Protocol

Development and Validation of a Scale to Measure Attitudes and Confidence Toward Oral Care Among Pharmacy Students in Japan: Protocol for a Preliminary Content Validation

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Abstract

Background: Oral health is closely linked to general health, and pharmacists are increasingly expected to contribute to oral health promotion. In Japan, oral care has recently been incorporated into the Model Core Curriculum for Pharmacy Education. To date, however, no standardized instrument has been developed specifically to assess pharmacy students' attitudes and confidence toward patients' oral care.

Objective: This study aims to develop a Japanese version of the Attitudes and Confidence in Oral Care for Pharmacy Students Scale (ACORP) by adapting the Attitudes and Confidence in Oral Care for Nursing Students Scale (ACORN) and to examine its reliability and validity.

Methods: An exploratory sequential mixed methods design was adopted. The ACORN scale was translated into Japanese through forward translation, reconciliation, back-translation, and expert committee review. Content validity was evaluated using the content validity ratio (CVR), item-level content validity index (I-CVI), scale-level content validity index (based on the average method, S-CVI/Ave, and based on universal agreement, S-CVI/UA), and modified κ coefficients. According to the study protocol, cognitive interviews with pharmacy students will be conducted to further refine the scale, followed by a cross-sectional survey involving at least 350 pharmacy students to examine structural validity, internal consistency, test-retest reliability, known-groups validity, convergent validity, and discriminant validity.

Results: The expert panel defined attitudes and confidence toward patients' oral care from a pharmacy perspective and adapted the ACORN scale accordingly. Items were modified to reflect pharmacists' communication-centered role, including medication-related management, patient education, identification of oral health problems, and dental referral. All items met the predefined criteria for content validity. CVR values were ≥0.75, I-CVI values for relevance and clarity were 1.00, and modified κ coefficients were 1.00 across all items. Both S-CVI/Ave and S-CVI/UA were 1.00 for relevance and clarity, and agreement regarding comprehensiveness reached 100%. The preliminary ACORP scale was finalized for subsequent cognitive interviews. According to the study protocol, cognitive interviews with 7 pharmacy students are planned between late 2026 and early 2027. A total of 500 students will subsequently be invited to participate in the validation study in 2027, with a target sample of at least

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350 participants. Structural validity, internal consistency, test-retest reliability, known-groups validity, convergent validity, and discriminant validity will be evaluated. Data analysis is planned for early 2028, with findings possibly published in 2028. Ethics approval was obtained from the Hoshi University Ethics Committee (2026-01) on May 18, 2026. This study received funding in April 2025.

Conclusions: The ACORP scale is the first instrument worldwide specifically designed to assess pharmacy students' attitudes and confidence toward patients' oral care. If its reliability and validity are established, it may help identify educational needs and evaluate oral care education and related educational interventions within pharmacy curricula.

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KEYWORDS

oral health; attitudes; confidence; scale development; validation; pharmaceutical education; pharmacy students; questionnaire; health communication

Introduction

According to the World Health Organization (WHO), approximately 3.5 billion people worldwide, representing about 45% of the global population, are affected by oral diseases, and conditions such as untreated dental caries, severe periodontal disease, edentulism, and lip and oral cancers constitute major global public health challenges [1]. These oral diseases cause pain, masticatory dysfunction, and aesthetic problems, leading not only to a decline in individuals' quality of life (QoL) but also to substantial socioeconomic burdens, including reduced work productivity and increased health care costs [2,3]. Oral health is an essential component of overall health, contributing not only to the maintenance of fundamental physiological functions such as mastication, swallowing, speech, and respiration but also to psychosocial well-being, including confidence in social interactions and psychological stability. It has also been shown to be closely associated with general health [2,4]. Poor oral hygiene has been associated with an increased risk of cardiovascular disease, diabetes, greater severity of infectious diseases, and cognitive decline [5-9]. In addition, appropriate oral care is effective in preventing aspiration pneumonia, and its importance is becoming increasingly significant in aging societies [10].

Against this background, the role of pharmacists as key providers of oral health in the community has attracted increasing attention [11]. Pharmacists are health care professionals who are frequently involved in frontline patient care and have continuous opportunities to interact with patients. They are well-positioned to influence patients' lifestyle and self-care behaviors through medication counseling and health consultations [12]. Community pharmacies are among the most accessible health care resources for the public and, as such, are expected to serve as key sites for the provision of oral health information and early intervention [11]. Pharmacist-led medication therapy management has been shown to improve clinical outcomes and reduce health care costs while also playing an important role in the early detection of adverse drug reactions and the optimization of prescribing [13]. Building on this professional expertise, pharmacists' involvement in oral health is of considerable importance for providing comprehensive community-based health care.

