Viswanath Aluru, M.D.

Ochsner Clinic Foundation

Stroke Rehabilitation: Are we doing enough?

Ochsner Health

Personal note and Disclosures

- Disclosures: None
- Endorsements: None
- Financial incentives: None
- Please note that my presentation is based on my personal experience treating patients. I don't have research data to share with you. However, I would like to share my thoughts on this topic and refer to some relevant research.
- My literature search and references are not exhaustive. It is based on the resources that are at my disposal within my time constrains that I feel are relevant to this presentation.
- I am personally not endorsing any studies, authors , entities or publishing agencies.
- All the published research presented here is only for educational/research purposes only. I have not received any incentives. No harm of any kind intended.

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What is stroke rehabilitation ?

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Combined and coordinated use of medical, social, educational and vocational measures for retraining a person to the highest possible level of functional ability

*World Health Organization: WHO Expert Committee on Medical Rehabilitation. WHO Tech Rep Ser No. 419, 1969, pp 1-23

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Goals of Stroke rehabilitation

Restore lost function

Prevent or minimize complications

Maximize cognition and communication

Improve quality of life

Improve community participation

Improve motivation

Provide environmental stimulation

*Peszczynski M, Benson F, Collins J, et al: II. Stroke Rehabilitation. Stroke 3: 375-407, 1972

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Takeaway

Interdisciplinary team approach

Realistic goals

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Why stroke rehabilitation ?

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Research

795, 000 suffer from stroke

130, 000 die from a new or recurrent stroke

10 million new strokes every year worldwide

6.5 million deaths each year worldwide

Second leading cause of death worldwide, 5th in the US

*Mozzafarian D, Benjamin EJ, Go AS, et al. Heart disease and stroke statistics-2016 updte: A report from the American heart association. Circulation. 2016;133.

*Fiegin VL, Norrving B, Mensah GA. Global burden of stroke. Circulation Res. 2017;120(3);439-448.

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85% have persistent arm and hand deficits after stroke

Up to 40 % experience spasticity post-stroke

Up to 30 % experience post stroke depression

15 % have long standing swallow disorders

50-60 % experience pain syndromes in 1st year after stroke

as well as..

Gait/LE impairment, cognition, aphasia, incontinence

Visual, perception, balance, coordination

Estimated yearly cost of stroke care in the US is about $33 billion

*Mozzafarian D, Benjamin EJ, Go AS, et al. Heart disease and stroke statistics-2016 updte: A report from the American heart association. Circulation. 2016;133.

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Takeaways

Rehabilitation is vital for maximizing recovery

Teach alternate strategies to compensate for lost function

Patient and family education

Decrease economic burden

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How early ?

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Animal studies by Biernaskie et al

Rehabilitation post-stroke at 5, 14, 30 days in rats: day 5>day 14>day 30 post-stroke recovery

Maulden et al (PSROP project)

Irrespective of severity , early admission to IPR was significantly associated with improvement in FIM

Paolucci et al, Salter et al

Functional outcomes were significantly higher with rehab beginning less 20 days compared to 21-40 days after stroke

Bernhardt et al

Very early mobilization within 24 hrs and until 14 days did not increase mortality and resulted in improved modified Rankin scores.

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Days from onset to IPR admission, IPR LOS

Stroke type	Age	Gender	Days between onset to admit	Length of stay
LH Stroke	71	F	2	14
LH Stroke	53	M	3	21
LH Stroke	66	F	3	22
LH Stroke	78	M	3	21
LH Stroke	70	F	3	23
LH Stroke	66	M	4	9
LH Stroke	62	F	4	25
LH Stroke	84	F	4	13
LH Stroke	59	M	6	14
LH Stroke	82	M	6	20
LH Stroke	58	M	7	21
LH Stroke	70	F	7	23
LH Stroke	71	F	7	21
LH Stroke	70	M	8	13
LH Stroke	62	F	16	22

Stroke type	Age	Gender	Days between onset to admit	Length of stay
RH Stroke	83	M	0	9
RH Stroke	77	F	4	13
RH Stroke	67	M	5	6
RH Stroke	74	F	6	22
RH Stroke	64	M	6	8
RH Stroke	71	M	6	6
RH Stroke	45	M	7	9
RH Stroke	62	F	7	15
RH Stroke	54	M	7	28
RH Stroke	59	M	7	20
RH Stroke	68	M	9	12
RH Stroke	61	M	10	13
RH Stroke	75	F	12	21
RH Stroke	63	F	18	19
RH Stroke	54	M	41	20

Days from onset to IPR admission, IPR LOS

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RH Stroke	75	F	12	21
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RH Stroke	54	M	41	20

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Takeaways

Early the better

Need to assess medical stability

Neurological stability

Accurate way to know when to transition patient

Need to eliminate process delays

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Who qualify ?

