# Mothership versus drip and ship organizations: a probability model

S. Vidale*, S. De Biasi^, M. Longoni°, E. Agostoni°

*Sant'Anna Hospital, Como – Italy

^University of Udine, Udine - Italy

°Niguarda Ca' Granda Hospital, Milan - Italy

**Background and purpose:** Mechanical thrombectomy (EVT) after intravenous thrombolysis (IVT) is recommended in selected patients with ischemic stroke due to large vessel occlusion. Because most hospitals have not facilities to perform EVT (PSC), the patients need a rapid transportation to comprehensive stroke centers (CSC) after IVT (drip and ship model – Figure 1; pathway A). In other cases, strokes arrive in CSC, directly (mothership model – Figure 2; pathway B). To date, there is no defined superiority of one model over other concerning clinical outcome. Aim of the present study was the assessment of a probability modeling that compared the two organizational pathways in achieving a good outcome.

**Methods:** We elaborated a probabilistic formula considering the probability of good outcome for each treatment type (EVT and IVT) and therapy-related effect, weighting these values with the mean delay time of acute management. These temporal delays were the results of previous real-world survey and project conducted in 11 Regional Hospitals of a geographical macro-area with more than 3 millions of inhabitants. Finally, we compared the results of this model in mothership and drip and ship organizations. We applied a comparison of proportions to test the statistical significance of the calculated difference.

**Results:** In our study we observed lower mean onset-to-needle and onset-to-groin times in CSC than PSC (onset-to-needle time: 133 vs 141 min; onset-to-groin time: 201 vs 242 min; Table 1). Appling the probabilistic model (Table 2), we observed a probability to achieve a good outcome of 82% in CSC (78 - 84) and 78% in PSC (73 - 80). Applying the proportion comparison test, we observed a significant difference between the above-mentioned probability of good outcome if about 2000 patients were treated and with a distribution ratio of 1:2 between CSC and PSC (p : 0.048).



Figure 1: Different organizational scenarios

| Temporal delay | CSC | PSC |
|---|---|---|
| Onset-to-door time (mins) | 84 | 76 |
| Onset-to-needle time (mins) | 133 | 141 |
| Onset-to-groin time (mins) | 201 | 242 |

Table 1

| Model | Median | LCI | HCI |
|---|---|---|---|
| mothership | 0,82 | 0,84 | 0,78 |
| Drip and ship | 0,78 | 0,80 | 0,73 |

Table 2: Different organizational scenarios

**Conclusions:** In our probabilistic model based on real-world data concerning acute management of patients with stroke, the motherhip organization was superior to the drip and ship model to allow the best prob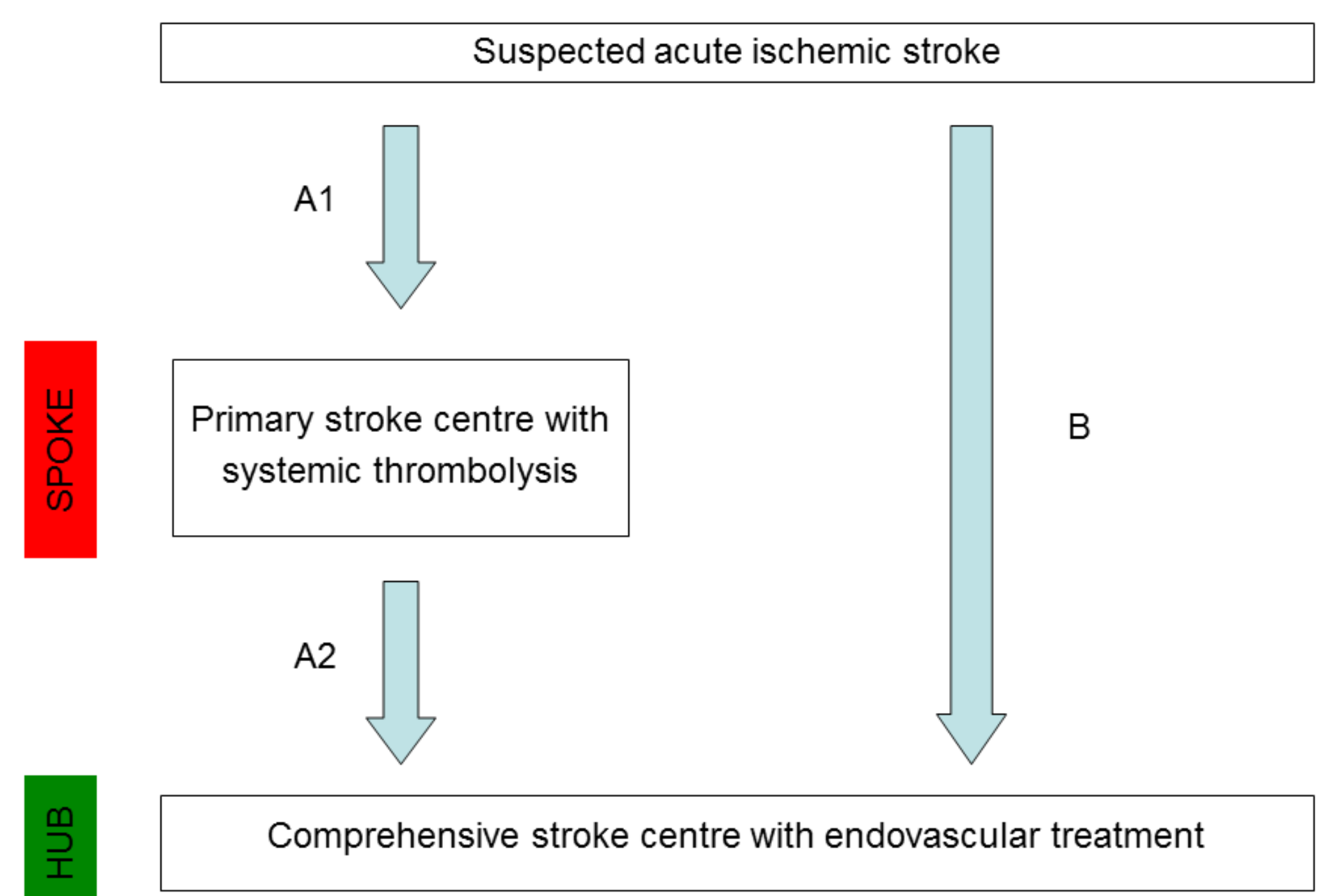ability of achieve a good outcome after IVT and EVT.