

1 **How common are Chinese patients with multimorbidity involved in decision**  
2 **making and having a treatment plan? a cross-sectional study**

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4 **Authors**

5 Lee, K P\*<sup>1</sup>,

6 Email: lkp032@cuhk.edu.hk

7 Wong, S Y S<sup>1</sup>

8 Email: [yeungshanwong@cuhk.edu.hk](mailto:yeungshanwong@cuhk.edu.hk)

9 Yip, B H K<sup>1</sup>

10 Email: benyip@cuhk.edu.hk

11 Wong, E L Y<sup>1</sup>

12 Email: [lywong@cuhk.edu.hk](mailto:lywong@cuhk.edu.hk)

13 Lai, F T T<sup>1</sup>

14 Email: franciscottlai@cuhk.edu.hk

15 Chan, D<sup>1</sup>,

16 Email: dicken@cuhk.edu.hk

17 Chau, P<sup>1</sup>

18 Email: patsychau@cuhk.edu.hk

19 Luk, L<sup>1</sup>,

20 Email: lawrenceluk@cuhk.edu.hk

21 Yeoh, E K<sup>1</sup>

22 Email: yeoh\_ek@cuhk.edu.hk

23

24 \*denotes corresponding author

25

26 <sup>1</sup>JC School of Public Health and Primary Care, The Chinese University of Hong Kong

27

28 \*Address for correspondence:

29 Prof. Lee, Kam Pui

30 Room 402, 4/F, Jockey Club School of Public Health and Primary Care Building, Prince  
31 of Wales Hospital, Shatin, N.T., Hong Kong

32 E-mail: lkp032@cuhk.edu.hk

33 Phone: +852 2252-8462

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46 **Title: How common are Chinese patients with multimorbidity involved in decision**

47 **making and having a treatment plan? a cross-sectional study**

48 **Author**

49 *KP Lee\*, SYS Wong, BHK Yip, ELY Wong, D Chan, P Chau, L Luk, EK Yeoh*

50 *\*denotes corresponding author*

51

52 **Abstract**

53 Background: Creating a treatment plan (TP) through shared decision making (SDM)

54 with healthcare professionals, is of paramount importance for patients with

55 multimorbidity. This study aims to estimate the prevalence of SDM and TP in patients

56 with multimorbidity, and study the association between SDM/TP with patients'

57 confidence to manage their diseases and hospitalization within the previous 1 year.

58 Method: This cross-sectional study used an internationally recognized survey. 1,032

59 patients aged 60 or above with multimorbidity, were recruited from a specialist

60 outpatient clinic, general outpatient clinic (GOPC) and a geriatric day hospital. The

61 proportion of patients reported to have SDM and TP were estimated. Associations

62 between the presence of SDM/TP and patients' demographic data, the confidence

63 level to manage their illnesses and hospitalization in previous 1 year were then studied

64 using logistic regression.

65 Results: The prevalence of SDM and TP were 35.8% and 82.1%, respectively. The  
66 presence of TP was associated with receiving healthcare from the same doctor or in  
67 the same facilities, and being recruited from GOPC. Presence of SDM (OR 1.352,  
68  $p=0.089$ ) and TP(OR=2.384,  $p<0.001$ ) were associated with enhanced confidence in  
69 dealing with diseases.

70 Conclusion: Most people with multimorbidity had TP in Hong Kong, but fewer patients  
71 had SDM.

72 Practice implications: Ways to promote SDM in HK are needed.

73

#### 74 **Background**

75 Multimorbidity (MM) is commonly defined as the 'co-existence of two or more chronic  
76 conditions, where neither is more central than the others'<sup>1</sup>. MM is common especially  
77 in the older and socioeconomically deprived populations<sup>2,3</sup>. A study involving a large  
78 database found that approximately 65% of patients older than 65 years old had MM<sup>3</sup>.  
79 MM is associated with mortality, disability, impaired quality of life, psychological  
80 distress, and increased health care utilization<sup>1,4-6</sup>

81 Despite the fact that much is known about the consequences of MM, there remains a

82 lack of evidence underpinning the management of MM, because randomized  
83 controlled trials typically exclude patients with MM and the resultant clinical  
84 guidelines are disease-focused and rarely deal with MM<sup>6,7</sup>. Managing patients with  
85 MM by strictly following these guidelines can overburden patients with MM with too  
86 many visits to healthcare professionals, excessive and conflicting lifestyle advice and  
87 prescription of medications<sup>7-14</sup>. Therefore, instead of following clinical guidelines, the  
88 American Geriatric Society<sup>15</sup> and The National Institute for Health and Care  
89 Excellence(NICE)<sup>16</sup> recommended a shared decision process to individualize a  
90 treatment plan that is in accordance with patients' preferences and values, and this  
91 may minimize treatment burden and maximize quality of life. Shared decision  
92 making(SDM) is defined as 'an approach in which the clinician and patient go through  
93 all phases of the decision making process together and in which they share the  
94 preference for treatment and reach an agreement on treatment choice'; this is in  
95 contrast to the traditional medical model where doctors are solely responsible for  
96 prescribing the 'best' treatment to patients<sup>17</sup>. Creating treatment plans(TP) by SDM  
97 has been shown to enhance patients' sense of control over their illness, improve their  
98 symptoms, enhance their knowledge and reduce concerns towards illnesses; which in  
99 turn, can enhance adherence to medications and improve quality of life<sup>17,18</sup>. While  
100 there were previous studies in Hong Kong investigating SDM in other patient

101 populations, including do-not-resuscitate decisions in patients with chronic  
102 obstructive lung diseases and in surgical and medical patients<sup>19,20</sup>, the prevalence of  
103 SDM and TP in patients with MM, who could benefit most from SDM in Hong Kong,  
104 was not previously known. Similarly, it remains unclear if the presence of SDM and/or  
105 TP can actually improve patients' outcomes such as a reduction in hospitalization.