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Prediction models with poor prediction rate, accuracy, reliability of variables

Overestimation or under estimation of severity and tolerance to therapy

*Prescott RJ et al. Predicting functional outcome following acute stroke using a standard clinical examination. Stroke 1982; 13(5); 641-647

*Counsell C et al. Systemic review of prognostic models in patients with acute stroke. Cerebrovascular Dis. 2001;12(3):159-170

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Based on stroke severity and impairment at least 3 scenarios exist for mild , moderate, severe sub types:

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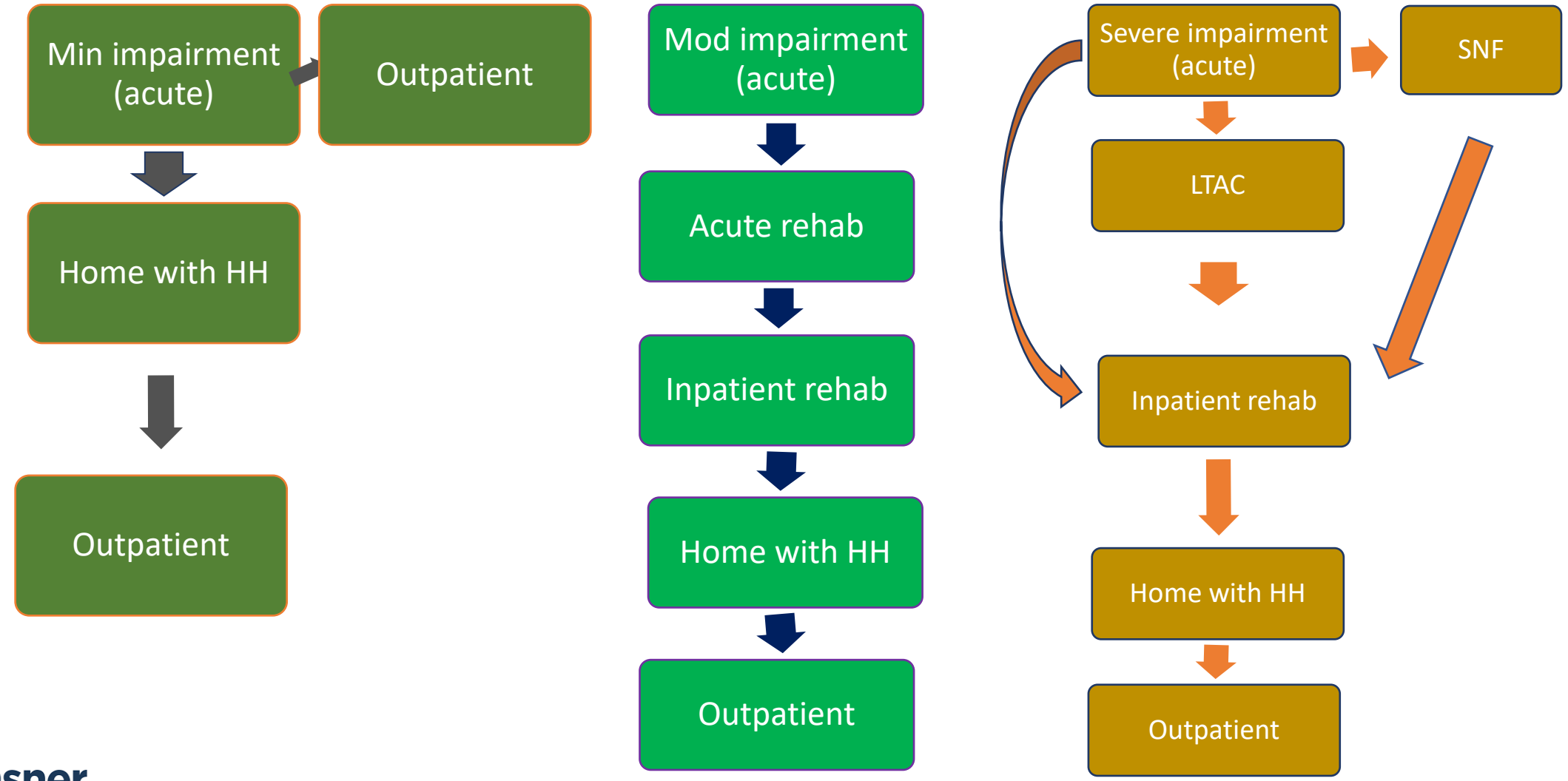

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Takeaways

Baseline assessments/Rehab MD eval on acute side

Assessment of impairment and functional status upon rehab admission

Setting accurate, reliable and achievable goals based on impairments and functional level at the time of admission

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For how long ?