In Japan, the need to systematically equip pharmacy students with knowledge and practical skills in oral health has been increasingly emphasized, as oral care has recently been incorporated into the Model Core Curriculum for Pharmacy Education, which serves as the national standard guideline for pharmacy education [14]. In addition, in response to population aging, Japan has promoted a community-based integrated care system that provides comprehensive services, including medical care, long-term care, prevention, and daily living support at the community level. Pharmacists play an important role as members of interprofessional health care teams within this system [15]. In light of these changes in health care delivery systems, pharmacists' involvement in oral care is expected to expand further, and the enhancement of their practical competencies will become increasingly important. Accordingly, pharmacy education has an increasingly important role in preparing students to participate in oral health promotion before they enter clinical practice.

Pharmacy education should prepare students to promote oral health and support the adoption of appropriate oral care practices among patients and the public [16]. According to the knowledge-attitude-practice (KAP) model, knowledge contributes to the development of attitudes, which in turn influence health-related practices [17]. In the context of oral health, this framework suggests that increasing pharmacy students' knowledge may foster positive attitudes toward oral care and ultimately support appropriate oral care practices in their future professional roles. In social cognitive theory (SCT), human behavior is determined by the reciprocal interaction of personal, environmental, and behavioral factors [18]. Among these, self-efficacy—defined as an individual's belief in their capability to perform a specific behavior—is considered a key determinant of behavioral practice [18]. Therefore, evaluating educational outcomes should extend beyond knowledge acquisition to include students' attitudes and confidence (self-efficacy) toward providing oral health care. Because undergraduate pharmacy education provides the foundation for future professional practice, these educational outcomes should be evaluated before students enter clinical practice. This requires valid instruments capable of assessing attitudes and confidence toward oral care.

However, standardized instruments with established reliability and validity for assessing pharmacy students' attitudes and

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confidence toward oral care are lacking. Despite the increasing importance of oral health education in pharmacy curricula, no such instrument has been developed specifically for pharmacy students. The Attitudes and Confidence in Oral Care for Nursing Students Scale (ACORN), originally developed for nursing students, is a reliable and valid instrument for measuring attitudes toward and confidence in oral care [19]. Similarly, the Chinese version of the ACORN scale has demonstrated high reliability and validity [20]. These findings suggest that, with appropriate translation and cultural adaptation, the scale can serve as a useful assessment tool across different cultural contexts.

Nevertheless, direct application of the ACORN scale to pharmacy students has inherent limitations. Nursing students and pharmacy students differ in their educational curricula, clinical experience, and perceptions of their professional roles. Whereas nursing students are trained to provide hands-on oral care, pharmacy students are expected to contribute to oral health through medication-related management of oral conditions, patient education, early identification of oral health problems, and referral to dental professionals. Furthermore, no Japanese version of the ACORN scale has been developed, and there is currently no internationally validated instrument specifically designed to evaluate oral care education among pharmacy students.

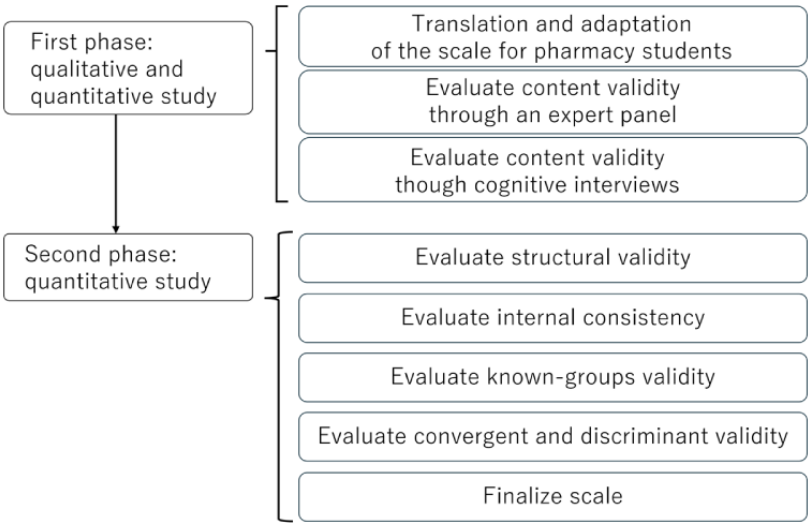
Based on the above background, the present study aims to develop a Japanese version of a scale measuring pharmacy students' attitudes and confidence toward oral care and to examine its reliability and validity.

Methods

Study Design

This study adopts an exploratory sequential mixed methods design [21,22] (Figure 1). This design involves conducting qualitative research first, followed by quantitative research based on the findings and hypotheses generated during the qualitative phase, and has been reported to be an appropriate methodology for scale development and validation.

