Intrinsic capacity and its bi-directional association with medication adherence among community-dwelling older adults: a longitudinal study

(社區長者的內在能力及用藥遵從性的關聯: 縱貫性研究)

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Source: United Nations (2022a).

Introduction



Disease-free is not always the priority → Shifting from disease-centered to Patient Goals-directed care

Tinetti, M. E., Naik, A. D., & Dodson, J. A. (2016). Moving From Disease-Centered to Patient Goals-Directed Care for Patients With Multiple Chronic Conditions: Patient Value-Based Care. JAMA Cardiol, 1(1), 9-10. doi:10.1001/jamacardio.2015.0248

Introduction

- Functional ability consists of the intrinsic capacity of the individual, relevant environmental characteristics and the interaction between them.
- Intrinsic capacity (IC) comprises all the mental and physical capacities that a person can draw on and includes their ability to walk, think, see, hear and remember.





Literature review

Study	Aim	Design	Measurement	Results
Meng et al. (2022)	IC → Med use (EPP, PIM, ADR)	Cross-sectional N = 37,993	IC: ICOPE Med use: self-report, NHI	 5 patterns: robust (59.4%), visual impairment (17.7%), PCS impairment (12.3%), DC impairment (7.7%), and all domains (2.9%) DC (EPP: aOR 4.35 [3.52–5.39]; PIM: aOR 2.73 [2.46–3.02]) "All domains impaired" (EPP: aOR 9.02 [7.16–11.37]; PIM: aOR 3.75 [3.24–4.34])
Lee et al. (2024)	IC → Adherence	Cross-sectional N = 894	IC: ICOPE Adherence: ARMS	 3 patterns: : "Overall low IC", PND and CPH. PND was significantly associated with non-adherence (aOR 1.66 [1.01–2.73]) Cognitive impairment: aOR 1.53 [1.03–2.27]; hearing loss: aOR 1.57 [1.03–2.37]; depression: aOR 1.81 [1.17–2.80]

aOR (95% CI), IC: intrinsic capacity, EPP: excessive polypharmacy, PIM: potential inappropriate medication, ADR: adverse drug reactions, PCS: physical-cognitivesensory, DC: depression-cognitive, PND: physical-cognitive-depression

Research gap

- Cross-sectional study \rightarrow Unable to assess temporal association
- Lack of study to examine the bi-directional relationship between IC and medication adherence

Objectives

- 1. To describe the characteristics, IC, and medication adherence of study population.
- 2. To examine the bi-directional association between IC and medication adherence.



Study design: Retrospective cohort study
Timeline: 2022 – 2023
Data source: Integrated Care Plan for Older Adults Project
Location: NCKU hospital, mobile hospitals in Tainan
Data collection: Face-to-face interview
Follow-up time: 1 year (2 time points)



Measurement tools

Intrinsic capacity

Integrated Plan for Older People framework (ICOPE) Evaluate 6 domains (cognition,

Evaluate 6 domains (cognition locomotion, vitality, vision, auditory, and psychosocial decline) through 2 screening stages:

- Initial screening: identify potential issues
- In-depth evaluation: for respective impairments



