer: 12% (7.1 million)
- Respiratory infections: 7% (3.7 million)
- Injuries: 9% (5.2 million)
- HIV/AIDS: 5% (2.8 million)
- Chronic obstructive pulmonary disease: 5% (2.7 million)
- Perinatal causes: 4% (2.5 million)
- Diarrhoeal diseases: 3% (1.8 million)
- Tuberculosis: 3% (1.6 million)
- Malaria: 2% (1.2 million)

Total deaths: 57 million

Source: 2004 WHO World Atlas on CVD/Stroke
Time trends in ischemic stroke 1970 to present:

High-income countries: 
*decrease 42%*

Low-middle income countries: 
*more than doubled*

COSTS OF STROKE IN THE US: 2007 AHA ESTIMATES

- Direct and indirect costs = $40 billion

- Mean lifetime cost = $140,048

- Inpatient hospital costs for an acute stroke event account for 70% of first-year post stroke costs.

- Estimates of total stroke cost between 2005-2050, in US dollars is projected to be $1.52 trillion for non-Hispanic whites, $313 billion for Hispanics, and $379 billion for Blacks

- Loss earnings is expected to be the highest cost contributor in each race/ethnic group.
<table>
<thead>
<tr>
<th>Geographic Region</th>
<th>N</th>
<th>Mean, $</th>
<th>Median, $</th>
<th>Range, $</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eastern Europe</td>
<td>13</td>
<td>2822</td>
<td>1865</td>
<td>468–11,523</td>
</tr>
<tr>
<td>Western Europe</td>
<td>40</td>
<td>9438</td>
<td>7437</td>
<td>1,448–25,909</td>
</tr>
<tr>
<td>Sweden</td>
<td>14</td>
<td>24,548</td>
<td>24,984</td>
<td>7,413–54,157</td>
</tr>
<tr>
<td>UK</td>
<td>27</td>
<td>22,377</td>
<td>15,720</td>
<td>5,026–107,860</td>
</tr>
<tr>
<td>Japan</td>
<td>6</td>
<td>12,883</td>
<td>8901</td>
<td>8266–22,566</td>
</tr>
<tr>
<td>USA</td>
<td>53</td>
<td>28,253</td>
<td>21,006</td>
<td>7309–146,149</td>
</tr>
<tr>
<td>Other (New Zealand, Australia, Canada)</td>
<td>12</td>
<td>16,762</td>
<td>14,229</td>
<td>7473–44,874</td>
</tr>
</tbody>
</table>
Prevention of stroke

Commonality of risk factors for...

... stroke
... coronary heart disease
... peripheral vascular disease
... many types of dementia
... many types of cancer
... respiratory tract disorders
... diabetes
...

Non-communicable diseases (NCD)

Need to join hands
Stroke risk factors

Non-modifiable
Age, Gender, Race, Heredity

Modifiable

Medical Conditions
- Hypertension
- Atrial fibrillation
- Hyperlipidemia
- Diabetes mellitus
- Carotid stenosis
- Prior TIA or stroke
- Elevated homocysteine

Behaviors
- Cigarette smoking
- Alcohol abuse
- Physical inactivity
For stroke the top 5 risk factors are

- hypertension
- atrial fibrillation
- diabetes
- physical inactivity
- smoking

account for 2/3 of all first-ever strokes
Global burden of blood-pressure related disease

About 54% of all strokes attributable to high blood pressure

Which factors drive stroke mortality rates? Only the risk factors?

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean systolic blood pressure</td>
<td>0.028</td>
</tr>
<tr>
<td>Tobacco use</td>
<td>0.041</td>
</tr>
<tr>
<td>Weight</td>
<td>0.017</td>
</tr>
<tr>
<td>National income</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

Links to strengths of health systems and primary care, and to poverty

How Many US Strokes Can Be Prevented by Controlling Risk Factors?

Hypertension: 391,935
Cholesterol: 165,360
Cigarettes: 97,785
Atrial Fibrillation: 74,730
Heavy Alcohol Use: 37,365

Number of preventable strokes

The International Agenda For Stroke

Prevent  Treat  Long term care
The International agenda for stroke

Prevent

Healthy lifestyles
- tobacco control
- salt reduction
- diet high in saturated fats and sugar
- harmful alcohol use
- physical inactivity

Blood pressure control

Treat

Long term care
Stroke prevention – a life course approach

Infancy and Childhood
- Nutrition
- Obesity

Adolescence
- Smoking
- Alcohol
- Lack of physical activity
- Diet
- Obesity

Adult life
- Established risk factors

Age

Accumulated risk

Stroke
The International agenda for stroke

Prevent

Healthy lifestyles
  tobacco control
  salt reduction
  diet high in saturated fats and sugar
  harmful alcohol use
  physical inactivity

Blood pressure control

Treat

Stroke unit care

Long term care
Organized stroke care: stroke units

- Assessment and monitoring
- Early mobilization
- Multidisciplinary care
Organised inpatient (stroke unit) care for stroke

Meta-analysis of 31 RCTs (6936 patients)

