Patient Preference and Adherence

Dovepress
Taylor & Francis Group

Open Access Full Text Article

ORIGINAL RESEARCH

Translation, Adaptation, and Validation of a Traditional Chinese Version of the Family Caregiver Medication Administration Hassle Scale

Te-Lien Ku[1]*, Shu-Ying Wu[2], Wei-Chu Chie[3], Yen-Ming Huang[4–6]*

[1]Social and Administrative Sciences Division, School of Pharmacy, University of Wisconsin–Madison, Madison, WI, 53705, USA; [2]Department of Pharmacy, Sijhih Cathay General Hospital, New Taipei City, 221037, Taiwan; [3]Institute of Epidemiology and Preventive Medicine, School of Public Health, National Taiwan University, Taipei, 100025, Taiwan; [4]Graduate Institute of Clinical Pharmacy, College of Medicine, National Taiwan University, Taipei, 100025, Taiwan; [5]School of Pharmacy, College of Medicine, National Taiwan University, Taipei, 100025, Taiwan; [6]Department of Pharmacy, National Taiwan University Hospital, Taipei, 100229, Taiwan

*These authors contributed equally to this work

Correspondence: Yen-Ming Huang, Graduate Institute of Clinical Pharmacy, College of Medicine, National Taiwan University, Taipei, 100025, Taiwan, Tel +886-2-3366-8784, Email yenming927@ntu.edu.tw; Te-Lien Ku, Social and Administrative Sciences Division, School of Pharmacy, University of Wisconsin-Madison, 2506 Rennebohm Hall, 777 highland Ave, Madison, WI, 53705, USA, Tel +1-608-960-5765;, Email tku6@wisc.edu

Background: The Family Caregiver Medication Administration Hassle Scale (FCMAHS) assesses the stress experienced by family caregivers in managing daily medication regimens for older adults. However, its suitability for the Taiwanese healthcare context has not yet been established.

Objective: To translate, cross-culturally adapt, and evaluate the reliability and validity of a Traditional Chinese version of the FCMAHS (FCMAHS-TC).

Methods: A two-phase cross-sectional study was conducted. In Phase I, the FCMAHS was translated into Traditional Chinese. In Phase II, a convergent mixed-methods study was carried out with a convenience sample of 138 family caregivers who completed the FCMAHS-TC. In parallel, 12 of those participants were interviewed to explore their experiences with medication administration tasks and associated stress. Content validity was assessed using the content validity index (CVI), whereas reliability was evaluated through Cronbach's alpha and intraclass correlation coefficients (ICCs). Exploratory factor analysis (EFA) was performed to investigate the FCMAHS-TC's factor structure. Qualitative data from interviews were analyzed using content analysis to provide triangulated evidence of scale adaptability.

Results: The FCMAHS-TC demonstrated strong internal consistency (Cronbach's alpha = 0.94) and test-retest reliability (ICC = 0.78). Expert evaluation indicated strong content validity, with the item- and scale-CVI value reaching 1.0. The EFA identified four key factors: information seeking and sharing, scheduling logistics, medication filling and prescription management, and safety issues, accounting for 59.57% of the total variance. Qualitative findings supported the factor structure identified and further highlighted care coordination among caregivers as an additional challenge.

Conclusion: The FCMAHS-TC is a valid and reliable tool for healthcare professionals in Taiwan to assess the challenges and stress associated with medication administration among family caregivers. Future research should explore social and demographic determinants of medication-related caregiving stress and develop targeted interventions to support caregivers in Taiwan.

Keywords: caregiving, hassle, medication, medication administration, older adult

Introduction

Aging is a global trend, and Taiwan is among the fastest-aging nations. In 2023, adults aged 65 and older accounted for 18.3% (nearly 4.3 million) of the Taiwanese population, and it is expected to exceed 20% (4.7 million) by 2025.[1,2] This demographic shift presents significant challenges to the nation's long-term care system, as aging is often linked to increased demand for daily support due to chronic conditions and functional impairments. In Taiwan, over 60% of older

Received: 25 January 2025
Accepted: 28 March 2025
Published: 1 May 2025

adults have multiple chronic conditions, and nearly half take more than five medications.[3,4] While medical advancements have improved chronic disease management, they have also heightened the risk of medication-related adverse events.[5] To safeguard patient health and prevent medication safety issues, older adults frequently rely on family members or loved ones to manage their medication routines, making medication administration one of the most common responsibilities in family caregiving.

Medication administration is an essential aspect of instrumental activities of daily living and healthcare-related tasks, ensuring that medications are taken correctly, appropriately, and on time.[6–8] Family caregivers undertake a range of complex medication-related activities, including ordering, organizing, and administering medications, gathering medication information, monitoring medication effects, making medication-related decisions, and communicating with patients and healthcare providers.[8] These activities can be classified into two categories: direct tasks, which involve the physical handling of medications, and indirect tasks, which require greater cognitive effort.[9] Given that medication administration is often a long-term responsibility for family caregivers of older adults, the time and energy required to manage associated challenges can be overwhelming, leading to caregiving burdens and stress. When healthcare providers are unaware of these responsibilities, caregivers may face delays in receiving necessary support, which can further exacerbate their stress and negatively affect both their well-being and patient outcomes.[10]

Several validated tools, such as the Modified Caregiver Strain Index and the Zarit Burden Interview, are widely used across diverse populations to assess caregiver burden by measuring physical, emotional, and financial strain.[11–13] However, these tools do not specifically capture the complexities of medication management within caregiving. This limitation restricts healthcare providers' ability to offer targeted support, potentially compromising disease management and medication safety for older adults. The Family Caregiver Medication Administration Hassle Scale (FCMAHS), developed by Travis et al, assesses the challenges and psychological strain that family caregivers experience when managing medication regimens for older adults.[14] Adaptations of this scale, such as the versions for Mexican American (FCMAHS-MA) and Turkish (FCMAHS-TR) family caregivers, have been developed to address cultural differences in caregiving experiences.[15,16] Unlike general caregiver assessments, the FCMAHS and its adaptations focus specifically on medication-related tasks and offer a more precise evaluation of caregivers' experiences in this area.

In Taiwan, nearly 98% of older adults reside at home, with approximately 88% living with family members or friends. This reflects a cultural tradition of filial piety, in which caring for older family members is considered a familial responsibility.[17] Consequently, around 2.31 million family caregivers in Taiwan provide unpaid support, including medication administration.[18] Despite growing evidence on family caregivers' experiences with medication administration, research on the role of Taiwanese family caregivers in this area remains limited.[19,20] Developing a culturally tool to assess their experiences and challenges is essential for understanding their needs. However, existing tools for assessing caregiving burden and stress associated with medication administration were primarily designed for non-Chinese populations. Their applicability in Taiwan and similar cultural contexts requires evaluation, as family structures, healthcare systems, and cultural expectations differ across regions. Therefore, this study aimed to translate the FCMAHS into Traditional Chinese (FCMAHS-TC), evaluate its adaptability for Taiwanese family caregivers, and identify any additional medication administration hassles not captured by the original scale.

Materials and Methods

Study Design

The translation and adaptation of the FCMAHS-TC were based on the original English version, which was developed with input from 180 American and English-speaking family caregivers.[14] The FCMAHS consists of 24 items across four subscales, namely, information seeking and sharing, scheduling logistics, safety issues, and polypharmacy concerns. It uses a six-point Likert scale, where higher scores indicate greater perceived hassles. The original tool has demonstrated strong reliability, with a Cronbach's alpha of 0.95 and a test-retest correlation of 0.84.[14]

This study followed a two-phase design, incorporating a modified translation and testing process based on the framework outlined by Sousa and Rojjanasrirat (Figure 1).[21] In phase I, the original FCMAHS was translated into Traditional Chinese, and cultural equivalence between the English and Traditional Chinese versions was assessed. Phase

