

European Stroke Conference 2009  
Stockholm, Sweden.  
28<sup>th</sup> May 2009  
Room K14



## Agenda

1. Welcome & introductions
2. Update on VISTA scientific activities
3. General discussion
  - a. Philosophy
  - b. Scientific proposals
  - c. Other potential collaborations
4. VISTA-Prevention section
5. VISTA-Rehab section
6. STIR / MR Stroke meeting

## Contact Details

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## Insights from VISTA

### The Virtual International Stroke Trials Archive

Myzoon Ali, MRes; Philip M.W. Bath, MD, FRCP; John Curram, PhD;  
Stephen M. Davis, MD, FRCP, FRACP; Hans-Christoph Diener, MD; Geoffrey A. Donnan, MD;  
Marc Fisher, MD; Barbara A. Gregson, BSc, PhD; James Grotta, MD; Werner Hacke, MD, PhD;  
Michael G. Hennerici, MD; Marc Hommel, MD; Markku Kaste, PhD, MD; John R. Marler, MD;  
Ralph L. Sacco, MD, MS; Philip Teal, MD; Nils-Gunnar Wahlgren, MD, PhD;  
Steven Warach, MD, PhD; Christopher J. Weir, PhD; Kennedy R. Lees, MD, FRCP

**Background and Purpose**—Stroke has global importance and it causes an increasing amount of human suffering and economic burden, but its management is far from optimal. The unsuccessful outcome of several research programs highlights the need for reliable data on which to plan future clinical trials. The Virtual International Stroke Trials Archive aims to aid the planning of clinical trials by collating and providing access to a rich resource of patient data to perform exploratory analyses.

**Methods**—Data were contributed by the principal investigators of numerous trials from the past 16 years. These data have been centrally collated and are available for anonymized analysis and hypothesis testing.

Stroke 2007; 38: 1905 - 1910

## SITS-MOST compared a registry with RCT

### Articles

#### Thrombolysis with alteplase for acute ischaemic stroke in the Safe Implementation of Thrombolysis in Stroke-Monitoring Study (SITS-MOST): an observational study



Nils Wahlgren, Niaz Ahmed, Anselmi Davalos, Gary A Ford, Martin Grand, Werner Hacke, Michael G Hennerici, Markku Kaste, Sanja Korkkila, Vincent Larrue, Kennedy R Lees, Risto O Roine, Lauri Salonen, Danilo Toni, Geert Vanhaesebroeck, for the SITS-MOST Investigators

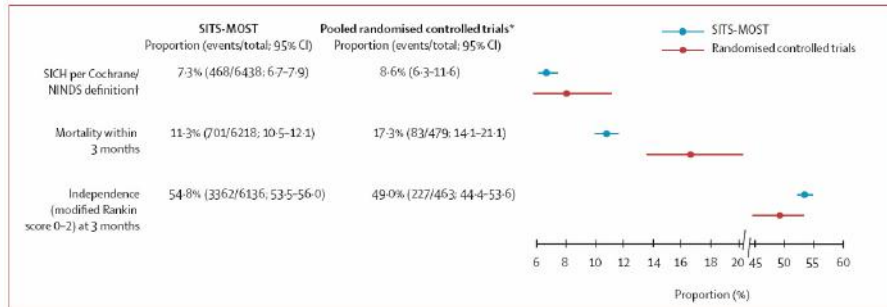
##### Summary

**Background** The aim of the Safe Implementation of Thrombolysis in Stroke-Monitoring Study (SITS-MOST) was to assess the safety and efficacy of intravenous alteplase as thrombolytic therapy within the first 3 h of onset of acute ischaemic stroke. Under European Union regulations, SITS-MOST was required to assess the safety profile of alteplase in clinical practice by comparison with results in randomised controlled trials.

**Methods** 6483 patients were recruited from 285 centres (50% with little previous experience in stroke thrombolysis) in 14 countries between 2002 and 2006 for this prospective, open, monitored, observational study. Primary outcomes were symptomatic (a deterioration in National Institutes of Health stroke scale score of  $\geq 4$ ) intracerebral haemorrhage type 2 within 24 h and mortality at 3 months. We compared mortality, the proportion of patients with symptomatic intracerebral haemorrhage as per the Cochrane definition, and functional outcome at 3 months with relevant pooled results from randomised controlled trials.

