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Research Paper

Advance care planning readiness among older adults in aged service centers: A cross-sectional study

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ABSTRACT

Objective: This study aimed to explore the readiness for advance care planning (ACP) among older adults in Macau's day service centers and investigate the influencing factors.
Methods: A cross-sectional study was conducted from October to December 2022 using a convenience sampling method. A total of 312 older adults were selected from 13 day service centers for older adults in Macau, China. The Advance Care Planning Acceptance Questionnaire and the Family Adaptation, Partnership, Growth, Affection, Resolve (APGAR) Scale were used to survey the older adults.
Results: A total of 306 older adults completed the survey. The score for advance care planning readiness was 65.55 ± 10.69, and 59.5% of participants ($n = 182$) were willing to participate in ACP. The family function score was 7.24 ± 2.51, while 70.3% of participants were from a highly functional family. The higher family function indicating a higher readiness for advance care planning ($r = 0.396$, $P < 0.001$). The multiple linear regression analysis indicated that the variables "age," "knowledge of ACP," "experience with ACP," and "received resuscitation of yourself, relatives or friends" combined with "family function" can influence advance care planning readiness among older adults ($R^2 = 0.317$, $F = 27.898$, $P < 0.001$).
Conclusions: Older adults in Macau's day service centers were willing to engage in ACP. The importance of family involvement is highlighted in the ACP readiness. Health education and improved family communication are vital for promoting ACP, which ensures individuals receive care when they lack the capacity to make that choice. Additionally, healthcare professionals should enhance communication and education with older adults during the medical care process.

What is known?

- Advance care planning is a discussion process between people and their healthcare providers to communicate their future choices regarding care.
- Advance care planning has several benefits for patients, their families, healthcare providers, and health systems, including improved end-of-life care communication, recording care preferences, dying in the place of choice, etc.

What is new?

- Older adults in Macau's day service centers were willing to engage in advance care planning.
- A positive correlation was identified between family function and advance care planning readiness, underscoring the significance of family involvement in ACP processes.

1. Introduction

Macau, a Special Administrative Region of China, boasts one of the highest life expectancies in the world. According to the Macau Health Bureau [1], life expectancy at birth in 2021 was 84.2 years. People live longer but not necessarily healthier lives. Therefore, quality of life and people's right to autonomy are becoming an

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increasing concern rather than the focus on life expectancy.

Advance care planning (ACP) is a process that refers to communication and discussion between people and their healthcare providers to communicate their future choices regarding care [2]. Readiness to engage in ACP refers to a patient's preparedness to discuss ACP [3]. ACP is the essential element of quality palliative care that enhances the quality of life at the end of life [4]. A systematic review of 80 systematic reviews conducted by Jimenez et al. [5] has identified several benefits of ACP for patients, their families, healthcare providers, and health systems, including improved communication near the end of life, recording of care preferences, dying in the place of choice and managing financial savings toward healthcare. The National Institute for Health and Care Excellence [2] indicated that as people near the limits of their treatment and face the end of their lives, ACP is a part of the best practice in managing and treating people with multiple chronic conditions.

In China, the family is the most central social unit and plays a significant role in social development. It also provides material security, emotional support, and social support for the survival and growth of family members. Chinese families emphasize the family's overall benefits, and the family's influence on family members is significant, especially in decision-making [6]. Family function is a measure of the operational status of the family system. They are a necessary factor influencing family members' physical and emotional health, especially older adults [7].

Death is a big taboo in Chinese culture and tends to be avoided in discussion, even though death is inevitable. Therefore, there is little opportunity for Chinese people and their families to discuss death in depth. Older adults who use day services frequently have specific care needs and various physical declines, making it more urgent to discuss ACP to ensure their end-of-life care wishes. Heyland et al. [8] found that older adults were more likely to prefer comfortable end-of-life care. However, their wishes were often not recorded, resulting in them ultimately receiving treatment and care that was not their preference, thus undermining the quality of their end-of-life care. Although previous review studies have reported the factors related to ACP readiness [9,10], they did not consider the different values and priorities of the Chinese culture, especially on the effect of family function on ACP. As a result of these shortcomings and the gap in the literature, this quantitative study was proposed to assess ACP readiness, family function, and its influencing factors.

