

# Assessing shared leadership in interprofessional team meetings: A validation study

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## Abstract

**Background:** Shared leadership, a team property whereby leadership is distributed among team members, is increasingly salient in interprofessional team-based care. There is currently no validated scale to measure shared leadership in healthcare teams. We aim to describe the development and validation of the Clinical Shared Leadership Scale (CSLS) in the context of interprofessional geriatrics care.

**Methods:** We adapted the CSLS from the Woods (2005) and Carson (2007) scales that were originally used to study management teams. We collected survey data from 115 healthcare professionals who attended interprofessional team meetings (IPTM) in two subacute geriatrics ward. We analyzed internal consistency using Cronbach's  $\alpha$ , as well as construct, convergent, divergent, concurrent and predictive validity using exploratory factor analysis (EFA), inferential statistics and logistic regression.

**Results:** The 14-item CSLS scale has mean score of  $52.32 \pm 4.86$  (range: 14-70). The scale exhibited high internal reliability (Cronbach's  $\alpha=0.76$ ). EFA identified three factors, namely social cohesion, joint involvement, and hierarchical structure ( $\alpha$ : 0.76, 0.80 and 0.46 respectively). The good correlation of CSLS total score with internal team environment (ITE) ( $r=0.78, p<.01$ ) and transactive memory system (TMS) ( $r=0.65, p<.01$ ) supports convergent validity, whereas poor correlation with task complexity ( $r=0.17, p=.08$ ) corroborates divergent validity. CSLS total scores increase significantly with increasing number of IPTM attended, higher ITE and higher TMS scores ( $p<.05$ ), indicating concurrent validity. CSLS total and factor scores, with the exception of factor 3, predicted satisfaction outcomes.

**Conclusion:** The CSLS is a reliable and valid measure to assess shared leadership in interprofessional team meetings. The third factor, hierarchical structure, merits further study.

**Keywords:** Clinical Shared Leadership Scale, Interprofessional team, Shared leadership, Validation, Geriatrics

## Practice Highlights

- Shared leadership refers to a property among teams whereby leadership is distributed among team members to achieve group or organizational goals.
- The Clinical Shared Leadership Scale (CSLS) is a reliable and valid instrument to assess shared leadership in interprofessional team meetings.
- The three dimensions of CSLS are social cohesion, joint involvement and hierarchical structure.
- The third factor, hierarchical structure, merits further study to ascertain if it also applies in other healthcare settings.

## I. INTRODUCTION

Traditionally, the study of leadership in the healthcare context has focused on the characteristics of individual leaders (Bass, 1992). In recent years, interprofessional collaborative work is increasingly required of healthcare professionals to render effective patient care. For instance, in geriatrics care, the professional

expertise of different healthcare professionals needs to be tapped upon to effectively and efficiently manage the complex interacting medical, functional and social issues in frail elderly patients (Tan et al., 2012). This has resulted in the concomitant shift in leadership trends from a top-down approach to a dynamic collaborative decision-making approach. Shared leadership, a well-developed concept in business and

organizational literature (Pearce & Sims, 2002; Mayo, Meindl & Pastor, 2003; Pearce, 2004; Pearce & Manz, 2005; Pearce, Hoch, Jeppesen, & Wegge, 2009), is thus salient in enhancing our understanding of the leadership dynamics that occur in interprofessional teams. Although several studies (Avolio et al., 2003; Hiller, Day and Vance, 2006; Hoch, Dulebohn and Pearce, 2010a; Grille & Kauffeld, 2015) have reported validated scales to assess shared leadership, none of these scales have been validated in the healthcare setting.

#### *A. Shared leadership*

Shared leadership is defined as ‘a dynamic, interactive influence process among individuals in groups for which the objective is to lead one another to the achievement of group or organisational goals’ (Pearce and Conger, 2003; p.1). It is a process of dynamic delegation (Dow et al., 2013; Klein et al, 2006) in which leaders emerge in teams when their expertise are required, such that leadership is “coproduced” rather than hierarchical or concentrated in formally appointed leaders (Shamir, 2007; Carsten & Uhl-Bien, 2013). Rather than following distinct leaders, team members work together interdependently, relying on each other’s expertise to accomplish goals and carry out tasks in lateral team structures (Orchard et al., 2010). Related concepts that have been previously mentioned in the healthcare literature include collaborative leadership and collective leadership (West et al., 2014). This collaborative approach of shared leadership is especially germane to decision-making processes within teams involved in complex care such as interprofessional healthcare teams, whereby the various inter-professional members “share” leadership responsibilities in patient care by bringing to bear unique expertise and experience, depending on the requirements of each situation (Lingard et al., 2012).