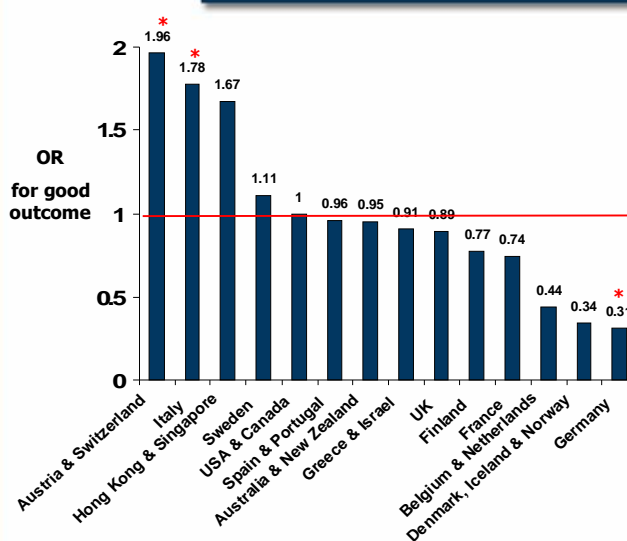
Lancet 2007; 359: 275-82  
See Comment page 249  
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(Prof A Davalos MD), Freeman

## SITS-MOST results were comparable with prior RCTs



Lancet 2007; 369:275-28

## OR for good functional outcome after stroke, by country



Fewer patients enrolled after 1998 had mild index stroke:  $p=0.006$ , adjusted OR=0.22 [0.07, 0.64].

Outcomes varied after adjustment for case mix: Austria, Switzerland and Italy better than North America; Germany worse.

Adjusted outcomes have not changed over last decade.

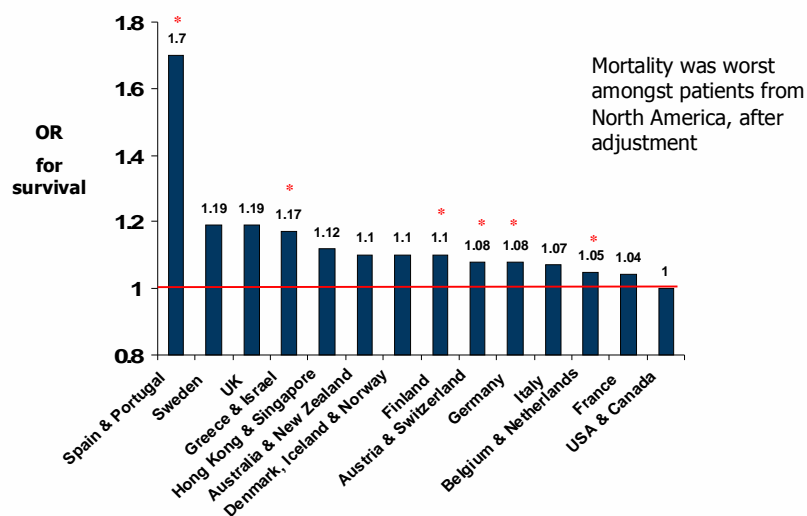
Stroke 2009; 40: 35-40

### Demography of trial patients, by country

Region	Age (Median [IQR])	BNIH (Median [IQR])	Atrial Fibrillation (% present)	Hypertension (% present)	MI (% present)	Diabetes (% present)
Australia & New Zealand	70 [62, 77]	13 [9, 19]	31	64	16	17
Austria & Switzerland	68 [59, 77]	10.5 [6, 15]	20	55	10	19
Belgium & Netherlands	71 [63, 78]	13 [8, 18]	39	48	15	15
Denmark, Iceland & Norway	67.5 [57, 73]	11 [7, 16]	12	32	17	6
Finland	69 [64, 75]	12 [7, 18]	20	32	11	11
France	68 [55, 74]	14 [10, 19]	25	55	5	10
Germany	66 [58, 72]	12 [7, 15]	14	51	10	16
Greece & Israel	76 [64, 81]	12 [7, 17]	42	76	10	22
Hong Kong & Singapore	74 [68, 79]	12 [8, 18]	40	67	4	28
Italy	72 [65, 78]	12 [7, 18]	22	61	6	14
Spain & Portugal	70 [64, 76]	14 [9, 19]	26	48	9	20
Sweden	73 [69, 77]	13 [6, 19]	33	44	16	22
UK	71 [64, 77]	14 [8, 19]	36	55	26	11
USA & Canada	72 [63, 79]	15 [10, 20]	26	72	20	25

