**APPENDIX**
**for manuscript entitled:**

# Design and validation of a clinical scale for prehospital stroke recognition, severity grading, and prediction of large vessel occlusion – the shortened NIH stroke scale for emergency medical services

## APPENDIX – EXTENDED METHODS

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## LIST OF ONLINE SURVEY PARTICIPANTS

A-Z; participants who gave consent to the publication of their name (as provided).

A. Ader, Anselm Angermaier, Simon Angst, Manfred Beck, Michael Bernhard, Sascha Berning, Patric Bialas, A. Binder, Markus Birkle, Patrick Blum, Manuel Bolognese, Tobias Braun, Werner Buchzik, Otto Busse, Joseph Claßen, Mackenrodt, Daniel, G. Dittmar, Martin Dörstelmann, Sebastian Edelbusch, · Eggers, · Emmert, Bernhard Engel, B. Fauser, Manuel Feilcke, Tobias Fellhauer, Daniel Frambach, Jan Fraundorfer, Karlheinz Fuchs, Andrea Fürst, Escheu Gabriele, Michael Glas, Malte Goltz, Nils Haag, Frank Hamilton, Anne Hartmann, Joachim Hartmann, Daniel Hecker, Mirjam Heldner, Mirjam Hensgen, Jan Henze, Benigna Herchenröder-Stelzmann, Tobias Höhle,· Huber-Hartmann, Matthias Huck, Marek Humpich, Malgorzata Jakubowska, Alexander Jung, Katsarava, Annemarie Keppler, Florian Keßler, Stephan Kinze, Rolf Kirchner, P. Klupp, T. Klüsener, H.-C. Koennecke, Michael König, Andrea Kraft, Viktor Krahl, Christos Krogias, Simon Kurras, Rüdiger Lange, Felix Lehmann, Michael Libicher, Christoph Lichy, Martin Liebetrau, Tilmann Lilienfein, Dennis Lischewski, Sascha Lorei,· Lukic, Dominik Martus, Fabian Meisel, Stefan Nauber, Oliver Neuhaus, Daniel Ostertag, Martin Pennekamp, Waltraud Pfeilschifter, Alexander Pistorius, Stoyan Popkirov, Helena Popp, · Prentkowski, Ulrich Pulkowski, Jens Regula, Torsten Rehfeldt, Gernot Reimann, Alexander Reischl, Daniel Richter, Martin Rieck, Frank Rieger, Bernd Ringelstein, Elisabeth Rohrbacher,

Joachim Röther, Jens Rothermel, Ingmar Sanden, Felix Schaller, Jan Scheitz, Hans-Michael Schmitt, Andreas Schneider, · Schuhmann, Rüdiger Seitz, Paul Sparenberg, Mario Strammiello, Veit Straßner, Adam Strzelczyk, Florian Tchorz, Joachim Thöne, Kerstin Tykocinski, Frank Uhlmann, Falk Vollnhals, Stefanie von, Daniel Wassenberg, · Weber, Andre Wiegratz, Joachim Wolf, Christian Woynar, Volker Ziegler.

**SAMPLE SIZE CALCULATION**

"To ensure that the number of obtained cases (N=689) is sufficient for analysis of test characteristics regarding stroke recognition, the sample size was calculated according to the method described by Buderer.[1] With reference to prior reports regarding stroke recognition scores published until 2011, a median sensitivity of 85% (range 44–96%) was found, as well as a median specificity of 83% (25–100%).[2,3,5,6,7-13] With a prevalence of definite TIA/ stroke of 29% in our population and maximum marginal error of estimate of 5% with 95% confidence level of the true value of sensitivity (or specificity), the total required sample size would have been 676 cases based on sensitivity (or 305 based on specificity). Subgroup analyses of patients with pmRS 0–2 versus 3–5 and age ≤65 versus >65 years were conducted. We performed sensitivity analyses assuming a 5% misallocation rate."

Modified from: Purrucker JC, Hametner C, Engelbrecht A, et al. Comparison of stroke recognition and stroke severity scores for stroke detection in a single cohort. J Neurol Neurosurg Psychiatry 2015;86:1021-8.