Previous studies reported that shared leadership is associated with improved healthcare team outcomes (Kunzle et al., 2010), effective discharge in the acute setting (Pethybridge, 2004), and higher levels of team satisfaction (Steinert, Goebel & Rieger, 2006). However, the process of shared decision-making amongst interprofessional team members may be hampered by inherent hierarchical structures arising from contesting professional identities (Kvarnstrom, 2008; Reeves et al., 2010; Dow 2013). In many cases, this was attributed to the prevailing culture of medical leadership in many healthcare teams (Roger, 2012). Interestingly, Lingard et al. (2012) reported that whilst doctors perceived that their teams work in a nonhierarchical manner, this contradicted her observational data as well as perceptions from other professional groups.

Despite the emerging importance of shared leadership and related concepts in the healthcare literature (Dow et al., 2013; Leasure et al., 2013; Lingard et al., 2012; Rogers, 2012; Kunzle et al., 2010; Klein et al, 2006; Steinert, Goebel, & Rieger, 2006), there is currently no validated instrument to assess shared leadership in interprofessional healthcare teams. There is also a significant gap in the understanding of what constitutes shared leadership in the healthcare setting, and its role in bringing about effective interprofessional collaboration. Hence, we developed an instrument, the Clinical Shared Leadership Scale (CSLS), to assess shared leadership as a measure of interprofessional collaborative practice in shared decision-making. Our aim was to validate the CSLS by determining its internal consistency, factor structure, as well as convergent, discriminant, concurrent and predictive validity in interprofessional team meetings in geriatrics care.

## II. METHODOLOGY

#### *A. Participants and settings*

This is a cross-sectional study of healthcare professionals who attended interprofessional team meetings (IPTM) at two Geriatrics sub-acute care wards of a tertiary teaching hospital in Singapore. The Geriatrics sub-acute wards accept the following categories of general medical elderly patients aged 65 years and above (mean age >80) who are primarily transferred from the acute wards and to a lesser extent, admitted directly from the Emergency Department or outpatient clinics : 1) continued management of medical conditions; 2) short course of functional rehabilitation (less than 2 weeks) to address deconditioning following the acute illness episode; 3) medically stable and awaiting transfer to a step-down care facility; and 4) management and medication titration of behavioural problems from dementia or delirium (Chong, Empensando, Ding, & Tan, 2012). Patients excluded for transfer to the subacute ward include those who are dangerously ill, unstable in parameters, awaiting urgent surgical procedures, and requiring oxygen therapy (except when on long term oxygen therapy for chronic lung conditions). The interprofessional team at the subacute wards comprises doctors, nurses, pharmacists, physiotherapists, occupational therapist, speech therapists, dieticians, care coordinators and medical social workers to meet the complex and interacting medical, functional and psychosocial needs of the patients. Not surprisingly, given the amount of nursing care required by the frail elderly patients, nurses constitute the largest professional group of the ward team.

The IPTM is a platform where interprofessional team members meet biweekly to discuss respective responsibilities in order to coordinate, negotiate and

plan for discharge or right siting of frail elderly patients with multiple interacting medical, functional, and/or social issues (Tan et al., 2012). To fulfil its functional role, IPTM not only allows team members to have a shared team mental model in the form of a collective transactive memory system (Tan et al., 2012), it also serves as a platform for shared leadership in which team members are expected to assume a leading role when their expertise is required in the process of decision-making for patient care. Leadership is thus distributed among different team members at different points of time depending on the situation. Senior geriatricians play an important role in the overall facilitation of IPTMs. This study was approved by the Institutional Review Board of the National Healthcare Group, Singapore.

### *B. Study procedures*

We invited healthcare professionals who attended IPTM in the preceding year to participate in the survey. Using pre-defined categories from an earlier study (Tan et al., 2014), we collected demographic details on age, gender, and clinical roles (doctors, nurses, therapists, social workers/care coordinators, and others). There was no pharmacist in our study because the only pharmacist attached to the geriatrics department is a member of our study team. We measured the level of experience in three ways: years in clinical service, exposure to geriatrics care services, and number of interprofessional team meetings attended. We collected data on satisfaction scores to ascertain the predictive validity of the CSLS as a measure of interprofessional collaborative practice. Participants were asked to rate their satisfaction on a 5-point Likert scale (1 for “very dissatisfied” through 3 for “neutral” to 5 for “very satisfied”) in two areas: 1) overall experience of IPTM (with reference to the last five meetings attended), and 2) working with the interprofessional geriatrics team. We also collected data on shared leadership, internal team environment (ITE) (Carson, Tesluk, & Marrone, 2007), Transactive Memory System (TMS) (Tan et al., 2012) and task complexity (Podsakoff & MacKenzie, 1994).