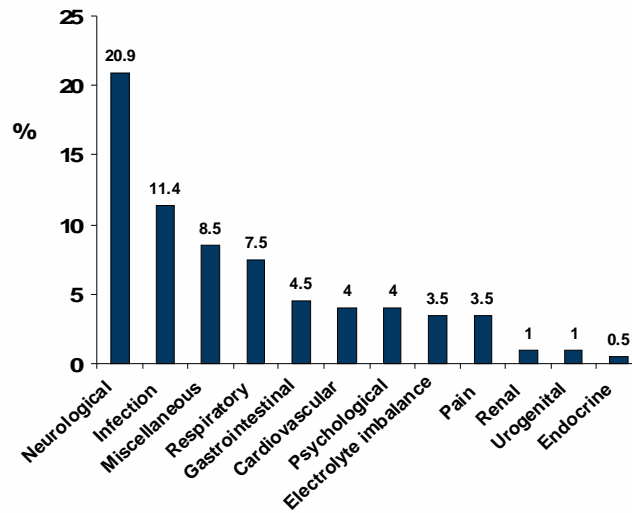
Stroke 2009; 40: 35 - 40

### Survival varied by country



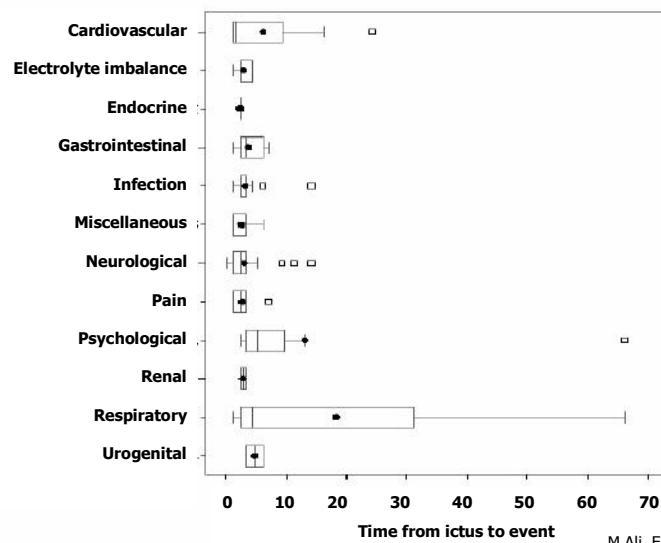
Stroke 2009; 40: 35-40

### Frequency and type of complications after ICH



M Ali, Eur J Neurol (in press)

### Timing of complications after ICH



M Ali, Eur J Neurol (in press)

### Impact of complications on outcome after ICH

- Assessed effect of complications of ICH on outcome
- Logistic regression for good functional outcome; Cox proportional hazards for mortality
- Tested: thromboembolic events, extension of haemorrhage, infection, fever, respiratory complication, cardiac complication
- Only significant predictor is extension of haemorrhage:
  - OR 21.9 for good outcome if no extension,  $p < 0.0001$
  - OR 6.8 for mortality if ICH extension,  $p < 0.0001$

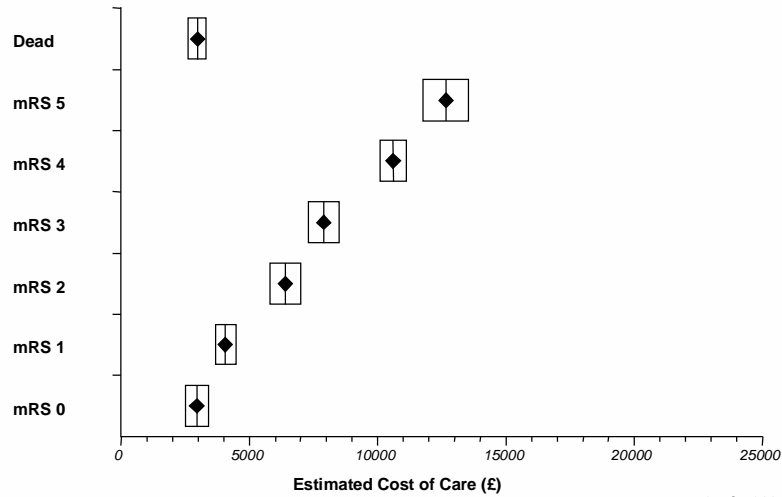
M Ali. Eur J Neurol (in press)