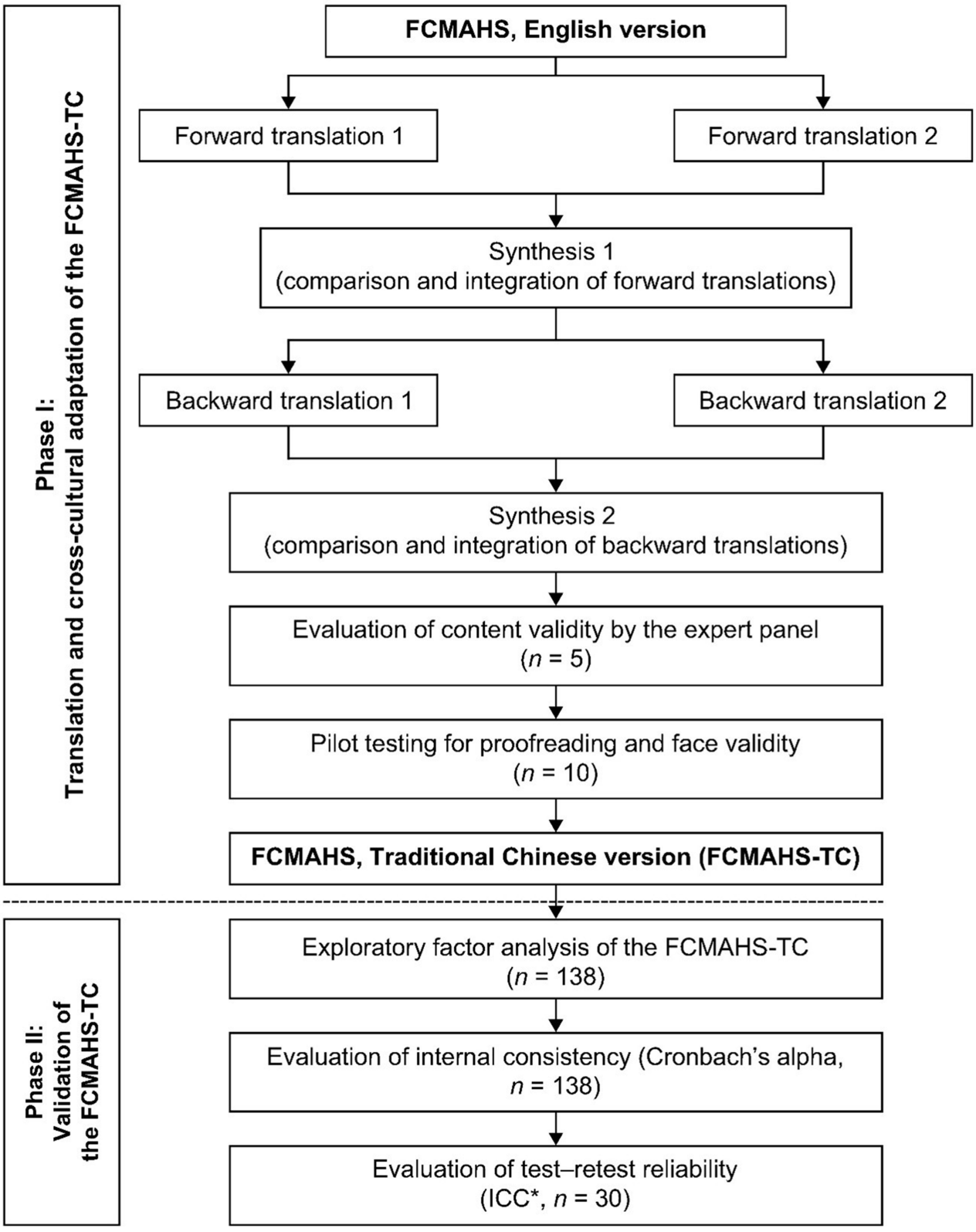

Figure 1 Translation and validation process of the Family Caregiver Medication Administration Hassle Scale-Traditional Chinese version.
Abbreviations: FCMAHS, Family Caregiver Medication Administration Hassle Scale; FCMAHS-TC, Family Caregiver Medication Administration Hassle Scale–Traditional Chinese version; ICC, intraclass correlation coefficient.

https://doi.org/10.2147/PPA.S516126

II focused on evaluating the psychometric properties of the FCMAHS-TC and identifying culturally specific hassles related to medication administration among Taiwanese family caregivers. This study procedure was approved by the Cathay General Hospital Institutional Review Board (CGH-P108008). The design and procedures of Phase I are detailed in a previously published preliminary report.[22]

Phase I: Translation and Cross-Cultural Adaptation of the FCMAHS-TC

Forward Translation and Synthesis I

Two licensed pharmacists, who are native Traditional Chinese speakers and proficient in English, independently translated the FCMAHS from English to Traditional Chinese. Neither translator had prior exposure to any version of the FCMAHS before the study. During Synthesis I, we compared the two forward translations and discussed any discrepancies with the two translators to achieve a unified forward translation draft.

Backward Translation and Synthesis II

Another two licensed pharmacists, who are native English speakers and fluent in Traditional Chinese, independently translated the forward translation draft back into English. None of them had previously seen any version of the FCMAHS before the study. In Synthesis II, we compared the two back translations, discussed discrepancies with the translators, and refined the draft into a combined backward translation.

Confirmation by the Original Developer of the FCMAHS

The combined backward translation draft was reviewed alongside the original FCMAHS through discussions between the study team and one of the original developers (Travis, S.S) to ensure consistency in content and meaning. Any translation discrepancies were clarified and resolved iteratively until consensus was reached among all translators, the original developer, and the study team, thereby establishing the first version of the FCMAHS-TC.

Expert Evaluation

Five experts, including a hospital pharmacist, a community pharmacist, a hospital registered nurse, and two university academic faculty members in social and administrative pharmacy, each with at least 5 years of clinical practice or research experience, evaluated the content validity of the FCMAHS-TC.[23] Each expert received the original FCMAHS, the first version of the FCMAHS-TC, and a self-developed content validity assessment tool. They rated the relevance of each item in the FCMAHS-TC on a five-point Likert scale (1 = highly nonadaptable to 5 = highly adaptable). Items rated below 3 (neither nonadaptable nor adaptable) were removed. Experts also provided suggestions for revision through open-ended responses. Content validity was assessed using the content validity index (CVI), with an item CVI (I-CVI) above 0.78 and a scale-CVI (S-CVI) above 0.80 considered acceptable.[24,25]

To ensure unbiased evaluations, we used the Delphi method, allowing each expert to assess the material through separate mailings.[26] Discussions between the study team and experts were conducted individually, with feedback shared anonymously. After each evaluation round, we revised the scale based on expert feedback and circulated the updated version, along with all expert comments, for further review. After two rounds of evaluation and revision, all experts unanimously approved the second version of the FCMAHS-TC.

Pilot Testing

A pilot study was conducted to assess the face validity of the FCMAHS-TC and proofread the scale. We recruited a convenience sample of 10 family caregivers in northern Taiwan according to the following eligibility criteria: (1) aged at least 20 years with Taiwan citizenship, (2) currently or previously assisting with daily living activities for a family member, relative, or friend aged 65 years or older residing at home for at least 6 months, and (3) primarily responsible for managing medications for their care recipients. Caregivers who were concurrently receiving caregiving assistance from another family member, relative, or friend were excluded.

Data collection included questionnaires on sociodemographic characteristics, caregiving details of both family caregivers and care recipients, the Barthel Index for activities of daily living, and the second version of the FCMAHS-TC. Participants also provided feedback on scale readability, potential revisions, and the time required to complete the

questionnaires. Each participant received a US$10 gift card. All participants reported that the FCMAHS-TC was clear and easy to understand, and no further revisions were suggested. Thus, the FCMAHS-TC was finalized, and all data collection approaches were incorporated into the field test.

Phase II: Field Testing

In this phase, the psychometric properties and cultural adaptability of the FCMAHS-TC were investigated using a convergent mixed-methods design.[27] Quantitative data were collected to examine the factor structure and reliability of the FCMAHS-TC, while qualitative interviews provided additional validation and insights into the specific challenges that Taiwanese family caregivers face in medication administration (Figure 2).

Participants and Sample Size

A convenience sample of family caregivers in northern Taiwan was recruited through traditional and social media channels, following the same eligibility criteria as in the pilot test. Traditional recruitment methods involved distributing flyers and posters at designated recruitment sites. For social media outreach, electronic flyers were posted on facility websites and in Facebook groups related to long-term care and caregiving. The first author conducted telephone screenings to confirm the eligibility of individuals referred by recruitment sites or self-referred individuals.

For the quantitative phase, the sample size was determined using the common rule of thumb of a 1:5 to 1:10 ratio of scale items to participants, requiring at least 120 participants for the 24-item FCMAHS-TC.[28,29] To gain deeper insights into medication administration experiences and associated challenges, approximately 10% of survey participants were invited for interviews until data saturation was achieved.