Measurement tools

• Medication adherence

Adherence to Refills and Medications (ARMS) Adherence with filling medications

Adherence with taking medications

12	16	Low adherent

	Question	Never	Sometimes	Usually	Aiways
	1. How often do you forget to take your	1	2	3	4
	medicine? (In the past 1 week)	(Never)	(1-2 times)	(3-4 times)	(≥ 5 times)
	2. How often do you decide not to take	1	2	3	4
	your medicine? (In the past 1 week)	(Never)	(1-2 times)	(3-4 times)	(≥ 5 times)
	3. How often do you forget to refill your	1	2	3	4
	medicine? (In the past 3 months)	(Never)	(1-2 times)	(3-4 times)	(≥ 5 times)
	4. How often do you run out of medicine?	1	2	3	4
	(In the past 3 months)	(Never)	(1-2 times)	(3-4 times)	(≥ 5 times)
	5. How often do you skip a dose of your	1	2	2	1
	medicine before you go to the doctor? (In	(Novor)	2 (Opeo)		(> 2 timos)
	the past 3 months)	(Never)	(Once)	(Twice)	(≥ 3 times)
	6. How often do you miss taking your	1	2	3	Λ
	medicine when you feel better? (In the	(Nover)	$(1_2 times)$	(3_1 times)	(> 5 times)
	past 1 week)	(146761)	(1-2 (11165)	(3-4 times)	(2 5 times)
	7. How often do you miss taking your	1	2	3	1
าร	medicine when you feel worse? (In the	(Novor)	$(1_2 times)$	(3_1 times)	(> 5 times)
	past 1 week)		(1-2 (11103)	(0-4 (11103)	(£ 0 times)
	8. How often do you miss taking your	1	2	З	Δ
	medicine when you are careless? (In the	(Never)	$(1_2 times)$	(3_1 times)	(> 5 times)
	past 1 week)		(1-2 (11103)	(0-4 (11103)	(= 0 times)
	9. How often do you change the dose of	1	2	3	4
	your medicine to suit your needs? (In the	(Never)	(1-2 times)	(3-4 times)	(> 5 times)
	past 1 week)		(12 (1103)	(0 1 (11103)	(= 0 till03)
48	10. How often do you forget to take your				
-•	medicine when you are supposed to take	1	2	3	4
	it more than once a day? (In the past 1	(Never)	(1-2 times)	(3-4 times)	(≥ 5 times)
	week)				
	11. How often do you put off refilling your	1	2	3	4
	medicines because they cost too much	(Never)	(Once)	(Twice)	$(\geq 3 \text{ times})$
	money? (In the past 3 months)	((0.100)	((
	12. How often do you plan ahead and refill	4	3	2	1
	your medicines before they run out?** (In	(Never)	(Once)	(Twice)	(^{≜1} 3 times)
	the past 3 months)			()	(

Aim 1: To describe the characteristics, IC, and medication adherence of study population.

Chi-squared tests and t-tests were conducted to comparing categorical variables and continuous variables

Aim 2: To examine the bi-directional association between IC and medication adherence

To use Generalized estimating equation (GEE) to examine the temporal relationship

Aim 3: To compare difference between LTFU and complete case samples



Baseline characteristics

Table 1. Baseline characteristics by IC status (N = 1,035)

	Tatal	By baseline IC		Variabla			By baseline IC		
variable	Iotai	Normal	Impaired	р	Variable	Total	Normal	Impaired	р
Age	73.34 ± 7.28	71.22 ± 6.64	73.84 ± 7.34	< 0.001	Study setting			-	
Sex					Community	278 (26.86)	17 (8.50)	261 (31.26)	< 0.001
Female	516 (49.86)	75 (37.50)	441 (52.81)	< 0 001	Hospital	757 (73.14)	183 (91.50)	574 (68.74)	\U.UU
Male	519 (50.14)	125 (62.50)	394 (47.19)	< 0.001	Smoking				
Financial source	es (n = 1,029)			No	989 (95.56)	188 (94.00)	801 (95.93)	0 225
Independent	600 (58.31)	138 (69.00)	462 (55.73)	< 0 001	Yes	46 (4.44)	12 (6.00)	34 (4.07)	0.235
Dependent	429 (41.69)	62 (31.00)	367 (44.27)	< 0.001	Alcohol				
Educational lev	vel (n = 1,029)				No	1,002	102 (06 00)	<u>810 (07 01)</u>	
≥ High school	367 (35.67)	116 (58.29)	251 (30.24)	< 0 001	NO	(96.81)	192 (90.00)	010 (97.01)	0.467
Other	662 (64.33)	83 (41.71)	579 (69.76)	< 0.001	Yes	33 (3.19)	8 (4.00)	25 (2.99)	
Cohabitant					Exercise (n = 1	,029)			
No	111 (10.72)	22 (11.00)	89 (10.66)	0 880	Low	304 (29.54)	40 (20.41)	264 (31.69)	
Yes	924 (89.28)	178 (89.00)	746 (89.34)	0.009	Moderate	409 (39.75)	72 (36.73)	337 (40.46)	< 0.001
Working status					High	316 (30.71)	84 (42.86)	232 (27.85)	
No	836 (80.77)	151 (75.50)	685 (82.04)	0 025	Morbidity	2.66 ± 1.48	2.06 ± 1.14	2.60 ± 1.38	< 0.001
Yes	199 (19.23)	49 (24.50)	150 (17.96)	0.020					

Baseline characteristics

Table 2. Baseline characteristics by adherence status (N = 1,035)