### *C. Instruments*

#### *1) Shared leadership:*

We adapted the Shared Leadership Perception Survey (Wood, 2005), which originally measured the occurrence of shared leadership by pastors within church management teams. We selected this scale because it assesses shared leadership at the team level with respect to: 1) team behaviour, 2) team structure, and 3) team members’ tendency to share leadership. Due to inappropriateness of three items under the “emotional support” subscale (Wood, 2005) in the healthcare setting, we substituted with questions from the “social support” subscale of Carson’s (2007) work

on management teams. The initial version of our CSLS comprised nineteen items. After a pilot study for our first draft, the study team in consult with experts in geriatric care reviewed the items for relevance to the geriatrics context. We omitted 4 items that lacked conceptual alignment with shared leadership in the IPTM setting, yielding the 15-item version that was used in the study. Each item was rated on a 5-point Likert scale (1 for “strongly disagree” through 3 for “neutral” to 5 for “strongly agree”),

#### *2) Transactive memory system:*

A TMS “is a set of individual memory systems in combination with the communication that takes place between individuals” (Wegner, 1986, p. 186). Such a memory system is essential when leading interprofessional team meetings because members need to know what information exists, where this information resides, and how to retrieve it to meet the complex medical, functional, and social needs of hospitalized elderly patients. Conceptually, shared leadership concerns collective influence, whereas TMS concerns collective cognition (Carson, Tesluk, & Marrone, 2007). Although the two concepts appear distinct, TMS is likely to be facilitated by shared leadership, through communications and social exchanges (Klimoski & Mohammed, 1994) that occur as team members engage in shared decision-making to solve a common task.

In our study, we used a validated 11-item TMS scale predicated on a two-factor structure, namely team dynamics and team knowledge (Tan et al., 2014). This scale was validated in the interprofessional team meeting context and it measures how knowledge resource is interdependently managed by team members. Each item was scored on a 5-point Likert scale and the possible total score of the scale is 55. The original TMS scale was developed in software management teams (Faraj and Sproull, 2000).

#### *3) Internal team environment:*

Previous literature showed that shared purpose (Sims, Hewitt, & Harris, 2015) and communication (Daiker, 2009) are essential for shared leadership and interprofessional work to succeed. According to Carson, Tesluk & Marrone (2007), internal team environment (ITE) is an important predictor for the emergence of shared leadership. In our study, we adopted two subscales, i.e. shared purpose (3 items) and voice (3 items), from the ITE scale described by Carson, Tesluk & Marrone (2007). Shared purpose exists when team members have similar understanding of their team’s goals and take steps to ensure a focus on collective goals. Voice refers to the degree to which team members have input into how the team carries out its goals (Carson, Tesluk &

Marrone, 2007). Each item of the ITE scale was scored on a 5-point Likert scale, thus yielding a possible total score of 30.

#### 4) Task complexity:

D'innocenzo et al. (2014) stated that there are three underlying components of task complexity: (a) component complexity, (b) coordinative complexity, and (c) dynamic complexity. In our study, we adapted the task complexity scale (Podsakoff & Mackenzie, 1994) that focuses on component complexity (i.e., the number of distinct acts and information cues needed to be attended to while performing the task) in order to explore how routine were the members' daily jobs and how it affects leading responsibilities to be shared in teams. Because coordination and communication (i.e. coordinative complexity) among team members are relatively more important in geriatrics care than component complexity (Daiker, 2009), the latter aspect of task complexity measures a different construct from shared leadership in our study setting of geriatrics IPTM.

#### D. Statistical analysis

Descriptive and analytical statistics were performed using STATA version 12. The level of statistical significance was set at 0.5. To validate the CSLS, we performed the following analysis for both total and factor scores: (1) construct, convergent, discriminant, concurrent, and predictive validity; and (2) internal consistency using Cronbach's  $\alpha$ .