Data Collection

Data collection was conducted by the first author, a licensed pharmacist trained in quantitative and qualitative methods. Surveys and interviews were scheduled per participants' availability and preferences. The data collection process consisted of a 30- to 60-minute face-to-face interview, followed by a survey, with an option to complete only the survey. Interviews followed a semi-structured guide (Appendix 1) focusing on participants' experiences with medication administration and the related challenges and hassles.

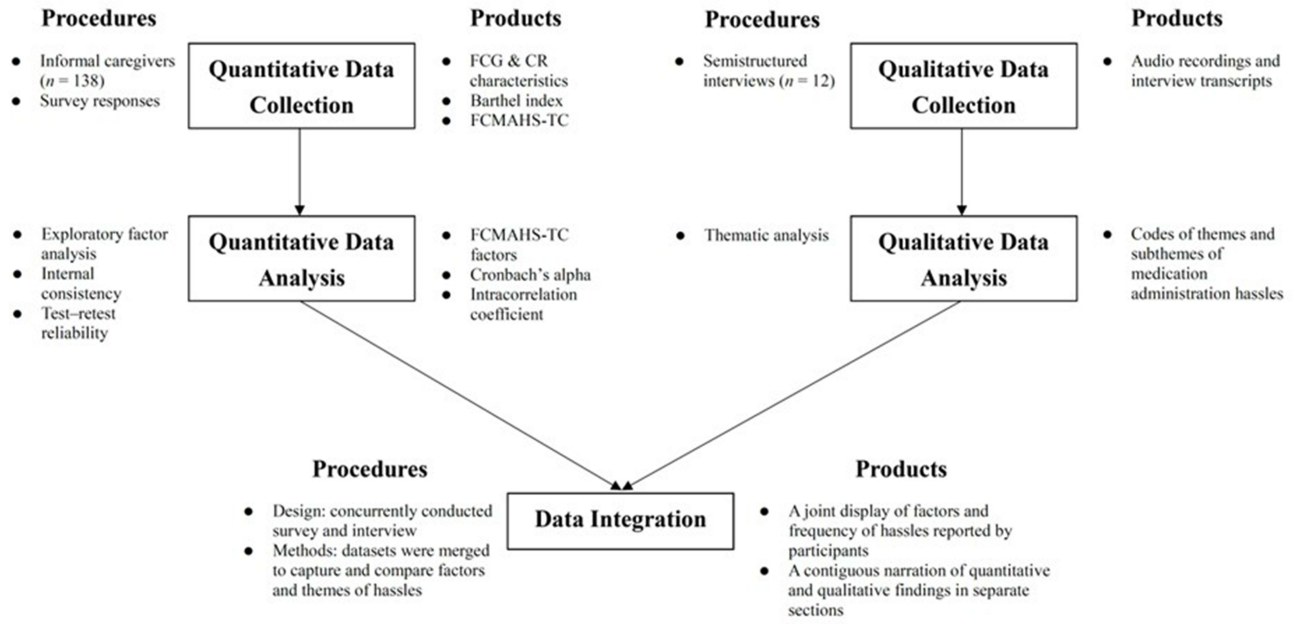

Figure 2 Study flow of the convergent mixed-methods study design.
Abbreviations: FCG, Family caregiver; CR, Care recipient; FCMAHS-TC, Family Caregiver Medication Administration Hassle Scale–Traditional Chinese version.

https://doi.org/10.2147/PPA.S516126

The same questionnaires and FCMAHS-TC used in the pilot test were employed for quantitative data collection. All interviews were audio-recorded and transcribed verbatim. Two weeks after the initial survey, a subset of 30 participants was invited for a retest, receiving the FCMAHS-TC by mail. Data collection took place from March to June of 2019. Participants received a US$10 gift card upon completing the interview, initial survey, and retest. Before participation, all participants provided written informed consent after receiving a detailed explanation of the study purpose and process. Additionally, permission was obtained for the publication of anonymized responses and direct quotes.

Data Analysis

Quantitative Phase

Descriptive statistics for participant characteristics were reported as means and standard deviations (SD) for continuous variables, and as frequencies and percentages for categorical variables. Group comparisons were conducted using two-sample *t*-test for continuous variables and chi-square or Fisher's exact tests for categorical variables. Data were managed using Microsoft Excel; psychometric evaluations and descriptive statistics were performed using SPSS v.29.

To determine the factor structure of the FCMAHS-TC and provide preliminary evidence of construct validity, an exploratory factor analysis (EFA) was performed. Sampling adequacy and the suitability for EFA were assessed using the Kaiser–Meyer–Olkin (KMO) test and Bartlett's test of sphericity. A KMO value above 0.6 was considered acceptable, while a value exceeding 0.8 indicated high adequacy.[30,31] Bartlett's test of sphericity was used to confirm significant correlations among variables, with a *p*-value below 0.05 suggesting suitability for factor analysis. Given the right-skewed data distribution, unweighted least squares with varimax rotation was applied for factor extraction. The number of extracted factors was determined based on the eigenvalue > 1 (K1 criterion) and scree plot.[32,33] Items were considered to load onto a factor if their factor had a factor loading of 0.4 or higher and were below 0.4 for other factors.[34]

The reliability of the FCMAHS-TC was evaluated using Cronbach's alpha and the intraclass correlation coefficient (ICC). Cronbach's alpha measures how well a set of items relates to one another as a group or construct. An alpha value above 0.70 is considered acceptable.[35] The ICC, calculated using a two-way mixed-effects model, was used to evaluate test-retest reliability to assess the stability of scores over time.[36]

Qualitative Phase

All interview transcripts were imported into NVivo v.14 for data management. A qualitative descriptive approach was used to explore family caregivers' experiences with medication administration.[37] To identify themes related to medication administration hassles, a content analysis was carried out using both conventional and directive approaches.[38] Following the definition by Travis et al, these hassles were categorized as minor daily irritants encountered by family caregivers in managing medications.[10] Directive content analysis used the original FCMAHS framework as a coding guide.[14] Two authors (TLK and YMH) independently reviewed the transcripts; identified and categorized hassles within the predefined framework. Any hassles that did not fit within existing categories were coded inductively. Given the potential impact of item correlations on the convergent and discriminant validity of the FCMAHS-TC, repeated coding across multiple items was permitted. Any coding discrepancies were discussed and resolved through consensus.

Data Integration

Following the integration approach outlined by Fetters et al, data were merged at multiple levels.[39] The convergent mixed-methods design allows for simultaneous collection and analysis of quantitative and qualitative data. At the methods level, the datasets were combined to explore the distribution of identified hassles. During interpretation and reporting, quantitative findings from the FCMAHS-TC survey were presented alongside qualitative themes from interviews, illustrating the percentage of participants experiencing specific hassles. Additionally, a contiguous narrative approach was used, presenting quantitative and qualitative findings in separate sections while highlighting newly identified hassles not previously covered by the scale.

Results

A total of 149 participants were recruited, of whom 143 (96.0%) met the inclusion criteria. Following the withdrawal of five participants, 138 (92.6%) individuals were enrolled in the study, including 12 who also participated in interviews. The mean duration of the interviews was 57 minutes and 2 seconds (SD: 19 minutes and 25 seconds). Table 1 presents the sociodemographic and caregiving characteristics of both the survey and interview groups. Overall, the sample primarily consisted of individuals aged 45 to 64 years. The largest group of caregivers were child or child-in-law (n = 113, 81.88%), followed by spouses (n = 23, 16.67%), with more female (n = 111, 80.43%) than male caregivers (n= 27, 19.57%). The only significant difference between the groups was that interview participants were younger than the overall sample.

Quantitative Findings

Validity

All five experts participated in two rounds of content validity evaluation. In the first round, the I-CVIs ranged from 0.6 to 1, with an S-CVI of 0.88. Based on the experts' feedback, all items were retained and revised. In the second round, the I-CVIs and S-CVI reached 1.0, indicating that all items were relevant or highly relevant to the study objectives.