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Depends on how patient is progressing in rehab

Patient involvement, motivation, carryover of information

Therapist experience

Rehab technology

Insurance limitations

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Right brain Vs. Left brain involvement

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Right brain with LH stroke

Stroke type	Age	Gender	Days between onset to admit	Length of stay
LH Stroke	71	F	2	14
LH Stroke	53	M	3	21
LH Stroke	66	F	3	22
LH Stroke	78	M	3	21
LH Stroke	70	F	3	23
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LH Stroke	62	F	4	25
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LH Stroke	58	M	7	21
LH Stroke	70	F	7	23
LH Stroke	71	F	7	21
LH Stroke	70	M	8	13
LH Stroke	62	F	16	22

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Left brain with RH stroke

Stroke type	Age	Gender	Days between onset to admit	Length of stay
RH Stroke	83	M	0	9
RH Stroke	77	F	4	13
RH Stroke	67	M	5	6
RH Stroke	74	F	6	22
RH Stroke	64	M	6	8
RH Stroke	71	M	6	6
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RH Stroke	68	M	9	12
RH Stroke	61	M	10	13
RH Stroke	75	F	12	21
RH Stroke	63	F	18	19
RH Stroke	54	M	41	20

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Takeaway

Might need to amend goals based on performance

Involvement of family during therapy sessions

Combining therapist expertise (co-treatment)

Appropriate use of rehab technology

Appropriate pharmacological interventions

Insurance appeals, peer to peer to maximize days

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Question

What goes into inpatient rehab ?

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Process

Intervention (therapy)

People

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Process

Initial evaluation upon admission
Setting goals/rehab plan of care
Multidisciplinary rehab care
Multidisciplinary team conference
Family involvement/care partner meeting
Medical management (avoiding or treating any complications)
Neurological (avoiding recurrent stroke/acute care transfer)
Patient and family education
Appropriate discharge planning

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Intervention

Initial therapy evaluation upon admission

Setting goals/rehab plan of care

Multidisciplinary rehab care

Type of therapy

Frequency

Intensity

Duration (therapeutic vs. non-therapeutic time)

One on one and group therapy

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People

Rehab physician oversight

Expertise of therapy staff

Rehab nursing

Wound care/management

Dietary/Nutrition

Expertise of administration

Case management/social work

Family support/home environment

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Takeaway

Appropriate use of time

Maximizing rehab therapy time

Coordinated effort

Efficient discharge planning

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Why some recover and some don’t ?

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- Flaccid paralysis
- Emergence of spasticity
- Increased spasticity, voluntary synergy movements
- Decrease in spasticity, emergence of isolated movements
- Increase in muscle strength, coordination, increased control of isolated movements
- Return of near normal muscle tone and motor control

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Functional recovery

Neurological recovery

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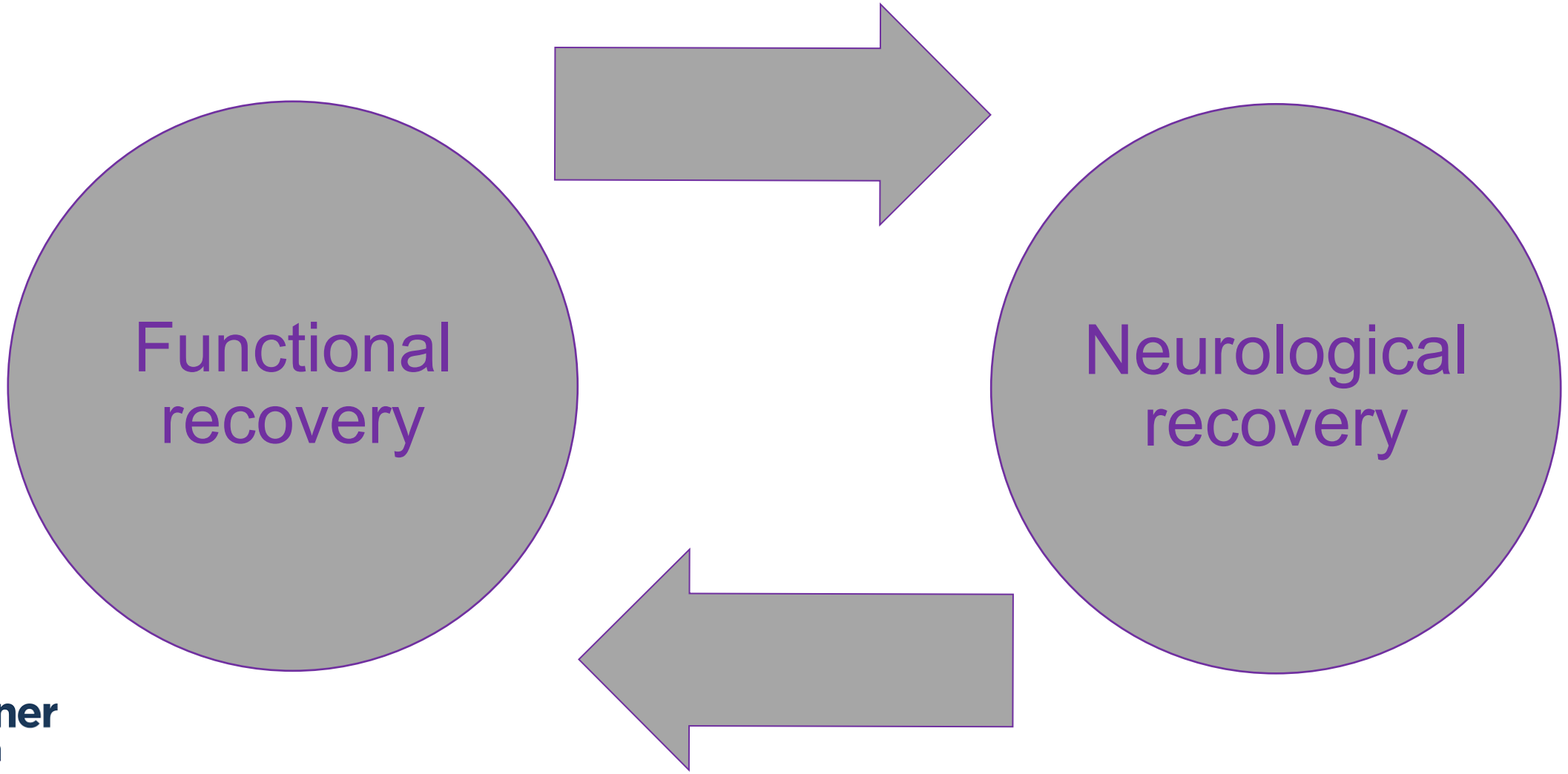
Functional Vs. Neurological recovery



