



Early mobility training after intracerebral haemorrhage (ICH)

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early mobility training

Potential to reduce immobility related complications

- **Venous thromboembolism**

- Clinically evident 2-7% (most within the first 7 days)
- Ultrasound prevalence of DVT 20-40%
- DVT risk up to 4 times greater in ICH than IS

‣ Impact of more severe stroke and hesitancy for pharmaceutical prophylaxis

- **Post stroke delirium** prevalence approximately 25%

- **UTI** after ICH 15-26%

- Manage or prevent **pneumonia** 18%

- Cai et al (2021) Mendel et al (2023) Mu et al (2020), Ahmed et al (2010), Fujita et al (2023,) Marini et al (2019)

[Intervention Review]

Very early versus delayed mobilisation after stroke

Peter Langhorne¹, Janice M Collier², Patricia J Bate³, Matthew NT Thuy⁴, Julie Bernhardt⁵

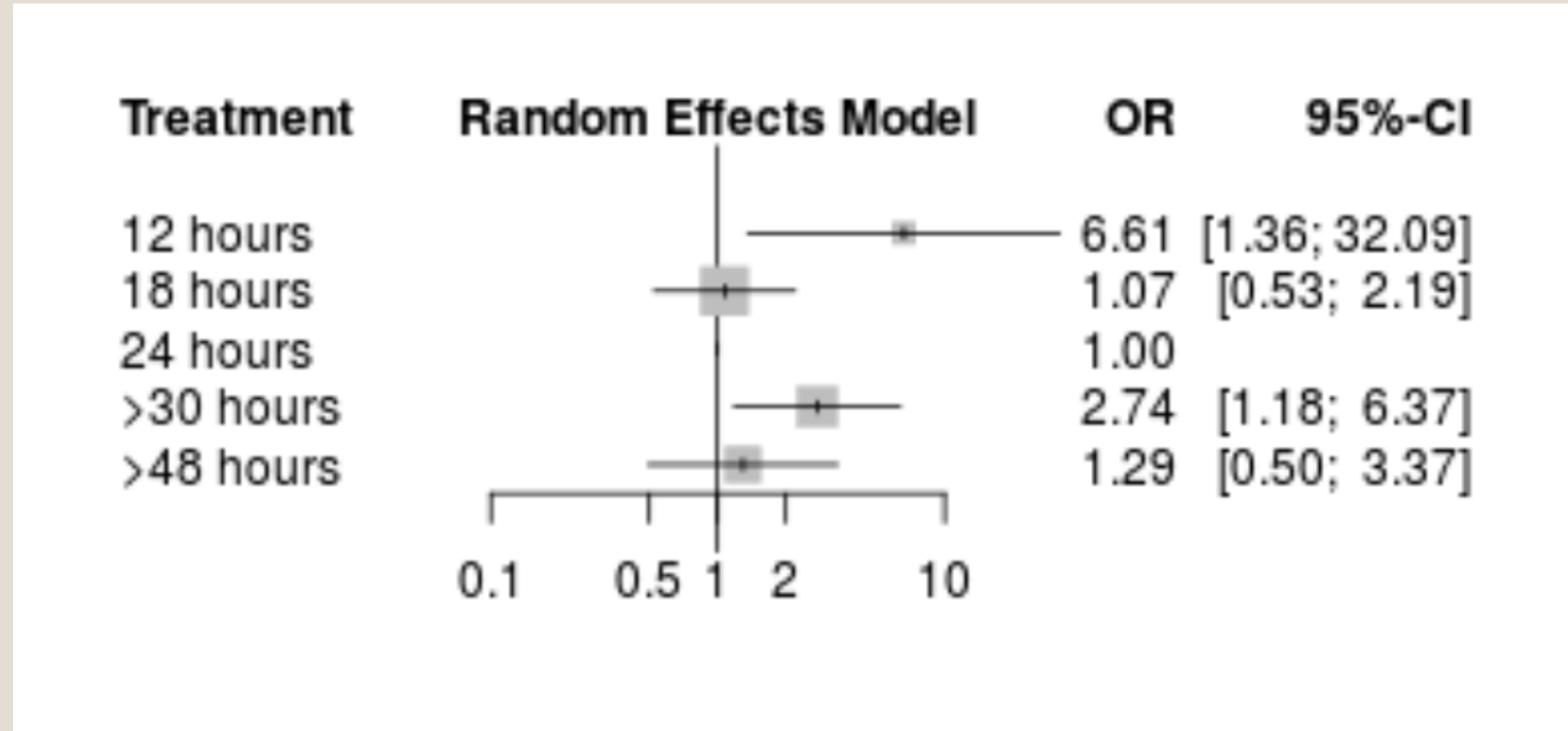
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why?

