

# MEDICAL OUTCOMES STUDY (MOS) WITH SHORT-FORM HEALTH SURVEY AND CHRONIC VENOUS DISEASE THAI PATIENTS

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**ABSTRACT Background:** Earlier finding from different health-related quality of life in Chronic Venous Disease Thai patients had been presented and published elsewhere by the same authors. This research notes capitalized on the issue from the finding whereby comparing both health-related quality of life of the same had been described elsewhere. **Objective:** Medical outcomes study, 14-item short-form health-survey for chronic venous insufficiency (MOS CIVIQ14) used in medical screening were reliable subsequent to reliability test. A cut-off score less than 75 to support primary screening of chronic venous disease (CVD) suggested in other study may cause false negative. The analysis of MOS CIVIQ14 Thai version used for 120 participants interviews in hospital during clinical trial recruitment, included 42 CVD patients attempted as ad hoc analysis of MOS CIVIQ14 score. Interviews data of a 12-item short-form health-survey (MOS SF12) were compared. **Result:** The inter-scale correlation and internal consistency reliability, Cronbach's alpha coefficients, of MOS CIVIQ14 score were 0.914(global score), 0.867(physical/pain score), 0.787(psychological score). MOS CIVIQ14 and MOS SF12 scores were correlated for physical/pain and global score with Pearson correlation coefficient, 95%CI of 0.713(0.663 to 0.790),  $p < 0.001$  and 0.745(0.640 to 0.819),  $p < 0.001$  but not for psychological score of -0.062(-0.197 to 0.091),  $p = 0.501$ . Global score of MOS CIVIQ14 significantly correlated four leg symptoms with Correlation Matrix(CM) of 0.762, 0.723, 0.765, 0.787, all  $P < 0.001$  except for psychological score. High incidence of CVD noted regardless of MOS CIVIQ14 reflecting high mean(SD), median global index score of 84.7(12.6), 87.8 despite suggested lower cut-off score in some study.

**KEYWORDS** Chronic Venous Disease, Medical Outcomes Study, 14-item Short-form Health Survey for Chronic Venous Insufficiency, MOS CIVIQ14  
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## Introduction

Chronic venous disease (CVD) is a global health burden, especially in the west. The presence of varicose veins as high as 20-33%, in many cases with clinical history and physical examination looking for patient's symptoms and severity, could confirm the diagnosis of CVD [1, 2]. In Thailand, the high incidence of superficial varicose vein of 32.99% or so may not accompany some leg symptoms. In most case, patients did not seek early medical treatment [3] despite variations in reported leg symptoms among CVD patients [4]. The medical outcomes study 14-item short-form health survey for chronic venous insufficiency (MOS CIVIQ14) had been widely used with suggesting cut-off score for CVD. The internationally employed CIVIQ 14 score has been published elsewhere including this finding leading to under-estimation of unless the otherwise probable higher incidence of Chronic Venous Disease. This should be the case for ambulatory patients with leg complaints symptoms attending our surgical clinics. Our research had been published earlier [5]. The recommended cut-off score of less than 75 [6] remains to be confirmed. This ad hoc analysis explored area for further development using both MOS CIVIQ14 and MOS SF12. This analysis employed sample data of an interventional trial. The trial recruited participants with diagnosed CVD. Should MOS CIVIQ14 score reliably for the screening of CVD, at a cut-off score of less than 75 [5] remain to be identified? This is an ad hoc analysis of data for further development.

## Methodology

### *Study area and period*

The study was conducted at public hospitals for the intervention study. Participants were recruited from Chiangrai Prachanukroh hospital and Somdej Phrayan Sangworn Wiang Chai Hospital across a 6-month before trial from October 2015 to November 2016.

### *Study design and sample size*

This study was a prospective trial with the objective to recruit CVD patients. The planned sample size of 150 participants for the intervention trial was calculated as per the single population proportion formula assuming 5% marginal error and 95% confidence interval ( $\Delta=0.05$ ) with anticipated 35% higher responder as compared active with standard care.

### *Sampling technique and procedures*

A simple, convenient sampling accepting participants seeking treatment at the ambulatory clinics for their leg symptoms. Individual participants both gender age above 18 years old with leg symptoms were eligible in the selection criteria. The information and study details of the trials were given to all participants by two researcher nurses. Once participants agreed and signed informed consent, they were included. The sample size obtained data from 120 participants after exclusion of incomplete data of MOS scores for analysis.