The conceptual framework for ACP for older people in Chinese culture was applied to explain the influencing factors of ACP readiness [11]. According to this framework, the individual, familial, and social factors influence the readiness of ACP, and these factors are the focus of this study. This study aimed to explore the readiness for ACP through the assessment of family function and other related factors among older adults in Macau's service centers for older adults, known as Aged Service Centers.

2. Methods

2.1. Study design and sample

A cross-sectional descriptive study was conducted at the Aged Service Centers in Macau. According to the Statistics and Census Service [12], Macau's population was 82,812 people aged 65 and over in 2021. The sample size was calculated using the formula of Finite Population Correction for Proportions [13] when the confidence level is 95%, so $Z = 1.96$ and $e = 0.05$ (5% type 1 error), assuming $P = 0.793$ (this estimated proportion was based on a study of community older adults in China regarding ACP by Zhu et al. [14]), the sample size was calculated as 252 to represent the population of older adults in Macau. If a drop-out rate of 10% is assumed, a total of 278 participants were needed for this study.

Macau was divided into three areas: Macau Peninsula, Taipa, and Coloane. There were thirteen daycare centers and five integrated support centers for older people in Macau, all providing older people with daycare services or day programs [15]. Through a formal application, nine daycare centers and four integrated support centers (eight in Macau Peninsula, three in Taipa, and two in Coloane) agreed to collect data for the study, representing 72.22% of all aged day service centers in Macau. The locations of these service centers for older people were distributed in different areas of Macau. Convenience sampling was used, with each institution being asked to recruit approximately 25 participants to ensure diversity and comprehensiveness based on the overall sample size requirement. The inclusion criteria of this study were as follows: 1) Macau citizens; 2) above 65 years old; 3) conversant or able to understand and speak in Cantonese or Mandarin; 4) able to hear and respond to a paper questionnaire. Older adults with serious memory impairment or cognitive disorder were excluded.

2.2. Instruments

2.2.1. Demographic information form

The demographic information form was designed to gather the participant's characteristics, their knowledge of ACP, personal experiences with rescue situations of themselves, relatives or friends, as well as previous experience with ACP. It also included two separate questions to assess self-perceived individual's health and self-perceived personal relationship with health care professionals, using a 5-Point Likert Scale (1–5, very poor to excellent). Furthermore, the form addressed participants' willingness to know their health details when they are terminally ill, their preference for their chosen medical decision-makers, and their desire to participate in ACP.

2.2.2. Advance Care Planning Acceptance Questionnaire

Ren and Zhao [16] developed the Chinese version of the Advance Care Planning Acceptance Questionnaire (ACPQ), which contained 19 items on a 5-point Likert scale. The questionnaire was divided into three domains: "attitude toward ACP" (items 1 to 3), "feelings about ACP" (items 4 to 14), and "intention about ACP" (items 15 to 19). Items 7 to 11 are based on reverse scoring. The overall scores ranged from 19 to 95. The higher the overall score, the higher the acceptance/readiness for ACP. The Cronbach's α coefficient of the ACPQ was 0.857 in this study.

2.2.3. Family Adaptation, partnership, growth, affection, resolve (APGAR) scale

The original Family APGAR scale (5 items) was developed by Smilkstein et al. [17]. The Chinese version of the Family APGAR scale [18] was used to measure family function, which was the ability of the family to work together as a unit to satisfy the basic needs of its members. The Family APGAR score consisted of five functional components: adaptability, partnership, growth, affection, and resolve. The scoring of each item on a 3-point Likert scale (0 = almost always, 1 = sometimes, 2 = almost never), giving a sum range between 0 to 10 points with family functioning being divided into highly functional family (7–10), dysfunctional family (4–6) or severely dysfunctional (0–3) [17]. The Cronbach's α coefficient for the scale was found to be 0.804 in this study.

2.3. Data collection

The participants were recruited from October 19, 2022, through December 5, 2022. A self-reported questionnaire was used. Six

investigators who completed university courses on quantitative research were responsible for collecting data after 3 h of standardized training and assessment, focusing on standardized questioning techniques, questionnaire administration, and addressing participant questions, with the principal investigator providing support during data collection. The investigators used a structured and consistent approach to clearly explain the purposes of this study, the time needed to complete the questionnaire, and to explain ACP and family function to participants. Furthermore, this survey was administered individually, with the investigators presenting each question, eliminating participants needing to read it themselves. This facilitated participation among older adults, particularly those of advanced age, enhancing their understanding and answer accuracy.