May ↓ length
of stay
without
additional
harm

**Concern with mobility
training started within
the first 24 hours may
increase risk of poorer
outcome at least for
some patients**

Network meta-analysis plot for poor outcome all stroke (death or dependency at 90 days)



Odds ratio for odds of poor outcome for time to first mobilisation of 24 hours as the reference (R =1.0)

n= 2958, 9 studies, Median proportion ICH 12%

Cochrane review Langhorne et al (2018)



Efficacy and safety of very early mobilisation within 24 h of stroke onset (AVERT): a randomised controlled trial



The AVERT Trial Collaboration group*

Summary

Lancet 2015; 386: 46-55

Published Online

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[S0140-6736\(15\)60690-0](http://dx.doi.org/10.1016/S0140-6736(15)60690-0)

This online publication has

Background Early mobilisation after stroke is thought to contribute to the effects of stroke-unit care; however, the intervention is poorly defined and not underpinned by strong evidence. We aimed to compare the effectiveness of frequent, higher dose, very early mobilisation with usual care after stroke.

Methods We did this parallel-group, single-blind, randomised controlled trial at 56 acute stroke units in five countries. **Patients** (aged >18 years) with ischaemic or haemorrhagic stroke, first or recurrent, who met physiological criteria

BUT

Too much & too early

↓ odds of favourable outcome

&

ICH may be more vulnerable

BUT... is time to first mobilisation the most important factor in early mobility training?

AVERT III, n = 2104 RCT Early Mobility Trial

	Very early mobilisation (n=1054)	Usual care (n=1050)	p value	Median shift (95% CI)
Time to first mobilisation (h)	<u>18.5</u> (12.8–22.3; n=1042*)	<u>22.4</u> (16.5–29.3; n=1036*)	<0.0001	4.8 (4.1–5.7)
Frequency per person†	<u>6.5</u> (4.0–9.5)	<u>3</u> (2.0–4.5)	<0.0001	3 (3–3.5)
Daily amount per person (min)‡	<u>31</u> (16.5–50.5)	<u>10</u> (0–18)	<0.0001	21.0 (20–22.5)
Total amount per person (min)§	<u>201.5</u> (108–340)	<u>70</u> (32–130)	<0.0001	117 (107–128)

Primary outcome which was ‘favourable outcome at 3 months’ determined by mRS of 0-2 at 3 months:

Overall result (ICH and ischaemic stroke) found **more favourable outcomes in the usual care** vs Early Mobility Training (480 vs 5252, OR 0.73 95%CI (0.59 to 0.90), p = 0.004).

Prespecified **subgroup analyses (not powered)** more favourable outcome for the usual care **estimated a stronger effect in patients intracerebral haemorrhage**, estimated with lower precision (OR 0.48 (0.25 to 0.92)).

AVERT III, **Dose response analysis**

(irrespective of treatment group)

Median time first mobilisation was 20.2hrs

75% participant mobility training within 24hrs.

Improved odds mRS 0-2 with:

- **Increased frequency** of out-of-bed sessions (time to 1st mobilisation constant)
- **Less time to first mobilisation**

Reduced odds of death:

Increased frequency of out-of-bed sessions

Reduced odds mRS 0-2 with:

- **More minutes per/day mobilising**

AVERT III, n = 2104 RCT Early Mobility Trial

Costs we comparable between usual care and early and intensive mobilisation

Open access

Research

BMJ Open Economic evaluation of a phase III international randomised controlled trial of very early mobilisation after stroke (AVERT)

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Prespecified dose-response analysis for A Very Early Rehabilitation Trial (AVERT)

OPEN ▲

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ABSTRACT

Objective: Our prespecified dose-response analyses of A Very Early Rehabilitation Trial (AVERT) aim to provide practical guidance for clinicians on the timing, frequency, and amount of mobilization following acute stroke.