### *Data collection*

The interviews for MOS assessments with either one of two MOS, disease-specific questionnaire (MOS CIVIQ14) or a general Health Survey (MOS SF12) separately. One researcher interviewed with MOS SF12 whereas other with MOS CIVIQ14.

All data collection obtained in case record form filed in hospital. Subsequently, participants were transferred to a surgeon for physical examination and diagnosed with CVD, classified and graded as per the descriptive Clinical, Etiologic, Anatomical, and Pathophysiological (CEAP) classifications [6]. Among 120 participants completed for screening, 42(35%) were diagnosed CVD, with CEAP Class1, 2. The general properties comparison of MOS CIVIQ14 score and MOS SF12 scores provided in Table 1.

### *Data collection tools and description*

The medical outcomes study (MOS) short-form health survey were data collection tools to obtain interview results. The original version of medical outcome study employing short form health survey was developed, validated for their psychometric properties regarding face validity, content and construct validity by original investigators [6,8-10]. The Thai version acquired from an original validated translation of MOS SF12 and MOS CIVIQ14. The MOS SF12, known as SF-12, was originally published by Ware et al. [7,8]. The MOS CIVIQ14, known as CIVIQ-14 was originally developed by Launois et al. [6,10]. Both questionnaires initially are a self-administered, however, in this investigation, the screening employed direct personal interviews by two different research nurses to ensure the correct understanding of questionnaires especially in case participants who cannot read. The original SF-12 estimates score for eight health concepts consisted of physical functioning, role physical, role emotional, and mental health, bodily pain, general health, vitality, and social functioning. There were two types of score, Physical Component Summary score (PCS) and Mental Component Summary score (MCS). The properties and scoring of SF-12 correlated with the SF-36 in diabetic food disease patients reported by Wukich DK et al. [12]. The CIVIQ-14 was a 14-item health survey questionnaires covered in three health dimensions, Physical (7-item), Pain (1-item), Psychological (6-item). The CIVIQ-14 scoring estimated score with five response choices. The CIVIQ-14 scores significantly correlated with the American Varicose Vein Questionnaire (AAVQ) reported by Kuet et al. [13].

### *Data and statistical analysis*

The objective of assessments of MOS CIVIQ14 was to analyse with descriptive exploratory statistics included (a) the comparison of MOS CIVIQ14 and MOS SF12 and its correlation (b) the correlation of MOS CIVIQ14 and MOS SF12 score with four-leg symptoms. (c) The reliability of scores with the Cronbach's alpha correlation coefficient for each item for MOS CIVIQ14. All data validated at research unit for analysis. The Statistical Package for Social Sciences (SPSS for Windows, version 17.0, SPSS Inc. Chicago, IL) used for all analysis. All independent and dependent variables analysis performed by (a) the Pearson correlation coefficient, with Bootstrap 1000 for bivariate correlation of two types of questionnaire. (b) the Correlation Matrix as analysis by factor analysis by dimension reduction of scale (c) the inter-class and intra-class correlation using the Cronbach's alpha correlation coefficient.

### *Ethical consideration*

The Ethical approval was obtained from the College of Public Health Sciences Chulalongkorn University and hospital ethical approval granted by Chiang Rai, Wiang Chai hospital for patient recruitment. Participants were well informed about the objective

**Table 1** Medical Outcomes Study – Short Form Health Survey Score, MOS SF12 and MOS CIVIQ14

Parameters	Physical Score		Psychological Score		Global Score	
	PCS	MOS CIVIQ	MCS	MOS CIVIQ	MOS	MOS
		Physical		Psychological	SF12	CIVIQ14
Mean ± SD	90.02±13.32	80.33±15.50	97.29±5.22	90.88±11.53	93.65±7.05	84.71±12.60
Min-Max	35.50-100	42.50-100	75-100	53.33-100	67.75-100	51.43-100
Range	64.50	57.50	25	46.67	32.25	48.57
Median	96.67	85.00	100.00	96.67	96.67	87.85
Standardized Cronbach's alpha coefficient	0.945	0.897	0.725	0.861	0.798	0.914
95% CI, ICC	0.921-0.954	0.867-0.922	0.560-0.746	0.785-0.867	0.756 -0.857	0.878 -0.928
*Correlation Coefficient	0.713		-0.062		0.745	
(95%CI)	(0.633 to 0.790),		(-0.197 to 0.091)		(0.640 to 0.819)	
p-Value	P<0.001**		P=0.501		P<0.001**	
<p>Note:</p> <p>.**p-Value with 95% Confidence Interval for a significant level &lt;0.001 with Pearson Correlation Coefficient</p> <p>ICC = Intra-Class Correlation denoted with 95% Confidence Interval for both lower and upper value</p> <p>*Pearson correlation coefficient performed with bivariate analysis with booth strap at N=1000.</p> <p>MOS CIVIQ Physical = Physical are 8 items inclusive of CIVIQ Pain items score MOS</p> <p>CIVIQ Psychological= Psychological are 6 items score</p> <p>PCS = Physical Component Summary score of SF-12,</p> <p>MCS = Mental Component Summary score of MOS SF12</p>						