Table 1 Demographic Characteristics of the Participants in Both the Survey and Interview Groups

Variables	Field test (n = 138)		Interview (n = 12)	
	n (%)	Mean (SD)	n (%)	Mean (SD)
Caregiver age*		55.41 (11.49)		47.17 (11.13)
Care recipient age		81.91 (8.11)		82.83 (11.77)
Caregiver sex (female)	111 (80.43)		8 (66.67)	
Care recipient sex (female)	78 (56.52)		6 (50.00)	
Relationship with care recipient				
Spouse	23 (16.67)		0	
Adult child	93 (67.39)		10 (83.34)	
Child-in-law	20 (14.49)		1 (8.33)	
Other relatives/friends	2 (1.45)		1 (8.33)	
Caregiver education				
Junior high school or below	16 (11.59)		0	
High school or equivalent	33 (23.91)		2 (16.67)	
College or university	66 (47.83)		7 (58.33)	
Graduate degree	23 (16.67)		3 (25.00)	
Caregiver employed	60 (43.48)		7 (58.33)	
Sole caregiver	34 (24.64)		3 (25.00)	
Living in the same residence	103 (74.64)		11 (91.67)	
Care recipient's ADL function				
Total dependency	34 (24.64)		5 (41.67)	
Severe dependency	25 (18.12)		1 (8.33)	
Moderate dependency	44 (31.88)		3 (25)	
Slight dependency	11 (7.97)		0	
Full independence	24 (17.39)		3 (25)	
Duration of care (months)		69.8 (62.57)		80.25 (74.19)
Number of managed medications		7.36 (4.20)		7.25 (5.82)
Daily medication administration (minutes)		23.14 (32.01)		23.33 (31.50)

Note: *$p < 0.05$; Two-sample *t*-test with unequal variance.
Abbreviations: ADL, activities of daily living; SD, standard deviation.

https://doi.org/10.2147/PPA.S516126

Factor Structure of the FCMAHS-TC

The KMO value was 0.88, and Bartlett's test yield a value of 2,288.24 ($p < 0.001$), indicating that the dataset was suitable for EFA. A four-factor solution was selected according to the K1 criterion and scree plot, explaining 59.57% of the total variance. Table 2 shows the factors along with their corresponding items and factor loadings, labeled as follows: Factor I: information seeking and sharing (caregivers' acquisition and dissemination of medication-related information), Factor II: scheduling logistics (caregivers' planning and supervision of medication schedules), Factor III: medication filling and prescription management (ensuring medication access and maintaining an adequate supply), and Factor IV: safety issues (safe handling and administration of medications).

Subscale correlations were calculated, and small-to-moderate correlations between factors were expected if the scale effectively measured conceptually distinct facets of medication administration hassles. Intercorrelations among subscales ranged from 0.45 to 0.69, with the highest found between Factors I and IV. Due to this high correlation, an oblique rotation was applied, which yielded results consistent with the orthogonal rotation, thereby confirming the independence of the four-factor structure. The four-factor solution was accepted, and all items were retained: 11 in Factor I, 7 in Factor II, and 3 each in Factors III and IV.

Table 2 Exploratory Factor Analysis of the Traditional Chinese Version of the Family Caregiver Medication Administration Hassle Scale (n = 138)

Items		I	II	III	IV	Cronbach's Alpha if Deleted
1	Knowing how to deal with an emergency when it occurs	**0.58**	0.20	0.05	0.38	0.94
2	Finding clear medication information	**0.72**	0.19	0.07	0.29	0.94
3	Knowing why a medication is prescribed and whether it is presenting/showing the expected efficacy	**0.67**	0.15	0.05	0.14	0.94
4	Able to discuss comfortably with physicians about medications	**0.75**	0.17	0.13	0.10	0.94
5	Someone is able to answer questions	**0.76**	0.04	0.05	0.18	0.94
6	Obtaining information within a reasonable timeframe	**0.80**	0.16	0.20	0.17	0.93
7	Feeling comfortable with the medication-related decision made	**0.69**	0.22	0.17	0.25	0.93
8	Knowing what questions to ask the physician	**0.83**	0.10	0.26	0.06	0.93
9	Understanding the delivered instructions and information	**0.54**	0.17	0.24	0.33	0.94
10	Administering medications at the right time	0.37	**0.48**	0.10	0.15	0.94
11	Planning the schedule for multiple medications to be given in a day	0.29	**0.47**	0.21	0.33	0.94
12	Arguing with the care recipient about when to take medications	0.09	**0.82**	0.12	0.00	0.94
13	Integrating medication schedules into my daily routine	0.20	**0.64**	0.33	0.20	0.94
14	Coordinating with the care recipient for the medication schedule	0.09	**0.48**	0.07	0.37	0.94
15	Sharing responsibility with the care recipient of maintaining the medication schedule	0.13	**0.83**	0.15	−0.002	0.94
16	Remembering to administer medications according to the medication schedule	0.18	**0.74**	0.18	0.20	0.94
17	Admitting my mistake to the physician or others	**0.53**	0.18	0.31	0.05	0.94
18	Knowing when to suspend, increase, decrease, or discontinue medication	**0.63**	0.37	0.17	0.16	0.93
19	Understanding when medications can be crushed, missed, dissolved, etc.	0.39	0.08	0.34	**0.41**	0.94
20	Being aware of the presence of side (adverse) effects	0.39	0.20	0.09	**0.63**	0.94
21	Knowing how to administer medication safely	0.39	0.13	0.27	**0.63**	0.94
22	Regularly refilling prescription medications	0.17	0.16	**0.82**	0.11	0.94
23	Refilling prescription medications in advance in order to maintain a sufficient supply over weekends or holidays	0.21	0.26	**0.83**	0.13	0.94
24	Managing medications prescribed by multiple physicians	0.18	0.38	**0.69**	0.18	0.94

Notes: The factor analysis was conducted using the unweighted least squares extraction method and the Varimax rotation method. Four factors were extracted: Factor I, Information seeking and sharing (α = 0.93); Factor II, Scheduling logistics (α = 0.87); Factor III, Medication filling and prescription management (α = 0.89); and Factor IV, Safety issues (α = 0.76). The bolded numbers indicate the factor to which each item belongs. Adapted from Travis SS, Bernard MA, McAuley WJ, Thornton M, Kole T. Development of the Family Caregiver Medication Administration Hassles Scale. *Gerontologist*. 2003;43(3):360–368, by permission of Oxford University Press.[14]

Reliability

The overall Cronbach's alpha for the full scale was 0.94, whereas subscale values ranged from 0.758 to 0.929. The ICC for the full scale over a 2-week interval was 0.78 ($p < 0.01$), with subscale ICC values ranging from 0.59 to 0.84.

Qualitative Results

Findings from the interviews comfirmed the FCMAHS-TC's factor structure. Five types of medication administration hassles were identified, four of which aligned with the factors derived from the EFA. Table 3 integrates the identified factors, their corresponding items, the distribution of reported hassles, and representative quotes illustrating each hassle.

Information Seeking and Sharing

Eleven out of 12 participants reported experiencing hassles related to obtaining and sharing medication information. At least half of them shared similar experiences regarding 8 of the 11 items within this factor. The less frequently reported hassles included: "knowing how to deal with an emergency when it occurs" (item 1), "obtaining information within a reasonable timeframe" (item 6), and "admitting my mistake to the physician or others" (item 17). Participants also described interactions with various healthcare professionals beyond physicians, including pharmacists and nurses. For example, one participant hesitated to ask pharmacists questions during peak hours at the pharmacy:

> Sometimes, we can't ask the pharmacists questions when picking up medications because we don't know what to ask yet, or they're just too busy, and we forget. (ID37, item 8)

Another participant recounted a conflict with nurses regarding a lack of medication information for their mother during a hospital stay:

> When my mother was admitted, we had to hand over all her medications to the nurses. The doctor would then make adjustments, and the nurse would tell me, 'Don't worry about what medication we're giving her.' This often led to conflicts. I know they were very busy, but I ended up arguing with one. She found me annoying and said, 'What can you do even if you know?' But I don't think that's right. (ID68, item 4)

Scheduling Logistics

All participants experienced difficulties in managing their care recipients' medication schedules. Among the seven items within this factor, six were reported by less than half of the participants, and only one participant mentioned item 14 ("coordinating with the care recipient for the medication schedule"). The most commonly experienced hassle was item 15: "sharing responsibility with the care recipient of maintaining the medication schedule" cited by 10 participants. This responsibility involved overseeing and tracking the care recipients' daily medication routines, which became especially difficult when the care recipient failed to adhere to the prescribed schedule. One caregiver described frequent intense arguments with their father over medication nonadherence:

> I would really scold him loudly about this, and I would say, 'If you keep doing this, you'll end up in the hospital again!' He would insist that he was in good health and didn't need the medication. I would argue back, 'Skipping your medication will just land you in the hospital again!'. This kind of drama happens all the time. (ID37, item 15)

Medication Filling and Prescription Management

Six participants reported difficulties refilling and managing their care recipients' prescriptions. The most commonly cited hassle was "regularly refilling prescription medications" (item 22). Other challenges included missing refill dates, limited access to brand-name medications, and transportation issue.

