

Reviewer ID: Zoe Raffard, John Zhu, Jeremy Mak, Kyle Diab, Gurmaan Gill			
Type of Outcome Measure: Craig Handicap Assessment and Reporting Technique (CHART) & CHART-Short Form (CHART-SF)			Total articles: 12
Author ID Year	Study Design	Setting	Population (sample size, age) and Group
Cusick 2001	Reliability study: level of agreement between proxies and persons with disabilities in reporting on CHART	Participants living in the community 6 months after onset of disability or completion of rehab.	N=983 and their proxies 57% participants were men 61% of proxies were women (43% of proxies were participant's spouse) Disabilities (reported separately) resulting from: SCI (224), MS (235), Traumatic brain injury (199) Stroke (177), Amputation (83), Burn (65),
Dijkers 1999	Follow-up survey comparing CHART to Satisfaction with Life Scale (SWLS)	1-20 years post-injury Followed up with SCI care	N=2183 (1766M, 417F) 19% <19 years 37% 20-29 years 20% 30-39 12% 40-49 12% >50yrs. Records from the National SCI database, containing entries since 1973.
Golhasani-Keshtan et al. 2013	Cross-sectional validation of Persian Version of CHART	Janbazan Clinic of Mashhad, northeast of Iran	N=52, 52M 0F Mean age 49.3, SD=7.9, 38~80 Iran-Iraq war veterans with long-term spinal cord injuries (23-31 years post-injury), 46 paraplegia, 6 tetraplegia 76.9% unemployed
Hall et al. 1998	Analysis of SCI Model Systems database: CHART follow-up at 1, 2, 5 years post-injury Data used for this analysis was at one time point: April 1997	No data available	N=1,998 81.5% males 67% <31 years of age 21% 21-40 22% >41 Traumatic Spinal Cord Injury with inpatient rehabilitation services: 18% high tetraplegia 34% low tetraplegia 48% paraplegia
Johnston et al. 2005	Cross-sectional survey	New Jersey Outpatient SCI Center	N=107 (88M, 19F) Mean age 39.1(11.16) Median age 38.0 Mean post-injury time: 11.36(9.56) yrs Median post-injury time: 8.71 yrs Community-living traumatic SCI individuals AIS-A/B/C/D: 56.4%/20.2%/14.9%/8.5%

			Neurologic Category: Tetraplegia complete: 38.7% Tetraplegia incomplete: 15.1% Paraplegia complete: 37.6% Paraplegia incomplete: 8.6%
Masedo et al. 2005	Reliability and validity (comparison to the self-report Functional Independence Measure (FIM)) studied: double blind/randomized trials.	Harborview Medical Center and University of Washington's Northwest Regional SCI System	SCI clinical trial of amitriptyline for pain: n=84 subjects; 44 given amitriptyline, 40 given an active placebo. Avg. age; 41.43±10.02 years, 80% Men. Mean time since injury was 13.96 yrs (SD = 9.36 yrs) Neurological level of injury: 53.6% cervical 38.1% thoracic 7.1% lumbar/sacral
Middleton et al. 2003	Descriptive, correlational study, validation study of a new instrument	Moorong Spinal Unit of the Royal Rehabilitation Centre Sydney, Sydney, New South Wales, Australia.	Sample 1: People with SCI living in the community who previously were at in-patient rehabilitation N=36, 28 male Mean age 36.33 (SD = 9.52) Mean time post-trauma 11.23 (SD = 9.67) years 11 paraplegia, 25 tetraplegia 15 incomplete, 21 complete Sample 2: People who had recently sustained a SCI and were currently enrolled at in-patient rehabilitation N=31, 23 male Mean age 31.48 (SD = 10.46) Mean time post-trauma 2.01 (SD = 2.50) months 21 paraplegia, 10 tetraplegia 13 incomplete, 18 complete Sample 3: People with SCI living in the community who previously were at in-patient rehabilitation N=108, 30 male Mean age 45.26 (SD = 15.99) Mean time post-trauma 7.92 (SD = 9.83) years 66 paraplegia, 42 tetraplegia 58 incomplete, 49 complete
Tozato 2005	Test-retest and discriminative validity study.	NRCD, Japan	293 participants in validity study; upper age limit =60 years old; 246M, 47F, avg. age = 38.3 years 54 participants in test-retest measure; 45M, 9F; avg. age = 42.5 years mean time since injury = 8.7 (SD = 6.6) 926 SCI discharged from the National Rehabilitation Center for the Disabled (NRCD) between 1992 – 2001 meant
Whiteneck 1992	Design and development of CHART: psychometric evaluation. & weighting scheme	2-35 years post recovery living in the community	135 SCI individuals; 16% Women Avg. age = 33. range 16-74 41 complete quadriplegia,