Figure 1. The scale development and evaluation process.



The study consists of 2 phases. The first phase includes (1) forward and backward translation of the original scale, followed by its adaptation for use among Japanese pharmacy students, (2) evaluation of content validity by an expert panel, and (3) further assessment of content validity through cognitive interviews with pharmacy students. The second phase includes evaluation of the adapted scale's structural validity, internal consistency, known-groups validity, convergent validity, and discriminant validity.

At the time of manuscript preparation, the expert-panel assessment of content validity conducted during the first phase had been completed, resulting in a preliminary version of the adapted scale. Ethical approval was subsequently obtained before pharmacy students were enrolled in the study. The remaining procedures, beginning with the planned cognitive interviews, are described prospectively in this protocol.

First Phase: Scale Development

ACORN

In this study, a Japanese version of the ACORN scale will be developed and adapted for use among pharmacy students [19]. Although pharmacists do not provide hands-on oral care, they play an important role in oral health promotion through patient education, identification of oral health problems, and referral to dental professionals. Therefore, the constructs of attitudes and confidence toward oral health care are also applicable to pharmacy students. Accordingly, adapting an existing theory-based instrument is more appropriate than developing an entirely new scale.

Rojo et al [19] developed the ACORN scale to assess nursing students' attitudes toward and confidence in oral care. The ACORN scale consists of 24 items and includes 2 subscales: attitudes (8 items) and confidence (16 items). Each item is rated on a 7-point Likert scale, ranging from "strongly disagree" (1 point) to "strongly agree" (7 points) for the attitude subscale, and from "not very confident" (1 point) to "very confident" (7

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points) for the confidence subscale. The total score ranges from 24 to 168. The Cronbach α coefficients of the original scale and its Chinese version have been reported as 0.94 and 0.95, respectively, indicating high internal consistency [19,20]. In addition, the Cronbach α coefficients for the subscales of the original scale were 0.92 for attitudes and 0.96 for confidence [19].

Translation Process

Permission was obtained from the original author of the ACORN scale on January 6, 2026, to translate the instrument into Japanese, adapt it for pharmacy students, and conduct reliability and validity testing following cultural adaptation for use in Japan. Subsequently, a Japanese version of the ACORN scale was developed using a team-based approach in accordance with established guidelines for scale translation [23-25].

One researcher without a pharmaceutical or clinical background but with experience in scale translation (RY) and 2 researchers with pharmaceutical and clinical backgrounds (TS and MI) independently translated the original scale into Japanese. Following the forward translation, a 150-minute reconciliation meeting was held among the 3 translators on January 26, 2026. Although no major discrepancies were observed among the 3 translations, minor revisions were made to improve clarity, including replacing technical terms with more accessible expressions to ensure that even first-year undergraduate pharmacy students could easily understand and respond to the items. During the reconciliation meeting, the 3 translators reviewed and discussed their respective translations and wording and developed a revised version that was more appropriate considering the Japanese cultural context.

Subsequently, two linguistics experts who (1) were native English speakers, (2) had no knowledge of the construct, (3) were proficient in Japanese, and (4) had no medical or pharmaceutical background independently performed back-translation of the scale into English. After the back-translation, a reconciliation meeting was held to review the translated versions, and it was confirmed that there were no substantial discrepancies compared with the original scale.

Following this process, an expert committee was convened on March 8 and 17, 2026 (total duration: 300 minutes), comprising 2 pharmacists specializing in oral care (TS and AT), 1 researcher with experience in scale development (RY), 1 nurse with expertise in scale development (HO), 1 clinical pharmacist (T Okada), and 2 faculty members involved in pharmaceutical education (MI and SS). During the expert committee meetings, a comprehensive evaluation was conducted to assess semantic, idiomatic, experiential, and conceptual equivalence across the 3 forward translations, the reconciled translation developed after the reconciliation meeting, and the 2 back translations. For items in which the back-translation suggested a potential alternative interpretation, revisions were made to ensure that the wording more closely reflected the meaning of the original version.

After incorporating these revisions, the members of the expert committee were asked to evaluate the Japanese translations of the instructions, individual items, and response options using a 5-point rating scale ranging from “completely disagree” to “completely agree.” As a result, 7/7 (100%) of committee members rated each translated item as either “agree” or “completely agree,” and final consensus was reached by the expert committee.

Content Validity Through Expert Panel

After the expert committee review of the translation, the expert panel conducted an assessment of content validity based on established methodological guidelines and prior research [26-31]. First, the constructs of attitudes and confidence toward patients’ oral care among pharmacy students were discussed. Based on this discussion, items considered less directly relevant to pharmacy education and the professional roles of pharmacists in Japan were revised.