of the study and provided informed consent before participation in the data collections. Their confidential data and privacy were strictly confidentiality throughout the study. No participant aged less than 18 were accepted.

## Results

### Scores of MOS CIVIQ14 and MOS SF12

Of all 120 participants, 42 patients (35%) were diagnosed CVD with CEAP stage 1 and CEAP stage 2. The mean (SD), min-max, ranges and median global score for MOS CIVIQ14 scores were 84.71(12.6), 51.43-100, 48.57 and 87.85 whereas physical score was 80.33 (15.50), 42.50-100, 57.50 and 85.00. The MOS CIVIQ14 tended to reflect 10 points less score than physical component summary (PCS) of MOS SF12 scores which reflected mean (SD) score of 90.0(13.3) and ranged from 35.5 to 100. Each of global score and physical score for both MOS CIVIQ14 and MOS SF12 significantly correlated, with bivariate Pearson correlation coefficient at 0.713 and 0.745 respectively despite a reversal with the negative correlation coefficient for the mental component summary (MCS) and MOS CIVIQ Psychological. The overall analysis results provided (Table 1).

### Leg symptoms with MOS CIVIQ14 and MOS SF12 score

Four leg symptoms complaints included leg pain 93/120 (77.5%), heavy leg 72/120(60%), leg swelling 57/120(47.5%) and burning sensation of leg 55/120(45.8%) were reported. There were two known co-morbidity hypertension 26/120 (21.7%) and musculoskeletal disease 18/120 (15.0%). In the context of leg symptoms, scores of both MOS CIVIQ14 and MOS SF12 were analyzed by factor analysis of correlation matrix (CM) with dimension reduction, assessed for correlation of score both MOS CIVIQ14 and MOS SF12 provided (Table 2). With the presence of leg pain, the mean(SD) scores for global index score or MOS CIVIQ14, 82.50(12.89) was at least 10-points lower as compared with MOS SF12, 93.14(7.72) although this two score was correlated (CM correlation coefficient of 0.762). In case of the physical score, MOS CIVIQ Physical, 77.50(15.37) was at least 10-points less than as compared with MOS SF12, 88.55(14.72). For all other leg symptoms, at least 10-points score of MOS CIVIQ14 less than MOS SF12 were noted. These were well correlated except for the psychological and mental components score (Table 2).

**Table 2** Correlation of medical outcomes study score with impact of leg symptoms

Health Related QOL Score	Pain Leg (N=93)		Heavy Leg (N=72)		Swelling Leg (N=57)		Burning Sensation (N=55)	
	Mean score (SD)	CM, p-Value	Mean score (SD)	CM, p-Value	Mean score (SD)	CM, p-Value	Mean score (SD)	CM, p-Value
MOS CIVIQ 14	82.50(12.89)	0.762, P<0.001	83.61(12.89)	0.723, P<0.001	82.15(14.15)	0.765, P<0.001	82.10(13.96)	0.787, P<0.001
MOS SF 12	93.14(7.72)		93.35(6.85)		92.28(8.29)		92.13(7.96)	
MOS CIVIQ - Physical	77.50(15.37)	0.722, P<0.001	79.30(15.29)	0.683, P<0.001	76.88(17.04)	0.715, P<0.001	78.09(17.45)	0.747, P<0.001
PCS	88.55(14.72)		89.45(13.08)		87.59(15.74)		87.60(15.63)	
MOS CIVIQ PSY	89.17(12.32)	-0.037, P=0.362	89.35(12.59)	-0.050, P=0.340	89.18(12.80)	-0.024, P=0.431	88.18(13.14)	-0.144, P=0.147
MCS	97.73(4.78)		97.25(4.83)		96.97(5.24)		96.66(5.85)	