Methods: Eligible patients were aged ≥ 18 years, had confirmed first (or recurrent) stroke, and were admitted to a stroke unit within 24 hours of stroke onset. Patients were randomized to receive very early and frequent mobilization, commencing within 24 hours, or usual care. We used regression analyses and Classification and Regression Trees (CART) to investigate the effect of timing and dose of mobilization on efficacy and safety outcomes, irrespective of assigned treatment group.

Results: A total of 2,104 patients were enrolled, of whom 2,083 (99.0%) were followed up at 3 months. We found a consistent pattern of improved odds of favorable outcome in efficacy and safety outcomes with increased daily frequency of out-of-bed sessions (odds ratio [OR] 1.13, 95% confidence interval [CI] 1.09 to 1.18, $p < 0.001$), keeping time to first mobilization and mobilization amount constant. Increased amount (minutes per day) of mobilization reduced the odds of a good outcome (OR 0.94, 95% CI 0.91 to 0.97, $p < 0.001$). Session frequency was the most important variable in the CART analysis, after

why?

exploratory
analysis

the **right**
timing &
amount →

optimise
long-term
function

AVERT III: Fatal and non-fatal adverse events at 2 weeks

EMT significantly greater odds of death by 14 days (aOR 1.76 95% CI 1.06 to 2.92), $p = 0.029$.

Absolute difference in deaths by day 14 was 16 more in the EMT group, and this difference remained at 3 months

Suggesting that when EMT-related death occurs, it occurs within the first 14 days after onset

Table 1 Characteristics of Participants Who Were Alive or Dead at 14 Days, With People Who Died Shown According to Group (continued)

	Died (n = 80) ^a			Alive (n = 2,018) ^a
	All (n = 80)	VEM (n = 48)	UC (n = 32)	
Intracerebral hemorrhage	15 (19)	<u>12 (25)</u>	<u>3 (9)</u>	242 (12)
rtPA treated	23 (29)	13 (27)	10 (31)	482 (24)
Time to randomization, h	16.5 (12.8–21.9)	18.1 (11.7–21.9)	16.4 (13.4–22.9)	18.2 (12.2–21.8)
Time to first mobilization,^c h	20.0 (13.4–23.8)	16.3 (12.0–23.1)	24.8 (16.7,26.6)	20.2 (14.7–23.8)
Time to first mobilization,^c category, h				
<12	11 (14)	9 (19)	2 (6)	364 (18)
12–24	35 (44)	26 (54)	9 (28)	1,173 (58)
>24	15 (19)	4 (8)	11 (34)	475 (24)
Never mobilized	19 (24)	9 (19)	10 (31)	6 (0.4)

AVERT III: Fatal and non-fatal adverse events at 2 weeks

A **greater odds of death BUT not significant for:**

- **ICH** with aOR 4.17, 95%CI (1.06 to 16.43), 12 deaths in EMT and 3 in the UC.
- **>80yrs** with aOR 2.38, 95%CI (1.12 to 5.08)

Most common cause of death was **stroke progression or recurrence**

Lack of specific guidance for ICH for early mobility training despite difference in pathophysiology and potential risk

Current guidance does not delineate between recommendations for early mobility between **ischaemic and haemorrhagic stroke**.