References:

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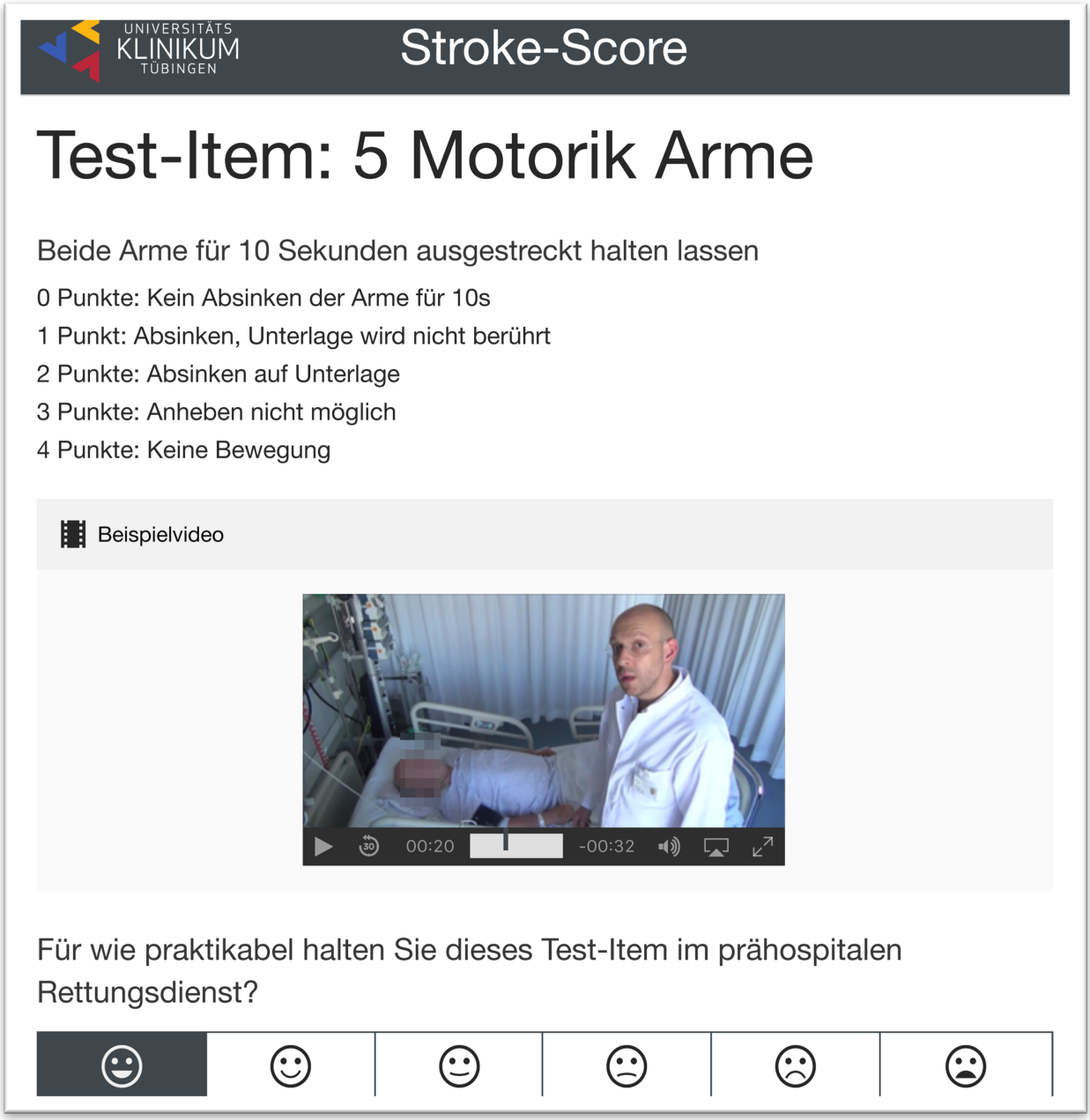


**Figure 1A.** Exemplary screenshot of the online survey frontend. Here the National Institutes of Health Stroke Scale item 5 is briefly described in the text and explained in a short video. In the lower part, the suitability of using the item in a prehospital emergency setting is then rated.