> I didn't write it down, I just checked when it was time. Sometimes I ended up missing the refill period. (ID 12)

> I can't get that medication in Taiwan anymore. I used to take a brand-name high blood pressure medicine. Last year, they replaced it with one from a local company. Now, the original one is no longer available. (ID 62)

https://doi.org/10.2147/PPA.S516126

Table 3 Qualitative Summary of Items and Representative Quotes in the Traditional Chinese Version of the Family Caregiver Medication Administration Hassle Scale

Items	ID12	ID15	ID18	ID24	ID37	ID38	ID43	ID49	ID62	ID68	ID96	ID101	Total	Representing quotes
Factor I: Information Seeking and Sharing														
1. Knowing how to deal with an emergency when it occurs			X	X		X							3	"Sometimes, we don't know who to call. For instance, when my grandma's blood sugar level was uncontrollably high, I felt that going to the emergency room was my only option because I didn't know whom to ask for help." (ID38)
2. Finding clear medication information	X	X			X	X	X	X	X	X	X		9	"Everyone has their own opinion. The nurse says one thing, the doctor says another, and even the home care staff sometimes joins. There's just too much information, and it overwhelms me." (ID43)
3. Knowing why a medication is prescribed and whether it is presenting/showing the expected efficacy		X	X	X	X		X	X	X	X	X		9	"My dad is prescribed magnesium oxide once daily, but he doesn't have any GI problems or problems with bowel movements. I'm confused about why he needs this pill." (ID24)
4. Able to discuss comfortably with physicians about medications	X	X	X	X	X	X	X		X	X			9	"I noticed that my dad seemed to bleed more easily after taking the anticoagulant, but the cardiologist insisted that he continue taking it. I told my dad, 'Just don't take it yet,' even though they kept telling me. In fact, I mentioned this to the doctor, but the doctor insisted that he [father] must take the medication. When my dad was at the hospital, they might have even forced him to take it." (ID37)
5. Someone is able to answer questions		X	X	X		X	X	X					6	"We can only see the doctor every 3 months, so when something goes wrong, there's often no one to ask for help in between visits." (ID18)
6. Obtaining information within a reasonable timeframe			X						X				2	"He will not tell you anything unless you ask specific questions. If there are no major problems, you just keep taking the medication as usual. It's only when you realize it's not working as expected and ask about it that you might find out you have been taking it incorrectly." (ID62)
7. Feeling comfortable with the medication-related decision made				X	X	X	X		X	X	X		7	"Of course not! I am always hesitant. When you ask the doctor, he just says, 'Check the situation yourself.' He prescribes more pills and lets you adjust the dose on your own. If the medication is not working well, you might think about increasing the dose. But with my dad's Parkinson's medication, increasing the dose makes his mental state worse, and he just ends up sleeping all the time." (ID62)
8. Knowing what questions to ask the physician			X	X	X	X	X		X	X	X		8	"What if I don't ask? What if he takes too much? It could be harmful to his body. I don't mind making more calls even if it's inconvenient for me. But what if I forget to ask him about it one day?" (ID96)

9. Understanding the delivered instructions and information	X	X			X	X	X	X	X		X		8	"I look up the medication online to see what it's for, but I just get more confused. I think it's better to ask doctors or pharmacists instead. I feel like searching the internet alone isn't enough for me to really understand." (ID12)
17. Admitting my mistake to the physician or others				X		X			X				3	"There was another medication for high blood pressure. After taking it, he had trouble walking, so we thought it might be the cause. It seemed suspicious. We stopped the medication for a while, but the cardiologist was not happy about it. He did not think the medication was the problem." (ID62)
18. Knowing when to suspend, increase, decrease, or discontinue medication	X			X	X	X			X	X			6	"Later, when I went back to the doctor, he said, 'You can adjust it to one pill in the morning and one in the evening.' But the prescription still said two pills in the morning. I was confused, like, 'Wait, what?' I do not really know when her medication should be adjusted because I do not know what's normal or not. All I can tell is whether she seems energetic." (ID38)
Factor II: Scheduling Logistics														
10. Administering medications at the right time				X				X	X				3	"She did not take it with her when she went out. Then I suddenly realized, 'Oh no, I forgot to give her the medication, and she didn't bring it either!' I had to call her back to take it. Luckily, this was an easy fix because I know how important it is for her to take it on time. If she misses even one dose, she will be out of breath all the time." (ID49)
11. Planning the schedule for multiple medications to be given in a day		X					X		X	X			4	"The hospital would crush the medications for us, but at home, we had to do it ourselves. Some medications could not be taken together, so we bought a pill box. I crushed them myself and had to be very careful while preparing a whole week's supply. At first, it took me over two hours each week. I just did my best, and my brother and I took turns." (ID43)
12. Arguing with the care recipient about when to take medications		X	X					X	X		X		5	"My mom has trouble hearing, so she could not clearly understand what the doctor said at the clinic. She insisted on taking the medication exactly as it was written on the bag. Even when I told her what the doctor actually said, she still believed the bag was correct. It was really frustrating." (ID62)

(*Continued*)

https://doi.org/10.2147/PPA.S516126

https://doi.org/10.2147/PPA.S516126

Table 3 (Continued).

Items	ID12	ID15	ID18	ID24	ID37	ID38	ID43	ID49	ID62	ID68	ID96	ID101	Total	Representing quotes
13. Integrating medication schedules into my daily routine		X					X	X				X	4	"I do not go there every day, and there's no fixed routine. Sometimes I stay for a few hours, just to check on things, and then leave. You know, the relationship between a mother-in-law and a daughter-in-law is different from that of a mother and daughter. What I mean is, the timing of my visits changes, and I cannot go every day because I have responsibilities at my own home too." (ID101)
14. Coordinating with the care recipient for the medication schedule		X											1	"It's not really inconvenient. The only problem is that sometimes I give them their medications but forget to take mine." (ID15)
15. Sharing responsibility with the care recipient in maintaining the medication schedule	X		X		X	X	X	X	X	X	X	X	10	"My father's medications are in this box. He used to take them by himself, but now his memory seems a bit worse. Sometimes he forgets or hesitates. For example, yesterday he took one dose in the afternoon and maybe another in the evening. I noticed the mistake, so now I have to keep a closer eye on it." (ID12)
16. Remembering to administer medications according to the medication schedule	X			X		X		X					4	"We use a pill box numbered from one to ten. Sometimes we notice there are two extra pills of a certain medication left, while the others are taken as usual, even though they should be taken together. I am not sure if she missed two pills on a specific day or if something else happened, because we only noticed it at the end, and it's impossible to figure out when the mistake occurred." (ID38)
Factor III: Medication Prescription Filling and Management														
22. Regularly refilling prescription medications	X	X		X					X		X		5	"It's really frustrating. Sometimes I remember that I need to refill my medications, but by the time I do, it's already the fourth day, and I can't get them anymore. I could get them on the third day, but not the fourth." (ID96)
23. Refilling prescription medications in advance in order to maintain a sufficient supply over weekends or holidays				X					X				2	"The insurance tells you how many days of medication you have left before you can refill it. Sometimes, if the doctors do not know, they schedule your appointment a week in advance, and then the nurse insists you pick up your medication on the first day. If you do not, you'll be stuck. You have to mark the date and place on your calendar to pick it up. If you miss that day, everything gets messed up." (ID62)

24. Managing medications prescribed by multiple physicians									X		X	X	3	"Another problem is that he now sees three different doctors: a cardiologist, a heart surgeon, and a gastroenterologist, each with a different appointment time. Later, I found out that the doctors had prescribed the same medication." (ID96)
Factor IV: Safety Issues														
19. Understanding when medications can be crushed, missed, dissolved, etc.		X					X		X				3	"Some medications cannot be crushed, like certain painkillers. For example, if I had a bone fracture and was given stronger painkillers that should not be crushed, it could be a problem. If I do not know this and take them the wrong way, it could cause severe stomach cramps." (ID15)
20. Being aware of the presence of side (adverse) effects	X	X	X	X	X	X	X		X		X		9	"I have noticed that since she started using this patch at the beginning of the year, the marks on her back have become more visible. She's been itching a lot, so I need to ask the doctor about it at our next visit. I am not sure why the area where she put it has become red, swollen, and itchy." (ID18)
21. Knowing how to administer medication safely		X		X		X	X	X				X	6	"That pill is really big, and she has trouble swallowing it. She could easily choke on it. So, I crush it a bit, but then I worry it will be too bitter for her. It's been like this for a while." (ID38)

Note: Adapted from Travis SS, Bernard MA, McAuley WJ, Thornton M, Kole T. Development of the Family Caregiver Medication Administration Hassles Scale. Gerontologist. 2003;43(3):360–368, by permission of Oxford University Press.[14]

https://doi.org/10.2147/PPA.S516126

> Since I live in [district], traveling all the way to [hospital pharmacy location] is really far and tiring. (ID 15)

Safety Issues

Eleven participants reported safety-related hassles, with two specific concerns cited by six or more participants. The most frequently mentioned issue, reported by nine participants, was "being aware of the presence of side (adverse) effects" (item 20). Caregivers struggled to distinguish between changes in the patient's health status and medication side effects. Additionally, they expressed concerns about drug interactions, particularly when managing multiple chronic conditions and medications.