2.4. Statistical analysis

The data were analyzed using SPSS version 26.0 (Statistical Package for Social Sciences). Descriptive statistics describe the characteristics of the older adults. Frequencies, means, standard deviations, and percentages were used to describe the distribution of these variables. For the inferential statistics, one-way ANOVA and independent *t*-test were used to explore the factors affecting ACP readiness. Pearson correlation coefficients were also used to identify the relationship between ACP readiness and family function. The inferential statistical analysis would determine the predictor factors and the combination of factors that best predict levels of ACP readiness would then be found in the multiple regression analysis. A *P*-value less than 0.05 was considered statistically significant in the current research.

2.5. Ethical consideration

Before inclusion in the study, all participants were asked to provide informed consent. Detailed information about the study, including its purpose, procedures, potential risks and benefits, confidentiality, and anonymity, were shared along with their rights as participants. This allowed them to make an informed decision about whether or not to participate. This study was reviewed and approved by the Research Management and Development Department of Macau Polytechnic University (FCSD/MSN-033/2022).

3. Results

3.1. Characteristics of the participants

A total of 312 older people who met the inclusion criteria expressed interest in this study. However, four older adults withdrew from the research, and severe visual and auditory impairment excluded two others. The demographics and characteristics of all participants ($n = 306$) are detailed in Table 1. The mean age of the participants was 75.79 ± 7.53 (65–95) years old. On average, the participants reported having 2.30 ± 1.29 (0–6) chronic diseases. Self-perceived health was rated at 2.95 ± 0.84, while self-perceived relationships with health professionals averaged 3.80 ± 0.76. In this study, 85.3% of the participants ($n = 261$) wanted to know their health details when terminally ill, while 4.9% did not, and 9.8% were unsure. In medical decision-making preferences, 49.7% of participants ($n = 152$) wanted to make their own health decisions, while 7.2% preferred shared decision-making with family and health professionals. Meanwhile, 20.3% indicated that family members decided for them, 18.3% relied on health professionals, and 4.6% were unsure. Additionally, 59.5% of participants ($n = 182$) expressed a willingness to engage in ACP, 16.7% indicated they were unwilling to participate, and 23.9% were unsure.

3.2. Overall status of ACP readiness and family function among older adults

Table 1 summarizes the relationship between variables associated with ACP readiness and family function. The general ACPQ mean score (65.55 ± 10.69) was among all participants. The study found that marital status, income, work after retirement, education, knowledge of ACP, experience of ACP, and received resuscitation experience were associated with the ACPQ score. The mean family function score in the current study was 7.24 ± 2.51, mainly at the highly functional level. The study found that marital status, income, work after retirement, education, experience of ACP, and received resuscitation experience were associated with the APGAR score.

The Pearson correlation coefficient assessed the relationship between the sum score ACP readiness and family function. The correlation ($r = 0.396$, $P < 0.001$) shows the relationship's strength, indicating that the ACP readiness score increases as the family function rises. In the correlation analysis, age was found to be significantly associated with ACP readiness ($r = 0.226$, $P < 0.001$). Also, self-perceived relationship with health professionals was also related to ACP readiness ($r = 0.116$, $P < 0.05$). Furthermore, self-perceived health ($r = 0.117$, $P < 0.05$) and self-perceived relationship with health professionals ($r = 0.151$, $P < 0.01$) were significantly associated with family function.

3.3. The predictor of ACP readiness

This study used multiple linear regression to explore the predictor of ACP readiness. A multiple linear regression model included the characteristics with significant predictors identified in the univariate analysis and the following adjustment. Detailed definitions and options for each variable are provided in Table 1. The final regression model includes "family APGAR score," "received resuscitation of individual, relatives or friends," "experience with ACP," "knowledge of ACP," and "age." The model is statistically significant (Table 2).

4. Discussion

This study revealed that the participants had an ACPQ score (65.55 ± 10.69). This ACPQ score was consistent with the studies of older Chinese patients with chronic diseases by Yang and Zhang [19] (ACPQ mean score 66.20 ± 8.3, $n = 271$) and Yang et al. [20] (ACPQ mean score 66.28 ± 8.28, $n = 471$), showing that the participants in this study had a positive readiness for ACP and that conducting an ACP discussion is feasible and necessary for user of Macau aged service centers for older adults. However, the question of "Willingness to participate in advance care planning," although 59.5% of participants were willing to participate in ACP, there are 16.7% and 23.9% of participants were unwilling and unsure of their willingness to participate in ACP. Future research could benefit from qualitative studies exploring the reasons for refusal among those unwilling to participate in ACP.