Following the expert panel discussion, each member evaluated the items in terms of essentiality, relevance, and clarity. In addition, we evaluated whether each subscale and the overall scale adequately covered the constructs initially defined by the expert panel. Subsequently, content validity indices were calculated for each item, including the content validity ratio (CVR), the item-level content validity index (I-CVI) for relevance, the I-CVI for clarity, and the modified κ coefficient, to examine the level of agreement among experts regarding item necessity. Furthermore, to evaluate the content validity of each subscale and the overall scale, the scale-level content validity index based on the average method (S-CVI/Ave), universal agreement (S-CVI/UA), and comprehensiveness were calculated.

Content Validity Through Cognitive Interviews

The following sections describe the study protocol, including procedures that are planned but had not yet been conducted at the time of this paper’s preparation.

As a pilot study and in accordance with previous research, the scale will be administered to 7 pharmacy students from the Faculty of Pharmacy, Hoshi University, ranging from first- to sixth-year students [32,33]. Snowball sampling will be used for participant recruitment. The sample size of 5-15 participants is considered appropriate for cognitive interviews assessing content validity; therefore, the present study meets this criterion.

Based on previous studies, an interview guide was developed in advance by the expert panel (n=7; Table 1) [34-38]. Specifically, participants will be asked to provide an overall evaluation of the questionnaire and to assess the clarity, relevance, and comprehensiveness of the items, the appropriateness of the response options, and opportunities for improvement. The Attitudes and Confidence in Oral Care for Pharmacy Students Scale (ACORP) will be refined based on the results of the cognitive interviews, followed by back-translation and subsequent review and approval by the original authors of the ACORN scale.

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Table 1. Interview guide.

Category	Questions
Overall evaluation of the questionnaire	• What were you thinking or feeling as you answered the questionnaire? • Did you feel any emotional or mental burden while answering?
Clarity	• To what extent were the instructions easy to understand? • To what extent was each item easy to understand? • To what extent were the response options easy to understand? • Are there any items that you think could be phrased more specifically?
Relevance	• To what extent is each item relevant to your situation as a pharmacy student? • Did you notice any items that appeared redundant or overly similar?
Comprehensiveness	• Do you think there are any missing areas in this questionnaire regarding pharmacy students' attitudes and confidence toward oral care? • How well do you think this questionnaire captures pharmacy students' attitudes and confidence toward oral care? • Do you think the way the questions are grouped is appropriate?
Response options	• Do you think the response options are appropriate?
Suggestions for improvement	• Do you have any recommendations for improving this questionnaire?

Second Phase: Scale Validation

Overview

The reliability and validity of the ACORP scale will be examined. Specifically, structural validity, internal consistency, test-retest reliability, known-groups validity, convergent validity, and discriminant validity will be assessed.

Participants and Recruitment Procedure

A questionnaire survey will be conducted among students of the Faculty of Pharmacy at Hoshi University to examine the reliability and validity of the scale. The participants will be first- to sixth-year pharmacy students. Recruitment will be conducted by faculty members, who will invite potential participants to take part in the study, and those who provide informed consent will complete the questionnaire. Convenience sampling will be used.

The inclusion criteria are as follows: (1) students enrolled in the first to sixth years of the Faculty of Pharmacy at Hoshi University and (2) individuals who provide informed consent to participate in the study.

To examine the reliability and validity of the scale, a sample of 10-15 participants per candidate item is considered necessary [39]. As the preliminary ACORP scale consists of 23 items, this criterion corresponds to a required sample size of 230-345 participants. For the known-groups validity analyses, a priori sample size calculations were performed using G*Power (Heinrich-Heine-Universität Düsseldorf) [40-42]. For comparisons across the 6 academic-year groups using 1-way ANOVA, assuming a medium effect size (f=0.25), an α error probability of .05, and a statistical power of .80, the analysis indicated a minimum total sample size of 216 participants. For comparisons between students intending to pursue clinical careers and those intending to pursue nonclinical careers using an independent-samples *t* test, assuming a 2-tailed test, a medium effect size (d=0.50), an α error probability of .05, a statistical power of .80, and an allocation ratio of 1:1, the analysis indicated a minimum sample size of 128 participants (64 per group). Therefore, a minimum sample size of 350 participants will be targeted for the validation study. Allowing for an anticipated nonresponse or attrition rate of approximately 30%, approximately 500 students will be invited to participate in the study [43].

Data Collection

Participant characteristics will include student ID, intended future occupation, and information regarding the decision to pursue a career in the health care field. Sociodemographic variables will include age, sex, academic year, parental occupation (ie, whether a parent is a health care professional), and experience of part-time work in a health care–related field. In addition, data will be collected on dental visit history, treatment experience, subjective oral health status, and subjective general health status. Scale-based assessments will include the ACORP scale and the Hiroshima University–Dental Behavioral Inventory (HU-DBI) [44].