			38, incomplete quadriplegia, 42 complete paraplegia, 14 incomplete paraplegia <u>Rehab professional rating</u> 65 low level handicap 70 high handicap
de Wolf et al. 2010	Longitudinal study exploring reliability, validity, sensitivity to change and clinical usefulness of the CHART	Three SCI rehabilitation units in Sydney, Australia (Royal Rehabilitation Centre Sydney; Royal North Shore Hospital; and Prince of Wales Hospital)	N=58 (control n=29; intervention n=29) (45 male, 13 female) Mean age: 35.3±15.2y Traumatic SCI <i>Lesion Level</i> Paraplegia: 25 Tetraplegia: 33 <i>Impairment Grade</i> AIS A: 33 AIS B: 4 AIS C: 5 AIS D: 16
Gontkovsky et al. 2009 (CHART-SF)	Correlational analysis, single session study for CHART-Short Form	Tertiary care rehab centers (Inpatient rehabilitation at Methodist Rehabilitation Center)	N= 28, 75 % male Mean age = 42 ±17 57% at their 1-year follow up 29% at their 2-year follow up 14% at their 3-year follow up 90% traumatic SCI 68% incomplete SCI 32% complete SCI AIS Classification 32.1% A 32.1% B 14.4% C 21.4% D Level of Injury 60.7% Cervical 35.7% Thoracic 3.6% Lumbar
Walker et al. 2003	Cross-sectional analysis	Colorado, USA	N SCI = 236, 75% male

1. RELIABILITY

Author ID	Internal Consistency	Test-retest, Inter-rater, Intra-rater, Other
Cusick 2001	No data available	Participant-proxy Total CHART: ICC =0.84 Physical Independence: ICC=0.69 Cognitive Independence: ICC=0.34 Mobility: ICC=0.86 Occupation: ICC=0.60 Social Integration: ICC=0.57

		Economic Independence: ICC=0.59
Golhasani-Keshtan et al. 2013	Cronbach's alpha: Physical Independence: 0.385 Mobility: 0.236 Occupation: 0.293 Cognitive Independence: 0.562 Social Integration: 0.351	
Tozato 2005	No data available	Test-retest reliability with 21-25 day interval (Pearson's r): CHART-J total score r=0.78, p<0.001; Physical independence r=0.53, p<0.001; Mobility r=0.96, p<0.001; Occupation r=0.86, p<0.001 Social Integration r=0.78, p<0.001 Economy r=1.00, p<0.001
Whiteneck 1992	No data available	CHART administered by same examiner twice (1 week apart) to each subject test-retest reliability coefficient = 0.93 for overall CHART score. <u>Individual dimensions:</u> <ul style="list-style-type: none"> • physical dimensions 0.92 • mobility 0.95, • occupation 0.89 • economic self-sufficiency 0.80, • social integration 0.81. Subject-proxy , r=0.83 for total chart score. <u>Individual dimensions:</u> <ul style="list-style-type: none"> • physical dimensions 0.8 • mobility 0.84, • occupation 0.81 • economic self-sufficiency 0.69, • social integration 0.29. (p<0.001) <p>better agreement when proxy lives with subject (social integration 0.57)</p> <p>Item separation defined 11 statistically distinct handicap strata. Item separation reliability = 0.99, indicating a well calibrated scale.</p>
Walker et al. 2003		Test retest: ICC: 0.87
2. VALIDITY		
Author ID	Validity	
De Wolf et al. 2010	Spearman rank-order correlation coefficients between CHART domains and SPRS & SF-6D domains: Sydney Psychosocial Reintegration Scale (SPRS)	