> When he first took [medication name], he felt nauseous. But when I checked the side effects, they didn't match, so I wasn't sure. (ID 37).

> Sometimes, when his medication routine becomes more complex, it's harder to tell the differences between the medications… (ID 24).

Care Coordination Between Caregivers

A newly identified hassle involved coordinating care among multiple caregivers (Table 4). This issue stems from the difficulty of managing caregiving roles and responsibilities to ensure consistent and high-quality care for patients with multiple caregivers at home. Nine out of 12 participants reported these challenges, aligning with the proportion of caregivers who were not the sole providers (Table 1). Other reported challenges included "handing over tasks", "negotiating caregiving plans and goals", "language barriers with foreign caregivers" and "supervising secondary caregivers". Although each of these concerns was mentioned by fewer than half of the interview participants, more than half of non-sole caregivers identified handing over tasks and supervising secondary caregivers as the most frequent difficulties. While sharing medication administration responsibilities may offer primary caregivers greater flexibility, it often introduces additional burdens when established routines are disrupted or altered.

> I usually handle the medications, but when I'm unavailable, I ask my siblings to take over. However, I worry they might not fully understand how and why I manage the medications the way I do, which could lead to them missing whether she [participant's mother] has already taken them. (ID 18)

Since primary caregivers are usually the most familiar with the care recipient's health and medication needs, it is important to ensure that all medication-related tasks are carried out safely when collaborating with other caregivers at home. One participant described her experience of teaching a hired foreign caregiver on the proper administration of insulin.

> I had to teach her [hired foreign caregiver] because my mother needs insulin, and it can be dangerous if given at the wrong time or if she skips a meal. For example, yesterday she didn't eat lunch at the daycare center… She [hired foreign caregiver] didn't know that before, and if she had simply followed the prescription, she would have given the insulin anyway. One time, my mother's blood sugar dropped too low because of this. So, I had to make sure she [hired foreign caregiver] understood how to adjust based on the situation. (ID 68)

Discussion

This study translated and validated the FCMAHS into Traditional Chinese, resulting in the first instrument specifically designed for Taiwanese caregivers to assess the burdens and psychological distress associated with medication administration. Developed in accordance with established guidelines, the FCMAHS-TC demonstrated strong psychometric properties, supporting its appropriateness for use among caregivers in Taiwan.

To ensure cultural and linguistic appropriateness for Chinese-speaking communities, we followed a rigorous translation process. All translators were licensed pharmacists fluent in both English and Chinese to ensure accuracy in both everyday language and professional terminology, supporting potential future adaptations for other Chinese-speaking populations. Additionally, one of the original developers of the FCMAHS was involved to further enhance the translation quality. For instance, multiple discussions occurred to clarify the meaning of item 14, ensuring it reflected the alignment of the care recipient's medication schedule with the caregiver's without implying negotiation or conflict. Finally, an expert panel from clinical, community, and academic fields reviewed the translation to ensure its relevance across various settings and professions.

Table 4 Qualitative Summary of Theme and Subthemes of Newly Identified Hassles and Representative Quotes

Subthemes	ID12	ID15	ID18	ID24	ID37	ID38	ID43	ID49	ID62	ID68	ID96	ID101	Total	Representing Quotes
Care Coordination between caregivers														
1. Handing over tasks	X		X				X	X				X	5	"We have to check the medication list to figure out why it's different from before. When her daughter takes her to the hospital, she just puts all the medications on the table, and the list says, 'One pill after breakfast.' But the elderly woman says, 'No, the doctor told me to take half a pill in the morning and at night.' You know, when someone else takes her to the doctor, there's no clear handover of information." (ID49)
2. Negotiating caregiving plans and goals				X		X				X			3	"Yes, they would get nervous and say, 'How could this happen?' They might even mention that similar-looking medications have been mixed up before, like Harnalige® [tamsulosin] and Rivotril® [clonazepam]. Since the two medications look very similar, they once gave the wrong one, which caused a disagreement between my brother and sister. I had to step in and explain that it was not a big deal since it only happened once." (ID24)
3. Language barriers with foreign caregivers		X				X							2	"I find it difficult to communicate with her, but. I also believe there are probably some things beyond her abilities, including her Chinese language skills." (ID38)
4. Supervising secondary caregivers		X	X	X		X				X			5	"Foreign caregivers. she does not understand, so. if she follows the instructions, she will give everything. Once, my mother almost had hypoglycemia because of this. The caregiver needs to be trained to handle situations, like if my mother eats ice cream one day." (ID68)

https://doi.org/10.2147/PPA.S516126

Adapted from the FCMAHS, the FCMAHS-TC maintains consistency in the number of items, extracted factors, item allocation, and naming conventions across its four dimensions. This consistency suggests that caregivers in Taiwan encounter medication administration challenges similar to those faced by their counterparts in the United States. When comparing the psychometric properties across versions, the FCMAHS-TC shows comparable explained total variance and strong internal consistency (Table 5). However, the test-retest reliability of the FCMAHS-TC is slightly lower than that reported for the English and Turkish versions. This difference may be attributed to medication consultations provided by the interviewer after the initial data collection, which could have influenced participants' perceptions and subsequently affected their responses in the follow-up assessment.

Factor analysis revealed that items 17 ("admitting my mistake to the physician or others") and 18 ("knowing when to suspend, increase, decrease, or discontinue medication") were grouped under the information seeking and sharing factor in the FCMAHS-TC, whereas they were categorized under safety issues in the English version. Participants viewed item 17 as related to medication adjustment rather than a mistake, and the term "admit" caused discomfort, similar to item 4, due to its focus on healthcare professionals' authority. Likewise, the term "knowing" in item 18 was seen as part of information acquisition, overlapping with item 7 about decision-making comfort. Additionally, item 19 ("understanding when medications can be crushed, missed, dissolved, etc.") was cross-loaded onto multiple factors, including I, III, and IV, due to confusion between information acquisition and decision-making. Given the support for the specific tasks described in item 19 from previous studies, we attributed the ambiguity to translation issues and decided to retain the item. However, further clarification and revision are recommended.

The qualitative findings support the construct validity of the FCMAHS-TC. Repeated coding within individual factors and minimal overlap across different factors corresponded with strong within-factor correlations and weaker between-factor

Table 5 Comparison of Psychometric Properties of Different Versions of the Family Caregiver Medication Administration Hassle Scale

Version	Number of items	Factors/Domains	Reliability		Variance Explained
			Cronbach's alpha	Test-retest Reliability	
FCMAHS	24	1. Information Seeking/Information Sharing 2. Scheduling Logistics 3. Safety Issues 4. Polypharmacy Concerns	0.95	0.84	59.51%
FCMAHS-MA	25	1. Initial Information Seeking 2. Safety Issues 3. Scheduling 4. Advanced Information Acquisition 5. Daily Routine 6. Prescription Filling	0.7-0.9[a]	0.64	53%
FCMAHS-TC	24	1. Information Seeking and Sharing 2. Scheduling Logistics 3. Medication Filling and Prescription Management 4. Safety Issues	0.94	0.78	59.57%
FCMAHS-TR	18	1. Medication Information Seeking 2. Medication Schedule 3. Prescription Filling 4. Medication Management 5. Medication Knowledge	0.95	0.92	62.6%

Note: [a]Range of Cronbach's alpha across six factors.
Abbreviations: MA, Mexican American; TC, Traditional Chinese; TR, Turkish.

correlations. The simultaneous collection of quantitative and qualitative data helped minimize potential interview and coding biases, thereby enhancing the study rigor through triangulation. These findings provide valuable insights for future FCMAHS-TC adaptations. While the reported hassles generally matched the four factors of the scale, additional concerns were raised. For example, item 20 ("being aware of the presence of side (adverse) effects") highlighted caregivers' concerns about drug interactions, particularly among those managing older adults on multiple medications. This concern is especially relevant in Chinese ethnicities, where both herbal and Western medications are commonly used.[40,41] Caregivers also faced challenges in communicating with not just physicians but also pharmacists.[42] As pharmacists are often the most accessible medication experts, future adaptations should consider communication with both physicians and pharmacists or use the term "healthcare professionals" to capture the full range of relevant interactions.