To ascertain construct validity, we conducted exploratory factor analysis (EFA) to determine the factor structure of CSLS, and then performed correlation analysis between the total and derived factor scores. The Kaiser – Meyer – Olkin (KMO) (Kaiser, 1970) statistic was used as a measure of sampling adequacy and the Bartlett test of sphericity was used as a measure of the necessity to perform a factor analysis (Bernstein, Garbin & Teng, 1988). We determined the number of factors to be retained via parallel analysis (Horn, 1965), a more robust and accurate method of factor retention that shows the least variability and was less likely to overestimate the number of factors (Wetzel, 2012). We eliminated items with loadings  $<0.3$ .

In convergent validity, we examined the degree to which the operationalization converges on other operationalizations that it theoretically should be similar to. ITE has been shown to be an important antecedent of shared leadership (Carson, Tesluk & Marrone, 2007), whereas TMS measures team dynamics and team expertise that facilitate interprofessional collaborative practice (Tan et al., 2012). Thus, to demonstrate convergent validity, we

examined the correlation between CSLS total and factor scores with and the related concepts of ITE and TMS. In comparison, discriminant validity refers to the degree to which the operationalization diverges from other operationalizations that it theoretically should be not be similar to. Hence, to demonstrate discriminant validity, we performed correlation with the component aspect of task complexity scores, which is a distinct aspect from shared leadership.

In concurrent validity, we assessed the operationalization's ability to distinguish between groups that it should theoretically be able to distinguish between. In the case of shared leadership, this would include related constructs such as level of experience, ITE, and TMS. An earlier study of geriatrics IPTM by Tan et al. (2014) indicated a dose-dependent relationship between team functioning with number of IPTM attended, but not with years in clinical service or exposure to geriatrics service. Thus, for concurrent validity, we compared CSLS total and factor mean scores across number of IPTM attended (66<sup>th</sup> percentile cutoffs to derive two categories,  $\leq 15$  and  $>15$ ) via independent sample *t*-test, and tertile cutoffs of ITE and TMS scores using one-way ANOVA. We also ascertained predictive validity via logistic regression to evaluate the significance of CSLS total and factor scores in predicting satisfaction outcomes, adjusting for number of IPTM attended, IPTM roles, age group and gender. As the dependent variable in logistic regression needs to be categorical, we transformed the satisfaction score into a dichotomous variable that comprises "not satisfied/neutral" and "satisfied" categories.

### III. RESULTS

#### A. Baseline Characteristics (Table 1)

Among 130 healthcare workers invited to take part in the survey, 115 (88% response) completed the survey questionnaire. The majority of the respondents were nurses (42%), predominantly females (90%), had greater than three years of experiences in geriatrics care (47%), and attended more than ten interprofessional team meetings (60%). The mean satisfaction scores for overall interprofessional team meeting experiences and work with IP geriatrics teams were 3.99 (SD = 0.61) and 4.09 (SD = 0.59) respectively. The CSLS mean total score was 52.32 (SD=4.86; total possible score of 70), whilst the mean factor scores were 22.58 (SD=2.77; total possible score of 30), 20.94 (SD=2.29; total possible score of 25) and 8.85 (SD=1.87; total possible score of 15) for social cohesion, joint involvement, and hierarchical structure, respectively.

Characteristics	Results <sup>a,b</sup>
Gender	
Male	11 (9.65)
Female	103 (90.35)
Age(years)	
21-25	20 (17.39)
26-30	31 (26.96)
31-35	32 (27.83)
>35	32 (27.83)
Clinical IP roles	
Doctors	37 (32.71)
Nurses	48 (41.74)
Therapists (includes physiotherapists, occupational therapists, speech therapists)	15 (13.04)
Care coordinators/Medical social workers	12 (10.43)
Others: Dietician	3 (2.61)
Years in clinical service	
<3 years	31 (26.96)
3-6 years	32 (27.82)
>6 years	52 (45.22)
Exposure to geriatrics care services	
<1 year	21 (18.75)
1-2 year(s)	38 (33.93)
>3 years	53 (47.32)
Number of IPTM attended	
1-5 times	19 (16.52)
6-10 times	27 (23.48)
>10 times	69(59.99)
Satisfaction with, <i>mean(SD)</i>	
Overall IPTM experience, (Range: 1-5)	3.99 (0.61)
Work with IP geriatrics teams, (Range: 1-5)	4.09(0.59)
Shared Leadership, <i>mean(SD)</i>	
Total score, (Range for mean: 14-70)	52.32 (4.86)
Factor 1 <sup>c</sup> , (Range for mean: 6-30)	22.58 (2.77)
Factor 2 <sup>c</sup> , (Range for mean: 5-25)	20.94 (2.29)
Factor 3 <sup>c</sup> , (Range for mean: 3-15)	8.85 (1.87)

Table 1. Baseline characteristics of survey participants (n=115)

Note. IP = Interprofessional; IPTM = Interprofessional Team Meetings

<sup>a</sup>Frequencies may not add up to the total number of respondents due to non-response for that question

<sup>b</sup>Number (percentage) presented unless otherwise indicated.