	<p><i>SPRS Occupation with CHART:</i> Physical: 0.34** Mobility: 0.64** Occupation: 0.57** Social: 0.36** Cognitive: 0.09</p> <p><i>SPRS Relationships with CHART:</i> Physical: 0.22 Mobility: 0.23 Occupation: 0.28* Social: 0.17 Cognitive: 0.13</p> <p><i>SPRS Living skills with CHART:</i> Physical: 0.70** Mobility: 0.64** Occupation: 0.50** Social: 0.28* Cognitive: 0.12</p> <p>Short Form-6D</p> <table border="0"> <tr> <td><i>CHART Physical with SF-6D:</i></td> <td><i>CHART Mobility with SF-6D:</i></td> <td><i>CHART Occupation with SF-6D:</i></td> <td><i>CHART Social with SF-6D:</i></td> <td><i>CHART Cognitive with SF-6D:</i></td> </tr> <tr> <td>Physical: -0.71**</td> <td>Physical: -0.46**</td> <td>Physical: -0.46**</td> <td>Physical: -0.19</td> <td>Physical: -0.22</td> </tr> <tr> <td>Role: -0.23</td> <td>Role: -0.19</td> <td>Role: -0.06</td> <td>Role: 0.06</td> <td>Role: -0.12</td> </tr> <tr> <td>Social: -0.22</td> <td>Social: -0.25</td> <td>Social: -0.25</td> <td>Social: 0.00</td> <td>Social: -0.03</td> </tr> <tr> <td>Pain: -0.17</td> <td>Pain: -0.21</td> <td>Pain: -0.12</td> <td>Pain: 0.08</td> <td>Pain: -0.31*</td> </tr> <tr> <td>Mental: -0.19</td> <td>Mental: -0.27*</td> <td>Mental: -0.18</td> <td>Mental: 0.04</td> <td>Mental: -0.13</td> </tr> <tr> <td>Vitality: -0.22</td> <td>Vitality: -0.33*</td> <td>Vitality: -0.26</td> <td>Vitality: -0.14</td> <td>Vitality: 0.04</td> </tr> </table> <p>*p<0.05, **p<0.001</p> <p>SPRS showed significant correlation coefficients with CHART (r=0.72, p<0.001). A moderate and statistically significant correlation coefficient was found between the Community Integration Measure (CIM) and CHART total (r=0.47, p<0.001).</p> <p>Time 1 = 6 weeks post-discharge from inpatient rehabilitation Time 2 = 1 year post-discharge Intervention = Received support from a coordinator to improve community reintegration after SCI. Used a whole of life approach which incorporated individualised support, liaising on behalf of the individual, and planning for the future.</p> <p>Sensitivity to change of CHART (intervention group): Time 1: 408.2±50.1 Time 2: 431.6±57.4</p> <p>Results showed a statistically significant improvement between Time 1 and Time 2 for CHART (p=0.002).</p>	<i>CHART Physical with SF-6D:</i>	<i>CHART Mobility with SF-6D:</i>	<i>CHART Occupation with SF-6D:</i>	<i>CHART Social with SF-6D:</i>	<i>CHART Cognitive with SF-6D:</i>	Physical: -0.71**	Physical: -0.46**	Physical: -0.46**	Physical: -0.19	Physical: -0.22	Role: -0.23	Role: -0.19	Role: -0.06	Role: 0.06	Role: -0.12	Social: -0.22	Social: -0.25	Social: -0.25	Social: 0.00	Social: -0.03	Pain: -0.17	Pain: -0.21	Pain: -0.12	Pain: 0.08	Pain: -0.31*	Mental: -0.19	Mental: -0.27*	Mental: -0.18	Mental: 0.04	Mental: -0.13	Vitality: -0.22	Vitality: -0.33*	Vitality: -0.26	Vitality: -0.14	Vitality: 0.04
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<p>Dijkers 1999</p>	<p><i>CHART scores were associated with those for the Satisfaction With Life Scale (SWLS).</i></p> <p>ANOVA and Eta². All four CHART subscales were significantly correlated to SLWS scores</p> <ul style="list-style-type: none"> • Physical independence score Eta²= 0.14, F= 85.17, df=4 (p<0.001) • Mobility score Eta²= 0.11, F= 159.18, df=3 (p<0.001) • Social integration score Eta²= 0.11, F= 84.3, df=3 (p<0.001) • Occupation score Eta²= 0.14, F= 85.18, df=4 (p<0.001) 																																			
<p>Golhasani-Keshtan et al. 2013</p>	<p>Pearson's correlations: CHART Mobility & SF36 Role Physical: 0.322, p=0.020 CHART Cognitive Independence & SF36 Physical Component Summary: 0.276, p=0.047 CHART Social Integration & SF36 Vitality: -0.429, p=0.002 CHART Social Integration & SF36 Social Functioning: 0.287, p=0.039</p>																																			
<p>Hall et al. 1998</p>	<p><u>Correlations:</u> GENDER</p>																																			