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Factors influencing functional recovery

Neurological recovery

Patient's involvement

Level of motivation

Actual rehab intervention

Therapist expertise

Family involvement and support

Home environment/availability of resources

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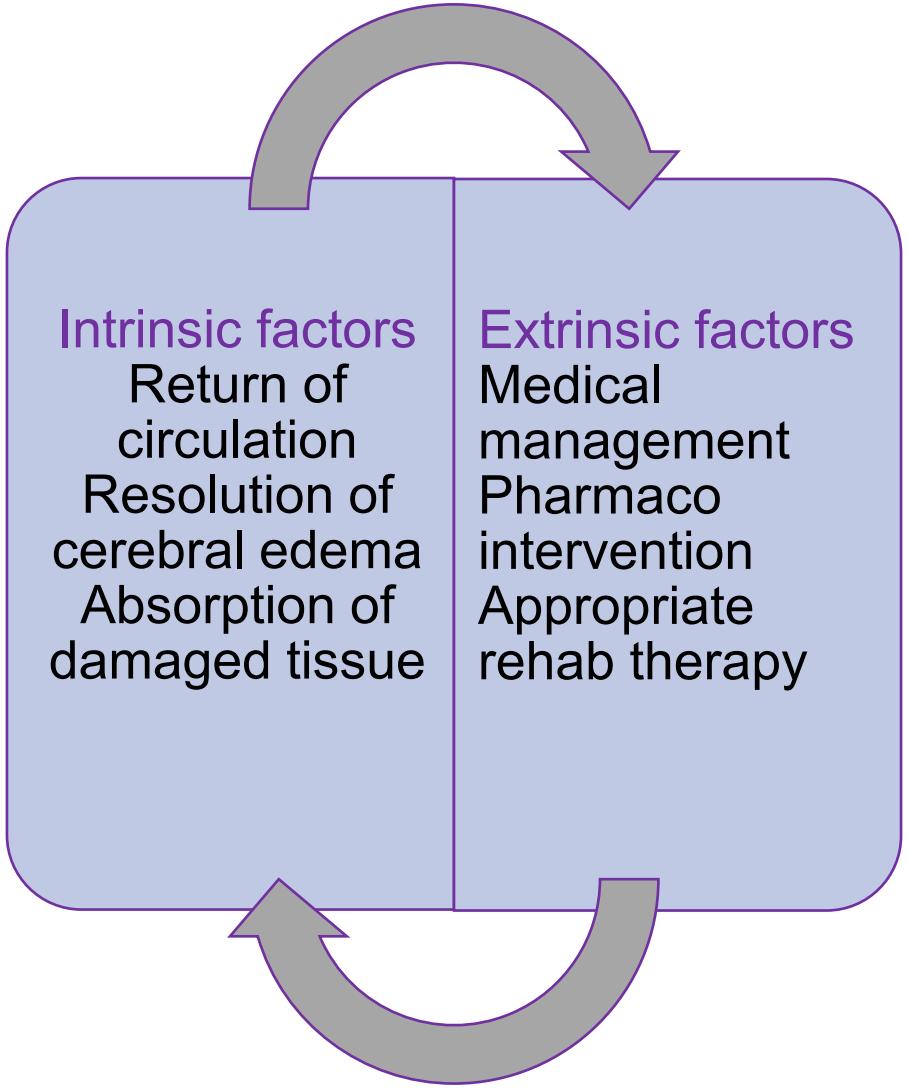
Factors influencing neurological recovery