<sup>c</sup>Items loaded in accordance with factor loading of Table 2: factor 1, social cohesion (6 items); factor 2, joint involvement (5 items); factor 3, hierarchical structure (3 items).

### B. Construct validity (Table 2)

Factor analysis was appropriate as the Kaiser-Meyer-Olkin measure of sampling adequacy was 0.78, and the Barlett test of sphericity was 479.31 ( $p < 0.0001$ ). We chose a three-factor solution, as per the optimal number recommended by parallel analysis (Horn, 1965). Both orthogonal (varimax) and oblique (direct oblmin) rotations yielded a three-factor solution with similar items loading on each factor. The item "Team members interject (even if outside an area of personal responsibility) to ensure the team fulfills its obligations" was dropped because of its low loading in all factors. Thus, there were 14 items in the final version of CSLS, which accounted for 51% of variance. The first factor (28.90% of variance) represented social cohesion; the second factor (13.20% of variance) represented joint involvement; and the third factor (9.04% of variance) represented hierarchical structure. There was good correlation between CSLS total and factor scores ( $r > 0.50$ ,  $p < 0.01$ ). Factor 2 was moderately correlated with factor 1 ( $r = 0.42$ ,  $p < 0.01$ ), whereas both were poorly correlated with factor 3 ( $r = 0.04$  and  $0.21$ ). The overall

Cronbach's alpha for the CSLS is 0.76. Cronbach's alpha of the first, second and third factors were 0.76, 0.80 and 0.46 respectively.

i. ii.		Item Loadings			Cronbach's alpha
		Mean (SD)	Factor 1	Factor 2	
<i>Factor 1: Social cohesion</i>					0.76
	1. Team members give encouragement to team members who seem frustrated.	3.60 (0.76)	<b>0.59</b>	0.21	-0.09
	2. Team members help one another to develop their job skills.	3.64 (0.69)	<b>0.73</b>	-0.04	0.17
	3. Team members recognize each other's accomplishments and hard work.	3.95 (0.59)	<b>0.62</b>	0.28	0.14
	4. Team members have a say in deciding how resources are allocated in teams.	3.61 (0.76)	<b>0.71</b>	0.19	-0.05
	5. Each team member is accountable to all other members of the team.	3.73 (0.76)	<b>0.62</b>	-0.12	-0.27
	6. When the team faces problems, team members share in deciding on the best course of action.	4.08 (0.46)	<b>0.65</b>	0.19	0.12
	7. Team members interject (even if outside an area of personal responsibility) to ensure the team fulfills its obligations. <sup>a</sup>	3.61 (0.65)	0.30	0.16	-0.06
<i>Factor 2: Joint involvement</i>					0.80
	8. Team members collaborate with one another in making decisions.	4.27 (0.69)	0.00	<b>0.85</b>	0.11
	9. Team members talk enthusiastically about our team's progress in patient care.	4.09 (0.74)	0.07	<b>0.83</b>	0.16
	10. Team members help to frame the patient care goals.	4.25 (0.51)	0.23	<b>0.72</b>	0.02
	11. Team members often learn cross disciplinary knowledge from other professionals in IPTMs.	4.19 (0.60)	0.43	<b>0.59</b>	-0.04
	12. Team members help to identify, diagnose, and resolve the problems that our team faces with regards to patient care.	4.19 (0.49)	0.47	<b>0.50</b>	0.08
<i>Factor 3: Hierarchical structure</i>					0.46
	13. There is a hierarchical structure in terms of professional groups in IPTMs. <sup>b</sup>	2.39 (0.91)	-0.24	0.13	<b>0.72</b>
	14. There is one individual who decides what other members will do with regard to task distribution in patient care. <sup>b</sup>	2.89 (0.93)	-0.01	0.02	<b>0.61</b>
	15. Despite the job designations used within this department, each member is considered equal.	3.55 (0.85)	0.38	0.08	<b>0.71</b>
Eigenvalue			4.33	1.98	1.36
Percentage of explained variance			28.90	13.20	9.04

Table 2. Principal component analysis of the Clinical Shared Leadership scale (varimax rotation)

Note. IPTM = Interprofessional Team Meetings

Boldtype indicates factor to which item is allocated.