106 The primary aim of this study was to determine the proportion of patients with MM  
107 who reported having SDM and/or a TP. As a secondary objective, participants were  
108 asked how confident they were to manage their illnesses and whether they have been  
109 hospitalized overnight in the past one year. The relationships between the presence of  
110 SDM and/or a TP and their confidence level to manage their illnesses and history of  
111 hospitalization, were delineated. We hypothesized that a high proportion of patients  
112 with MM had SDM and/or a TP, and having these could enhance their confidence in  
113 disease management and reduce hospitalization.

114

## 115 **Method**

116 This cross-sectional study utilized an internationally recognized survey (see below).  
117 1,032 patients were recruited, who (i) were aged 60 or above, and (ii) who self-  
118 reported to have at least three chronic conditions (*appendix 1*). Patients were

119 recruited at one General outpatient clinics (GOPCs), one geriatric specialist outpatient  
120 clinic (SOPC) and/or geriatric day hospital (GDH) in each of the seven HA clusters, from  
121 June 2016 to July 2017. Written consent was obtained from all participants before their  
122 participation of the project. We included patients only older than 60 years old because  
123 MM is most common in the older population. Besides, all patients in GDH and SOPC  
124 were older than 60 years old. While Hong Kong has a dual healthcare system where  
125 patients can choose to obtain healthcare from both private and the public sector, the  
126 vast majority of patients with chronic diseases were seen under the Hospital Authority  
127 system, where the current study was conducted<sup>21</sup>.

128 The questions used in the current research were extracted from the International  
129 Health Policy Survey of Older Adults, which was used previously in multinational  
130 research involving 11 countries and more than 15,000 participants<sup>22</sup>. The instrument  
131 consists of questions to estimate or understand health care costs and access, doctor-  
132 patient relationships, health promotion, management of chronic conditions, and  
133 caregiving<sup>22</sup>. The survey has been used in various other large-scale research projects<sup>23</sup>.  
134 The survey was translated and validated by iterative forward-backward translation,  
135 and cognitive debriefing interviews in Hong Kong<sup>24</sup>. After the questionnaire was  
136 piloted, a few questions were added by the expert panel, which consisted of three  
137 clinical and social experts involved in the care of elderly, each possessing at least 10

138 years working experience. These additional questions were aimed to fine-tune the  
139 instrument to fit the local cultural context. Demographics including number of chronic  
140 illnesses, age, sex, education level, marital status, financial income sources (social  
141 allowance Comprehensive Social Security Assistance (CSSA) signifies disadvantages  
142 financially), regular healthcare provider for participants' chronic illness, whether the  
143 participant had health insurance, frailty level and number of medications were  
144 collected. Frailty level was measured by the validated Chinese version of five-item  
145 FRAIL scale; phenotypes of being robust, pre-frail and frail were represented by score  
146 0, 1-2 and 3-5 in the scale respectively <sup>25,26</sup>.

147 Questions about (i) whether patients had SDM and TP, (ii) patient's confidence in  
148 managing their chronic conditions, and (iii) patient's number of hospitalizations in the  
149 past 1 year were extracted to investigate both their mutual associations and their  
150 associations with aforementioned demographic characteristics.

151

## 152 **Statistical analysis**

153 The demographic characteristics of the study participants were summarized as count  
154 and percentage. The outcomes collected by 4-option items were simplified into 2  
155 levels to facilitate their analysis and interpretation of the results. The proportion of

156 patients who were involved in components of SDM and TP, as well as confidence in  
157 managing their chronic conditions and hospitalization history, were presented. Logistic  
158 regression was constructed to study the relationship between various demographic  
159 data and the presence of shared decision making process, treatment plan. Variables,  
160 set at p-value < 0.1 in the initial univariate analyses, were entered into the multivariate  
161 model to determine the most significant associations. The associations between the  
162 presence of shared decision process and treatment plan and patients' confidence in  
163 managing chronic disease and history of hospitalization, were also studied using  
164 logistic regression. Results were adjusted for demographics data and confounding  
165 factors in model 1 and were further adjusted for mutual effects of SDM and TP in  
166 model 2. Because the complexity of MM depends on the nature of the diseases and  
167 their combination, sensitivity analysis to detect effect of individual disease on our  
168 outcomes was conducted using the Jackknife method<sup>27</sup>, which replicates the main  
169 analyses multiple times with patients having each of the chronic conditions used to  
170 define MM excluded<sup>28</sup>. Odds ratio (OR) and 95% confidence interval (CI) were  
171 estimated to clarify the strength of association, and the significance is considered a  
172 two-sided P < 0.05. Statistical analyses were conducted using IBM SPSS Statistics 21.

173 The percentages of missing data for four major outcomes were lower than 6%. Missing  
174 data was assumed to be missing at random (MAR), therefore our analysis was based



175 on complete cases only. No characteristics differences were found between subjects  
176 with and without missing values.