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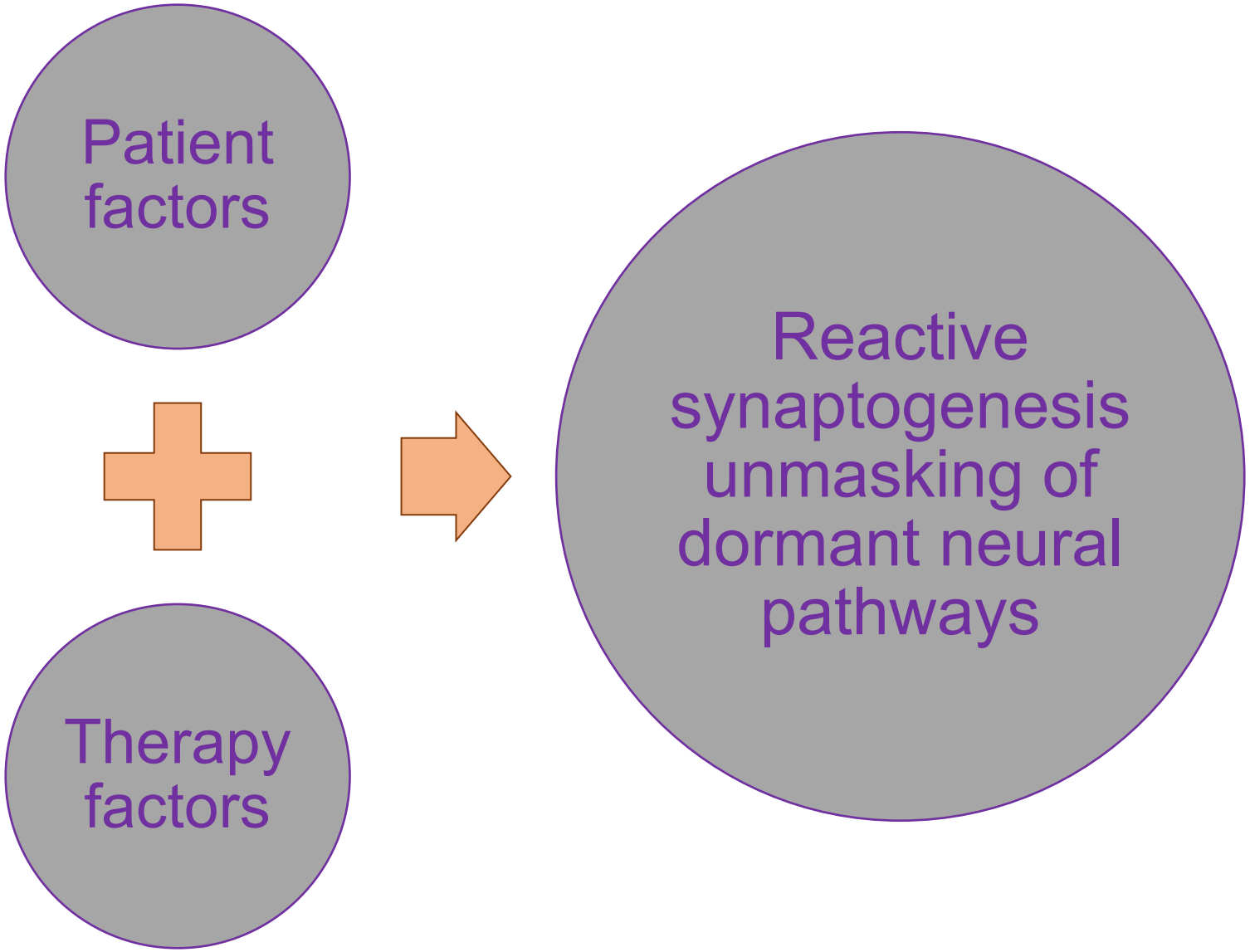

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Art is where life is..

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Functional recovery – Transfers

Stroke type	Age	Gender	Onset to admit	LOS	BedToChairADM	BedToChairDIS	ToiletADM	ToiletDIS	CarADM	CarDIS
LH Stroke	71	F	2	14	3	4	4	4	3	4
LH Stroke	53	M	3	21	1	4	1	3	88	3
LH Stroke	66	F	3	22	1	4	3	4	88	4
LH Stroke	78	M	3	21	1	4	1	4	88	4
LH Stroke	70	F	3	23	2	4	2	4	88	3
LH Stroke	66	M	4	9	3	6	3	6	4	6
LH Stroke	62	F	4	25	1	4	1	4	88	4
LH Stroke	84	F	4	13	3	4	3	4	3	3
LH Stroke	59	M	6	14	1	4	3	4	10	4
LH Stroke	82	M	6	20	1	3	1	3	88	3
LH Stroke	58	M	7	21	1	4	3	4	88	4
LH Stroke	70	F	7	23	1	3	1	3	88	3
LH Stroke	71	F	7	21	1	3	1	3	88	3
LH Stroke	70	M	8	13	1	4	3	4	3	3
LH Stroke	62	F	16	22	1	3	88	3	88	1