<sup>a</sup> Item 7 was removed from the final 14-item Clinical Shared Leadership Scale; <sup>b</sup> Reverse-coded items

*C. Convergent and Discriminant Validity (Table 3)*

Both ITE and TMS, were significantly correlated with CSLS total scores (r: 0.78 and 0.65 respectively,  $p < 0.01$ ), supporting the convergent validity of CSLS. For factor scores, factors 1 and 2 have higher correlation with ITE and TMS (Range of r: 0.45 – 0.70, all  $p < 0.01$ ), compared with factor 3 (Range of r:

0.20 – 0.31,  $p < 0.05$ ). In contrast, task complexity as measured by involvement of multiple professions and routine series of job steps, was poorly correlated with both CSLS total (r: 0.12 and 0.15 respectively,  $p > 0.05$ ) and factor scores (Range of r: 0.05 – 0.16, all  $p > 0.05$ ), thus corroborating the discriminant validity of CSLS.

	Total scores	Social Cohesion	Joint Involvement	Hierarchical structure
<b>Shared Leadership</b>				
Social Cohesion	0.77**	-		
Joint Involvement	0.79**	0.42**	-	
Hierarchical structure	0.51**	0.04	0.21*	-
<b>Task Complexity</b>				
Involvement of multiple professions in task completion at job	0.12	0.06	0.14	0.09
Routine series of steps at job	0.15	0.15	0.05	0.16
<b>Internal Team Environment</b>				
Total scores	0.78**	0.65**	0.70**	0.24*
Shared purpose	0.72**	0.60**	0.64**	0.23*
Voice	0.67**	0.55**	0.62**	0.20*
<b>Transactive Memory System</b>				
Total scores	0.65**	0.45**	0.61**	0.31**
Team dynamics	0.72**	0.57**	0.66**	0.24**
Team knowledge	0.36**	0.15	0.34**	0.30**

Table 3. Correlation between 14-item CSLS total and factor scores with internal team environment, transactive memory system, and task complexity scores

\* $p < 0.05$ ; \*\* $p < 0.01$

**D. Concurrent Validity (Table 4)**

CSLS total mean scores showed a significant increase with increasing number of IPTM attended ( $\leq 15$  vs  $> 15$  meetings: 51.14 vs 53.59,  $p=0.01$ ), higher ITE scores (tertile cutoffs: 50.16 vs 52.06 vs 58.23,  $p<0.01$ ) and higher TMS scores (tertile cutoffs: 49.53 vs 51.59 vs

56.03,  $p<0.01$ ). This attests to the concurrent validity of the CSLS. For the factor scores, there was a significant difference across categories for ITE and TMS ( $p<0.05$ ), although for number of IPTM attended, there was a significant difference only factor 2 with a trend for factor 1.

	Total mean score							
	Overall scale	$\rho$	Social Cohesion	$\rho$	Joint Involvement	$\rho$	Hierarchical structure	$\rho$
Number of IPTM attended								
$\leq 15$	51.14	0.01**	22.14	0.07	20.38	0.01**	8.73	0.48
$\geq 16$	53.59		23.07		21.54		8.98	
Internal Team Environment (Range of scores: 6-30)								
$\leq 24$	50.16	<0.01**	21.58	<0.01**	19.88	<0.01**	8.70	<0.01**
25	52.06		22.13		21.19		8.75	
$\geq 26$	58.23		25.44		23.58		9.30	
Transactive Memory System (Range of scores: 11-55)								
$\leq 40$	49.35	<0.01**	21.45	<0.01**	19.48	<0.01**	8.43	0.01*
41-43	51.59		22.18		20.76		8.65	
$\geq 44$	56.03		23.83		22.56		9.64	

Table 4. Comparison table of total and factor scores by baseline characteristic, internal team environment and transactive memory system

Note. IPTM = Interprofessional Team Meetings

\* $p < 0.05$ ; \*\* $p < 0.01$

**E. Predictive validity (Table 5)**

In logistic regression adjusting for IPTM attended, IPTM roles, age group and gender, CSLS was a significant predictor of satisfaction working with interprofessional geriatrics teams (OR = 1.37,  $p<0.01$ ) and satisfaction with overall IPTM experience (OR = 1.37,  $p<0.01$ ).