The study by Wang et al. [21] investigated 180 doctors in Shandong. It revealed that 98% of doctors discussed the cancer diagnosis with family members before informing the patient. In contrast, 82% of doctors did not inform the patient if the family requested it because telling the truth directly was seen as potentially harmful or hopeless for the patient. However, the current study revealed over 85% of participants, older adults, wanted to know about their condition, suggesting that older adults are increasingly aware of their rights to information. It provides a basis for Macau's professionals to disclose directly. By aligning

Table 1
Summary of the relationship between demographic variables, ACP readiness and family function ($n = 306$).

Variables		n (%)	ACP readiness			Family function		
			Mean ± SD	*t/F*	*P*	*Mean ± SD*	*t/F*	*P*
Gender	Female	246 (80.4)	65.65 ± 10.70	−0.322	0.748	7.26 ± 2.50	−0.407	0.684
	Male	60 (19.6)	65.15 ± 10.72			7.12 ± 2.58		
Marital status	Married	136 (44.4)	66.89 ± 10.22	1.972	0.049	7.60 ± 2.20	2.359	0.019
	Not married	170 (55.5)	64.48 ± 10.95			6.94 ± 2.71		
Number of family member	1–2	99 (32.4)	64.93 ± 9.96	0.541	0.583	6.74 ± 2.85	3.020	0.052
	3–4	127 (41.5)	66.30 ± 11.64			7.41 ± 2.42		
	≥5	80 (26.1)	65.13 ± 10.00			7.78 ± 2.12		
Income (MOP)	3,000 and less	61 (19.9)	62.95 ± 9.60	8.769	<0.001	6.93 ± 2.74	4.849	0.008
	3,001–6,000	194 (63.4)	64.97 ± 10.46			7.07 ± 2.63		
	≥6,001	51 (16.7)	70.84 ± 11.21			8.22 ± 1.27		
Work after retirement	Yes	70 (22.9)	68.73 ± 10.85	2.868	0.004	7.79 ± 1.93	2.484	0.014
	No	236 (77.1)	64.61 ± 10.48			7.07 ± 2.64		
Education	None	56 (18.3)	60.52 ± 10.24	5.222	<0.001	6.18 ± 2.84	3.217	0.013
	Primary school	165 (53.9)	65.86 ± 10.54			7.42 ± 2.46		
	Junior high school	58 (19.0)	67.90 ± 9.24			7.53 ± 2.32		
	High school	18 (5.9)	67.22 ± 10.80			7.78 ± 1.90		
	College or above	9 (2.9)	72.67 ± 14.63			7.44 ± 2.19		
Religion	Yes	182 (59.3)	66.51 ± 10.09	1.905	0.058	7.26 ± 2.43	−0.193	0.847
	No	124 (40.5)	64.15 ± 11.39			7.20 ± 2.64		
Knowledge of ACP	Yes	31 (10.1)	73.10 ± 11.15	4.264	<0.001	8.03 ± 1.80	1.87	0.062
	No	275 (89.9)	64.70 ± 10.31			7.15 ± 2.57		
Experience of ACP	Yes	78 (25.5)	71.21 ± 10.15	5.688	<0.001	7.95 ± 2.04	3.319	0.001
	No	228 (74.5)	63.61 ± 10.18			6.99 ± 2.61		
Rescue experiences	Yes	112 (36.6)	66.90 ± 10.95	5.686	<0.001	7.66 ± 2.31	2.339	0.020
	No	194 (63.4)	63.04 ± 9.70			6.99 ± 2.60		

Note: ACP = advance care planning.

Table 2
Multiple linear regression analysis with the score of ACPQ ($n = 306$).