177

## 178 **Sample size**

179 Due to a lack of previous similar studies, at a precision of 3.1% and a presumed  
180 prevalence of 50% of patients with MM who received shared decision making (which  
181 required the largest possible sample size), the required sample was determined to be  
182 1,000 participants. Therefore, our sample size of 1,032 patients was considered  
183 adequate.

184

## 185 **Results**

### 186 *Participants*

187 Out of 2,331 patients that were approached, 1,032 patients completed the  
188 questionnaire and the response rate was therefore 44.3%. More than one-third of our  
189 participants were older than 80 years old (35.2%). Around half of them were male  
190 (53.5%) and most participants received some level of education (80.9%), were married  
191 (67.4%), had three to four diseases (60.9%), received  $\geq 4$  medications (52.3%), and no  
192 health insurance (90.9%). Around one-fifth were classified as being “robust” (21.9%)

193 and were receiving comprehensive social security assistance (CSSA) (16.7%). The vast  
194 majority reported that they had regular health care facilities to visit or regular doctors  
195 (93.1%). (*Table 1*).

196

197 *Proportion of presence of shared decision making and a treatment plan*

198 82.1% of patients reported the presence of TP. But for a shared decision making  
199 process, only those having follow-up by regular doctor/facility were guided to answer  
200 this item, and among them, only 35.8% of patients reported a shared decision making  
201 process (*Table 2*).

202

203 *Factors associated with the presence of shared decision making and a treatment plan*

204 The presence of the SDM process was not associated with any demographic data,  
205 including age, sex, education, marital status, the presence of CSSA, health insurance  
206 or regular doctors/facilities, number of diseases, the recruitment location, frailty level  
207 and number of medications; thus the multivariate model for SDM was not applicable.  
208 In the univariate model, the presence of a TP was more likely if the participants  
209 reported a regular doctor/facility (OR=2.203; p =0.004) and if the patients received  
210 education up to secondary school level (OR=1.569; p=0.049); conversely, a TP was less

211 common in patients aged  $\geq 80$  (OR=0.470;  $p=0.015$ ), were recruited from SOPC  
212 (OR=0.538,  $p=0.009$ ) or GDH (OR=0.554,  $p=0.001$ ), and were pre-frail (OR=0.630,  
213  $p=0.042$ ) (Table 2). In the multivariate model, only those having follow-up by regular  
214 doctor/facility (OR=1.876;  $p=0.024$ ) remained the significant predictor for the  
215 presence of a TP; conversely, TP was less prevalent in patients being recruited from  
216 GDH (OR=0.613;  $p=0.014$ ) (table 3).

217 Our sensitivity analysis by the Jack-knife approach showed that regular doctor/facility  
218 remained an important factor for presence of TP in most models (appendix 2).  
219 However, participants being recruited from SOPC and/or GDH were less likely to  
220 receive a TP when chronic pain conditions, eye diseases, diabetes mellitus and  
221 musculoskeletal diseases, were excluded.

222

223 *Association between presence of shared decision making/treatment plan and patients'*  
224 *confidence to manage disease and hospitalization*

225 Overall, a quarter of patients (25%) felt not confident enough to manage their health  
226 problems. In the fully adjusted model, the presence of TP enhanced patients'  
227 confidence to manage their diseases (OR 2.384 ,  $p<0.001$ ) (table 4). SDM may enhance  
228 patients' confidence but this was statistically non-significant (OR 1.353 ,  $p =0.168$ ).

229 Other demographic characteristics that were associated with higher level of  
230 confidence included older age, higher education, being recruited from GOPC and being  
231 frail. Furthermore, 414 patients (40.5%) were hospitalized in the previous one year;  
232 however, the presence of TP and SDM were not associated with the history of  
233 hospitalization. Other demographic characteristics that were associated with  
234 hospitalization in the previous year included older age, higher education, being  
235 recruited from GOPCs, and being robust.

236 The sensitivity analysis found that TP remains an important association with patients'  
237 confidence in most models. Similarly, TP/SDM were not associated with hospitalization  
238 in most models but the presence of TP increased hospitalization when hypertension  
239 (OR 3.930,  $p = 0.007$ ) or diabetes (OR 1.917,  $p = 0.021$ ) were excluded (*appendix 3*).

## 240 **Discussion**

241 This is one of the first studies that explores the prevalence of SDM and TP in Chinese  
242 patients with multimorbidity, which showed that the presence of SDM and/or TP were  
243 associated with enhanced patients' confidence to manage their illnesses. Previous  
244 similar studies involved Chinese patients with breast cancer and found inconclusive  
245 results. One study revealed that 70% of patients were allowed to decide their  
246 preferred surgery<sup>29</sup>; but a second study mentioned that the level of shared decision

247 making in which these patients were engaged was low, according to a validated scale  
248 using direct observations of the actual consultations<sup>30</sup>. In the current study, the  
249 majority (82.1%) of participants were aware of a TP, but only around one-third of  
250 participants recalled having an SDM process in which their priorities and preferences  
251 were taken into consideration to build the TP. It was likely that TPs were prescribed by  
252 doctors rather than as a product of discussion with patients. Nevertheless, both the  
253 presence of shared decision making (OR 1.352, p =0.089) and treatment plan (OR  
254 2.384, p<0.001) appeared to enhance participants' confidence to manage their  
255 illnesses. Participants who were recruited from primary care clinics (GOPC) were more  
256 likely to have a treatment plan (especially those reported having a regular  
257 doctor/having follow-up in a regular facility) and were more confident to handle their  
258 diseases. This may be because primary care doctors were trained to provide  
259 continuous and comprehensive patient care, and therefore are more likely to  
260 formulate a TP that patients can recall<sup>31</sup>. However, the presence of SDM or TP were  
261 not associated with history of hospitalization, suggesting that hospitalization was  
262 mainly driven by the progression of diseases and actual needs. In fact, when patients  
263 with hypertension or diabetes were excluded, TP was associated with increased  
264 hospitalization. It is possible that TP included advices to observe for alarming

265 symptoms or signs and this may prompt hospitalization when physical conditions  
266 deteriorate.