- Australia and New Zealand Stroke Guidelines

- NICE Recommendations

Lack of specific guidance for ICH for early mobility training despite difference in pathophysiology and potential risk

ICH specific guidelines to not specifically address early mobility training or based on IS and ICH data:

- Chinese Stroke Association Guidelines update for ICH (Cao et al 2019): Under recommendations for *Screening and prevention of deep vein thrombosis (DVT)*: Patients should be **mobilised as early as possible**.
- American Heart Association ICH guidelines (Greenberg et al 2022): Starting rehabilitation after 24 to 48 hours after stroke onset seems beneficial; however, intense and frequent mobilization within the first 24 hours is not recommended – informed by AVERT

Australian Stroke Registry: Not meeting 'achievable benchmark'

Mobilisation same day or the day after arrival at hospital

Achievable benchmark **82%**

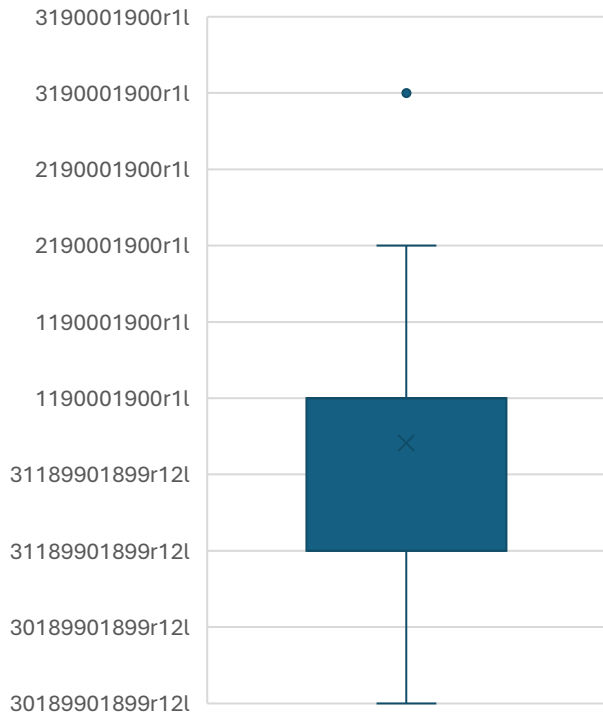
Ischaemic stroke 71% (90% anytime during admission)

Intracerebral haemorrhage 42% (69% anytime during admission)