Similarly, factors 1 and 2 significantly predicted satisfaction outcomes, especially factor 2 in predicting satisfaction working with interprofessional geriatrics teams (OR: 3.09,  $p<0.01$ ). In contrast, factor 3 did not predict either satisfaction outcomes.

Characteristics	Satisfaction working with IP geriatrics teams			Satisfaction with overall IPTM experience		
	$\beta$	OR <sup>a</sup>	$p$ -value	$\beta$	OR <sup>a</sup>	$p$ -value
Shared Leadership Score	0.32	1.37	<0.01**	0.31	1.37	<0.01**
Factor 1	0.26	1.30	0.03*	0.38	1.47	<0.01**
Factor 2	1.71	3.09	<0.01**	0.55	1.73	<0.01**
Factor 3	0.16	1.17	0.32	0.17	1.19	0.34

Table 5. Logistic regression for satisfaction outcomes

Note. IP = Interprofessional; IPTM = Interprofessional Team Meetings

<sup>a</sup>Odds ratio (95% confidence interval) displayed, adjusted for number of IPTM attended, IPTM roles, age group and gender.

\* $p < 0.05$ ; \*\* $p < 0.01$

#### IV. DISCUSSION

Earlier studies that investigated leadership skills in interprofessional practice focused largely on the characteristics of a formally appointed leader in teams. In line with the broader movement to reconsider the collaborative approach in leadership (Lingard et al., 2012), we drew heavily from previous work in the field of business management and geriatrics care to develop a validated tool to measure shared leadership. As far as we are aware, this is the first study to validate a shared leadership tool in healthcare. We demonstrated the novel use of the 14-item CSLS as a valid and reliable measure of interprofessional collaborative practice in the context of an interprofessional geriatrics team. Our study builds upon the body of evidence by explicating the three key dimensions that underpin shared decision-making processes in interprofessional team meetings, and by providing an assessment tool of shared leadership that can serve as an intermediary outcome to bridge the causal chain between interprofessional practice and patient outcomes (Lim, 2013).

The CSLS is predicated on the three-factor structure of: (1) social cohesion; (2) joint involvement; and (3) hierarchical structure. Factor 1 pertains to the emotional bonding and trust among team members whilst factor 2 refers to the collaborative approach through which individual team members with their unique clinical expertise and experience, are involved in task completion. Factor 3, corresponding to the dimension of 'decentralized interaction among personnel dimension' in Wood (2005), refers to the existence of hierarchical structure in teams - an important contextual consideration in interprofessional team meetings. Factors 1 and 2 have high mean scores, good internal consistency and are moderately correlated with each other. This supports the conceptual alignment of both factors, such that team members are better able to work collaboratively and effectively when they feel emotionally safe and socially attached to each other. In support of this, the high correlation of factors 1 and 2 with CSLS total scores, corroborates the perceived importance of social cohesion and joint involvement as integral aspects of shared leadership.

In contrast, factor 3 has lower mean scores, moderate internal consistency and is poorly correlated with the other two factors. However, we retained this dimension in our scale for three reasons. Firstly, by assessing hierarchical structure in teams, it measures a valid and fundamental aspect of shared leadership. As opposed to the vertical structure of leadership which is highly reliant on an appointed leader for effective team functioning, shared leadership emphasizes the

distribution of leadership in a more "horizontal" team structure (Pearce & Manz, 2005). Secondly, our results support the concurrent validity, discriminant validity, and to a lesser degree, convergent validity of factor 3 as a distinct dimension. Thirdly, the inclusion of factor 3 offers unique and invaluable insights that explicate the complex construct of shared leadership amongst interprofessional healthcare teams. Of note, the discrepant mean scores between factor 3 with factors 1 and 2, suggest that despite the perceived hierarchical structure of IPTMs, interprofessional team members value joint involvement and social cohesion within the team, an observation which is corroborated by the high satisfaction scores. In view of the above reasons, we submit that hierarchical team structure is an integral aspect of shared leadership that should be assessed, especially in the healthcare setting. Lingard et al. (2012) reported the existence of hierarchical structure in their seminal study of five high-functioning interprofessional healthcare teams working at teaching hospitals in urban Ontario, Canada. They highlighted that deeply embedded traditional health care, education, and medical-legal systems which reinforce the idea of physicians sitting at the top of the hierarchy, could pose a considerable challenge to implementing the ideal "flat" model of shared leadership with absolutely no hierarchy. Rather, by openly recognizing and discussing the tensions between traditional and interprofessional discourses of collaborative leadership, this may help different members of interprofessional teams work together more effectively.