267 SDM was reported only infrequently in our sample, despite its internationally-  
268 recognized importance in patients with multimorbidity<sup>15,16</sup>. The prevalence of SDM in  
269 MM in other countries was under-reported and the current study is one of the first  
270 that reported the prevalence of SDM and TD in patients with MM. However, shared  
271 decision making remained underutilized in many populations (e.g., without MM)  
272 internationally; for example, a study found that around only half of the seriously ill  
273 patients who wished to refuse resuscitation, had a 'do-not-resuscitate' order, and  
274 healthcare professionals were found to have a poor understanding of these  
275 preferences<sup>32</sup>.

276 Yet, SDM might improve patients' outcomes. A Cochrane review of randomized  
277 controlled trials supported that the involvement of patients through using decisional  
278 aids, could improve their knowledge and reduce internal conflicts within decision  
279 making<sup>33</sup>. A cohort study in women with breast cancer also suggested that shared  
280 decision making enhanced patients' quality of life<sup>34</sup>. Evidence also suggested that  
281 shared decision making may reduce the financial burden of healthcare systems,  
282 because when provided with choices, participants often opted for more conservative,  
283 rather than intensive and expensive treatments<sup>33</sup>. However, despite shared decision

284 making being recommended in managing patients with multimorbidity by  
285 international guidelines<sup>15,16</sup>, there remains a relative lack of research showing that  
286 SDM can directly impact on patients' physical health.

287 In addition, it is not known how SDM can be promoted. A systematic review suggested  
288 that the major barriers to SDM included time constraints, patients' characteristics and  
289 nature of diseases<sup>35</sup>. While decisional aids were suggested to help patients make  
290 informed decisions, the relevance of these aids to patients with multimorbidity was  
291 uncertain because these decisional aids were usually disease-focused and were only  
292 available for a limited spectrum of diseases<sup>36</sup>. The use of decisional aids in Chinese  
293 contexts is especially understudied<sup>33</sup>. Doctors can be reluctant to use decisional aids  
294 during consultation because they can lengthen the consultation time by 2.6 minutes<sup>33</sup>,  
295 while the average consultation time in GOPC is around 5-7 minutes in Hong Kong<sup>37</sup>.  
296 Furthermore, many patients, especially Chinese, may not want to be involved in the  
297 decision making process<sup>38</sup>; doctors may be reluctant to involve patients in making  
298 decisions if they perceive patients to be unwilling to make a decision, or if the patients  
299 were not educated enough to engage in such a discussion<sup>35</sup>. Previous research showed  
300 that older Chinese people are less willing to make health-related decisions and the  
301 presence of SDM depended also on patients' education level<sup>29,30</sup>. The latest Cochrane  
302 Review also suggested that there is a lack of evidence of ways to encourage clinicians

303 to involve patients in making decisions<sup>39</sup>. Research on interventions to promote SDM  
304 in our patients with MM is therefore needed; such trials can then provide evidence on  
305 health benefits and cost-effectiveness, if any, of shared decision making.

306 The current study recruited more than a thousand patients with multimorbidity from  
307 both primary and specialist clinics from all areas of Hong Kong, and represented one  
308 of the largest studies in a Chinese population. However, a few limitations must be  
309 discussed. Firstly, the study only recruited older patients from the public sector, where  
310 most patients with chronic diseases in Hong Kong receive regular care. The extent of  
311 the applicability of the results for younger patients and patients in the private sector  
312 is not known. Additionally, as a questionnaire study, the results were prone to  
313 reporting bias. It is possible that patients could not recall being involved in the SDM  
314 process, even if they had been. Future studies may include auditing consultation notes  
315 or video-taping doctors' performance. However, we argue that a treatment  
316 plan/shared decision process is only meaningful if the patient can recall them.

317 Furthermore, as a limitation shared with most cross-sectional studies, casual  
318 relationships could not be established. For example, while it is most likely that patients  
319 with treatment plans could deal with their diseases more effectively, it is also possible  
320 that patients who are confident and are motivated in their disease management, can  
321 better recall their treatment plan. Finally, the study could not explain the barriers or



322 motivating factors for using shared decision making from the clinicians' perspective,  
323 nor the relevant training needs of the clinicians – and this could be included in future  
324 studies.

### 325 **Conclusion**

326 In conclusion, most patients with multimorbidity in Hong Kong had a treatment plan,  
327 but fewer had been involved in making health-related decisions. Treatment plans and  
328 shared decision processes appeared to help patients to manage their diseases. Going  
329 forward, research is needed on interventions that promote shared decision making in  
330 patients with multimorbidity.