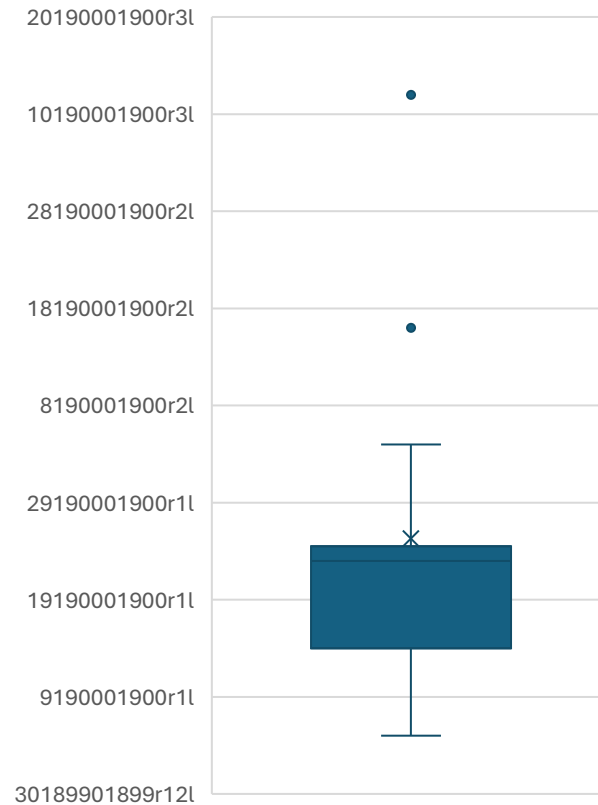
International survey

Heterogeneity of early mobility after ICH, n=89

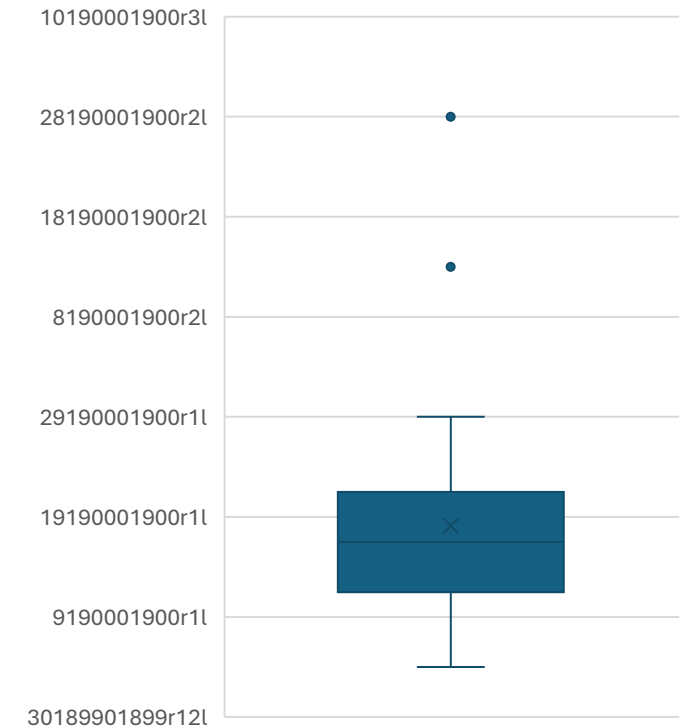
Frequency, per day of sessions in early mobility training (1st 3 days)



Time(hr) to first mobility training



Duration (min) of first early mobility session



Clinicians
want further
guidance

ORIGINAL RESEARCH article

Front. Neurol., 05 February 2021

Sec. Stroke

Volume 12 - 2021 | <https://doi.org/10.3389/fneur.2021.606525>

Early Mobilization After Stroke: Do Clinical Practice Guidelines Support Clinicians' Decision-Making?



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PEMTeam

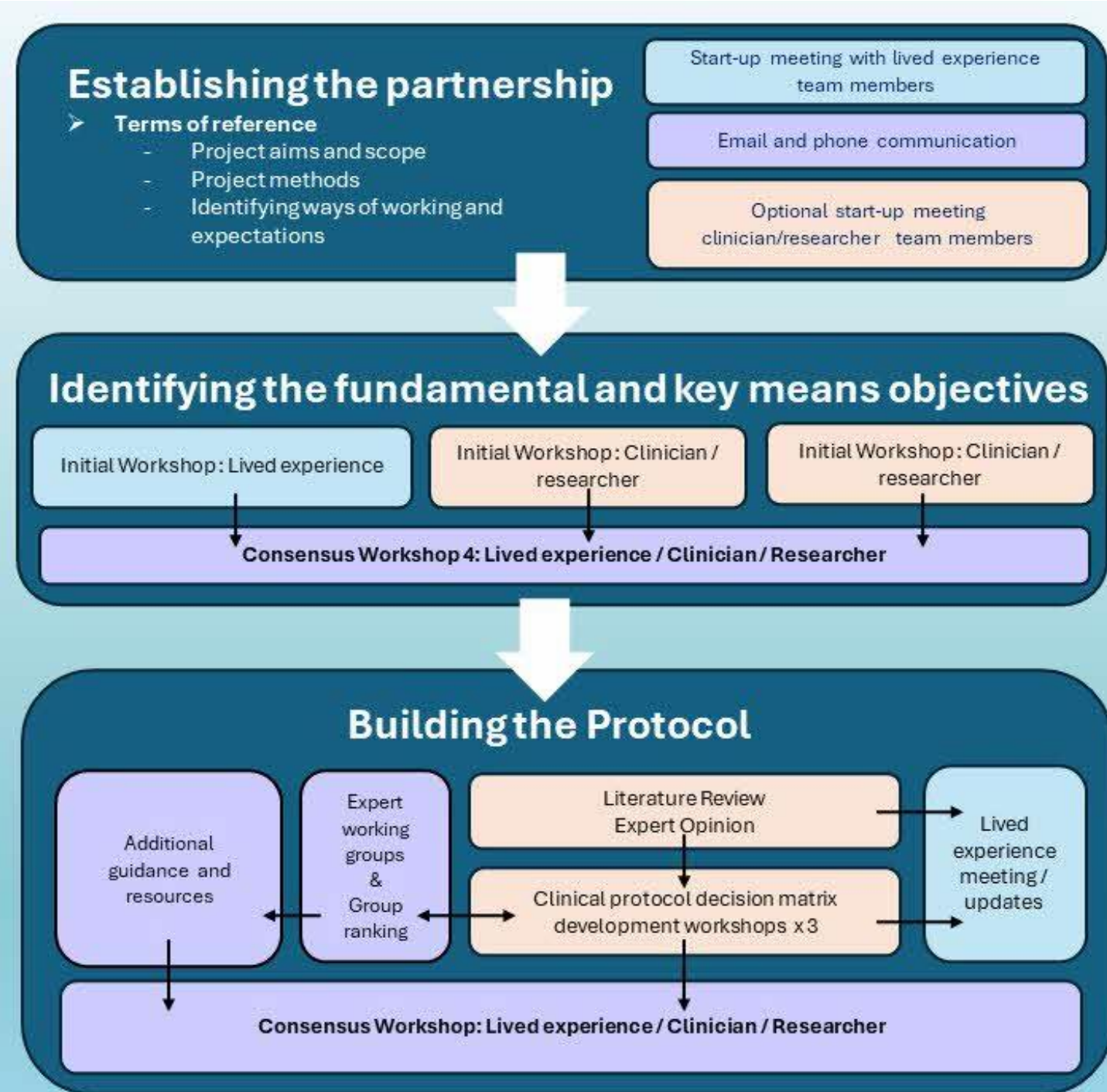
Protocols for Early Mobility Training
Team: 26 Experts 9 Countries



