

# Singapore's Telerehabilitation Experience: Its Basis and How It Works



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# What is Telemedicine?

- **Telemedicine** is the use of medical information exchanged from one site to another via electronic communications to improve a patient's clinical health status (American Telemedicine Association).
- It includes a growing variety of applications and services using two-way video, email, smart phones, tablets, wireless tools and other forms of telecommunications technology.
- It has been fueled by the increasing speeds and decreasing cost of technology.

# What is Telerehabilitation?

- **Telerehabilitation** is the clinical application of consultative, preventative, diagnostic, and therapeutic rehabilitation services via two-way interactive telecommunication technology (American Occupational Therapy Association).
- It was developed due to the need to provide equal access to rehabilitation services for clients in remote rural geographic locations.
- However, Singapore and Hong Kong are densely populated cities – is telemedicine relevant?

# **What is the Basis for Telerehabilitation?**

## **The Singapore Experience**

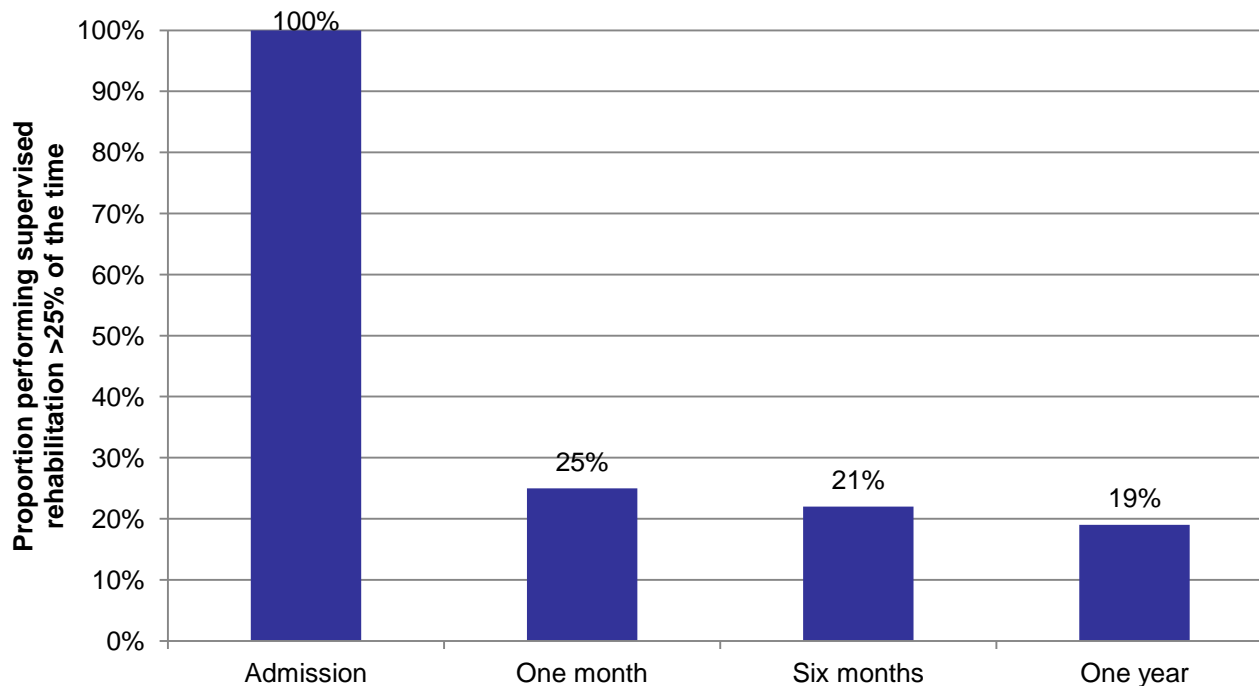
# Post-Stroke Functional Recovery in Singapore

- Greater participation in supervised rehabilitation at day rehabilitation centre >25% of time at 1 and 6 months independently predicted higher Barthel Index (BI) scores 1 year by 25%, adjusted for baseline function, socio-demographic variables, cognition, depression, stroke severity & other variables.
- Unsupervised rehabilitation at home had no effects on function at 1 year.

	Adjusted Mean BI Score at 1 Year (95% CI)	Adjusted $\beta$ -estimate (95% CI)	p-value
<b>Performing therapy at home</b>			
One month			
> 75% of the time	64.7 (54.0 – 75.3)	-4.7 (-10.5 – 1.0)	0.103
$\leq$ 75% of the time	69.4 (58.5 – 80.3)	-	
Six months			
> 75% of the time	67.5 (56.8 – 78.2)	1.0 (-5.0 – 7.0)	0.729
$\leq$ 75% of the time	66.5 (55.6 – 77.4)	-	
<b>Performing therapy at outpatient rehab centre</b>			
One month			
> 25% of the time	72.4 (61.6 – 83.1)	10.7 (3.3 – 18.2)	<b>0.006</b>
$\leq$ 25% of the time	61.7 (50.3 – 73.0)	-	
Six months			
> 25% of the time	<b>74.7</b> (64.1 – 85.3)	15.3 (7.1 – 23.5)	<b>0.001</b>
$\leq$ 25% of the time	<b>59.4</b> (47.7 – 71.1)	-	

# Performance of Rehabilitation after Discharge

- The proportion of stroke patients performing supervised rehabilitation at day rehabilitation centre after discharged dropped to 25.3% at 1 month and declined to 19.0% by 1 year.