331

### 332 **Abbreviations**

333 TP: Treatment Plan

334 SDM: Shared Decision Making

335 GOPC: General Outpatient Clinic

336 MM: Multimorbidity

337 NICE: National Institute for Health and Care Excellence

338 SOPC: Specialist Outpatient Clinic

339 GDH: Geriatric Day Hospital

340 CSSA: Comprehensive Social Security Assistance

341 OR: Odds ratio

342 CI: Confidence Interval

343

344 **Declarations**

345 Ethics approval and consent to participate:

346 Hong Kong East Cluster Clinical and Research Ethics Committee (CREC Ref. No.: HKEC-

347 2016-018)

348 Institutional Review Board of the University of Hong Kong/Hospital Authority Hong

349 Kong West Cluster (IRB Reference Number: UW 16-087)

350 Kowloon Central/ East Cluster Clinical and Research Ethics Committee (KC/KE-16-

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352 Kowloon West Cluster Clinical and Research Ethics Committee (KWC-REC reference:

353 KW/EX-16-096(100-02))

354 New Territories West Cluster Clinical and Research Ethics Committee (CREC Ref. No.:

355 NTWC/CREC/16026)

356 The Joint Chinese University of Hong Kong – New Territories East Cluster Clinical

357 Research Ethics Committee (CREC Ref. No: 2015.359)

358 All the above 6 Ethics committees are affiliated to the Hong Kong Hospital Authority.

359 Written consent were obtained from all participants before their participation of the  
360 project.

361 Consent for publication: Not applicable

362 Availability of data and materials: 'The datasets used and/or analyzed during the  
363 current study are available from the corresponding author on reasonable request.'

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369 Authors' contributions:

370 KPL, SYSW, BHKY, ELYW, DC and EKY were responsible for the literature review section.  
371 They also contributed to creating and organizing the figures, as well as the design for  
372 the above study. In addition, they were involved in data analysis, data interpretation,  
373 and writing the manuscript. While PC and LL were also involved in the data collection  
374 and data analysis.

375 All authors read and approved the final version of the manuscript.

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**Table 1. Proportion of Demographic Characteristics, Shared Decision Making and Treatment Plan (N=1032)**

<b>Characteristics</b>	<b>N</b>	<b>%</b>
<b>Age group</b>		
60-64	123	11.9
65-69	176	17.1
70-74	176	17.1
75-79	194	18.8
80 or above	363	35.2
<b>Gender <sup>a</sup></b>		
Male	552	53.5
Female	479	46.5
<b>Education <sup>b</sup></b>		
No formal education	196	19.1
Primary	392	38.2
Secondary	359	35.0
Tertiary or above	80	7.8
<b>Marital status <sup>c</sup></b>		
Married/Cohabiting	690	67.4
Widowed/Separated/Divorced/ Single/Not married	334	32.6
<b>Comprehensive Social Security Assistance (CSSA) Scheme recipient</b>		
No	860	83.3
Yes	172	16.7
<b>Health insurance <sup>d</sup></b>		
No	927	90.9
Yes	93	9.1
<b>Number of chronic diseases</b>		
3-4	628	60.9
5-6	285	27.6
≥ 7	119	11.5
<b>Regular doctor or healthcare facility <sup>e</sup></b>		



No	71	6.9
Yes	952	93.1
<b>Source of recruitment</b>		
GOPC	530	51.4
SOPC	141	13.7
GDH	361	35.0
<b>Frailty level</b>		
Robust (score = 0)	226	21.9
Pre-frail (score = 1-2)	481	46.6
Frail (score = 3-5)	325	31.5
<b>Number of medications<sup>f</sup></b>		
No	32	3.1
1	97	9.4
2-3	361	35.2
≥ 4	537	52.3

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Missing data – <sup>a</sup>1, <sup>b</sup>5, <sup>c</sup>8, <sup>d</sup>12, <sup>e</sup>9, <sup>f</sup>5

**Table 2. Univariate association between characteristics and Shared Decision Making/Chronic Disease Planning Items by Logistic Regression**

Variables	Deciding a treatment according to your will and get you involved <sup>a</sup>						Do you have a treatment plan for your chronic conditions <sup>b</sup>					
	Sometimes/ Rarely/Never		Always/Often		OR (95%CI)	P-value	No		Yes		OR (95%CI)	P-value
	N	%	N	%			N	%	N	%		
	576 (64.2%)		321 (35.8%)			183 (17.9%)		842 (82.1%)				
<b>Age group</b>												
60-64	74	66.7	37	33.3	ref	-	14	11.5	108	88.5	ref	-
65-69	89	58.9	62	41.1	1.393 (0.836, 2.322)	0.203	33	19.1	140	80.9	0.550 (0.280, 1.079)	0.082
70-74	88	58.7	62	41.3	1.409 (0.845, 2.349)	0.189	26	14.9	149	85.1	0.743 (0.371, 1.489)	0.402
75-79	118	67.4	57	32.6	0.966 (0.583, 1.602)	0.894	32	16.5	162	83.5	0.656 (0.335, 1.287)	0.220
80 and above	207	66.8	103	33.2	0.995 (0.628, 1.576)	0.984	78	21.6	283	78.4	0.470 (0.255, 0.866)	0.015*
<b>Gender</b>												
Male	310	64.9	168	35.1	ref	-	93	17.0	454	83.0	ref	-
Female	266	63.6	152	36.4	1.054 (0.802, 1.387)	0.704	90	18.9	387	81.1	0.881 (0.640, 1.213)	0.437
<b>Education</b>												
No formal education	111	64.2	62	35.8	ref	-	42	21.5	153	78.5	ref	-
Primary	216	65.1	116	34.9	0.961 (0.655, 1.412)	0.841	70	17.9	320	82.1	1.255 (0.818, 1.926)	0.299
Secondary	201	62.6	120	37.4	1.069 (0.728, 1.570)	0.734	53	14.9	303	85.1	1.569 (1.002, 2.459)	0.049*
Tertiary or above	44	66.7	22	33.3	0.895 (0.492, 1.629)	0.717	17	21.3	63	78.7	1.017 (0.539, 1.920)	0.958
<b>Marital status</b>												
Married/Cohabiting	384	64.6	210	35.4	ref	-	126	18.4	559	81.6	ref	-