Variables	*B*	*SE*	Beta	*t*	*P*	95%*CI*
Constant	67.881	5.631	–	12.055	<0.001	56.800, 78.963
Family APGAR score	1.292	0.208	0.304	6.202	<0.001	0.882, 1.702
Received resuscitation of individual, relatives or friends	4.626	1.085	0.209	4.263	<0.001	2.491, 6.762
Experiences of ACP	5.046	1.201	0.206	4.202	<0.001	2.689, 7.409
Knowledge of ACP	5.439	1.714	0.154	3.173	<0.002	2.065, 8.813
Age	−0.201	0.069	−0.141	−2.908	<0.004	−0.336, −0.065

Note: $R^2 = 0.317$, adjusted $R^2 = 0.306$, $F = 27.898$, $P < 0.001$. ACPQ = the Advance Care Planning Acceptance Questionnaire. APGAR = Family Adaptation, Partnership, Growth, Affection, Resolve. ACP = advance care planning.

professional practices with the expressed preferences of the old adults, it is possible to foster a more patient-centered approach to healthcare in Macau.

Older adults generally have more life experiences and reflection on life, and end-of-life care may be an inevitable and unavoidable consequence of old age. However, almost 90% of participants reported that they had not heard of the term “ACP,” which was consistent with the study of Chinese community-dwelling older adults by Zhu et al. [14]. After the meaning of “ACP” was clearly explained, more than one-quarter of the participants indicated they had, perhaps unknowingly, attended an ACP discussion. The results of this study suggest ACP was not widely known among Macau’s older adults, but almost 50% of participants were clear that they wanted to make their own health decisions, with 7.2% wanting to include family and healthcare providers in that decision. This strongly suggests that older adults’ views should be considered before decisions are made on their behalf.

As previously mentioned, most participants had limited knowledge of ACP until the investigators introduced the topic. Most Chinese regions were already implementing ACP [22], which may explain why older people in other areas of China were more willing to participate in ACP. There is clear room for improvement in the willingness of older people in Macau to participate in ACP, and future studies could consider implementing intervention programs to increase ACP participation among older people in Macau.

The majority of participants in this study had good family functioning (7.24 ± 2.51), higher than older adults in Wuhan City (5.36 ± 2.92) [23] but lower than older adults in Chengdu City (8.0 ± 0.92) [24]. This aligned with the high family function (75.5%) reported in Guangzhou City [25]. The literature suggested good family functioning has been associated with better physical, psychological, and social health and quality of life [23,26,27]. The family is an important component of the lives of older people, and the care and support between family members can effectively enhance this population’s health and quality of life. Consequently, when developing policies for the welfare of older adults, it is crucial to prioritize strengthening the family unit and providing appropriate support services for both older adults and their families in need.

Additionally, it is vital to direct greater attention towards older adults with low-income family functions. This study revealed that demographic characteristics such as being married, having a high income, working after retirement, and having a high education were associated with higher APGAR scores, consistent with a previous study by Falaki et al. [28]. Other related factors are also in need of further investigation. However, the cross-sectional design limits conclusions about predicting family function over time. A cohort study is recommended for further research to confirm

factors related to family functioning.

"Age," "knowledge of ACP," "experience with ACP," and "received resuscitation of yourself, relatives or friends" combined with "family function" were identified as having an influence on ACP readiness. The high ACP readiness was predicted by high family function, which was consistent with a previous study among older adults [29]. Nevertheless, a study among Chinese Americans aged 55 years and older in Hawaii found that ACP discussion was more likely to occur when there were higher levels of family conflict [30]. This significantly different result is surprising as the culture of the Chinese family is founded in Confucianism and is one of the greatest influences on Chinese people, making the family the most trustworthy social unit for Chinese people [31]. Chinese parents typically do their best to give everything to their children and do not want them to suffer any physical or mental harm. ACP is widely promoted in the U.S., and the study by Pei et al. [30] found that Chinese Americans were more aware of ACP and understood the potential benefits and risks of ACP. Despite being influenced by traditional Chinese culture, the mediating cultural effects on family function may change when different cultural and economic norms come into play.

Interestingly, ACP is relatively difficult to promote in Chinese culture. This is because, with high family functioning, the family will seek to work together to meet the needs of its members, excluding outside influences, even though the older adult's readiness for discussing end-of-life topics is high. Thus, promoting relationships and communication between older people and their families is one of the strategies for promoting ACP, as quality patient care and communication cannot be achieved without respecting and optimizing cultural differences. However, the mediating effects of culture should be further investigated in future research.

Generally, older adults who were younger had significantly higher ACP readiness than older adults, which was consistent with the study by Miyashita et al. [32]. Facing the approach of death, older adults tend to be more willing to perform ACP. However, it was more challenging for the older adults in this study to understand the meaning and concept of ACP, which may lead to lower readiness to undertake ACP than younger older adults. Older people who know ACP may be aware of its benefits, therefore, be more willing to participate. It would help older adults to understand the potential benefits of ACP and to prepare in advance if they knew that the prognosis was poor or that death was inevitable.