### VISTA comparison with DESTINY

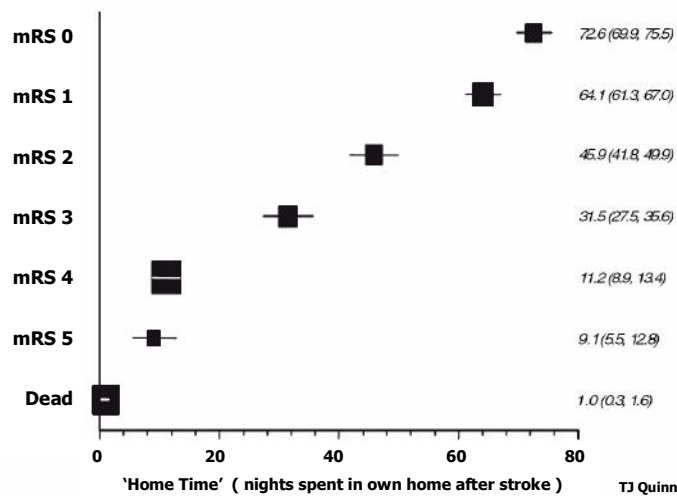
- Matched VISTA trial patients with DESTINY
- $n=32$  VISTA fulfilled criteria versus  $n=17$  DESTINY
- Demography:
  - Age 51 (IQR 47,56) versus 43 (IQR 34-49)
  - NIHSS 23.5 (IQR 21,26) versus 21 (IQR 20,23)
- Outcome:
  - Mortality 28% versus 12%  $p=0.4$
  - Favourable (mRS) 19% versus 47%  $p=0.04$
- Results based on small sample, but consistent with RCT and meta-analysis
- Greater validity if entry criteria coincide
- Potential for validation of phase II results

Ali, Juttler, Diedler et al, DESTINY & VISTA collaborators - Int J Stroke (in press)

### Association of disability measures with healthcare cost

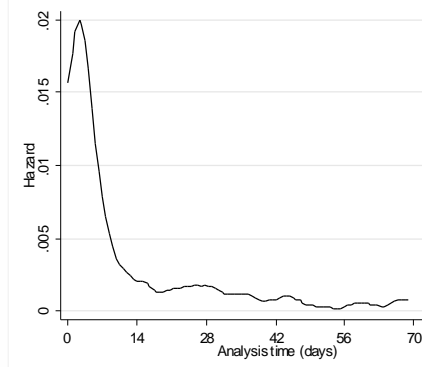


### 'Home Time' relates closely to mRS



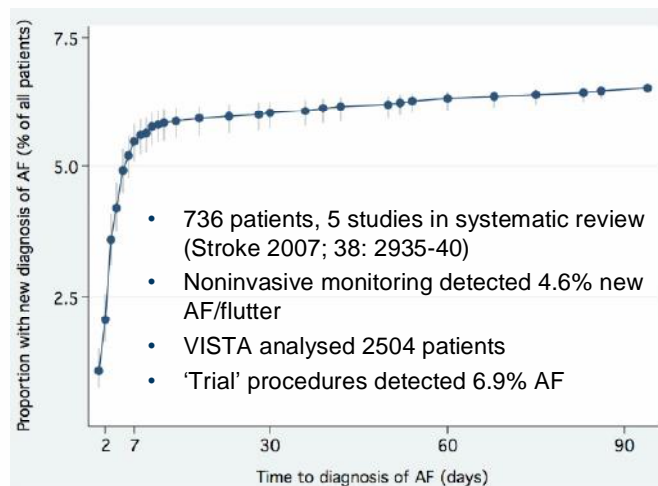
### Risk of serious cardiac adverse events

- 4% risk of serious cardiac adverse events
- Maximal risk in first week
- Maximal mortality in second week
- Predictive factors,  $p < 0.001$ :
  - OR 3.3 heart failure
  - OR 2.1 diabetes
  - OR 2.0 severe stroke
  - OR 1.9 prolonged QTc or Ves
  - OR 1.8 creatinine  $>115\mu\text{M}$
- Risk 6.3% with no predictive factor
- Risk 62% with  $>3$  predictive factors



J Prosser. Stroke 2007; 38: 2295 - 2302

### Time taken to reach diagnosis of AF



- 736 patients, 5 studies in systematic review (Stroke 2007; 38: 2935-40)
- Noninvasive monitoring detected 4.6% new AF/flutter
- VISTA analysed 2504 patients
- 'Trial' procedures detected 6.9% AF

H Kamel. J Stroke Cerebrovascular Dis (in press)



### Conclusions from VISTA

- Includes only trial-eligible patients (*cf* registers)
- Geographical variation
- Rigorous source data verification
- Adverse events consistently coded
- Large sample (28,000), rich information
- Several intriguing findings published
- Potential for
  - natural history
  - comparator groups
  - validation of predictors
  - trial planning
- Proposals for collaboration welcome

### VISTA: subgroups & developments

- VISTA-Rehab
  - some eligibility criteria relaxed (eg  $n > 100$ , monitored)
  - M Ali, A Ashburn, A Bowen, M Brady, E Brodie, S Corr, A Drummond, J Edmans, J Gladman, L Jongbloed, L Kalra, P Langhorne, KR Lees, N Lincoln, P Logan, G Mead, E Patchick, A Pollock, V Pomeroy, C Sackley, P van Vliet, M Walker
  - 22 trials, 3272 patients
- VISTA-Prevention
  - HC Diener et al
- VISTA-Plus
  - Registers and less rigorously monitored but valuable data collections: essential for population-based comparisons
- Collaborations:
  - MR-Stroke
  - STIR
  - EST-Net
  - NINDS common data elements project