Not married /Widowed/Separated/Divorced	189	64.1	106	35.9	1.026 (0.766, 1.372)	0.865	56	16.9	276	83.1	1.111 (0.786, 1.571)	0.552
<b>Comprehensive Social Security Assistance (CSSA) Scheme recipient</b>												
No	472	63.4	272	36.6	ref	-	154	18.0	700	82.0	ref	-
Yes	104	68.0	49	32.0	0.818 (0.564, 1.185)	0.287	29	17.0	142	83.0	1.077 (0.697, 1.666)	0.738
<b>Health insurance</b>												
No	526	64.8	286	35.2	ref	-	167	18.1	754	81.9	ref	-
Yes	46	61.3	29	38.7	1.159 (0.713, 1.886)	0.551	13	14.1	79	85.9	1.346 (0.731, 2.477)	0.340
<b>Number of chronic disease</b>												
3-4	352	64.9	190	35.1	ref	-	108	17.4	514	82.6	ref	-
5-6	162	65.6	85	34.4	0.972 (0.708, 1.334)	0.861	58	20.4	226	79.6	0.819 (0.574, 1.168)	0.270
≥ 7	62	57.4	46	42.6	1.375 (0.903, 2.092)	0.138	17	14.3	102	85.7	1.261 (0.725, 2.193)	0.412
<b>Regular Doctor/Facility<sup>c</sup></b>												
No							22	31.0	49	69.0	ref	-
Yes							160	16.9	785	83.1	2.203 (1.295, 3.746)	0.004**
<b>Type of clinic</b>												
GOPC	300	62.8	178	37.2	ref	-	72	13.6	456	86.4	ref	-
SOPC	67	59.3	46	40.7	1.157 (0.761, 1.759)	0.494	32	22.7	109	77.3	0.538 (0.338, 0.857)	0.009**
GDH	209	68.3	97	31.7	0.782 (0.577, 1.060)	0.113	79	22.2	277	77.8	0.554 (0.389, 0.788)	0.001**
<b>Frailty level</b>												
Robust	132	65.3	70	34.7	ref	-	30	13.3	195	86.7	ref	-
Pre-frail	272	65.9	141	34.1	0.978 (0.686, 1.393)	0.900	94	19.6	385	80.4	0.630 (0.404, 0.984)	0.042*
Frail	172	61.0	110	39.0	1.206 (0.828, 1.756)	0.329	59	18.4	262	81.6	0.683 (0.424, 1.101)	0.117
<b>Number of medications</b>												

0	17	65.4	9	34.6	ref		6	18.8	26	81.2	ref	
1	45	54.2	38	45.8	1.595 (0.638, 3.987)	0.318	21	21.6	76	78.4	0.835 (0.304, 2.295)	0.727
2-3	186	60.0	124	40.0	1.259 (0.544, 2.915)	0.590	56	15.6	302	84.4	1.245 (0.490, 3.162)	0.646
≥ 4	326	68.6	149	31.4	0.863 (0.376, 1.982)	0.729	99	18.6	434	81.4	1.012 (0.406, 2.524)	0.980

<sup>a</sup> The response of “Sometimes/Rarely/Never” was considered as reference category; <sup>b</sup> No treatment plan was considered as reference category

<sup>c</sup> Only patients answered “Yes” in the item of “Regular Doctor/Facility” were guided to answer the item “Deciding a treatment according to your will and get you involved”.

\*p<0.05, \*\*p<0.01

**Table 3. Multivariate Model of Characteristics and Chronic Disease Planning Items <sup>a</sup>**

Variables	OR (95%CI)	P-value
<b>Age group</b>		
60-64	ref	-
65-69	0.588 (0.296, 1.169)	0.130
70-74	0.815 (0.402, 1.651)	0.570
75-79	0.740 (0.371, 1.477)	0.393
80 and above	0.618 (0.324, 1.180)	0.145
<b>Education</b>		
No formal education	ref	-
Primary	1.184 (0.756, 1.854)	0.462
Secondary	1.330 (0.815, 2.170)	0.253
Tertiary or above	0.930 (0.482, 1.793)	0.828
<b>Regular Doctor/Facility</b>		
No	ref	-
Yes	1.876 (1.087, 3.238)	0.024*
<b>Type of clinic</b>		
GOPC	ref	-
SOPC	0.643 (0.396, 1.044)	0.074
GDH	0.613 (0.415, 0.906)	0.014*
<b>Frailty level</b>		
Robust	ref	-
Pre-frail	0.709 (0.446, 1.125)	0.144
Frail	0.941 (0.556, 1.595)	0.822

<sup>a</sup> No treatment plan was considered as reference category; \*p<0.05

Multivariate models include variables which  $p < 0.10$  in the univariate analysis.

The item 'Deciding a treatment according to your will and get you involved' was not shown here due to all variables had  $p \geq 0.10$  in the univariate analysis.