**Table 1A** Rating of suitability of each National Institutes of Health Stroke Scale item for use in a prehospital emergency setting.

| No. | NIHSS Item | Total | EMS personnel | Stroke physicians | *P* Value |
|---|---|---|---|---|---|
| 1a | Level of Consciousness | 0 (0 – 1) | 0 (0 – 1) | 0 (0 – 1) | 0.27 |
| 1b | LOC Questions | 1 (0 – 1) | 0 (0 – 1) | 1 (0 – 2) | 0.20 |
| 1c | LOC Commands | 1 (0 – 1) | 0 (0 – 1) | 0 (0 – 1) | 0.95 |
| 2 | Best Gaze | 2 (1 – 3) | 2 (1 – 2) | 2 (1 – 3) | <0.01 |
| 3 | Visual | 3 (2 – 4) | 2 (1 – 3) | 3 (2 – 4) | 0.01 |
| 4 | Facial Palsy | 1 (0 – 1) | 1 (0 – 1) | 1 (0 – 2) | 0.36 |
| 5 | Motor Arm (R+L) | 1 (0 – 1) | 1 (0 – 1) | 1 (0 – 1) | 0.39 |
| 6 | Motor Leg (R+L) | 1 (0 – 2) | 1 (0 – 2) | 1 (0 – 2) | 0.16 |
| 7 | Limb Ataxia | 3 (2 – 4) | 2 (1 – 3) | 3 (3 – 4) | <0.001 |
| 8 | Sensory | 1 (0 – 2) | 1 (0 – 1) | 1 (1 – 2) | <0.001 |
| 9 | Best Language | 1 (0 – 2) | 1 (0 – 1) | 1 (1 – 2) | <0.001 |
| 10 | Dysarthria | 1 (0 – 2) | 1 (0 – 1) | 1 (1 – 2) | <0.001 |
| 11 | Extinction and Inattention (formerly Neglect) | 3 (2 – 4) | 2 (1 – 3) | 4 (3 – 4) | <0.001 |

Data are median (interquartile range). Theoretical range from 0 (most suitable) to 5 (most unsuitable). P value for difference between Emergency Medical Services (EMS) personnel and stroke physicians (Mann-Whitney-U test). R+L, right and left; NIHSS, National Institutes of Health Stroke Scale.

**Table 2A.** Cross Tabulations.

**Stroke Recognition**
Cut-off 1

| | | Stroke | | |
|---|---|---|---|---|
| | | 0 | 1 | n |
| sNIHSS-EMS | 0 | 252 | 19 | 271 |
| | 1 | 237 | 181 | 418 |
| n | | 489 | 200 | 689 |

**Stroke Recognition, excluding comatose patients**
Cut-off 1

| | | Stroke | | |
|---|---|---|---|---|
| | | 0 | 1 | n |
| sNIHSS-EMS | 0 | 252 | 19 | 271 |
| | 1 | 213 | 156 | 369 |
| n | | 465 | 175 | 640 |

**Prediction of Large Vessel Occlusions**
Cut-off 6

| | | LVO | | |
|---|---|---|---|---|
| | | 0 | 1 | n |
| sNIHSS-EMS | 0 | 364 | 86 | 450 |
| | 1 | 87 | 204 | 291 |
| n | | 451 | 290 | 741 |

**Table 3A.** Characteristics of the Validation Cohort for Prediction of Large Vessel Occlusion (N = 741).

| Variable | Validation Cohort |
|---|---|
| Age, mean (± SD) | 72.1 (± 13.9) |
| Female sex, n (%) | 354 (47.8) |
| NIHSS at admission, median (IQR) | 6 (3 – 12) |
| Type of imaging, n (%) | |
| CTA | 644 (86.9) |
| MRA | 92 (12.4) |
| Digital subtraction angiography | 5 (0.7) |
| Vessel occlusion, n (%) | |
| Presence of large vessel occlusion | 324 (43.7) |
| Left sided | 155 (48.0) |
| Site of vessel occlusion, n (%) | |
| CCA | 7 (2.2) |
| ICA | 69 (21.3) |
| Carotid T | 11 (3.4) |
| MCA | 173 (53.4) |
| M1 | 94 (29.0) |
| M2 | 68 (21.0) |
| M3/4 | 11 (3.4) |
| ACA | 2 (0.6) |
| PCA | 20 (6.2) |
| VA | 23 (7.1) |
| BA | 19 (5.9) |

CTA, computer tomography angiography; MRA, magnetic resonance angiography; CCA, common carotid artery; ICA, internal carotid artery; MCA, middle cerebral artery; M1, M2 and M3/4, MCA segments; ACA, anterior cerebral artery; PCA, posterior cerebral artery; VA, vertebral artery; BA, basilar artery.