## Trial Eligibility Criteria for VISTA

### Criteria

Confirmation of stroke diagnosis by cerebral imaging within 7 days  
Minimum dataset of 100 patients  
Documented entry criteria  
Documented consent or waiver of consent following local IRB-approved procedure  
Baseline assessment within 24 hours of stroke onset  
Baseline assessment includes recording of neurological deficit by Oxford, NIHSS, SSS or similar  
Outcome assessed between 1 and 6 months after stroke onset  
Outcome assessment includes recording of at least one of NIHSS, SSS, Rankin, Barthel or GOS  
Monitoring procedures existed to validate data

## Summary of Data within VISTA

Variable	Frequency (%)	Median [IQR]
Age	-	71 [61, 78]
Sex	M=15,503 (54.7%) F= 12,502 (45.4%)	-
Onset to Treatment Time (OTT)	-	4.7 [3.5, 6.2]
Stroke Type	Ischaemic=24,208 (90.7%) ICH= 2438 (9.1%) Other= 54 (0.2%)	-
Baseline NIHSS	-	11 [6, 17]
NIHSS at 90 days	-	4 [1,9]
mRS at 90 days	-	3 [1,4]
BI at 90 days	-	85 [40, 100]
Mortality at 90 days	Alive=22,060 (83.6%) Dead= 4332 (16.4%)	-

## Submit a Project Proposal

For the consideration for the VISTA Steering Committee, please submit a project proposal consisting of

- Title
- Names of principal investigators
- Background
- Hypotheses
- Methods
- References and appendices
- Proposed funding arrangements & resources/staffing for analyses (this is usually in the order of a £2000 [4000 USD] contribution to VISTA for academic projects, please feel free to discuss this in advance with the VISTA team)

Proposals should be emailed to [myzoonali@clinmed.gla.ac.uk](mailto:myzoonali@clinmed.gla.ac.uk)

## Publication List

### Manuscripts

1. Ali M, Atula S, Bath PMW, Grotta J, Hacke W, Lyden P, Marler J, Sacco RL, Lees KR, for the VISTA Investigators, Stroke Outcomes in Clinical Trials Patients Deriving from Different Countries. *Stroke* 2009;40:35-40
2. Ali M, Bath PMW, Curram J, Davis SM, Diener HC, Donnan GA, Fisher M, Gregson BA, Grotta JC, Hacke W, Hennerici MG, Hommel M, Kaste M, Marler JR, Sacco R, Teal P, Wahlgren NG, Warach S, Weir CJ and Lees KR. The Virtual International Stroke Trials Archive. *Stroke* 2007;38:1905-1910.
3. Ali M, Lyden P, Sacco RL, Shuaib A, Lees KR, for the VISTA investigators. Natural History of Complications after Intracerebral Haemorrhage. *European Journal of Neurology*; 2009: 16:624-630
4. Ali M, Sacco R, Lees KR, On behalf of the VISTA Investigators. Primary endpoint times, functional outcome and adverse event profile after acute ischaemic stroke. *International Journal of Stroke*, 2009;4 (6) (in press)
5. Ali M, Jüttler E, Lees K.R, Hacke W, Diedler J, for the VISTA and DESTINY Investigators. Patient Outcomes in Historical Comparators Compared with Randomised Controlled Trials. *International Journal of Stroke* 2009; (in press).
6. Dawson J, Lees JS, Chang TP, Walters MR, Ali M, Davis SM, Diener HC, Lees KR, for the GAIN and VISTA Investigators. Association between disability measures and healthcare costs after initial treatment for acute stroke. *Stroke*.2007;38:1893-1898
7. Dawson J, Lees KR, Weir CJ, Quinn TJ, Ali M, Hennerici M, Walters MR, and the VISTA collaborators. Baseline serum urate and 90-day functional outcomes following acute ischemic stroke. *Cerebrovascular Diseases*, 2009; (in press).
8. Fink JN, Frampton CM, Lyden P, Lees KR, on behalf of the VISTA Investigators. Does hemispheric lateralization influence functional and cardiovascular outcomes after stroke? An analysis of placebo-treated patients from prospective acute stroke trials. *Stroke* 2008;39:3335-3340
9. Gray LJ, Ali M, Lyden P, Bath PMW, for the VISTA Investigators. Relationship between the National Institutes of Health Stroke Scale (NIHSS) and Scandinavian Stroke Scale (SSS) in patients with acute stroke. *Journal of Stroke and Cerebrovascular Diseases*, 2009; (in press)
10. Hallevi H, Albright KC, Martin-Schild S, Barreto AD, Grotta JC, Savitz SI, on behalf of the VISTA investigators. Anticoagulation after cardioembolic stroke CVD 2008;26:38-40
11. Kamel H, Lees KR, Lyden P, Teal PA, Shuaib A, Ali M and Johnston SC, on behalf of the VISTA Investigators. Delayed detection of atrial fibrillation after ischaemic stroke. *Journal of Stroke and Cerebrovascular Diseases*, 2009; (in press).
12. König IR; Ziegler A; Bluhmki E; Hacke W; Bath PMW; Sacco RL; Diener HC; Weimar C; on behalf of the Virtual International Stroke Trials Archive (VISTA) Investigators. Predicting long-term outcome after acute ischemic stroke. A simple index works in patients from controlled clinical trials. *Stroke*. 2008;39:1821-1826
13. Ovbiagele B; Starkman S; Teal P; Lyden P; Kaste M; Davis SM; Hacke W; Fierus M; Saver JL; on behalf of the VISTA Investigators, Serum calcium as prognosticator in ischemic stroke. *Stroke*. 2008;39:2231-2236
14. Prosser J; MacGregor L; Lees KR; Diener HC; Hacke W; Davis SM; on behalf of the VISTA investigators. Predictors of early cardiac morbidity and mortality after ischemic stroke. *Stroke*. 2007;38:2295-2302