	<ul style="list-style-type: none"> • Gender and Mobility Subscales was significant $r=-0.06$ ($p\leq 0.05$) • Males were significantly more mobile than Females $t=2.998$ ($p<0.01$) <p>AGE</p> <ul style="list-style-type: none"> • Age and all Subscales were significant $r= -0.20$ to -0.10 ($p\leq 0.0001$) <p>INJURY</p> <ul style="list-style-type: none"> • Injury level and all Subscales, except economic self-sufficiency, were significant $r=0.11$ to 0.45, ($p\leq 0.0001$) • Completeness of injury and all Subscales, except social integration, were significant $r=0.07$ to 0.17 ($p\leq 0.05$) • Years since injury and Subscales $r=0.09$ to 0.21 ($p\leq 0.0001$) <p>RACE/ETHNICITY</p> <ul style="list-style-type: none"> • Race/ethnicity and all Subscales $r=0.12$ to 0.34 ($p\leq 0.0001$) <p>EDUCATION/OCCUPATION</p> <ul style="list-style-type: none"> • Education and Subscales $r=0.12$ to 0.33 ($p\leq 0.0001$) • Occupation and Subscales $r=0.24$ to 0.60 ($p\leq 0.0001$) <p>MARITAL STATUS</p> <ul style="list-style-type: none"> • Marital status and all Subscales, except physical independence and mobility, were significant $r=0.08$ to 0.32 ($p\leq 0.05$)
Johnston et al. 2005	<p>Pearson's correlation between ASIA Motor Score and:</p> <p>CHART Total: 0.07 ($P=0.54$) CHART Physical Total: 0.46 ($P=0.001$) CHART Mobility Total: 0.04 ($P=0.75$) CHART Occupational Total: -0.11 ($P=0.37$) CHART Social Interaction Total: -0.22 ($P=0.06$) CHART Economic Total: -0.04 ($P=0.72$)</p>
Masedo et al. 2005	<p>Correlations of the CHART with FIM-SR were positive, as expected: CHART total score: $r=0.26$ ($p<0.01$) CHART mobility subscale: $r=0.30$ ($p<0.01$) CHART physical subscale: $r=0.49$ ($p<0.01$)</p> <p>Almost all subscales of the FIM-SR had moderate and significant correlations ($p<0.005$, $p<0.001$) with CHART subscales; support provided for the motor scales of FIM-SR, with the exception of locomotion subscale of FIM-SR which did not correlate significantly with the Physical Independence subscale of the CHART.</p>
Tozato 2005	<p>Validity (compared score differences between employed and unemployed) acceptable in all domains, with exception of Social integration. Employed respondents exhibited significantly higher sub scores than unemployed respondents in all CHART subscales except Social Integration</p> <p>CHART-J total score $t=11.39$, $p<0.0001$; Physical independence $t=4.795$, $p<0.0001$; Mobility $t=11.092$, $p<0.0001$; Occupation $t=15.030$, $p<0.0001$ Social Integration $t=0.997$ $p=0.319$ Economy $t=3.799$, $p<0.0001$</p>
Whiteneck 1992	<p>Significantly different CHART scores between high & low level of handicap groups support the validity of the CHART</p> <p>CHART total score $t=6.36$, $p<0.001$</p> <p>subscales:</p> <ul style="list-style-type: none"> • physical independence $t=4.54$, $p<0.001$ • mobility $t=3.89$, $p<0.001$ • occupation $t=6.8$, $p<0.001$, social integration $t=2.02$, $p<0.05$
Middleton et al. 2003	<p>Spearman correlations of Moorong Self-Efficacy Scale with (Sample 1 only, N=36): CHART physical (N=29): -0.07 ($P>0.05$)</p>

	CHART mobility: 0.15 (P>0.05) CHART occupational: 0.47 (P<0.05) CHART social: -0.24 (P>0.05)																																																						
Gontkovsky et al. 2009 (SF)	Convergent validity: <ul style="list-style-type: none"> Adequate to Excellent correlation between the Community Integration Questionnaire (CIQ) and CHART total scores (see table below) Poor to Adequate correlation between CIQ and CHART domains <table border="1"> <thead> <tr> <th colspan="5">CHART-SF and CIQ Correlations:</th> </tr> <tr> <th rowspan="2"></th> <th colspan="4">CIQ</th> </tr> <tr> <th>Home Integration</th> <th>Social Integration</th> <th>Productive Activity</th> <th>Total</th> </tr> </thead> <tbody> <tr> <td>CHART-SF</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Physical Independence</td> <td>0.55**</td> <td>0.01</td> <td>0.14</td> <td>0.33</td> </tr> <tr> <td>Cognitive Independence</td> <td>0.57**</td> <td>0.43*</td> <td>0.07</td> <td>0.53**</td> </tr> <tr> <td>Mobility</td> <td>0.52**</td> <td>0.68**</td> <td>0.39*</td> <td>0.73**</td> </tr> <tr> <td>Occupation</td> <td>0.56**</td> <td>0.46*</td> <td>0.41*</td> <td>0.64**</td> </tr> <tr> <td>Social Integration</td> <td>0.47*</td> <td>0.77**</td> <td>0.34</td> <td>0.73**</td> </tr> <tr> <td>Economic Self-Sufficiency</td> <td>0.25</td> <td>0.01</td> <td>0.37</td> <td>0.24</td> </tr> <tr> <td>Total</td> <td>0.74**</td> <td>0.57**</td> <td>0.42*</td> <td>0.79**</td> </tr> </tbody> </table> <p>*p < 0.05 **p < 0.01 CIQ = Community Integration Questionnaire</p>	CHART-SF and CIQ Correlations:						CIQ				Home Integration	Social Integration	Productive Activity	Total	CHART-SF					Physical Independence	0.55**	0.01	0.14	0.33	Cognitive Independence	0.57**	0.43*	0.07	0.53**	Mobility	0.52**	0.68**	0.39*	0.73**	Occupation	0.56**	0.46*	0.41*	0.64**	Social Integration	0.47*	0.77**	0.34	0.73**	Economic Self-Sufficiency	0.25	0.01	0.37	0.24	Total	0.74**	0.57**	0.42*	0.79**
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3. RESPONSIVENESS – no data available

