Early rehabilitation in patients with stroke
We are not very good at healing stroke:

1. Stroke is the most common cause of long-term disability in adults.
2. 40% of stroke patients are left with moderate functional impairment and 15% 30% with severe disability.
3. The prevalence of stroke-related burden is expected to increase over the next two decades.

Langhorne P et al., 2011; Barnes 2003;
Number of admitted patients with stroke to our clinic

Stroke unit: 50 beds + 10 ICU
• 26 % of patients with stroke receives IVT with average DTN time 36 min.
• LoH is 11.53 days
• Mortality 12 %
Patients with stroke benefit from stroke units:

1. from acute interventions and
2. from multidisciplinary management:
   - treatment optimization,
   - minimization of complications and
   - early neurorehabilitation.

Warlow C. et al, 2003
“REHABILITATION MEDICINE / NEUROREHABILITATION focuses on the restoration of function and the subsequent reintegration of the patient into the community.”

Fontera et al, 2010
The correlation between different levels of health after stroke IS NOT LINEAR!

Table 2  New classifications of the International Classification of Functioning and Disability: ICIDH II

| Impairment | The loss or abnormality of a body structure or of a physiological or psychological function |
| Activity | The nature and extent of functioning at the level of the person. Activities may be limited in nature, duration, and quality |
| Contextual factors (participation) | Include the features, aspects and attributes of objects, structures, human made organisations, service provision, and agencies in the physical, social, and attitudinal environment in which people live and conduct their lives. Contextual factors include both environmental factors and personal factors |

WHO 1998.

Langhorne P et al., 2011; Barnes 2003;
Neurorehabilitation unit at UMC Ljubljana for stroke unit:

- 6 Physio Th.
- 3 OT
- 3 Respiratory Th.
- 3 Speech Th.
- 2 Psychologists
- 1 Rehab. Med. Specialist

 Outsourced:
  1. Dietician
  2. Social worker
1. Does ischemia open a sensitive period of heightened responsiveness to training and mediate functional recovery from a stroke?

Yes, we believe so.

2. Do we or can we influence that?

Yes, we believe so:

- early start with fragmentation pharmacotherapy
- enriched experience

Zeiler SR et al., 2016, Krakauer J, 2017
“Proportional Recovery Model”:
\[ \Delta \text{FMA-UE}_{\text{predicted}} = 0.7 \cdot (66 - \text{FMA-UE}_{\text{initial}}) + 0.4 \]

Winters C. et al., 2016
We also care for:

1. Sleep,
2. Nutrition

Cramer, 2008
Our basics:

1. early start
2. goal setting meetings
3. specific, measurable, achievable rehabilitation goals for each relevant dysfunctions for the patient
4. at least 45 minutes of each relevant stroke rehabilitation therapy for a minimum of 5 days a week
5. “task-specific” therapy
6. »context-specific« therapy
7. cognitive rehabilitation, emotional support
8. early supported discharge support

NICE, 2013; AHA, 2016
Can the patient produce any voluntary muscle activity in the affected upper limb?

Yes

Box 1
Assess, treat hand edema
- Passive ROM
- ES
Compensatory techniques
Education
Supportive devices
Continuous PROM
Spasticity Mx
Mirror therapy
Shoulder Mx (Box 9)

Not yet

Reassess weekly

>12w

Box 2
Motor imagery
Education
Supportive devices
ES for edema, recovery
AA/PROM for hand edema
Mirror therapy
Sensory retraining
Continuous PROM
Spasticity Mx
Robot assisted therapy
Shoulder Mx (Box 9)

Not yet

Reassess weekly

>12w

At 12 weeks review goals and determine if a new approach is required

Can the patient produce any voluntary muscle activity in the affected upper limb?

Yes

In a seated position, can the patient produce any shoulder abduction against gravity?

Yes

With the forearm prone on a table and the hand and fingers unsupported, can the patient initiate finger (and/or thumb) extension three times within a minute?

Yes

Box 3
Motor imagery
Strength training
Task-specific training
ES, EMG-triggered ES
Mirror therapy
Sensory retraining
Bilateral arm training
Robot assisted therapy
Video gaming

Not yet

Reassess weekly

>12w

Box 4
Strength training
Task specific training
Mod-CIMT or CIMT
Motor imagery
Sensory retraining
Video gaming

Not yet

Progression weekly

>12w

Box 9 (applicable to all)
Education
Gentle mobilization
ES for subluxation
Analgesia
Team prevention
Avoid strapping
Botulinum toxin for spasticity

During late phase goal achievement and progress must be reviewed regularly to determine if progress is still being made; if not convert to independent program

Plus:
1. music therapy
2. tDCS
3. rTMS
4. ES for dysphagia
5. cognitive rehabilitation

Wolf et al., 2016
The difficulties we face:
1. general position of rehabilitation medicine
2. specific position of neurorehabilitation (for example vs. palliative medicine)
3. traditional roles of neurologists and nurses
4. changes of the management of the clinic

We hope for:
1. quick change from “pay-for-service” to “pay-for-performance” systems
Thank you!