<table>
<thead>
<tr>
<th>Event</th>
<th>OR</th>
<th>% Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Death</td>
<td>0.86</td>
<td>-14 %</td>
</tr>
<tr>
<td>Death/institutional care</td>
<td>0.82</td>
<td>-18 %</td>
</tr>
<tr>
<td>Death/Dependency</td>
<td>0.82</td>
<td>-18 %</td>
</tr>
</tbody>
</table>

Stroke Unit Trialists’ Collaboration
Cochrane Corner. Stroke 2008;39:2402-2403
**Absolute benefits of acute stroke therapies in a 1 million population with 2400 strokes/year**

<table>
<thead>
<tr>
<th>Therapy</th>
<th>NNT</th>
<th>Proportion treated</th>
<th>N of deaths/dep avoided</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aspirin</td>
<td>83</td>
<td>80%</td>
<td>23</td>
</tr>
<tr>
<td>Trombolysis</td>
<td>15</td>
<td>10%</td>
<td>15</td>
</tr>
<tr>
<td>SU care</td>
<td>18</td>
<td>80%</td>
<td>107</td>
</tr>
</tbody>
</table>

Proportion of patients treated at stroke units, Sweden 1994 – 2009
ORGANIZATION OF STROKE SERVICES

- Primary prevention
- Pre-hospital care
- Emergency room
- **Stroke Unit**
- Long term care rehabilitation
- Secondary prevention
A network of organized stroke care ....

Educational tools to establish stroke units in low resource settings
Stroke ABC programme

Launched in CapeTown 2006
China 2007
Vietnam 2008
South Korea 2010
Sri Lanka 2011
Marocco 2011

Interested? Welcome to contact!
bo.norrving@med.lu.se
The International agenda for stroke

Prevent

Healthy lifestyles
  - tobacco control
  - salt reduction
  - diet high in saturated fats and sugar
  - harmful alcohol use
  - physical inactivity

Blood pressure control

Treat

Stroke unit care

Long term care

Strengthen systems for follow up
Global burden of disabilities in low – mid-income countries

PAPF, population-attributable prevalence fractions

<table>
<thead>
<tr>
<th>Condition</th>
<th>YLD ($\times10^6$) [contribution to total chronic-disease YLDs [%]]</th>
<th>Rank order (by YLD)</th>
<th>PAPF*</th>
<th>Rank order (by PAPF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dementia</td>
<td>8.3 (10.2%)</td>
<td>3</td>
<td>25.1%</td>
<td>1</td>
</tr>
<tr>
<td>Cerebrovascular diseases</td>
<td>3.5 (4.3%)</td>
<td>8</td>
<td>11.4%</td>
<td>2</td>
</tr>
<tr>
<td>Musculoskeletal diseases</td>
<td>7.2 (8.9%)</td>
<td>4</td>
<td>9.9%†</td>
<td>3</td>
</tr>
<tr>
<td>Neuropsychiatric diseases (other than dementia)</td>
<td>5.9 (7.3%)</td>
<td>6</td>
<td>8.3%</td>
<td>4</td>
</tr>
<tr>
<td>Eye diseases</td>
<td>2.7 (33.9%)</td>
<td>1</td>
<td>6.8%</td>
<td>5</td>
</tr>
<tr>
<td>Digestive diseases</td>
<td>1.6 (1.9%)</td>
<td>11</td>
<td>6.5%</td>
<td>6</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>2.1 (2.5%)</td>
<td>10</td>
<td>4.1%</td>
<td>7</td>
</tr>
<tr>
<td>Respiratory conditions</td>
<td>4.3 (5.3%)</td>
<td>7</td>
<td>3.3%‡</td>
<td>8</td>
</tr>
<tr>
<td>Hearing loss</td>
<td>9.2 (11.3%)</td>
<td>2</td>
<td>2.2%</td>
<td>9</td>
</tr>
<tr>
<td>Skin conditions</td>
<td>0.5 (0.6%)</td>
<td>15</td>
<td>2.1%</td>
<td>10</td>
</tr>
<tr>
<td>Heart disease</td>
<td>6.1 (7.5%)</td>
<td>5</td>
<td>0.8%§</td>
<td>11</td>
</tr>
<tr>
<td>Oral conditions</td>
<td>2.6 (3.3%)</td>
<td>9</td>
<td>Not assessed</td>
<td>–</td>
</tr>
<tr>
<td>Malignant neoplasm</td>
<td>0.9 (1.1%)</td>
<td>12</td>
<td>Not assessed</td>
<td>–</td>
</tr>
<tr>
<td>Endocrine disorders</td>
<td>0.8 (1.0%)</td>
<td>13</td>
<td>Not assessed</td>
<td>–</td>
</tr>
<tr>
<td>Genitourinary diseases</td>
<td>0.6 (0.7%)</td>
<td>14</td>
<td>Not assessed</td>
<td>–</td>
</tr>
<tr>
<td>Total chronic disease burden</td>
<td>81.1 (100%)</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>

The International Agenda For Stroke

Prevent
Healthy lifestyles
Blood pressure control

Treat
Stroke unit care

Long term care
Strengthened health systems
Collaboration is the key

Figure 2: Five priority actions by countries and international agencies for the non-communicable disease (NCD) crisis