15. Sare GM, Ali M, Shuaib A, Bath PMW, for the VISTA Collaboration. Hyperacute blood pressure in acute ischaemic stroke. *Stroke* 2009; (in press)
16. Weimar C, Ziegler A, Sacco RL, Diener HC, Ziegler A, Koenig IR. Predicting recovery after intracerebral hemorrhage - an external validation in patients from controlled clinical trials. *J Neurol.* 2009 (In press)
17. Whitehead J, Bolland K, Valdès-Márquez E, Lihic A, Ali M, Lees KR, for the VISTA Collaborators. Using historical lesion volume data in the design of a new phase II clinical trial in acute ischaemic stroke. *Stroke* 2009; 40:1347-1352
18. Diener HC, Weimar C, Ali M, Lees KR, Die virtuelle internationale Schlaganfallstudien-Archiv (VISTA) - Bedeutung für die Schlaganfallforschung, *Aktuelle Neurologie*; 2009 (in press)
19. Saini M, Saqqur M, Kamruzzaman A, Lees KR, Shuaib A for the VISTA investigators. Effect of hyperthermia on prognosis following acute ischaemic stroke. *Stroke* 2009 (in press)

## Abstracts/ Posters

1. Ali M, Atula S, Bath PMW, Grotta J, Hacke W, Lyden P, Marler J, Sacco RL, Lees KR, for the VISTA Investigators, Stroke outcomes in clinical trials patients deriving from different countries. **Poster** Presented at EFNS, Madrid, Spain, 2008.
2. Ali M, Lyden P, Sacco RL, Shuaib A, Lees KR, for the VISTA investigators. Natural history of complications after intracerebral haemorrhage. **Poster** at AAN meeting, Seattle, USA, 2009.
3. Dawson J, Lees JS, Chang TP, Walters MR, Ali M, Davis SM, Diener HC, Lees KR, for the GAIN and VISTA Investigators. Association between disability measures and healthcare costs after initial treatment for acute stroke. **Poster** Presented at ISC, San Francisco, USA. 2007.
4. Morris JG; Kane K, Fisher M, on behalf of the VISTA Investigators. Pre-treatment with Angiotensin Converting Enzyme Inhibitors (ACEI) or Angiotensin Receptor Blockers (ARB) reduce stroke severity at presentation. **Abstract** presented at International Stroke Conference San Diego, USA, 2009.
5. Muir KW; McCormick M; Baird T; for the VISTA investigators. Hyperglycaemia in Acute Stroke Trials: Prevalence, predictors and prognostic value- An analysis of the Virtual International Stroke Trials Archive (VISTA). **Abstract** presented at the International Stroke Conference San Francisco, USA. 2007.
6. Gray LJ, Ali M, Bath PMW, for the VISTA Collaboration. Interconversion of National Institutes of Health Stroke Scale (NIHSS) and Scandinavian Stroke Scale (SSS) impairment/severity measures in stroke trials. **Abstract** presented at the European Stroke Conference, Glasgow, UK, 2007.
7. Saini M, Shuaib A, on behalf of the VISTA Investigators. Is hyperthermia a poor prognostic factor in acute ischemic stroke patients? **Abstract** for ISC, San Diego, USA, 2009.