4. FLOOR/CEILING EFFECT

Author ID	Floor/Ceiling Effect
De Wolf et al. 2010	No floor effects. Ceiling effects occurred for the Social and Cognitive dimensions at both 6 weeks post-discharge from inpatient rehabilitation (57-66% and 65-66%, respectively) and 1-year post discharge (44-66% and 84-86%, respectively).

Hall et al. 1998	Percentage of sample who received maximum score on CHART subscales
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Subscale	AIS A, B, or C			AIS D
	High tetra	Low tetra	Para	All
Physical Independence	6 (14)	18 (89)	56 (442)	63 (213)
Mobility	13 (34)	34 (172)	49 (393)	55 (189)
Occupational status	10 (27)	23 (117)	34 (270)	36 (125)
Social integration	39 (103)	45 (224)	45 (341)	52 (172)
Economic self-sufficiency	44 (56)	41 (113)	49 (225)	62 (123)

5. INTERPRETABILITY

Author ID	Interpretability
De Wolf et	MDC = 53.3 between Time 1 (6 weeks post-discharge from inpatient rehabilitation) and Time 2 (1 year post-

al. 2010	discharge) The percentage of participants that met the minimum difference for CHART: 14%				
Hall et al. 1998	Subscale:	AIS A,B, or C High tetraplegia: Mean (SD) [n]	AIS A,B, or C Low tetraplegia: Mean (SD) [n]	AIS A,B, or C Paraplegia: Mean (SD) [n]	AIS D All: Mean (SD) [n]
	Physical Independence	49.9 (30.4) [253]	71.8 (28.3) [498]	90.3 (19.8) [787]	90.7 (20.6) [340]
	Mobility	58.5 (28.0) [267]	76.0 (25.6) [513]	85.5 (21.0) [804]	86.2 (22.4) [346]
	Occupational status	34.5 (32.9) [270]	51.0 (36.9) [512]	61.8 (35.5) [793]	62.1 (36.5) [347]
	Social integration	78.7 (25.6) [261]	83.5 (23.1) [493]	85.6 (20.4) [760]	86.7 (20.2) [331]
	Economic self-sufficiency	59.6 (40.7) [128]	62.0 (36.7) [274]	66.0 (37.6) [460]	77.6 (32.0) [201]
	Total score	294.1 (101.4) [116]	369.2 (89.9) [259]	404.1 (87.5) [419]	420.5 (85.3) [186]
Tozato et al. 2005	CHART-J (Japanese version) mean (SD) scores and SEM:				
	Domain:	Mean (SD) CHART-J score:	SEM (calculated from data in this article):	MDC (calculated from data in this article):	
	Physical independence	93 (12)	8.2	22.8	
	Mobility	77 (25.9)	5.2	14.4	
	Occupation	56.8 (39.6)	14.8	41.1	
	Social Integration	76.4 (24.7)	11.6	32.1	
	Economy	75.5 (28.1)	0	0	
CHART-J total score:	378.7 (86.8)	40.7	112.9		
Gontkovsky et al. 2009 (SF)	Published data for CHART-Short Form:				
	Subscale:	Mean (SD):	Range:		
	Physical Independence	47.0 (44.2)	4-100		
	Cognitive Independence	66.5 (36.4)	0-100		
	Mobility	69.6 (30.7)	17-100		
	Occupation	38.3 (39.4)	0-100		
	Social Integration	72.8 (35.2)	0-100		
	Economic Self-Sufficiency	38.4 (33.2)	0-100		
Total	332.6 (145.8)	36-580			