Note: CM = Correlation Matrix as analysis by factor analysis by dimension reduction of scale  
MOS CIVIQ-14=Global CIVIQ-14 score,  
MOS SF -12 = Global SF-12 score,  
MOS CIVIQ Physical Score = MOS CIVIQ-14 Pain+ Physical score  
PCS = Physical Component Summary score of MOS SF-12,  
CIVIQ PSY = Psychological Score of MOS CIVIQ-14,  
MCS = Mental Component Summary score of MOS SF-12

**InterScale/Intra-Class Cronbach's alpha correlation coefficient of MOS CIVIQ14**

The reliability correlation of MOS CIVIQ14 score employed an exploratory analysis for the stability of scores by inter-class and internal consistency reliability intra-class correlation with Cronbach's alpha coefficient. For MOS CIVIQ14, the average mean score from item CV1 to CV8 was ranged from 72 to 81.83. Pain score was ranged from 72 and less. Each of individual item score of CV2, CV4, CV6, CV7 and CV8 all reflected higher Cronbach's alpha correlation coefficient above 0.7 against the global score. Each of individual item with inter-scale correlations and internal consistency Cronbach's alpha coefficient were provided (Table 3).

**Discussion**

In this analysis, 96/120(84%) were women. Disturbance leg symptoms were major causes that bring the patient to seek treatment. The probable systematic bias for patient-centred outcomes in this investigation could be partly improved since interviews and assessments were conducted by two individual researchers employing different questionnaires (different MOS) independently. The study was not primarily set to investigate the sensitivity and specificity of the medical outcomes study. However,

in circumstance, the prevalence study in Thailand employing the global index score cut-off point lower than 75 among hair-dressers had reported CVD prevalence of 18.7% which may result in fewer patients or true negative [14].

On the contrary, the same noted that an investigation of CIVIQ-14 among Croatian reported that the median, 5th-95th percentile ranges of global score of CIVIQ-14 at 86, 50-100 which indicated clinical CVD CEAP stage 1 and CEAP stage 2 [15] which was a higher score in line with this data analysis among Thai population. Therefore, necessarily there is a need to develop better predictive score in the Thai population, should the MOS CIVIQ14 be employed for primary screening for CVD. Since the investigation initiated with independent patient interviews separated from clinical diagnosis by a specialist, this procedure should be more reliable [16]. The physical components score of MOS CIVIQ14 Physical and the physical component summary score, PCS reflected with Cronbach's alpha higher at 0.867 and 0.939 whereas psychological components MOS CIVIQ14 Psychological and the mental component summary score, MCS at 0.787 and 0.661. These results were different from the West such as the Bonn vein study [17,18] when the psychic component was higher than physical component rated as of 0.73 Vs 0.67, as urged by authors, probably due to the ageing group.

In this investigation, the physical score for both MOS

**Table 3** The inter-scale correlations and internal consistency reliability (Cronbach's alpha coefficients, on the diagonal) of the MOS CIVIQ14

Type	Item	CV1	CV2	CV3	CV4	CV5	CV6	CV7	CV8	CV9	CV10	CV11	CV12	CV13	CV14	CIVIQ14
P A I N	CV1	1.000														
	CV2	0.641	0.641													
	CV3	0.504	0.529	0.504												
P H Y S	CV4	0.396	0.519	0.490	0.396											
	CV5	0.239	0.298	0.280	0.574	0.239										
	CV6	0.271	0.449	0.337	0.641	0.430	0.271									
	CV7	0.258	0.467	0.388	0.580	0.392	0.649	0.258								
	CV8	0.323	0.438	0.372	0.634	0.430	0.663	0.676	0.323							
P S Y C H	CV9	0.405	0.553	0.610	0.447	0.277	0.323	0.422	0.403	0.405						
	CV10	0.428	0.578	0.483	0.414	0.249	0.488	0.413	0.523	0.619	0.428					
	CV11	0.058	0.077	-0.001	0.013	0.076	0.033	0.073	-0.017	0.130	0.181	0.058				
	CV12	0.349	0.518	0.401	0.413	0.169	0.344	0.379	0.452	0.630	0.338	0.338	0.349			
	CV13	0.178	0.308	0.361	0.353	0.231	0.251	0.398	0.336	0.291	0.077	0.077	0.426	0.178		
	CV14	0.331	0.419	0.293	0.451	0.349	0.368	0.561	0.529	0.341	0.028	0.028	0.515	0.520	0.331	
G L O B	CIVIQ14	0.585	0.734	0.651	0.773	0.583	0.701	0.730	0.761	0.693	0.211	0.211	0.687	0.519	0.659	1.000

