Why do I think we need 50 or more procedures for training?
What should we do?
CREST trial: learning curve

operators <15
CAS: stroke/death rate 7.1%

operators >15
CAS: stroke/death rate 3.7%
stroke/death rate: 9.6%

12 CAS or 35 stenting procedures in the supraaortic trunks, 5 of which had to be CAS
SPACE: learning curve

stroke/death rate: 6.84%

25 successful percutaneous transluminal angioplasties or stent procedures
Risk Score for Peri-Interventional Complications of Carotid Artery Stenting

Robert Hofmann, MD; Alexander Niessner, MD; Alexander Kypka, MD; Clemens Steinwender, MD; Jürgen Kammler, MD; Klaus Kerschner, MD; Michael Grund, MD; Franz Leisch, MD; Kurt Huber, MD

Risk score for adverse events within 30 days CAS

- Age > 80 years,
- DM with HbA1c > 7%,
- Plaque Ulceration,
- Contralateral stenosis > 50%
Predictors of death and stroke after carotid angioplasty and stenting. A subgroup analysis of the Pro-CAS data

Wolfram Theiss, Peter Hermanek, Klaus Mathias, Hartmut Brückmann, Jürgen Dembski, Franz-Josef Hoffmann, Rüdiger Kerner, Franz Leisch, Harald Mudra, Karl-Ludwig Schulte, and Horst Sievert
Learning curve: Perugia experience

Stroke and death rate at 30 days, from 2000 to 2006 for CAS and CEA

As the experience increases (learning curve), the complications decrease....

Siena experience

Invited Commentary

SPACE and EVA 3S trials: the need of standards for Carotid Stenting

Carlo Setacci, MD; Alberto Cremonesi, MD.

EJVES 2007; 33: 47-8
“As difficult as it is to say, we must admit that both EVA 3S and SPACE didn’t match an acceptable level of physician training and credentialing. The consequences of this technical bias on the reported CAS results are left to the scientific community’s evaluation.”

Setacci C, Cremonesi A. SPACE and EVA 3S trials: the need of standards for Carotid Stenting. EJVES 2007; 33: 47-8
Carotid Artery Stenting: First Consensus Document of the ICCS-SPREAD Joint Committee

Alberto Cremonesi, MD; Carlo Setacci, MD; Angelo Bignamini, MD; Leonardo Bolognese, MD; Francesco Briganti, MD; Germano Di Sciascio, MD; Domenico Inzitari, MD; Gaetano Lanza, MD; Luciano Lupattelli, MD; Salvatore Mangiafico, MD; Carlo Pratesi, MD; Bernard Reimers, MD; Stefano Ricci, MD; Gianmarco de Donato, MD; Ugo Ugolotti, MD; Augusto Zaninelli, MD Gian Franco Gensini, MD

Stroke.2006; 37: 2400-2409
Recommendation 10: Grade GPP [C]
Once the basic skill for catheter-based intervention has been achieved by the already-active interventionist, the minimum recommended training to achieve competence is as follows:

1. At least 150 procedures of supra-aortic vessel engagement (during diagnostic as well as interventional procedures) within 2 years, of which at least 100 as the primary operator.
2. At least 75 carotid stenting procedures, of which at least 50 as the primary operator, within a 2-year fellowship.

Recommendation 11: Grade GPP [C]
The minimum requirement to maintain technical skill (competence) is the number of 50 carotid stenting procedures performed and documented by each primary operator per year.
Learning –curve: what I think

Do an embroidery at least 100 times to guarantee a good result
Why simulators are a good training model?
APTITUDE PREDICTS ENDOVASCULAR PERFORMANCE OF INEXPERIENCED INDIVIDUALS BEFORE AND AFTER VIRTUAL REALITY TRAINING

CONCLUSIONS
Simulator-based training in endovascular skills improved performance in naive individuals. A plateau in the learning process occurred but remained inferior to the performance of experienced interventionalists.
The Carotid Artery Stenting is a process of tailoring the endovascular procedure to a specific patient and a specific kind of carotid lesion.

We need to have a deep knowledge of patient clinical status, vascular anatomy, carotid plaque findings and technical features of the materials (guiding catheters and sheaths, wires, balloon, stents, etc.).

Only a correct learning curve could guarantee all those points.
Thank you for your attention