# Performance of Rehabilitation after Discharge

- Performance of rehabilitation in day rehabilitation centre at 1 month was very strongly predictive of performance of supervised rehabilitation at 6 months and 1 year.

Variables	Adjusted OR (95% CI)	p-value
<b>At one month</b>		
Age >75 years (vs. ≤75 years)	0.43 (0.20 – 0.91)	0.028
<b>At six months</b>		
Caregiver availability (vs. none)	0.07 (0.01 – 0.49)	0.007
Performance of supervised therapy >25% of the recommended time at 1 month	<b>11.64</b> (4.52 – 29.97)	<0.001
<b>At one year</b>		
Performance of supervised therapy >25% of the recommended time at 6 months	<b>76.46</b> (12.52 – 466.98)	<0.001

# Why Patients Do Not Go for Rehabilitation in Singapore

- Although the majority (76.8%) acknowledged that inpatient rehabilitation was beneficial, only 40.0% wanted to continue with rehabilitation after discharge.
- The barriers to adherence with rehabilitation after discharge were:
  - Functional
  - Social
  - Financial
  - Medical
  - Perceptual





# Functional Barriers

Problems with ambulating from home to rehabilitation centre

62%

Problems with ambulating within the home

21%



# Social Barriers

Inconvenient for subject	57%
No caregiver available to accompany subject	31%
Subject does not wish to burden caregiver	29%
Inconvenient for caregiver	21%
Caregiver is too busy	19%
Subject is too busy	12%

*“I am afraid I might fall again if I go alone. However, I would like to continue rehabilitation if I can.”*

*[69-year-old Chinese male]*



*“There is no one to bring me for my rehabilitation sessions if there will be any. However, I would like to continue rehabilitation if I am able to do so as I find it good and useful.”*

*[74-year-old Chinese female]*

# Financial Barriers

Financial problems from out-of-pocket payments	29%
Financial problems from high cost per session	21%
Financial problems from long duration of rehabilitation	5%

*“I think (the cost of rehabilitation) will be okay for the first few weeks but will be a problem if it goes beyond that. After all, I already have to pay for my (other medical) bills.”*

*[62-year-old Chinese female]*

*“Money is an important factor. I am concerned that I cannot use Medishield or Medisave\* (government insurance) for physiotherapy and transport. I currently have no income, thus I cannot pay.”*