Note:

PHYS=Physical, PSYCH=Psychological, GLOB=Global CIVIQ14 score, CV=CIVIQ Item no.,  
 CVQ 14 =CIVIQ 14 total score, CA =Cronbach's alpha coefficient  
 PAIN=CV1 Pain in the leg, CV2 Impairment at work, CV3 Sleeping poorly, 3 items CA=0.791  
 PHYSICAL=CV4 Climbing several floors, CV5 Squatting /  
 Kneeling, CV6 Walking at a good pace, CV7 Going to party, CV8 Performing athletic activities, 5-item CA=0.867  
 PSYCHOLOGICAL=CV9 Feeling nervous, CV10  
 Having the impression of being a burden, CV11 Being embarrassed to show  
 legs, CV12 Becoming easily irritable, CV13 Having the impression of being  
 disabled, CV14 Having no desire to go out, 6-item CA= 0.787 Global CIVIQ 14 score, 14-item, CA = 0.940

CIVIQ14 and MOS SF12 were reliable with Cronbach's alpha of 0.949 and 0.897 and significantly correlated with mean, 95% CI of Pearson correlation coefficient of 0.713 (0.633 to 0.790),  $p < 0.001$ . Moreover, a global score of the same reflected a Cronbach's alpha of 0.798 and 0.914, with a Pearson correlation coefficient of 0.745 (0.640 to 0.819),  $p < 0.001$ . We observed that only physical score of MOS CIVIQ14 demonstrated similar patterns as its global score in Table 1. The CIVIQ-14 and CIVIQ-20 reliability was also reliable interchangeably as conducted and proposed by Lozano et al. [19], with a high correlation coefficient of 0.81 among diagnosed CVD patients may have similar impacts from the psychological score. Although, CIVIQ-14 score strongly correlated with Venous Clinical Severity Score [20-22].

Moreover, an epidemiology survey with symptoms-based using CIVIQ-14 as a comparison against a GP-screened of CVD patients were reported reliable by Van der Velden et al. [23], These scores should be interpreted with a definitive clinical diagnosis of CVD. These observations were similar in an assessment attempted by Biemans AAM et al. which confirmed the high correlation of CIVIQ-14 and SF-12 for global score and physical component summary score whereas moderately correlate for psychological or mental component summary [24]. In the current circumstance, Thailand per se when CVD patient does not seek early medical treatment meanwhile clinical diagnosis need to be performed in a hospital setting, larger heterogeneous sample need to be defined for research validity to support the use of MOS CIVIQ14 especially their level cut-off score for supporting for diagnosis of CVD.

## Conclusion

The medical outcomes study with short-form health survey were beneficial to detect patients at large for early treatment. A 14-item short-form health-survey for chronic venous insufficiency (MOS CIVIQ14) reflected a reliable scoring, correlated for scoring on physical function especially four leg symptoms but not psychological symptoms. The specific cut-off score of MOS CIVIQ14 use for screening for CVD patients should be determined in large heterogeneous population as a standardised diagnosis study protocol if this should be employed for primary screening of chronic venous disease.

## Limitation

Participants in this investigation maybe perceived, though not yet definitively confirmed the diagnosis as CVD patients by a physician at the time of interviews and therefore could inevitably causing recall bias. The participants recruited in a hospital setting may expose the higher risk of recall bias for psychological components of the score. Since, this study was not planned for a diagnostic test of sensitivity or specificity of the use of health survey, which may demand larger sufficient sample size and in a different population, as such real scores may be different from this ad hoc analysis.

## Authors' contributions

AU: conceived, designed the protocol, trained the researcher associate, monitored data collection, analysed the data and wrote the first manuscript.

NK: conceived, designed, obtained research funds, editing the manuscript and advising the whole research paper.

PP: conceived, supervise research associate, recruiting participants, validated the data and manuscript. All authors read and approved the final manuscript.

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## Competing Interests

This manuscript maintains no competing financial interest declaration from any person or organization and no conflict of interest involved in the outcomes of the finding.

## Availability of data and materials

The datasets generated and analyzed during the current study are part of the full dataset of registered intervention trial and shall be available at corresponding author on reasonable request.

## Consent to publish

Not applicable.

## Ethics approval and consent to participate

Ethical approval was obtained from the college of public health sciences Chulalongkorn university and Chiang Rai, Wiang Chai hospital for patient access. Participants were well informed about the objective of the study and provided informed consent before participation in the data collection; their data privacy was kept as confidentiality throughout the study.

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