Our results also shed light on important factors that influence shared leadership in interprofessional teams. Shared purpose and voice, subdomains of ITE adopted from Carson, Tesluk & Marrone (2007), were found to be highly correlated with shared leadership. When team members feel recognized within their team, they are more willing to share responsibility and commit to the team's collective goals. In addition, during shared decision making at IPTMs, it is important that team members can tap upon and retrieve information from their shared memory system to set consensus goals to facilitate patient discharge, as reflected by positive correlation between TMS and shared leadership. Conversely, our results indicated that the component aspect of task complexity is dissociated from shared leadership, indicating both concepts measure different dimensions. This could be because interprofessional team members are proficient when completing tasks within their area of expertise, such that minimal contact with other professional groups is required to solve less complex tasks.

The concurrent validity of CSLS total and factor scores

with increasing number of IPTM attended, ITE score, and TMS score, suggests a dose-dependent relationship of shared leadership with these covariates. We found a similar dose-dependent relationship with TMS in IPTMs (Tan et al., 2014). From the perspective of shared leadership, new-comers to the interprofessional team meeting team would initially be unfamiliar with the inherent team roles and team processes. With greater exposure to IPTMs, they will become more familiar with mutual team roles and responsibilities through collaborative knowledge sharing and communication (Kitaygorodskaya, 2006). Increasing familiarity with each other's role encourages the formation of shared purpose and common mental models among team members, enabling the team to more efficiently and effectively formulate a common discharge plan. Over time, through increasing socialization into team processes and culture, members would then develop deeper bonding and attachment with each other and transcend profession-specific boundaries to norm and perform as a team (Tuckman, 1965), thus enhancing the distribution of leadership in the decision-making process during IPTMs.

Several limitations are worth highlighting. First, the limited number of items (N=3) in Factor 3 contributes to the low reliability ( $\alpha=.46$ ) of the subscale. Further research is required to better delineate the dimension of "hierarchical structure" among interprofessional teams in different healthcare setting, and what facilitates shared leadership despite the presence of hierarchy within team structures. It is unclear whether hierarchical structure would be more pronounced in certain societies with more deferential cultures, although evidence suggests that hierarchy in healthcare teams is also fairly pervasive across different societies (Reeves et al., 2010; Lingard et al., 2012; Dow et al., 2013). Secondly, the generalizability of the CSLS beyond the context of the IPTMs in a specialized sub-acute geriatrics ward remains to be established. In addition, our study was not designed to examine shared decision making with direct involvement of patients and their caregivers (Col et al., 2011). Nonetheless, by different interprofessional team members representing the unique perspective of the voice of the patient/caregiver, the interests of the patient/caregiver from the medical, functional and psychosocial angles can still be comprehensively considered and integrated in the management plan through shared leadership even though the patient/caregiver may not be directly involved in the IPTMs. Finally, our study through its quantitative nature was not designed to elucidate the underlying reasons for our findings. Further in-depth qualitative inquiry may shed more light into the complexity of the shared leadership construct and its

dimensions.

## V. CONCLUSION

Our study adds to the understanding on the specific dimensions of shared leadership in interprofessional team meetings in an Asian geriatrics care context. We describe three dimensions of shared leadership, namely social cohesion, joint involvement and hierarchical structure. Although internal consistency for hierarchical structure is moderate, it is retained as a factor because it measures a valid and unique aspect of shared leadership in the healthcare context. Factors that influence shared leadership include internal team environment, transactive memory system, and number of IPTMs attended. Our findings highlight the need for further studies to determine the applicability of the CSLS in other interprofessional settings, and in-depth qualitative research to explicate the dimension of hierarchical structure.

## Notes on Contributors

Ms. Yu Han Ong contributed to the conception and design of the study, and the acquisition, analysis and interpretation of data, and drafted the paper. Mr. Issac Lim contributed to the conception and design of the study. Dr. Mark Chan and Ms. Keng Teng Tan contributed to the acquisition of data. Dr. Wee Shiong Lim contributed to the conception and design of the study, acquisition, analysis and interpretation of data and critical revision of the paper. All authors approved the final manuscript for publication.

## Ethical Approval

The study was approved by the Institutional Review Board, National Healthcare Group. (NHG DSRB Ref: 2013/00973)

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## Declaration of Interest

The authors declare that they have no competing interests.

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