\* $p < 0.05$ , \*\* $p < 0.01$

**Table 4. Logistic Regression for Shared Decision Making/ Chronic Disease Planning Items and Patient's Confidence/Hospitalization**

<b>How confident you are that you can control and manage your health problems? *</b>						
<b>Variables</b>	<u>Unadjusted</u>		<u>Adjusted</u>			
	OR (95%CI)	P-value	Model 1 OR (95%CI)	P-value	Model 2 ^ OR (95%CI)	P-value
<b>Deciding a treatment according to your will and get you involved</b>						
Sometimes/Rare or Never	ref	-	-	-	ref	-
Always/Often	1.381 (0.994, 1.918)	0.054	-	-	1.352 (0.955, 1.914) <sup>c</sup>	0.089
<b>Do you have a treatment plan for your chronic conditions</b>						
No	ref	-	ref	-	ref	-
Yes	2.195 (1.559, 3.092)	<0.001**	2.110 (1.473, 3.020) <sup>a</sup>	<0.001**	2.384 (1.604, 3.543) <sup>c</sup>	<0.001**
<b>Have you been hospitalized overnight in the past one year? #</b>						
<b>Variables</b>	<u>Unadjusted</u>		<u>Adjusted</u>			
	OR (95%CI)	P-value	Model 1 OR (95%CI)	P-value	Model 2 ^ OR (95%CI)	P-value
<b>Deciding a treatment according to your will and get you involved</b>						
Sometimes/Rare or Never	ref	-	-	-	ref	-
Always/Often	0.906 (0.685, 1.199)	0.490	-	-	0.944 (0.677, 1.317) <sup>c</sup>	0.735
<b>Do you have a treatment plan for your chronic conditions</b>						
No	ref	-	ref	-	ref	-
Yes	0.910 (0.658, 1.260)	0.571	1.326 (0.899, 1.957) <sup>b</sup>	0.155	1.353 (0.881,2.077) <sup>c</sup>	0.168

\* "Not very confident/Not at all" was considered as reference category. 255 patients answered "Not very confident/Not all" (25%) while 764 patients answered "Very confident/Confident" (75%) in this item.

# "No" was considered as reference category. 609 patients gave response of "No" (59.5%) while 414 patients gave response of "Yes" in this item (40.5%).

<sup>a</sup> Adjusted by Education, Type of clinic and Frailty level; <sup>b</sup> Adjusted by Age group, Education, Type of clinic and Frailty level; <sup>c</sup> ORs of SDM and TP mutually adjusted on top of Model 1

\*p<0.05, \*\*p<0.01



**Appendix 1. Frequency of chronic conditions** (in the sequence of case number, more to less)

<b>Type of chronic disease</b>		<b>N</b>	<b>%</b>
Hypertension ^	Yes	814	78.9
	No	217	21.0
Chronic pain (e.g. chronic shoulder pain, back pain, joint pain) ^	Yes	646	62.6
	No	385	37.3
Eye disease (e.g. glaucoma, cataract, visual impairment) ^	Yes	455	44.1
	No	573	55.5
Diabetes ^	Yes	413	40.1
	No	617	59.8
Rheumatic diseases (e.g. rheumatoid arthritis, multiple sclerosis) ^	Yes	355	34.4
	No	672	65.1
Digestive diseases (e.g. Indigestion, irritable bowel syndrome, constipation, inflammatory bowel diseases)	Yes	299	29.0
	No	733	71.0
Tinnitus or hearing loss ^	Yes	285	27.6
	No	744	72.1
Heart disease (e.g. Ischemic heart disease, heart failure, atrial fibrillation) ^	Yes	251	24.3
	No	778	75.4
Stroke including transient ischemic accidents ^	Yes	250	24.2
	No	779	75.5
Peripheral vascular diseases (e.g. varicose veins, arteriosclerosis) ^	Yes	175	17.0
	No	842	81.6
Thyroid diseases ^	Yes	76	7.4
	No	954	92.4
Nephritis or chronic kidney diseases ^	Yes	69	6.7
	No	958	92.8

Cancer	Yes	63	6.1
	No	969	93.9
Depression ^	Yes	61	5.9
	No	970	94.0
Asthma	Yes	58	5.6
	No	974	94.4
Anxiety ^	Yes	58	5.6
	No	973	94.3
Chronic obstructive pulmonary disease	Yes	41	4.0
	No	991	96.0
Viral hepatitis ^	Yes	37	3.6
	No	993	96.3
Chronic sinusitis ^	Yes	20	1.9
	No	1009	97.9

^ Responses of “Don’t know” or missing data.