Variable	Total	By baseline adherence			Variable	Tatal	By baseline adherence		
variable	Iotai	Poor	Good	р	variable	Iotai	Poor	Good	<u>p</u>
Age	73.34 ± 7.28	73.02 ± 6.80	73.42 ± 7.40	0.470	Study setting				
Sex					Community	278 (26.86)	103 (46.61)	175 (21.5)	~ 0 001
Female	516 (49.86)	120 (54.3)	396 (48.65)	0 126	Hospital	757 (73.14)	118 (53.39)	639 (78.5)	< 0.001
Male	519 (50.14)	101 (45.7)	418 (51.35)	0.130	Smoking				
Financial source	es (n = 1,029)			No	989 (95.56)	206 (93.21)	783 (96.19)	0.057
Independent	600 (58.31)	122 (55.71)	478 (59.01)	0 270	Yes	46 (4.44)	15 (6.79)	31 (3.81)	0.057
Dependent	429 (41.69)	97 (44.29)	332 (40.99)	0.379	Alcohol				
Educational lev	vel (n = 1,029)				No	1002 (96.81)	215 (97.29)	787 (96.68)	0 651
\geq High school	367 (35.67)	69 (31.22)	298 (36.88)	0 4 0 0	Yes	33 (3.19)	6 (2.71)	27 (3.32)	0.051
Other	662 (64.33)	152 (68.78)	510 (63.12)	0.120	Exercise (n = 1	,029)			
Cohabitant			· · · · · · · · · · · · · · · · · · ·		Low	304 (29.54)	83 (37.9)	221 (27.28)	
No	111 (10.72)	21 (9.5)	90 (11.06)	0 500	Moderate	409 (39.75)	100 (45.66)	309 (38.15)	< 0.001
Yes	924 (89.28)	200 (90.5)	724 (88.94)	0.508	High	316 (30.71)	36 (16.44)	280 (34.57)	
Working status		(Morbidity	2.66 ± 1.48	2.43 ± 1.38	2.51 ± 1.54	0.343
No	836 (80.77)	179 (81)	657 (80.71)	0.005					
Yes	199 (19.23)	42 (19)	157 (19.29)	0.925					

Intrinsic capacity

Table 3. Intrinsic capacity at baseline and follow-up

	Baseline (by adherence status)				Follow-up (by baseline adherence)			
Variable	Total (n = 1,035)	Poor	Good	р	Total (n = 234)	Poor (baseline)	Good (baseline)	р
Total IC	1.46 ± 1.11	1.72 ± 1.11	1.39 ± 1.11	< 0.001	1.06 ± 1.18	1.45 ± 1.35	0.98 ± 1.13	0.025
IC status								
Normal	200 (19.32)	20 (9.05)	180 (22.11)	<	95 (40.60)	0 (0.00)	36 (17.22)	0 020
Impaired	835 (80.68)	201 (90.95)	634 (77.89)	0.001	139 (59.40)	25 (100.00)	173 (82.78)	0.020

Medication adherence

-	Baseline (by IC status)				Follow-up (by baseline IC)			
Variable	Total	Normal	Impaired	р	Total	Normal (baseline)	Impaired (baseline)	р
Total ARMS	13.80 ± 2.85	13.14 ± 1.53	13.92 ± 3.01	0.021	13.47 ± 2.46	12.36 ± 0.87	13.67 ± 2.6	< 0.001
Adherence stat	tus							
Poor	200 (19.32)	20 (9.05)	180 (22.11)	<	25 (10.68)	9 (9.47)	29 (20.86)	0 040
Good	835 (80.68)	201 (90.95)	634 (77.89)	0.001	209 (89.32)	86 (90.53)	110 (79.14)	0.018

Table 4. Medication adherence at baseline and follow-up

Bi-directional association between IC and medication adherence

Figure 1. Bi-directional association between IC and medication adherence (total sample)



- IC impaired group had 1.81 times significantly higher odds of having poor adherence compared to the healthy individuals (OR: 1.81; 95% CI: 1.19 - 2.76; p = 0.006).
- Individuals with poor adherence were 2.02 times more likely to have worsened IC compared to those with better adherence (OR: 2.02; 95% CI: 1.28 3.19; p = 0.003)

*Adjusted for age, sex educational level, cohabitation, study settings

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Comparison between complete case and LTFU

Table 5. Comparison between complete case (CC)and lost-to follow-up (LTFU) samples

