NEUROINTERVENTIONAL news

November 2017

Introduction

Dear Neurointerventionalists,

The Neurointerventional Newsletter has a tradition of more than a decade and we thought it might be necessary to change the format. From now on the newsletter will appear bi-monthly just with one review of a single article.
This way we will be much more up-to-date with recent studies that are of interest for our community. We are kicking-off the new format with a paper on cost and cost-effectiveness of Acute Ischemic Stroke therapy, kindly reviewed by Dr. Wim van Zwam. Please do not hesitate to comment on the new format.

Best regards,

Michael Forsting, Editor
Chairman of the Institute of Radiology and Neuroradiology
at the University Clinics Essen, Germany

Critical review of literature

Sevick LK, Ghali S, Hill MD, Danthurebandara V, Lorenzetti DL, Noseworthy T, Spackman E, Clement F
Stroke. 2017 Sep; 48(9):2519-2526. doi: 10.1161/STROKEAHA.117.017199. Epub 2017 Jul 17.

Systematic review of the cost and cost-effectiveness of rapid endovascular therapy for acute ischemic stroke

Once the clinical benefit of endovascular treatment (EVT) in a defined group of patients with acute ischemic stroke (AIS) has been established, it is a logical next step to explore the costs, or cost savings, associated with this new treatment. These costs are of interest for various stakeholders in the medical field: health policy makers, insurance companies, hospital administrations, etc. Several attempts to decifer these costs, from different perspectives, have been made in the past few years. This paper gives an overview of some of these attempts, so as published in medical literature since the late 2010's, when the first studies had shown the potential benefit of EVT. This study is presented as a 'systematic review' because a systematic literature search has been performed and the chosen papers have been chosen for their methodological quality using a published list of quality criteria. However, as the title already suggests, two different topics are reviewed: the first on costs of EVT (7 studies) and the second on the cost-effectiveness of this new procedure (10 studies). It would have been more comprehensible and easier to read if the two topics were dealt with separately, with results in separate tables (or even in separate papers).
The cost analysis studies mainly compare costs of different techniques (e.g. aspiration versus stent retriever),

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EVT versus IV treatment alone (Simpson 2014, Rai and Evans 2015), or actual cost versus current reimbursement (Brinjikji 2011). Included in calculations are devices and other material costs (Kass-Hout 2015, Turk 2014, Comai 2015) or total hospitalization costs, including material costs (Brinjikji 2011, Simpson 2014, Rai and Evans 2015, Turk 2015). In these cost analysis studies, no costs related to post-hospital patient care were included, and rather only actual treatment costs are considered. Therefore, these results could not serve as input parameters for cost-effectiveness studies.

What we can learn from the cost-analysis studies is that EVT is more expensive than IV therapy only – which is not a surprise -, and that treatment with stent retrievers is more expensive than treatment with first generation devices or with aspiration.

Therefore, to justify the use of stent retrievers, the latter should prove a better performance in regards to recanalization and/or clinical outcome. This has been shown in the SWIFT and TREVO-2 trials for the comparison with first-generation Merci devices, but not yet in direct comparison with aspiration.

Unfortunately, the ASTER trial (Lapergue et al. JAMA 2017: 318(5); 443-52) failed to show superiority of aspiration and lacked a non-inferiority analysis.

The cost-effectiveness studies show a wide variety in their analysis. Although the chosen models use pretty much the same input variables, they differ among all studies. A well-known phrase for measuring the quality of the outcomes of such models is: "Garbage in, garbage out". The term 'garbage' does not apply to the studies looked at here, but the differences in input variables do influence outcomes tremendously.

The first difference is the estimated efficacy of EVT. In the pre-2015 studies, data came from first-generation MERCI trials (Patil 2009, Kim 2011, Nguyen-Huyen 2011) or from estimated differences in clinical outcome based on recanalization rates reported in older studies: IMS 2004, EMS 1999 and PROACT II 1999 (Bouvy 2013).

While these latter estimates seem to be what I would call 'garbage', it is probably because this was the best available data at that time. The post-2015 studies all used EVT efficacy estimates from the five 2015 NEJM published trials (MRCLEAN, ESCAPE, EXTEND IA, SWIFT PRIME and REVASCAT). However, the estimated treatment effect of EVT before and after the 2015 trials do not differ significantly in these studies. Also, long-term health utilities and mortality rates based on mRS categories do not differ significantly among the different cost-effectivity studies.

More important differences are found in total cost estimates, especially whether post-hospital costs are included in the calculations and if so, the way they are calculated. For example, the study of Nguyen-Huyen only included in-hospital costs, based on average Medicare payment rates. All other studies included long-term cost estimates based on clinical outcomes: some studies (Leppert 2015, Kunz 2016, Xie 2016) calculated post-treatment costs trichotomized by mRS (0-2, 3-5 and 6 [death]) as suggested by Earnshaw et al (Stroke 2009: 40: 1710-20).Others used a more stratified system with differentiated costs for five mRS categories (Bouvy 2013; 0-1 and 2-3 combined) or for all seven mRS categories (Aronsson 2016, Lobotesis 2016).

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In my personal opinion, these latter cost estimates most accurately reflect true long-term costs. And it is, in my opinion, not surprising that these two studies show dominance of EVT over non-EVT, meaning that EVT is more effective and less costly in the long term. Both studies, however, use cost calculations from Western European health care systems (Sweden and UK). Compared to the US in-hospital costs, these are generally lower, while long-term costs are actually probably higher in Europe, resulting in increased cost savings by EVT. Therefore, total cost saving by EVT in the US might be much lower or even negative, but still (with a 'willingness-to-pay' threshold of $50.000 per QALY) EVT will be very cost-effective.

Two recent publications, both using data from SWIFT PRIME, but with resources for long-term costs from Spain (Andres-Nogales et al. Eur Stroke J 2017: 2 (3); 272-84) and the US (Shireman et al. Stroke 2017: 48; 379-87) confirm the dominance of EVT with cost savings per patient over lifetime projections of €44,387 and $23,203 in Spanish and US contexts respectively.

In summary: EVT has the potential to be cost-effective and most likely even dominant (more effective and less costly) over non-EVT.This is important information for health policy makers and insurance companies and a strong argument to implement EVT as soon as possible where it is not yet the standard of practice.

Stent retriever thrombectomy appears to be more expensive than with first generation devices, but also more effective. Stent retriever-first technique appears to be more expensive than aspiration-first techniques from the presented studies. However, clinical superiority – or non-inferiority - of either one of these techniques still has to be determined.

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