Codesign

+

Value Focused Thinking



So....

For optimal early mobility after intracerebral haemorrhage it is fundamentally important to:



Maximise recovery for all stroke survivors



Maximise participation of patients, family, carers



Maximise ability to deliver appropriate care

Maximise:
ability to deliver
appropriate
care

PROTOCOL IMPLEMENTATION CHECKLIST

Hospitals applying this protocol should ensure processes are in place to achieve the outcomes included in the checklist below to optimize early mobility training after intracerebral haemorrhage. However, the strategies used to achieve this will vary between settings.

Optimising stroke survivor engagement, including:

- Support to optimize engagement in early mobility training.

Maximise:
participation of
patients, family,
carers;
ability to deliver
appropriate
care

Recovering movement following your stroke

After a stroke completing your **usual activities** can become more **challenging**

Practicing activities can **help** your **recovery**.

Practicing activities in upright positions early after your stroke

Upright activities include sitting and reaching, activities in standing and walking



When and **how much** practice is important for:



Recovery



Preventing negative effects of prolonged bed rest

Considers

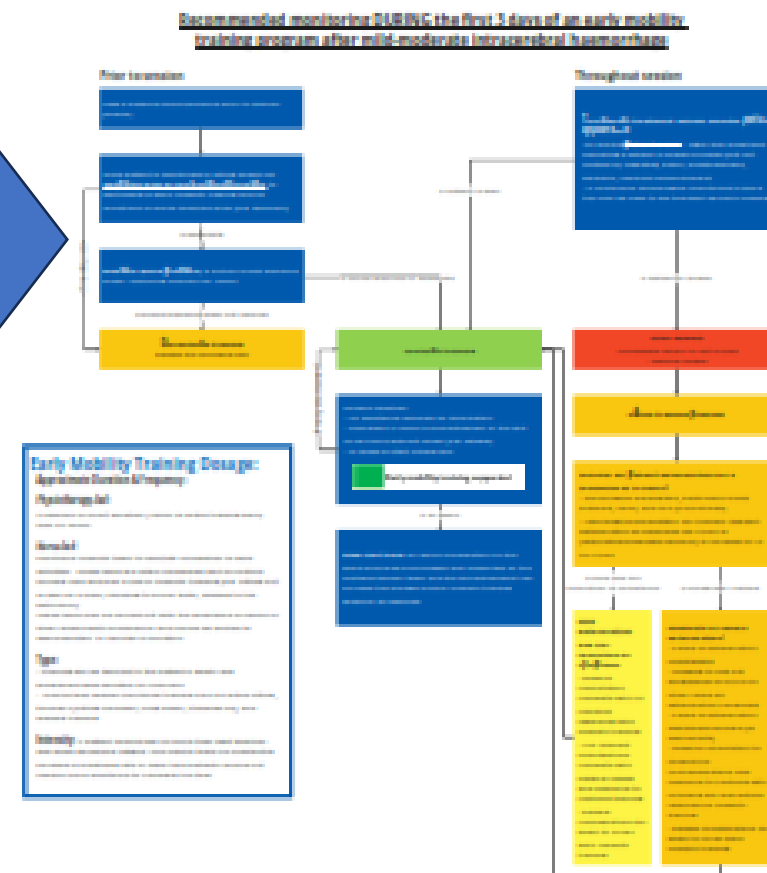
- ICH severity
- Palliative status
- Deterioration
- Blood pressure
- Oxygen saturation
- Intracranial pressure monitoring
- Agitation
- Acute interventions
- Seizures
- Plans for surgical intervention
- Time post-event
- Response to upright positioning
- Wellness
- Response to prior training