Another emerging issue is the sharing of caregiving responsibilities and collaboration between the primary and other caregivers, which was not addressed in other versions. Differences in caregiving experiences, knowledge backgrounds, and expectations can complicate communication and coordination, potentially leading to inconsistencies and conflicts in medication administration.[43] Furthermore, while only two interview participants raised concerns about language barriers with foreign caregivers, half of those who had hired foreign caregivers reported such challenges. With foreign caregivers, mainly from Southeast Asia, making up nearly 30% of Taiwan's long-term care workforce, these language barriers add complexity to caregiving.[44] Effective communication between primary and foreign caregivers is crucial for maintaining consistent and high quality of care. While foreign caregivers may excel at physical tasks, they often face difficulties with the cognitive aspects of caregiving due to language barriers and cultural differences, which can result in misunderstandings and gaps in medication administration. Incorporating a new construct that reflects the dynamics between various caregiving roles may enhance the cultural relevance and adaptability of the FCMAHS-TC in the Taiwanese context.

Unlike the Mexican American version, the FCMAHS-TC does not include items related to financial concerns. This decision is supported by the fact that nearly 100% of Taiwan's population is covered by the National Health Insurance, including prescription medications, which caps outpatient copayments at US$10.[45,46] Our qualitative findings confirm that medication costs are not a significant concern for caregivers compared to other caregiving expenses. However, an issue related to access to brand-name medications emerged, arising from Taiwan's reliance on imported medications and society's preference for brand-name over generic alternatives. The healthcare system's increasing pharmaceutical expenditures and ongoing negotiations on drug price reimbursement also affect medication supply sustainability.[47,48] Additionally, caregivers with lower education attainment often rely on the physical appearance of medications for identification, making it difficult to manage when generic medications replace brand-name ones. Thus, future revisions may need to include an item addressing medication acquisition.

The FCMAHS-TC offers significant potential for clinical use, as it can be utilized by healthcare professionals across various disciplines and care settings, including for initial assessment or discharge planning. Physicians, nurses, pharmacists, social workers, and rehabilitation therapists can use this tool to understand the stressors that family caregivers face when managing medications with care recipients. By identifying specific challenges, healthcare professionals can tailor interventions and offer targeted resources to alleviate caregiving burdens, such as educating caregivers on medications, teaching effective pillbox use, and improving communication skills with prescribers and care recipients. Ultimately, integrating the FCMAHS-TC into practices supports caregiver well-being and enhances care quality.

This study has several limitations. First, the sample was predominantly from metropolitan areas (96%), which limits the generalizability of the FCMAHS-TC to rural caregivers. Further research is needed to assess the tool's applicability to diverse demographic and geographic groups. Additionally, the study did not collect data on the health status of care recipients, which restricts our understanding of the tool's applicability to caregivers of patients with specific diseases. Lastly, the reliance on participants' recall of medication administration experiences may have introduced recall bias, which could affect the study findings.

Conclusions

The FCMAHS-TC demonstrates strong psychometric properties and has been linguistically and culturally adapted for family caregivers in Taiwan. It serves as a valuable tool for researchers and healthcare professionals to assess and understand the challenges of medication administration and the associated caregiving burdens. Future research should aim to refine the tool by incorporating new aspects related to care collaboration and expanding its evaluation across diverse regions and healthcare

settings. Additionally, further investigation into social and demographic determinants is needed to identify elements that may alleviate or exacerbate caregivers' hassles, which can inform the development of targeted interventions.

Ethics Approval and Consent

The study procedures described in the manuscript received ethical approval from the Cathay General Hospital Institutional Review Board (CGH-P108008). Informed consent, including permission for the publication of anonymized responses and direct quotes, was obtained from all participants prior to their enrollment. The study was conducted in adherence to the principles of the Declaration of Helsinki.

Acknowledgments

The authors would like to thank Sam (Yu-Chia) Hsu, Estee (Hsin-Ying) Chou, Xin Yi Wong, Chan-Xi Chew, Tony (Yen-Hui) Tarn, Fang-Ju Lin, Jue-Zong Yeh, and Ya-Ning Lo for their valuable expertise and contributions to the development of the FCMAHS-TC. We also extend our gratitude to the Taiwan Association of Family Caregivers, Taipei City Association of Family Caregivers, New Taipei City Association of Family Caregivers, Genesis Social Welfare Foundation, and the Nursing Department of Sijhih Cathay General Hospital for their assistance in participant recruitment.

Funding

This work was supported by Cathay General Hospital (CGH), New Taipei City, Taiwan [grant number: CGH-MR-B108008], and the National Science and Technology Council (NSTC), Taiwan [grant number: NSTC 113-2628-B-002-018-MY3].

Disclosure

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

1. Department of Household Registration, Ministry of the Interior, Republic of China (Taiwan). Population by sex and 5-year age group for counties and cities. 2024. Available from: https://www.ris.gov.tw/app/en/3910. Accessed August 13, 2024.
2. Department of Human Resources Development, National Development Council. Population projections for the Republic of China (Taiwan) 2022-2070. 2024. Available from: https://pop-proj.ndc.gov.tw/main_en/Default.aspx. Accessed April 13, 2025.
3. Health Promotion Administration, Ministry of Health and Welfare. National health interview survey 2017. 2023. Available from: https://www.hpa.gov.tw/Pages/Detail.aspx?nodeid=364&pid=13636. Accessed August 13, 2024.
4. Meng LC, Kojima T, Suzuki Y, et al. Medication overload: a closer look at polypharmacy and potentially inappropriate medications among older people in Taiwan and Japan. *Arch Gerontol Geriatr*. 2023;115:105100. doi:10.1016/j.archger.2023.105100
5. Davies LE, Spiers G, Kingston A, Todd A, Adamson J, Hanratty B. Adverse outcomes of polypharmacy in older people: systematic review of reviews. *J Am Med Dir Assoc*. 2020;21(2):181–187. doi:10.1016/j.jamda.2019.10.022
6. Lawton MP, Brody EM. Assessment of older people: self-maintaining and instrumental activities of daily living. *Gerontologist*. 1969;9(3):179–186. doi:10.1093/geront/9.3_Part_1.179
7. Reinhard S, Young HM, Levine C, Kelly K, Choula R, Accius J. Home Alone Revisited. Washington, DC: AARP Public Policy Institute. 2019. Available from: https://doi.org/10.26419/ppi.00086.001. Accessed August 13, 2024.
8. Reinhard SC, Levine C, Samis S. Home Alone: family caregivers providing complex chronic care. Washington, DC: AARP Policy Institute. 2012. Available from: https://www.aarp.org/content/dam/aarp/research/public_policy_institute/health/home-alone-family-caregivers-providing-complex-chronic-care-rev-AARP-ppi-health.pdf. Accessed August 13, 2024.
9. Look KA, Stone JA. Medication management activities performed by informal caregivers of older adults. *Res Social Adm Pharm*. 2018;14(5):418–426. doi:10.1016/j.sapharm.2017.05.005
10. Travis SS, Bethea LS, Winn P. Medication administration hassles reported by family caregivers of dependent elderly persons. *J Gerontol A*. 2000;55(7):M412–M417. doi:10.1093/gerona/55.7.m412
11. Thornton M, Travis SS. Analysis of the reliability of the modified caregiver strain index. *J Gerontol B Psychol Sci Soc Sci*. 2003;58(2):S127–S132. doi:10.1093/geronb/58.2.s127
12. Bachner YG, O'Rourke N. Reliability generalization of responses by care providers to the zarit burden interview. *Aging Ment Health*. 2007;11(6):678–685. doi:10.1080/13607860701529965
13. Bédard M, Molloy DW, Squire L, Dubois S, Lever JA, O'Donnell M. The zarit burden interview: a new short version and screening version. *Gerontologist*. 2001;41(5):652–657. doi:10.1093/geront/41.5.652
14. Travis SS, Bernard MA, McAuley WJ, Thornton M, Kole T. Development of the Family Caregiver Medication Administration Hassles Scale. *Gerontologist*. 2003;43(3):360–368. doi:10.1093/geront/43.3.360