Previous studies demonstrated that ACP is conceptualized as a set of health behaviors [33,34]. The multiple linear regression analysis found that older adults who had experienced ACP had a significantly higher ACP readiness than those who hadn't, consistent with a previous study by Gallagher et al. [35]. Participants with experience of ACP may be aware of the benefits of ACP and may, therefore, be willing to take part again. In addition, participants who had experienced resuscitation of themselves, relatives, or friends had significantly higher ACP readiness than those who hadn't, which was consistent with a previous study by Zhu et al. [14]. Perhaps prior experience of ACP and resuscitation overcomes some of the anxieties associated with seeking health care.

For some older Chinese adults, asking them to participate in ACP to discuss their medical care and wishes can be very burdensome. Therefore, it is recommended that ACP be introduced and promoted initially to those with a high level of readiness among the ACP population. The experience of people who have participated as family members in the discussion and successful implementation of ACP could increase engagement more widely with those with lower readiness levels.

For future ACP practice, this study highlighted the importance of increasing awareness and understanding of ACP among older adults in Macau. Educational efforts and intervention programs can be crucial in promoting ACP discussion. Health education for older people and others to promote the concept and benefits of ACP and life education. Facilitating communication between older people, their families, and healthcare professionals is essential to promoting ACP. This helps to promote ACP and ensure that older people can make informed choices about how they want to be cared for. The association between family function and ACP readiness underscored the significance of involving families in ACP discussion. Promoting relationships and communication between older adults and their families can be an effective strategy for promoting ACP. Regarding further research, this study has provided insight into the factors that influence ACP readiness and has established the foundation for the design of interventional studies to test the effect of ACP. Further research should focus on evaluating the effectiveness of educational and interventional programs in promoting ACP among older adults. Additionally, future studies should explore other potential factors, including cultural factors, influencing ACP readiness to develop comprehensive strategies for ACP promotion.

5. Limitations

This research focused solely on a segment of older adults in aged care services in Macau over a limited period and lacked the implementation of random sampling. Older adults who could not communicate or did not use the aged day services could not be included in this study, meaning that the needs of some older adults will not have been considered. Moreover, the researcher initially planned to recruit participants from all-day centers and integrated support centers for older people in Macau. Due to the COVID-19 pandemic and other reasons, only 72.5% of aged daycare facilities agreed to allow the researcher to collect samples, which could lead to bias. It is recommended that a more generalized sampling method, such as random sampling and a larger sample size, be used to increase the result's precision. Furthermore, it is worth noting that although the researchers explained the relevant content of ACP to older adults during the questionnaire survey, data bias may still have occurred due to many participants' unfamiliarity with ACP. This limitation should be taken into consideration in the design of future studies.

6. Conclusions

The participants in this study have shown a positive readiness for ACP and a willingness to engage in ACP. Most participants expressed a desire for information about their health conditions and demonstrated a willingness to be involved in the medical decision-making processes. However, the majority of participants lacked a full comprehension of ACP. Additionally, family function was found to be associated with higher ACP readiness. Therefore, strengthening mutual understanding and harmonious support within the family can be an effective strategy for promoting ACP. In clinical work, ACP for older adults can be preceded by a family function test, and if family functions are poor, a tailored ACP plan is needed to facilitate the success of ACP. Targeting individuals with high readiness, such as those who have participated in previous ACP discussions or have experienced resuscitation, would be an effective strategy for promoting ACP more broadly across a community. This is particularly important for promoting greater engagement and decision-making in healthcare across society.

CRediT authorship contribution statement

Kalok Wong: Conceptualization, Methodology, Validation,

Formal analysis, Investigation, Resources, Data curation, Writing - original draft, Writing - review & editing, Project administration. **Haobin Yuan:** Conceptualization, Methodology, Validation, Formal analysis, Data curation, Writing - review & editing, Supervision, Project administration. **Stephen Tee:** Methodology, Formal analysis, Data curation, Writing - review &; English editing, Supervision. **Sinkei Cheong:** Formal analysis, Investigation, Resources, Data Curation, Writing - original draft.

Data availability statement

The datasets generated during and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Declaration of competing interest

The authors have declared no conflict of interest.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ijnss.2024.12.005.

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