Mild-moderate intracerebral hemorrhage

	0-10 mm	11-20 mm	21-30 mm	>30 mm	Large
Any perihematomal edema?	No	Yes	Yes	Yes	Yes
Any midline shift?	No	Yes	Yes	Yes	Yes
Any significant mass effect?	No	Yes	Yes	Yes	Yes
Any significant ventricular compression?	No	Yes	Yes	Yes	Yes
Any significant sulcal effacement?	No	Yes	Yes	Yes	Yes
Any significant cisternal compression?	No	Yes	Yes	Yes	Yes
Any significant brainstem compression?	No	Yes	Yes	Yes	Yes
Any significant herniation?	No	Yes	Yes	Yes	Yes
Any significant intracranial pressure?	No	Yes	Yes	Yes	Yes
Any significant Glasgow Coma Scale?	No	Yes	Yes	Yes	Yes
Any significant pupillary changes?	No	Yes	Yes	Yes	Yes
Any significant vital signs?	No	Yes	Yes	Yes	Yes
Any significant laboratory values?	No	Yes	Yes	Yes	Yes
Any significant imaging findings?	No	Yes	Yes	Yes	Yes

Legend:
Green: Stable
Yellow: Mildly unstable
Orange: Moderately unstable
Red: Severely unstable
Purple: Unstable



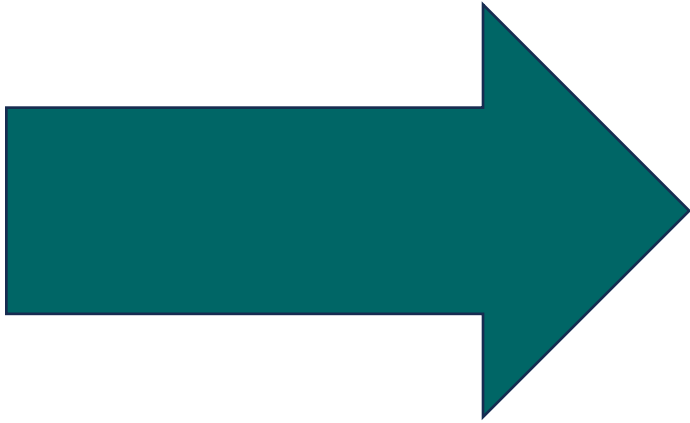
Evaluation

5 Independent Experts + 12 PEMTeam members

Potential to improve outcomes after ICH

Evaluation of key aspects of the protocol through clinical trial

Simplify and test key elements in clinical trial



Summary

Guidelines recommend mobility within 48 hours of stroke

Early mobility training has potential to improve outcomes and reduce complications of prolonged bed rest without increased costs

But first we must demonstrate:

- If a structured approach to early mobility after ICH improves outcome

HOW MUCH may be just as important as WHEN in early mobility training after ICH