6 Independent; 5 set up; 4 supervision or min A; 3 Mod A; 2 Max A; 1 Dependent; 7 Patient refused; 9 Not applicable; 10 Not attempted due to environment limitation; 88 Not attempted due to medical condition

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Functional recovery – Transfers

Stroke type	Age	Gender	Onset to admit	LOS	BedToChairADM	BedToChairDIS	ToiletADM	ToiletDIS	ADM	TransferCarDIS
RH Stroke	83	M	0	9	3	4	3	4	3	4
RH Stroke	77	F	4	13	3	4	3	4	4	4
RH Stroke	67	M	5	6	3	6	3	6	3	6
RH Stroke	74	F	6	22	1	4	1	4	88	4
RH Stroke	64	M	6	8	4	6	4	6	4	4
RH Stroke	71	M	6	6	4	6	4	6	4	6
RH Stroke	45	M	7	9	1		88		88	
RH Stroke	62	F	7	15	1	3	1	3	88	2
RH Stroke	54	M	7	28	3	4	4	4	4	4
RH Stroke	59	M	7	20	2	3	2	1	88	1
RH Stroke	68	M	9	12	2	4	2	4	3	4
RH Stroke	61	M	10	13	3	6	3	6	3	4
RH Stroke	75	F	12	21	3	4	3	4	1	3
RH Stroke	63	F	18	19	1		1		88	
RH Stroke	54	M	41	20	2	3	2	3	1	4

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Functional recovery – ADLs (dressing)

Stroke type	Age	Gender	Onset to admit	LOS	DressUpperBodyADM	DressUpperBodyDIS	DressLowerBodyADM	DressLowerBodyDIS
LH Stroke	71	F	2	14	3	6	2	4
LH Stroke	53	M	3	21	2	4	1	3
LH Stroke	66	F	3	22	2	6	2	4
LH Stroke	78	M	3	21	3	5	1	4
LH Stroke	70	F	3	23	3	3	2	4
LH Stroke	66	M	4	9	5	6	3	6
LH Stroke	62	F	4	25	1	4	1	4
LH Stroke	84	F	4	13	3	4	3	4
LH Stroke	59	M	6	14	4	6	2	5
LH Stroke	82	M	6	20	2	4	1	4
LH Stroke	58	M	7	21	1	6	2	4
LH Stroke	70	F	7	23	3	4	1	4
LH Stroke	71	F	7	21	2	3	1	3
LH Stroke	70	M	8	13	3	5	2	3
LH Stroke	62	F	16	22	1	3	1	3

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Functional recovery – ADLs (dressing)

Stroke type	Age	Gender	Onset to admit	LOS	DressUpperBodyADM	DressUpperBodyDIS	DressLowerBodyADM	DressLowerBodyDIS
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RH Stroke	77	F	4	13	3	5	3	4
RH Stroke	67	M	5	6	4	6	3	6
RH Stroke	74	F	6	22	3	6	1	4
RH Stroke	64	M	6	8	3	6	3	6
RH Stroke	71	M	6	6	4	6	4	6
RH Stroke	45	M	7	9	2		1	
RH Stroke	62	F	7	15	1	3	1	2
RH Stroke	54	M	7	28	3	6	3	4
RH Stroke	59	M	7	20	4	5	3	1
RH Stroke	68	M	9	12	5	6	3	4
RH Stroke	61	M	10	13	4	6	3	6
RH Stroke	75	F	12	21	4	5	2	4
RH Stroke	63	F	18	19	2		1	
RH Stroke	54	M	41	20	2	3	1	3

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Functional recovery – walking

Stroke type	Age	Gender	Days between onset and admit	Length of stay	Walk10FeetADM	Walk10FeetDIS	Walk50FeetADM	Walk50FeetDIS	Walk150FeetADM	Walk150FeetDIS	Walk10FeetUnevenADM	Walk10FeetUnevenDIS
LH Stroke	71	F	2	14	3	4	3	4	3	4	3	4
LH Stroke	53	M	3	21	0	3	0	3		0		3
LH Stroke	66	F	3	22	1	4	0	4	0	4	0	4
LH Stroke	78	M	3	21	1	4	1	4	1	4	1	4
LH Stroke	70	F	3	23	0	3	0	3		1		1
LH Stroke	66	M	4	9	4	6	4	6	4	6	4	6
LH Stroke	62	F	4	25	0	4	0	4		4		4
LH Stroke	84	F	4	13	3	4	3	4	1	4	3	4
LH Stroke	59	M	6	14	3	4	1	4	1	4	1	4
LH Stroke	82	M	6	20	1	4	0	4	0	0	1	0
LH Stroke	58	M	7	21	1	4	0	4	0	4	0	4
LH Stroke	70	F	7	23	0	3	0	0		0		0
LH Stroke	71	F	7	21	0	4	0	3		0		4
LH Stroke	70	M	8	13	4	4	4	4	0	0	4	4
LH Stroke	62	F	16	22	0	0	0					