Statistical Analysis

Overview

Statistical analyses will be conducted using R (version 4.4.1 for Windows; R Foundation), and a *P* value of less than .05 will be considered statistically significant.

Descriptive Analysis

Descriptive statistics, including means, percentages, and SDs, will be calculated for intended future occupation, information regarding the decision to pursue a career in the health care field, age, sex, academic year, parental occupation, experience of part-time work in a health care–related field, dental visit history, treatment experience, subjective oral health status, and subjective general health status.

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Item Exclusion Criteria

Items will be considered for removal if more than 15% of participants select the highest or lowest response option, which would indicate the presence of a ceiling or floor effect [45]. In addition, items with item-total or item-remainder correlations below 0.30 will be considered for deletion [46]. In the exploratory factor analysis (EFA), items with factor loadings below 0.40 will likewise be considered for removal [46].

Examination of Structural Validity

To examine the structural validity of the ACORP scale, an EFA will be conducted. The number of factors will be determined based on eigenvalues greater than 1, inspection of the scree plot, and the results of parallel analysis [47]. If these criteria suggest different numbers of factors, alternative factor solutions will be compared based on factor loadings, cross-loadings, and the interpretability of the resulting factors. Priority will be given to solutions supported by parallel analysis and characterized by a simple structure, adequate factor loadings, and minimal cross-loadings, while the extent to which each solution is consistent with the theoretically defined constructs of the ACORP scale will also be considered. Mardia kurtosis test will be used to assess multivariate normality, and the extraction method will be selected accordingly [48]. Furthermore, based on the results of the EFA, a confirmatory factor analysis (CFA) will be performed. The estimation method for the CFA will also be selected based on the assessment of multivariate normality [48]. Maximum likelihood (ML) estimation will be used when the assumption of multivariate normality is met; otherwise, weighted least squares (WLS) estimation will be used [48]. Model fit will be evaluated according to the predefined criteria (Table 2) [49-51]. Acceptable model fit will be defined as a chi-square statistic to degrees of freedom ratio (χ^2/df) of ≤3; goodness-of-fit index (GFI), comparative fit index (CFI), Tucker-Lewis index (TLI), adjusted goodness-of-fit index (AGFI), and normed fit index (NFI) values of ≥0.95; and root mean square error of approximation (RMSEA) and standardized root mean square residual (SRMR) values of ≤0.05.

Table 2. Model fit indices.

Fit indices	Cutoff
Chi-square statistic or df	≤3
Goodness-of-fit index	≥0.95
Comparative fit index	≥0.95
Tucker-Lewis index	≥0.95
Adjusted goodness-of-fit index	≥0.95
Normed fit index	≥0.95
Root mean square error of approximation	≤0.05
Standardized root mean square residual	≤0.05

Examination of Reliability

Internal consistency will be evaluated by calculating Cronbach α coefficients together with item-total and item-remainder correlations. A Cronbach α value exceeding 0.70 will be considered indicative of acceptable internal consistency [46]. Test-retest reliability will be assessed by readministering the ACORP scale to a subsample of 100 participants 7 days after the baseline survey [28]. Allowing for an anticipated attrition rate of approximately 30% between the initial and retest surveys, at least 143 participants will be invited to participate in the retest survey [52]. If the data meet the assumption of normality, intraclass correlation coefficients (ICCs) will be calculated using the scores obtained at baseline and at the 7-day follow-up [53].

Examination of Known-Groups, Convergent, and Discriminant Validity

To examine known-groups validity, group comparisons will be performed using 1-way ANOVA or the independent-samples *t* test when the data are normally distributed. The study is based on the following hypotheses: (1) attitudes and confidence toward patients' oral care increase with academic year [54], and (2) students intending to pursue clinical careers are expected to demonstrate more positive attitudes and greater confidence toward patients' oral care than those intending to pursue nonclinical careers [55].

As students progress through the pharmacy curriculum, they acquire greater professional knowledge and clinical experience while developing a stronger professional identity and patient-centered perspective [56]. These educational experiences are expected to enhance their attitudes toward patients' oral care as well as their confidence in providing oral health support. Therefore, we hypothesized that attitudes and confidence toward patients' oral care will increase with academic year.

Students intending to pursue clinical careers are expected to demonstrate more positive attitudes and greater confidence toward patients' oral care than those intending to pursue nonclinical careers because previous research has shown that pharmacy students pursuing patient-facing roles place greater importance on direct patient contact and contributing to patients' health and well-being [55].