**Appendix 2. Multivariate Model of Characteristics and Chronic Disease Planning Items (Jack-knife approach)**

**Do you have a treatment plan for your chronic conditions #**

Type of chronic disease	Without Hypertension (N = 814)		Without Chronic Pain (N = 646)		Without Eye diseases (N = 455)		Without Diabetes Mellitus (N = 413)		Without Diseases of the musculoskeletal system and connective tissue (N = 355)	
	OR (95%CI)	P-value	OR (95%CI)	P-value	OR (95%CI)	P-value	OR (95%CI)	P-value	OR (95%CI)	P-value
<b>Variables</b>										
<b>Age group</b>										
60-64	ref	-	ref	-	ref	-	ref	-	ref	-
65-69	0.606 (0.173, 2.130)	0.435	0.546 (0.197, 1.514)	0.245	0.586 (0.255, 1.348)	0.209	0.378 (0.149, 0.955)	0.040*	0.709 (0.295, 1.706)	0.443
70-74	1.435 (0.322, 6.402)	0.636	1.264 (0.426, 3.752)	0.672	0.482 (0.207, 1.119)	0.089	0.608 (0.230, 1.609)	0.316	0.717 (0.296, 1.737)	0.462
75-79	0.943 (0.244, 3.653)	0.933	0.695 (0.250, 1.936)	0.486	0.711 (0.298, 1.693)	0.441	0.475 (0.185, 1.217)	0.121	0.476 (0.202, 1.125)	0.091
80 and above	0.743 (0.215, 2.561)	0.638	0.724 (0.274, 1.915)	0.661	0.525 (0.237, 1.164)	0.113	0.566 (0.233, 1.377)	0.209	0.443 (0.198, 0.991)	0.048
<b>Regular Doctor/Facility</b>										
No	ref	-	ref	-	ref	-	ref	-	ref	-
Yes	2.807 (1.047, 7.523)	0.040	3.234 (1.540, 7.175)	0.002**	1.635 (0.727, 3.680)	0.235	1.907 (1.003, 3.625)	0.049*	2.147 (1.081, 4.264)	0.029*
<b>Type of clinic</b>										
GOPC	ref	-	ref	-	ref	-	ref	-	ref	-
SOPC	0.563 (0.210, 1.508)	0.253	0.543 (0.250, 1.182)	0.124	0.492 (0.258, 0.942)	0.032*	0.499 (0.279, 0.892)	0.019*	0.418 (0.233, 0.748)	0.003**
GDH	0.815 (0.345, 1.924)	0.641	0.371 (0.192, 0.719)	0.003**	0.588 (0.349, 0.990)	0.046	0.501 (0.304, 0.826)	0.007**	0.448 (0.271, 0.740)	0.002**
<b>Frailty level</b>										
Robust	ref	-	ref	-	ref	-	ref	-	ref	-
Pre-frail	1.500 (0.598, 3.762)	0.388	0.821 (0.427, 1.576)	0.552	0.551 (0.305, 0.998)	0.049*	0.683 (0.384, 1.215)	0.194	0.601 (0.344, 1.051)	0.074
Frail	1.769 (0.599, 5.227)	0.302	1.269 (0.553, 2.912)	0.574	0.788 (0.390, 1.594)	0.507	1.046 (0.537, 2.039)	0.894	0.839 (0.437, 1.611)	0.599

# No treatment was considered as reference category; \*p<0.05, \*\*p<0.01

Only chronic diseases with cases of more than one-third of the sample size were included in this table.

Multivariate models include variables which p<0.10 in the univariate analysis of overall sample.

**Appendix 3. Logistic Regression for Shared Decision Making/Chronic Disease Planning Items and Patient's Confidence/Hospitalization (Jack-knife approach)**

		Deciding a treatment according to your will and get you involved				Do you have a treatment plan for your chronic conditions			
		Sometimes/Rare or Never		Always/Often		No		Yes	
Condition	N	OR (95%CI)	P-value	OR (95%CI)#	P-value	OR (95%CI)	P-value	OR (95%CI)#	P-value
<b>How confident you are that you can control and manage your health problems? <sup>a</sup></b>									
Without Hypertension	814	ref	-	1.363 (0.676, 2.748)	0.386	ref	-	1.463 (0.645, 3.318)	0.362
Without Chronic pain (e.g. chronic shoulder pain, back pain, joint pain)	646	ref	-	1.640 (0.864, 3.112)	0.130	ref	-	1.795 (0.892, 3.612)	0.101
Without Eye disease (e.g. glaucoma, cataract, visual impairment)	455	ref	-	1.562 (0.961, 2.539)	0.072	ref	-	2.206 (1.300, 3.745)	0.003**
Without Diabetes	413	ref	-	1.277 (0.819, 1.991)	0.218	ref	-	2.493 (1.501, 4.140)	<0.001**
Without Rheumatic diseases (e.g. rheumatoid arthritis, multiple sclerosis)	355	ref	-	1.477 (0.945, 2.308)	0.087	ref	-	2.400 (1.471, 3.916)	<0.001**
<b>Have you been hospitalized overnight in the past one year? <sup>b</sup></b>									
Without Hypertension	814	ref	-	1.698 (0.799, 3.609)	0.169	ref	-	3.930 (1.464, 10.551)	0.007**
Without Chronic pain (e.g. chronic shoulder pain, back pain, joint pain)	646	ref	-	0.916 (0.516, 1.627)	0.765	ref	-	1.468 (0.712, 3.024)	0.298
Without Eye disease (e.g. glaucoma, cataract, visual impairment)	455	ref	-	1.172 (0.738, 1.862)	0.501	ref	-	1.248 (0.704, 2.213)	0.448
Without Diabetes	413	ref	-	0.921 (0.599, 1.417)	0.710	ref	-	1.917 (1.105, 3.325)	0.021*
Without Rheumatic	355	ref	-	0.921 (0.597, 1.420)	0.709	ref	-	1.205 (0.707, 2.053)	0.492

diseases (e.g. rheumatoid arthritis, multiple sclerosis)

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Only chronic diseases with cases of more than one-third of the sample size were included in this table.

<sup>a</sup> Not very confident / Not at all was considered as reference category; <sup>b</sup> No hospitalized overnight during the past one year was considered as reference category.

# Adjusted by age group, education and type of clinic; and ORs of SDM and TP were mutually adjusted.

\* $p < 0.05$ , \*\* $p < 0.01$