Please be aware that all VISTA based manuscripts should be circulated within the VISTA Steering Committee prior to submission.

## Steering Committee

Steering Committee Members	Location
Dr. Marian Brady, (Chair)	NMAHP Research Unit, Glasgow Caledonian University, UK
Dr. Alex Pollock	NMAHP Research Unit, Glasgow Caledonian University, UK
Prof. Peter Langhorne,	Academic Section of Geriatric Medicine, Glasgow Royal Infirmary and University of Glasgow, UK
Prof. Kennedy R. Lees	Cardiovascular and Medical Sciences, University of Glasgow, UK
Prof. Marion Walker	School of Community Health Sciences, University of Nottingham, UK
Dr. Myzoon Ali	NMAHP Research Unit, Glasgow Caledonian University, UK
Prof. Catherine Sackley	University of Birmingham, UK
Dr. Susan Corr	University of Northampton, UK
Prof. Valerie Pomeroy	Division of Clinical Developmental Sciences, St George's University of London, UK
Dr. Avril Drummond	School of Community Health Sciences, University of Nottingham, UK
Prof. John Gladman	Queens Medical Centre, Nottingham, UK
Dr. Pip Logan	School of Community Health Sciences, University of Nottingham, UK
Dr. Lyn Jongbloed	University of British Columbia, Canada
Dr. Gillian Mead	Royal Infirmary of Edinburgh, UK
Dr. Judi Edmans	Queens Medical Centre, Nottingham, UK
Prof. Nadina Lincoln	School of Psychology, University of Nottingham, UK
Prof. Eric Brodie	Department of Psychology, Glasgow Caledonian University, UK
Prof. Lalit Kalra	Guy's, King's & St. Thomas' School of Medicine, London, UK
Prof. Ann Ashburn	School of Health Professions and Rehabilitation Science, University of Southampton, UK
Prof. P. van Vliet	Division of Physiotherapy Education, University of Nottingham, Nottingham, UK
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## Eligibility Criteria for VISTA-Rehab

### Entry Criteria for VISTA-Rehab

1. Clinical diagnosis of stroke
2. Minimum dataset of 20 patients
3. Documented entry criteria
4. Documented consent or waiver of consent following local Institutional Review Board-approved procedure
5. Patients included were randomised
6. Baseline assessment includes recording of a recognised impairment/ activity limitation measure, eg. Barthel Index, NEADL, FIM, FAM, Oxford, NIHSS, SSS or similar
7. Documentation of onset to treatment time
8. Outcome(s) assessed using one or more recognised measure(s)
9. Trial was conducted within the last 10 years

### Summary of data

Variable	n	Median [Interquartile Range]	Frequency (%)
Age	3230	73 [65.4,80]	-
Gender	3213	-	Male=52.8
Hemisphere affected by stroke	1847	-	Left=26.9
Barthel Index at baseline	1902	16 [9, 19]	-
Nottingham Extended Acts of Daily Living score at baseline	623	26 [14, 42]	-
Pre-Stroke modified Rankin Scale	604	0 [0, 1]	-
Modified Rankin Scale score at 6 months	490	3 [2, 3]	-
Barthel Index at 6 months	1551	17 [13, 19]	-
Nottingham Extended Acts of Daily Living score at 6 months	1339	29 [14, 47]	-

### Submit a Project Proposal

For the consideration for the VISTA-Rehab Steering Committee, please submit a project proposal consisting of

- Title
- Names of principal investigators
- Background
- Hypotheses
- Methods
- References and appendices
- Proposed funding arrangements & resources/staffing for analyses (this is usually in the order of a £2000 [4000 USD] contribution to VISTA for academic projects, please feel free to discuss this in advance with the VISTA team)

Proposals should be emailed to [myzoon.ali@gcal.ac.uk](mailto:myzoon.ali@gcal.ac.uk)

## VISTA-Rehab ESC Abstract

### Rehabilitation Trials within the Virtual International Stroke Trials Archive - VISTA-Rehab

Myzoon Ali, Peter Langhorne, Kennedy R. Lees, Alex Pollock, Marion Walker, Marian Brady, On behalf of the VISTA-Rehab Investigators

**Background** The Virtual International Stroke Trials Archive (VISTA) is a collaborative resource that aids the exploration of natural history and methodological issues related to stroke. The aim is to improve stroke trial design and thus improve patient care. VISTA initially concentrated on data from acute trials and so far holds data on more than 27,500 patients and has generated 11 peer reviewed publications. We now seek to expand this resource through collation of data from rehabilitation trials (VISTA-Rehab) to assist trial design in this methodologically challenging area.