To examine convergent validity, Pearson correlation coefficients will be calculated between the ACORP scale and the HU-DBI. Although the HU-DBI assesses students' personal oral health-related attitudes and behaviors rather than their professional attitudes toward oral care for patients, no existing validated instrument was identified that directly assesses the

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same constructs as the ACORP scale among pharmacy students. The HU-DBI was therefore selected as a theoretically related external measure. Students' own oral health behaviors reflect their understanding of preventive dental care and their recognition of the importance of oral health [57]. Furthermore, favorable knowledge, attitudes, and behaviors among health care professionals are associated with the implementation of preventive care and patient education [57]. Therefore, pharmacy students with better oral health-related knowledge, attitudes, and behaviors are expected to demonstrate more positive attitudes and greater confidence toward patients' oral care. Accordingly, a positive, although not necessarily strong, correlation is expected between scores on the ACORP scale and those on the HU-DBI.

A multitrait-scaling analysis will be performed to evaluate convergent and discriminant validity. Convergent validity will be demonstrated when each item shows a correlation of at least 0.40 with its hypothesized subscale [53]. Discriminant validity will be demonstrated when an item correlates more significantly with its own subscale than with other subscales [53]. Furthermore, the proportions of scaling success and scaling errors will be calculated [53].

Ethical Considerations

The study will be conducted according to the principles of the Declaration of Helsinki. Ethics approval was obtained from the Hoshi University Ethics Committee (2026-01) on May 18, 2026, before research involving pharmacy student participants commenced.

One week before the questionnaire survey, all eligible students will receive a participant information sheet explaining the study purpose, procedures, and requirements of participation. The information sheet will explicitly state that participation is entirely voluntary and that the decision to participate, decline to participate, or withdraw from the study will not affect students' academic grades or course credits. Students will also be informed that participation will not be required or otherwise influenced by their relationship with faculty members. These points will also be explained verbally at the time when the participant information sheet is distributed.

One week later, at the time of the questionnaire survey, students who wish to participate will access the online questionnaire via a QR code provided in the participant information sheet and provide electronic informed consent before proceeding to the questionnaire. Participants will be informed that they may discontinue participation in the questionnaire at any time during completion.

They may also withdraw their consent within 1 week of submitting the questionnaire without incurring any academic disadvantage. After this period, individual data can no longer be withdrawn. Participants who wish to withdraw their consent will be instructed to contact the research team using the contact information provided in the participant information sheet.

Student ID will be collected solely to link responses from the baseline and retest surveys for the assessment of test-retest reliability. After completion of the retest survey and completion of the data linkage, the data will be anonymized, and the linkage key will not be retained. Data analysis will be conducted on a password-protected computer equipped with antivirus software, and study data will be stored on a password-protected USB drive stored in a locked cabinet in the Department of Medical Communication at Hoshi University. The data will be retained for 10 years after completion of the study and then permanently deleted.

The questionnaire is not intended to provide a clinical assessment or diagnosis of individual oral health conditions. After anonymization, individual participants will no longer be identifiable; therefore, the study team will not provide individual feedback on responses that may suggest oral health problems.

Preliminary Results

Permission to translate and adapt the original ACORN scale was obtained from the original author in January 2026. The forward- and back-translation procedures and subsequent reconciliation were then completed, followed by a review by the expert committee and an expert panel assessment of content validity in March 2026. These processes resulted in the development of a preliminary Japanese version of the ACORP scale, for which content validity was subsequently evaluated by an expert panel.

Expert Panel Members

The expert panel for the content validity assessment consisted of 2 pharmacists specializing in oral care (TS and AT), 1 researcher with experience in scale development (RY), 1 nurse with experience in scale development (HO), 1 clinical pharmacist (T Okada), and 2 faculty members involved in pharmaceutical education (MI and SS). The expert panel met on March 8 and 17, 2026 (total duration: 300 minutes; Table 3). The expert panel consisted of 7 members with a mean age of 45 (SD 5.29) years; 3 (43%) were male, and 4 (57%) were female. All members were researchers and held doctoral degrees. Five (71%) were pharmacists, and 1 (14%) was a nurse.

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Table 3. Characteristics of the expert panel for content validity assessment (n=7).

	Values
Gender, n (%)	
Male	3 (43)
Female	4 (57)
Profession[a], n (%)	
Pharmacist	5 (71)
Nurse	1 (14)
Researcher	7 (100)
Marital status, n (%)	
Married	5 (71)
Education, n (%)	
PhD	7 (100)
Age (years), mean (SD)	45 (5.29)

[a]Multiple responses allowed.