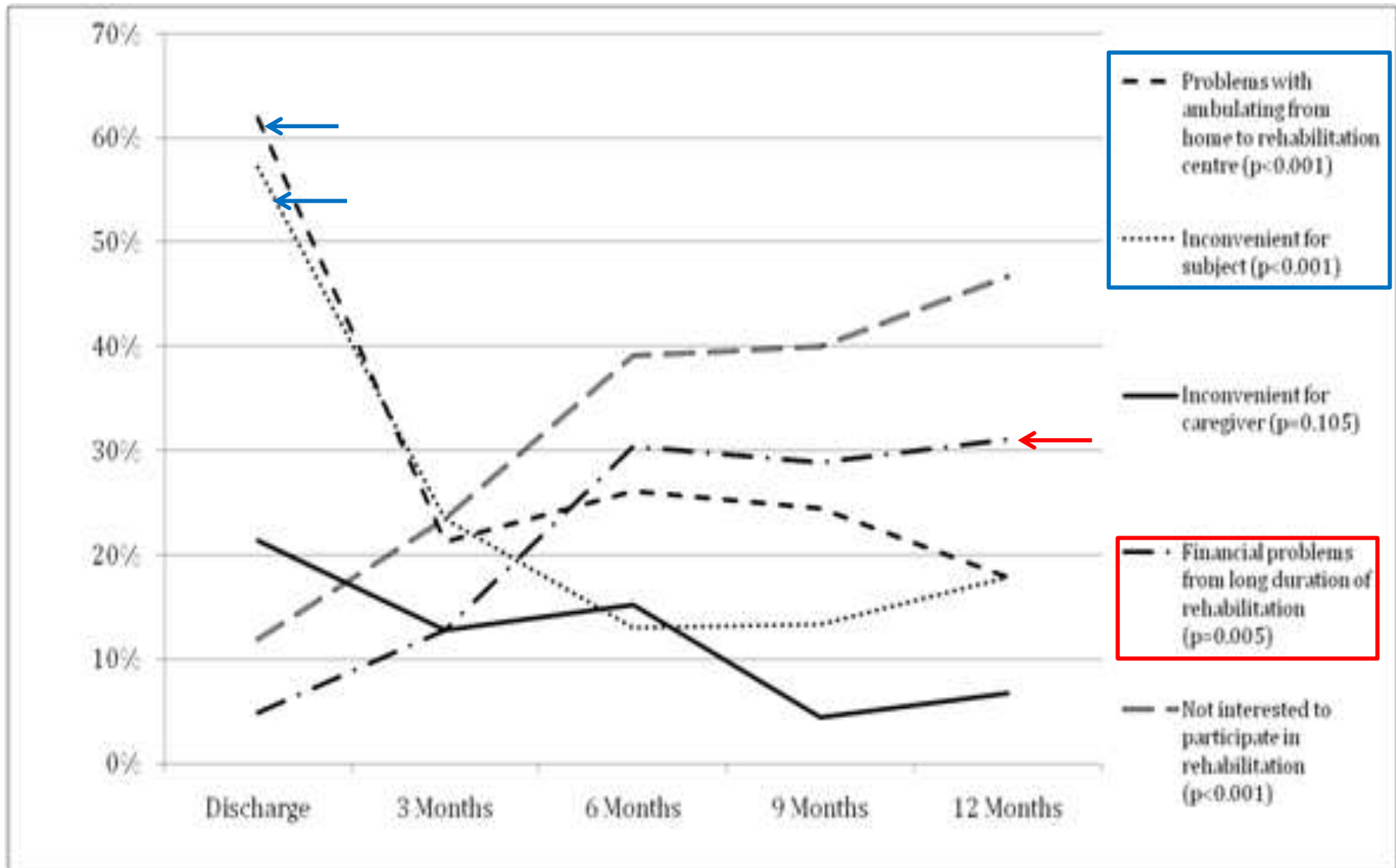
*[52-year-old Indian male]*

\* From July 2012, Medisave was allowed to be used for day rehabilitation up to S\$20 per day, subject to a maximum of S\$1,500 a year.

# Financial Barriers

	Specialist Outpatient	Day Rehabilitation Centre
Cost per Visit	\$150 per visit	\$50 per visit
Ratio of Cost Per Visit	<b>3 : 1</b>	
No. of Visit Over 3 Months	1 visit	Once a week X 12 weeks = 12 visits
Total Cost Over 3 Months	\$150	\$600
Ratio of Cost for Visits Over 3 Months	<b>1 : 4</b>	

# How Did Barriers to Rehabilitation After Discharge Change with Time?



# How Can We Increase Adherence to Rehabilitation?

## Home Rehabilitation?

### Advantages

- No need for patient to overcome physical barriers
- No need for caregiver to take time off to accompany patient to rehabilitation centre (but will need to be present during tele-rehabilitation)

### However...

- Currently no public subsidies
- Cost = \$150 per visit X 1 visit a week  
= \$1,800 over 12 weeks (3 months)
- 3X more expensive than centre-based rehabilitation

# How Can We Increase Adherence to Rehabilitation?

## Telerehabilitation?

### Advantages

- Therapist does not need to visit patient at home
- No need for patient to overcome physical barriers
- Caregiver need not go to rehabilitation centre
- May be provided after office hours

### However...

- Currently no public subsidies in Singapore
- Estimated cost = \$100 per visit = \$1,200 over 3 months
- 2X more expensive than centre-based rehabilitation
- Caregiver needs to be present during rehab and video-conference session



# The Basis for Telerehabilitation

- Singapore and Hong Kong both have an ageing population.
- The incidence and prevalence of disability increases with age.
- Rehabilitation reduces the burden of disability but...
  - Only a quarter of patients continue with centre-based rehabilitation after discharge
  - Home rehabilitation is expensive
- At a cost between the cost of centre and home based rehabilitation, telerehabilitation may improve:
  - Access to rehabilitation and subsequent independence.
  - Transition of rehabilitative care from hospital to home.

# Studies on Telerehabilitation

Current published studies on tele-rehabilitation have used a combination of:

- Home visits
- In-home messaging device ->
- Telephony
- *Store-and-forward* video recording by therapy aide during home visits



However:

- Still require face-to-face home visits which are expensive
- Does not leverage on *live (realtime)* video-conferencing which is more cost-effective and efficient
- No physical data collected
- Unlike in tele-psychiatry & tele-dermatology, tactile data is important in tele-rehabilitation

Chumbler NR, Quigley P, Li X, Morey M, Rose D, Sanford J, Griffiths P, Hoenig H. Effects of telerehabilitation on physical function and disability for stroke patients: a randomized, controlled trial. *Stroke*. 2012;2168-74.

# Telerehabilitation

Can we use instead:

- *Training* for patients & caregivers on use of telerehabilitation system before discharge to home;
- *Live real-time video-conferencing* (e.g. FaceTime on iPads);
- *Sensors* to capture *physical data* to help therapists assess recovery process and prescribe next level of exercises;
- *Pushing training videos* of therapist-prescribed exercise *to patients?*

# Telerehabilitation

- Since 2010, National University of Singapore has been developing a tele-rehabilitation system in collaboration with acute and community hospitals in Singapore
- Incorporates previously mentioned elements
- Its efficiency was evaluated in a time motion study.
- Its effectiveness is currently being evaluated in a randomized controlled trial.



Log in

# STARS THERAPIST

Sign In

**Thank you**

**Any questions?**