**Methods** Clear protocols, guidelines and procedures for the submission of trial data to VISTA-Rehab have been developed. These cover issues relating to eligibility, confidentiality, ethics, storage and access to data. Analyses of these data will be carried out following the development of clear research questions and proposals, which will be reviewed by a Steering Committee that will include all collaborators who have contributed trial data. Treatment effects arising from the interventions studied in the original clinical trials will not be re-examined.

**Results** VISTA-Rehab contains data from 12 stroke rehabilitation trials, including physiotherapy, occupational therapy and interventions for perceptual problems: these total 1605 patient records. Data are held for outcome measures such as Barthel Index, Nottingham Extended Acts of Daily Living and modified Rankin Scale, plus demographic variables. Trial recruitment is ongoing and commitment of data from an additional 12 trials has been secured. Use of these data will benefit the stroke patient, clinical and research groups.

**Conclusion** We invite potential collaborators to join VISTA-Rehab and seek the opportunity to discuss contributions of trial data with trialists. We welcome proposals from researchers interested in using the data in VISTA-Rehab. This will form a valuable resource for stroke rehabilitation clinicians and researchers.

Poster: 27<sup>th</sup> May 2009, Red poster Session, 12.30-14.00pm.

## Publication List

### Abstracts/ Posters

1. Ali M, Corr S, Drummond A, Edmans J, Gladman J, Jongbloed L, Langhorne P, Lees KR, Lincoln N, Logan P, Mead G, Pollock A, Pomeroy V, Sackley C, Walker M and Brady M. Rehabilitation trials within the Virtual International Stroke Trials Archive (VISTA-Rehab). **Poster** Presented at SRR Conference 3<sup>rd</sup> Feb 2009, Derby, UK.
2. Ali M, Corr S, Langhorne P, Lees KR, Pollock A, Walker M and Brady M. Rehabilitation trials within the Virtual International Stroke Trials Archive (VISTA-Rehab). **Poster** Presented at UKSF, 2<sup>nd</sup> -4<sup>th</sup> Dec 2008, Harrogate, UK.
3. Ali M, Corr S, Langhorne P, Lees KR, Pollock A, Walker M and Brady M. Rehabilitation trials within the Virtual International Stroke Trials Archive (VISTA-Rehab). **Poster** Presented at SSRN, 28<sup>th</sup> Oct 2008, Glasgow, UK.

Please be aware that all VISTA-Rehab based manuscripts should be circulated within the Steering Committee prior to submission.

## VISTA Steering Committee and Collaborators

Steering Committee Members	Location
K.R. Lees	Glasgow, UK
L. Claesson	Pittsburgh, USA
E. Bluhmki	Biberach, Germany
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J. Curram	Newbury, UK
P. Teal	Vancouver, Canada
M.G. Hennerici	Heidelberg, Germany
N.G. Wahlgren	Stockholm, Sweden
P. Lyden	San Diego, USA
P.W. Bath	Nottingham, UK
R. Sacco	Miami, USA
S.M Davis	Melbourne, Australia
W. Hacke	Heidelberg, Germany
S. Warach	Bethesda, USA
M. Fisher	Worcester, USA
M. Hommel	Grenoble, France
M. Kaste	Helsinki, Finland
K. Muir	Glasgow, UK
A. Shuaib	Alberta, Canada
C. Weimar	Essen, Germany

Collaborators	Location
B. Oviagele	Los Angeles, USA
J. Prosser	Melbourne, Australia
M. Hill	Calgary, Canada
J. Fink	Christchurch, New Zealand
J. Whitehead	Reading, UK
K. Kucher	Basel, Switzerland
S. Atula	Helsinki, Finland
S. Weiss	Tel Aviv, Israel
J. Dieder	Heidelberg, Germany
L. Gray	Nottingham, UK
H. Hallevi	Houston, USA
H. Altman	Tel Aviv, Israel
J. Dawson	Glasgow, UK
H. Kamel	San Francisco, USA
C. Johnston	San Francisco, USA
A. Aleu	San Diego, USA
D. Toni	Rome, Italy
M. Saini	Alberta, Canada
G. Sare	Nottingham, UK
J. Morris	Worcester, USA
T. Chou	New Jersey, USA
D. Dowlatshahi	Calgary, Canada
N. Mishra	Glasgow, UK
A. Demchuck	Calgary, Canada
J. Saver	Los Angeles, USA
V. Thijs	Gasthuisberg, Belgium
S. Yip	San Diego, USA
H. Tu	Melbourne, Australia