Variable	CC	LTFU	р
Age	73.78 ± 6.99	73.21 ± 7.36	0.287
Sex			
Female	117 (50.00)	399 (49.81)	0.060
Male	117 (50.00)	402 (50.19)	0.900
Financial sources			
Independent	140 (60.09)	460 (57.79)	0 522
Dependent	93 (39.91)	336 (42.21)	0.332
Educational level			
High school and	04 (40 24)	072 (24 20)	
above	94 (40.34)	213 (34.30)	0.090
Other	139 (59.66)	523 (65.70)	
Cohabitant			
No	30 (12.82)	81 (10.11)	0 220
Yes	204 (87.18)	720 (89.89)	0.239
Working status			
No	194 (82.91)	642 (80.15)	0.247
Yes	40 (17.09)	159 (19.85)	0.347
Study setting			
Community	44 (18.80)	234 (29.21)	0 002
Hospital	190 (81.20)	567 (70.79)	0.002
Morbidity	2.66 ± 1.48	2.44 ± 1.31	0.048

Comparison between complete case and LTFU

 Table 5. Comparison between complete case (CC) and lost-to follow-up (LTFU) samples

Variable	CC	LTFU	р	Variahlo	77	ITEII	n
Cognition					00		μ
Normal	219 (93.59)	682 (85.14)	< 0.001	Total IC score	1.41 ± 0.98	1.47 ± 1.15	0.479
Impaired	15 (6.41)	119 (14.86)	< 0.001				
Locomotion				IC status			
Normal	131 (55.98)	410 (51.19)	0 106				
Impaired	103 (44.02)	391 (48.81)	0.190	Normal IC	36 (15.38)	164 (20.47)	0.00
Vitality				Impaired IC	100 (04 60)	607 (70 50)	0.08
Normal	223 (95.3)	762 (95.13)	0.016	impaired ic	190 (04.02)	037 (79.33)	
Impaired	11 (4.7)	39 (4.87)	0.910	Total ARMS	13 80 + 2 85	14 28 + 2 97	0 027
Vision					10.00 = 2.00	11.20 = 2.01	0.027
Normal	97 (41.45)	402 (50.19)	0.010	Adherence statu	IS		
Impaired	137 (58.55)	399 (49.81)	0.019				
Auditory				Nonadherent	38 (16.24)	183 (22.85)	
Normal	186 (79.49)	641 (80.02)	0 957		400 (00 70)		0.030
Impaired	48 (20.51)	160 (19.98)	0.057	Adherent	196 (83.76)	618 (77.15)	
Psychosocial							
Normal	217 (92.74)	733 (91.51)	0 5 4 0				20
Impaired	17 (7.26)	68 (8,49)	U.34ŏ				ZU

Comparison between complete case and LTFU

Figure 1. Bi-directional association between IC and medication adherence (total sample)



Figure 2. Bi-directional association between IC and medication adherence (complete case)



→ Under estimation?

Discussion

- Given such high proportion of attrition, the results (Figure 1 and 3) might be underestimated → Validity? Solution?
- Follow-up times between participants varied, ranging from 7 months to 18 months, leading to inconsistent observation periods across the two waves of data → Considering control for it?
- Should the cross-sectional study be conducted initial to the longitudinal?
- Is this topic publishable? What needs to be improved?

THANK YOU FOR YOUR ATTENTION

$\textbf{Suppl.: IC} \rightarrow \textbf{Medication adherence}$

Figure 1. Distribution of participants with normal IC at baseline and follow-up

- ADH_{0/1} (+): good adherence at baseline/ follow-up
- ADH_{0/1} (-): poor adherence at baseline/ follow-up
- IC_{0/1} (+): normal IC at baseline/follow-up
- IC_{0/1} (-): impaired IC at baseline/follow-up



Suppl.: Medication adherence \rightarrow IC

Figure 2. Distribution of participants with good adherence at baseline and follow-up

- ADH_{0/1} (+): good adherence at baseline/ follow-up
- ADH_{0/1} (-): poor adherence at baseline/ follow-up
- IC_{0/1} (+): normal IC at baseline/follow-up
- IC_{0/1} (-): impaired IC at baseline/follow-up



Suppl.: Bi-directional association between IC and medication adherence: crosssectional

Figure 3. Bi-directional association between IC and medication adherence: cross-sectional



- IC impaired group had 2.14 times significantly higher odds of having poor adherence compared to the healthy individuals (aOR: 2.14; 95% CI 1.27 - 3.60; p = 0.004).
- Individuals with poor adherence were 2.22 times more likely to have worsened IC compared to those with better adherence (aOR: 2.22; 95% CI 1.33 3.73; p = 0.002)

*Adjusted for age, sex educational level, cohabitation, study settings