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Stroke type	Age	Gender	Days between onset and admit	Length of stay	Walk10FeetADM	Walk10FeetDIS	Walk50FeetADM	Walk50FeetDIS	Walk150FeetADM	Walk150FeetDIS	Walk10FeetUnevenADM	Walk10FeetUnevenDIS
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RH Stroke	62	F	7	15	0	1		0		0		0
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Functional recovery – wheelchair

Stroke type	Age	Gender	Days between onset and admit	Length of stay	Wheel50FeetADM	Wheel50FeetDIS	Wheel150FeetADM	Wheel150FeetDIS
LH Stroke	71	F	2	14	2	4	3	4
LH Stroke	53	M	3	21	2	6	88	6
LH Stroke	66	F	3	22	88	6	88	6
LH Stroke	78	M	3	21	4	6	2	6
LH Stroke	70	F	3	23	88	4	88	4
LH Stroke	66	M	4	9	3	6	3	6
LH Stroke	62	F	4	25	88	6	88	6
LH Stroke	84	F	4	13	2	6	2	6
LH Stroke	59	M	6	14	4	6	4	6
LH Stroke	82	M	6	20	88	3	88	2
LH Stroke	58	M	7	21	4	6	4	6
LH Stroke	70	F	7	23	88	6	2	6
LH Stroke	71	F	7	21	6	6	6	6
LH Stroke	70	M	8	13	6	6	6	6
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Functional recovery – wheelchair

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Functional recovery – disposition

Stroke type	Age	Gender	Days between onset to admit	Length of stay	Discharge setting
LH Stroke	71	F	2	14	Home with HH
LH Stroke	53	M	3	21	Home with outpatient
LH Stroke	66	F	3	22	Home with outpatient
LH Stroke	78	M	3	21	Home with HH
LH Stroke	70	F	3	23	Home with outpatient
LH Stroke	66	M	4	9	Home with outpatient
LH Stroke	62	F	4	25	Home with HH
LH Stroke	84	F	4	13	Home with HH
LH Stroke	59	M	6	14	Home with HH
LH Stroke	82	M	6	20	Home with HH
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LH Stroke	71	F	7	21	Home with outpatient
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RH Stroke	64	M	6	8	Home with outpatient
RH Stroke	71	M	6	6	Home with outpatient
RH Stroke	45	M	7	9	SNF
RH Stroke	62	F	7	15	Home with HH
RH Stroke	54	M	7	28	Home with outpatient
RH Stroke	59	M	7	20	Home with outpatient
RH Stroke	68	M	9	12	Home with outpatient
RH Stroke	61	M	10	13	Home with HH
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RH Stroke	63	F	18	19	SNF
RH Stroke	54	M	41	20	Home with HH

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6 Independent; 5 set up; 4 supervision or min A; 3 Mod A; 2 Max A; 1 Dependent; 7 Patient refused; 9 Not applicable; 10 Not attempted due to environment limitation; 88 Not attempted due to medical condition

Takeaway

Recovery is multi-factorial

Functional vs. neuro recovery

Intrinsic vs. extrinsic recovery

Early vs. late recovery

Patient factors and therapy factors

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How can we improve recovery ?

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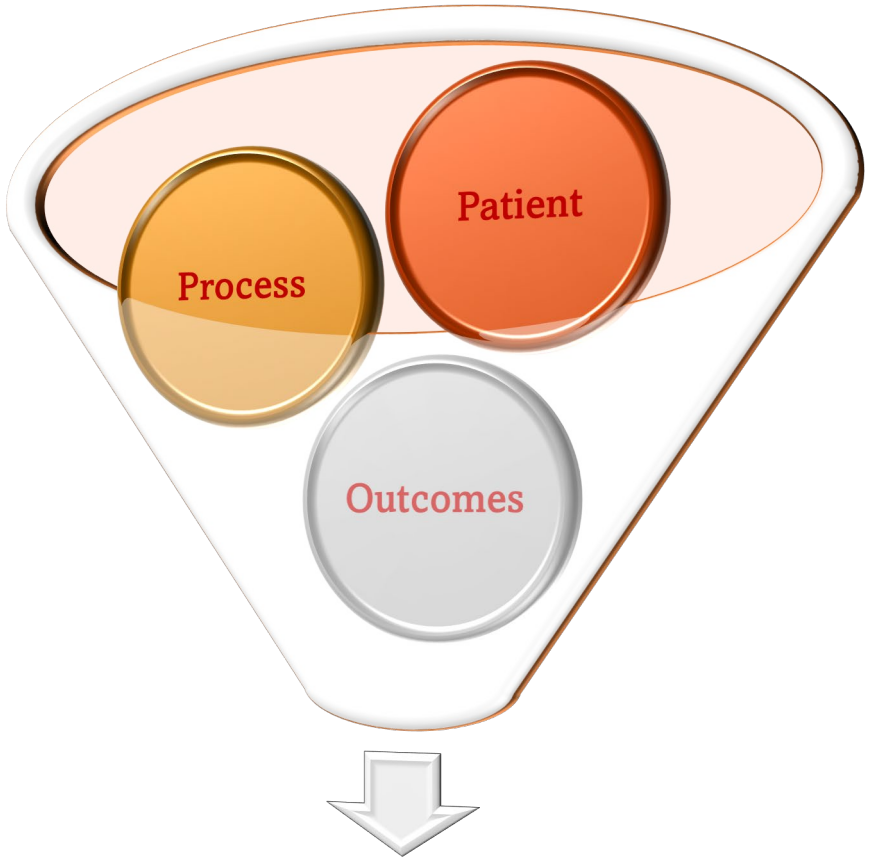