Conceptual Constructs of Attitudes and Confidence in Oral Care for Pharmacy Students

During the expert panel discussions, the panel recognized that pharmacists differ from nurses in terms of their job responsibilities and the relative importance of each professional duty and that pharmacists do not directly provide care within the oral cavity. Therefore, the conceptual constructs of attitudes and confidence toward oral care among pharmacy students were first examined.

Attitudes toward oral care among pharmacy students were defined as "the extent to which pharmacy students recognize the prevention and early detection of oral health problems, support for pharmacotherapy, support for self-care, and referral for dental consultation when necessary as important professional responsibilities of pharmacists, and perceive that they should actively engage in indirect oral health support."

Confidence toward oral care among pharmacy students was defined as "the extent to which pharmacy students perceive themselves as capable of identifying oral health problems through communication with patients and symptom inquiry and of implementing behaviors that contribute to appropriate pharmacotherapy support, oral care support, referral for dental consultation, and early detection."

Adaptation of the ACORN Scale for Pharmacy Students

Based on the constructs discussed, the scale was modified as follows. For item 1, considering that the importance of roles related to oral care differs between nurses and pharmacists, the phrase "one of the roles" was added to better reflect the relative importance of pharmacists' responsibilities in oral care. For item 2, the original item related to pressure injury care, which is a nursing responsibility, was replaced with an item on infection prevention, a topic considered more relevant to pharmacists' professional practice. For items 3 and 4, the target profession was changed from nurses to pharmacists. For item 5, the original item was retained because appropriate management of oral dryness is known to promote salivary secretion and contribute to the maintenance and improvement of swallowing function. Pharmacists also play an important role in identifying medications that may cause xerostomia, providing medication counseling, and advising patients on the selection and use of oral care products, such as oral moisturizers. For items 6 and 7, differences in the roles of nurses and pharmacists in oral care were taken into consideration. For item 6, oral care was redefined as one of the pharmacists' professional responsibilities. For item 7, the wording was softened by replacing "should" with "are expected to have." For item 12, the original item was removed because, unlike nurses, pharmacists do not directly perform oral care procedures. Instead, a new medication-related item was added. This revision was made to better reflect pharmacists' professional responsibilities, which include assessing oral conditions such as oral candidiasis and stomatitis and providing appropriate pharmacological management. Furthermore, the instructions for section 3 were revised to reflect the pharmacist's role in contributing to the early identification of oral health problems through communication with patients rather than through direct intraoral examination or oral care. Because section 3 of the original ACORN scale assumed that nurses provide direct oral care, it was restructured to better align with pharmacists' scope of practice. Following these revisions, the preliminary version of the ACORP scale was completed (Table 4).

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Table 4. Initial version of the ACORP[a].

Characteristics, item	Description
ACORN[b] scale	
This next section will ask you questions about your attitudes towards oral healthcare. Please select the button that best describes your response.	
1	It is a nursing responsibility to ensure patients have good oral hygiene
2	Oral care of patients is as important as providing pressure area care
3	It is important for nurses to initiate dental referrals when required
4	Nurses are well-positioned to provide early detection of oral health problem(s)
5	Providing oral care is always required for patients with swallowing difficulty
6	It is the role of the nurse to remind patients to attend to their oral care
7	Nurses should have the skills to conduct oral health assessment
8	It is important to ensure patients of all ages have adequate oral care
By selecting the buttons, please indicate how confident you are in performing the following:	
9	Discussing oral health with patients
10	Discussing with patients about the relationships between oral health and their health condition
11	Providing comprehensive oral care to a conscious patient who is unable to get out of bed
12	Referring a patient to dental services following your oral health assessment
Using the buttons, please indicate your confidence in identifying the following:	
13	Healthy gingiva/gums
14	Healthy teeth
15	Tooth decay
16	Oral pain
17	Lip ulcers
18	Food particles
19	Plaque
20	Tartar
21	Receding gums
22	Swollen gums
23	Broken teeth
24	Worn down teeth
ACORP scale	
This next section will ask you questions about your attitudes towards oral healthcare. Please choose the answer that best describes you.	
1	Ensuring good oral hygiene in patients is one of the roles of pharmacists
2	Oral care of patients is as important as providing infection prevention
3	It is important for pharmacists to initiate dental referrals when required
4	Pharmacists are well-positioned to provide early detection of oral health problem(s)
5	Providing oral care is required for patients with swallowing difficulty
6	It is one of the roles of pharmacists to encourage patients to take an interest in their own oral hygiene care
7	Pharmacists are expected to have the skills to assess oral health status
8	It is important to ensure patients of all ages have adequate oral care
How confident are you in your ability to take the following actions? Please select from the options below.	
9	Discussing oral health with patients

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Characteristics, item	Description
10	Discussing with patients about the relationships between oral health and their health condition
11	Referring patients to dental care after assessing their oral health status
12	Providing appropriate drug treatment after assessing the patient's oral condition
Are you confident in detecting oral problems early after hearing about the following symptoms/ clinical findings from patients? Please select from the options below.	
13	Oral pain
14	Lip sores
15	Swollen gums
16	Xerostomia
17	Oral thrush
18	Stomatitis
19	Bleeding gums
20	Taste disorder
21	Discoloration of the tongue
22	Toothache
23	Jaw pain

[a]ACORP: Attitudes and Confidence in Oral Care for Pharmacy Students Scale.