15. Kao HFS, Lynn MR. Use of the measurement of medication administration hassles with Mexican American family caregivers. *J Clin Nurs*. 2009;18(18):2596–2603. doi:10.1111/j.1365-2702.2008.02752.x
16. Kingir ZB, Sancar M, Ay P, et al. Reliability and validity of the Turkish version of the family caregiver medication administration hassles scale. *Fam Pract*. 2024;41(4):596–604. doi:10.1093/fampra/cmad040
17. Ministry of Health and Welfare. Report of the senior citizen condition survey 2022. 2024. Available from: https://dep.mohw.gov.tw/DOS/lp-5095-113-xCat-y111.html. Accessed August 14, 2024.
18. Chou TJ, Peng JK, Chen YL, Chang HH, Lee YH, Huang KC. Regular home health care visits reduce health expenditure among home care patients: a retrospective cohort study in a community hospital in Northern Taiwan. *Research Square Preprint*. doi:10.21203/rs.3.rs-898434/v1
19. Gillespie R, Mullan J, Harrison L. Managing medications: the role of informal caregivers of older adults and people living with dementia. A review of the literature. *J Clin Nurs*. 2014;23(23–24):3296–3308. doi:10.1111/jocn.12519
20. Lim RH, Sharmeen T. Medicines management issues in dementia and coping strategies used by people living with dementia and family carers: a systematic review. *Int J Geriatr Psychiatry*. 2018;33(12):1562–1581. doi:10.1002/gps.4985
21. Sousa VD, Rojjanasrirat W. Translation, adaptation and validation of instruments or scales for use in cross-cultural health care research: a clear and user-friendly guideline. *J Eval Clin Pract*. 2011;17(2):268–274. doi:10.1111/j.1365-2753.2010.01434.x
22. Ku TL, Wu SY, Su YL, Lai CM, Chie WC. Development and validation of the Family Caregiver Medication Administration Hassle Scale-Chinese version (FCMAHS-CH). *Taiwan J Public Health*. 2020;39(2):216–230. doi:10.6288/TJPH.202004_39(2).108098
23. Almanasreh E, Moles R, Chen TF. Evaluation of methods used for estimating content validity. *Res Social Adm Pharm*. 2019;15(2):214–221. doi:10.1016/j.sapharm.2018.03.066
24. Polit DF, Beck CT. The content validity index: are you sure you know what's being reported? Critique and recommendations. *Res Nurs Health*. 2006;29(5):489–497. doi:10.1002/nur.20147
25. Polit DF, Beck CT, Owen SV. Is the CVI an acceptable indicator of content validity? Appraisal and recommendations. *Res Nurs Health*. 2007;30(4):459–467. doi:10.1002/nur.20199
26. Nasa P, Jain R, Juneja D. Delphi methodology in healthcare research: how to decide its appropriateness. *World J Methodol*. 2021;11(4):116–129. doi:10.5662/wjm.v11.i4.116
27. Creswell JW, Clark VLP. *Designing and Conducting Mixed Methods Research*. 3rd ed. Los Angeles, CA: SAGE Publications; 2017.
28. Anthoine E, Moret L, Regnault A, Sébille V, Hardouin JB. Sample size used to validate a scale: a review of publications on newly-developed patient reported outcomes measures. *Health Qual Life Outcomes*. 2014;12:176. doi:10.1186/s12955-014-0176-2
29. Tinsley HEA, Tinsley DJ. Uses of factor analysis in counseling psychology research. *J Couns Psychol*. 1987;34(4):414–424. doi:10.1037/0022-0167.34.4.414
30. Sürücü L, İ Y, Maslakçi A. Exploratory factor analysis (EFA) in quantitative researches and practical considerations. *Gümüşhane Üniversitesi Sağlık Bilimleri Dergisi*. 2022;13(2):947–965. doi:10.31219/osf.io/fgd4e
31. Hadi NU, Abdullah N, Sentosa I. An easy approach to exploratory factor analysis: marketing perspective. *J Educ Soc Res*. 2016;6(1):215–223. doi:10.5901/jesr.2016.v6n1p215
32. Conway JM, Huffcutt AI. A review and evaluation of exploratory factor analysis practices in organizational research. *Organ Res Methods*. 2003;6(2):147–168. doi:10.1177/1094428103251541
33. Bandalos DL. *Measurement Theory and Applications for the Social Sciences*. Kenny DA, Little TD, eds. New York, NY: The Guilford Press; 2018.
34. UCLA statistical consulting group. A practical introduction to factor analysis: exploratory factor analysis. 2024. Available from: https://stats.oarc.ucla.edu/spss/seminars/introduction-to-factor-analysis/a-practical-introduction-to-factor-analysis/. Accessed August 14, 2024.
35. Tavakol M, Dennick R. Making sense of Cronbach's alpha. *Int J Med Educ*. 2011;2:53–55. doi:10.5116/ijme.4dfb.8dfd
36. Koo TK, Li MY. A guideline of selecting and reporting intraclass correlation coefficients for reliability research. *J Chiropr Med*. 2016;15(2):155–163. doi:10.1016/j.jcm.2016.02.012
37. Willis DG, Sullivan-Bolyai S, Knafl K, Cohen MZ. Distinguishing features and similarities between descriptive phenomenological and qualitative description research. *West J Nurs Res*. 2016;38(9):1185–1204. doi:10.1177/0193945916645499
38. Hsieh HF, Shannon SE. Three approaches to qualitative content analysis. *Qual Health Res*. 2005;15(9):1277–1288. doi:10.1177/1049732305276687
39. Fetters MD, Curry LA, Creswell JW. Achieving integration in mixed methods designs-principles and practices. *Health Serv Res*. 2013;48(6 Pt 2):2134–2156. doi:10.1111/1475-6773.12117
40. Chen KC, Lu R, Iqbal U, et al. Interactions between traditional Chinese medicine and western drugs in Taiwan: a population-based study. *Comput Methods Programs Biomed*. 2015;122(3):462–470. doi:10.1016/j.cmpb.2015.09.006
41. Cyj N, Zhao Y, Wang N, et al. A multi-center cross-sectional study of Chinese herbal medicine-drug adverse reactions using active surveillance in Singapore's Traditional Chinese Medicine clinics. *Chin Med*. 2024;19(1):44. doi:10.1186/s13020-024-00915-z
42. Felkai C, Newby D, Cooper J, Nielsen S, Reeves A, Croft H. Medication management issues perceived by pharmacists and disability caregivers while supporting people with disability. *Explor Res Clin Soc Pharm*. 2024;15:100489. doi:10.1016/j.rcsop.2024.100489
43. Dieker J, Yun S, Weber K, Qualls S. Family conflict over illness beliefs and care strategies: implications for burden in family caregivers. *Aging Ment Health*. 2024;28(3):457–465. doi:10.1080/13607863.2023.2282683
44. Ministry of Labor, Republic of China (Taiwan). Foreign workers in productive industries and social welfare by industry. 2024. Available from: https://statdb.mol.gov.tw/html/mon/c12020.htm. Accessed August 20, 2024.
45. Lee YT, Lee YH, Kaplan WA. Is Taiwan's national health insurance a perfect system? Problems related to health care utilization of the aboriginal population in rural townships. *Int J Health Plann Manage*. 2019;34(1):e6–e10. doi:10.1002/hpm.2653
46. National Health Insurance Administration, Ministry of Health and Welfare. Copayment. 2023. Available from: https://www.nhi.gov.tw/en/cp-29-34b85-17-2.html. Accessed September 26, 2024.
47. Chung CH. Trends in pharmaceutical expenditure in the Taiwan national health insurance database at different hospital levels. *J Comp Eff Res*. 2023;12(2):e220162. doi:10.2217/cer-2022-0162
48. Chung HJ. *Taiwanese perceptions and attitudes of brand name and generic medications*. [Doctoral dissertation]. Madison, WI: University of Wisconsin-Madison. 2018.