Road to recovery

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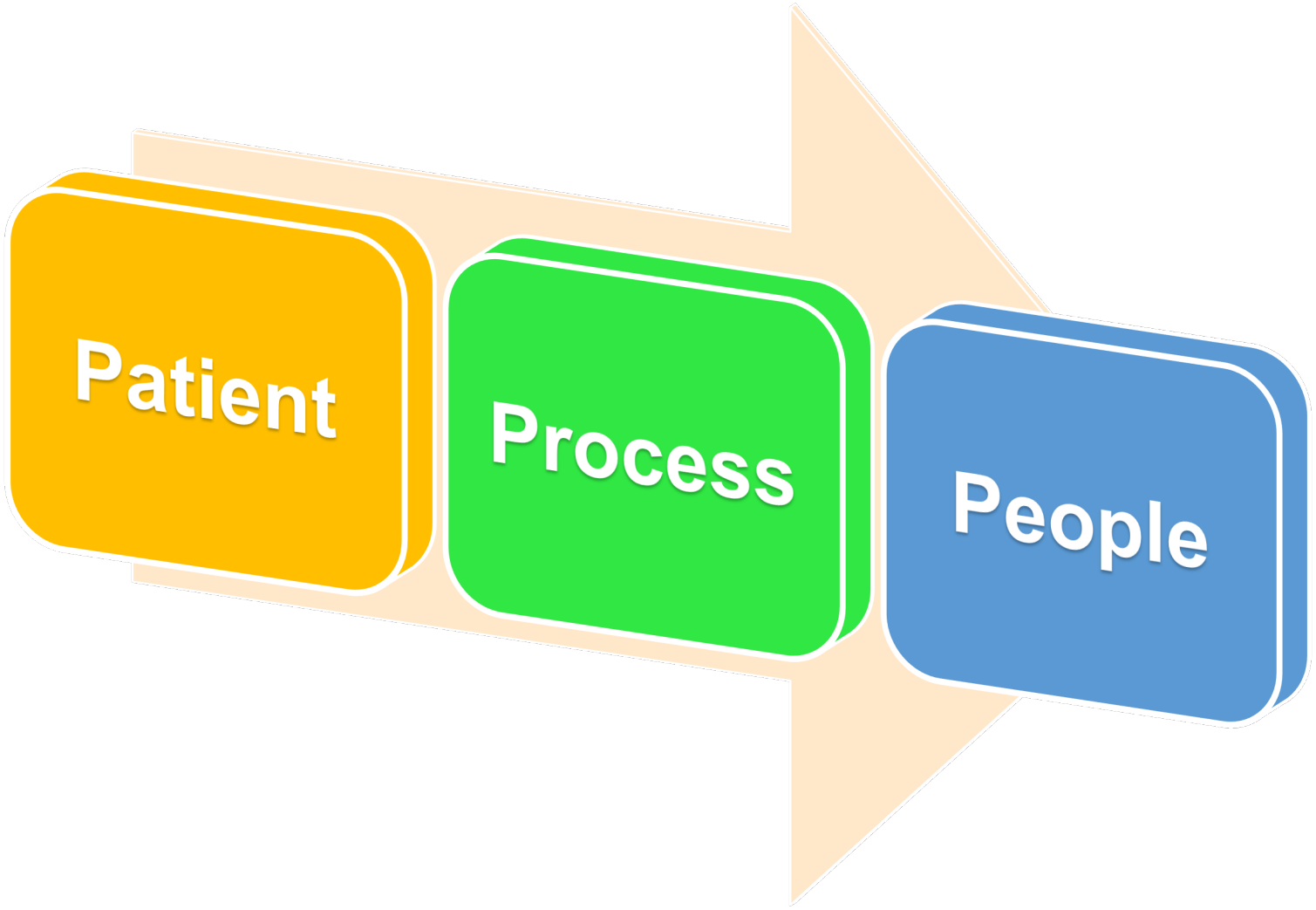
Pathway to Stroke Recovery – P3 strategy



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Takeaway

More objectivity in terms of outcomes

More specificity in terms of therapy

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