[b]ACORN: Attitudes and Confidence in Oral Care for Nursing Students Scale.

To clarify the theoretical basis of the preliminary ACORP scale, each item was conceptually mapped to the theoretical framework corresponding to its intended construct (Table 5). The attitude items were aligned theoretically with the attitude component of the KAP model, whereas the confidence items were aligned with the self-efficacy construct in SCT. Specifically, the attitude items (items 1-8) addressed attitudes toward the role of pharmacists in oral care, including attitudes toward the importance of oral care, dental referrals, early detection of oral health problems, oral care for patients with swallowing difficulties, support for patients' oral self-care, oral health assessment, and the oral care across age groups. The confidence items (items 9-23) addressed self-efficacy for oral health–related activities, including discussing oral health with patients, explaining the relationship between oral and general health, assessing oral health and making dental referrals, providing appropriate pharmacotherapy based on patients' oral conditions, and identifying various oral health problems. Finally, the expert panel confirmed that the revised items and the overall scale adequately represented the predefined constructs.

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Table 5. Theoretical item–construct mapping of the preliminary ACORP[a] scale.

Item	ACORP item	Subscale or construct	Theoretical framework	Theoretical concept
1	Ensuring good oral hygiene in patients is one of the roles of pharmacists	Attitudes	KAP model[b]	Attitude toward pharmacists' professional role
2	Oral care of patients is as important as providing infection prevention	Attitudes	KAP model	Attitudes toward the importance of oral care
3	It is important for pharmacists to initiate dental referrals when required	Attitudes	KAP model	Attitude toward dental referral
4	Pharmacists are well-positioned to provide early detection of oral health problem(s)	Attitudes	KAP model	Attitude toward early detection
5	Providing oral care is required for patients with swallowing difficulty	Attitudes	KAP model	Attitude toward oral care for swallowing difficulty
6	It is one of the roles of pharmacists to encourage patients to take an interest in their own oral hygiene care	Attitudes	KAP model	Attitude toward self-care support
7	Pharmacists are expected to have the skills to assess oral health status	Attitudes	KAP model	Attitude toward oral health assessment
8	It is important to ensure patients of all ages have adequate oral care	Attitudes	KAP model	Attitude toward oral care across age groups
9	Discussing oral health with patients	Confidence	SCT[c]	Self-efficacy in patient communication
10	Discussing with patients about the relationships between oral health and their health condition	Confidence	SCT	Self-efficacy in discussing oral-general health
11	Referring patients to dental care after assessing their oral health status	Confidence	SCT	Self-efficacy in assessment and referral
12	Providing appropriate drug treatment after assessing the patient's oral condition	Confidence	SCT	Self-efficacy in pharmacotherapy support
13	Oral pain	Confidence	SCT	Self-efficacy in early identification of oral health problems
14	Lip sores	Confidence	SCT	Self-efficacy in early identification of oral health problems
15	Swollen gums	Confidence	SCT	Self-efficacy in early identification of oral health problems
16	Xerostomia	Confidence	SCT	Self-efficacy in early identification of oral health problems
17	Oral thrush	Confidence	SCT	Self-efficacy in early identification of oral health problems
18	Stomatitis	Confidence	SCT	Self-efficacy in early identification of oral health problems
19	Bleeding gums	Confidence	SCT	Self-efficacy in early identification of oral health problems
20	Taste disorder	Confidence	SCT	Self-efficacy in early identification of oral health problems
21	Discoloration of the tongue	Confidence	SCT	Self-efficacy in early identification of oral health problems
22	Toothache	Confidence	SCT	Self-efficacy in early identification of oral health problems
23	Jaw pain	Confidence	SCT	Self-efficacy in early identification of oral health problems

[a]ACORP: Attitudes and Confidence in Oral Care for Pharmacy Students Scale.

[b]KAP model: knowledge-attitude-practice model.

[c]SCT: social cognitive theory.

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Indices for Content Validity Evaluation

The results of the CVR, I-CVI, S-CVI/UA, S-CVI/Ave, and modified κ are presented in Tables 6 and 7. The CVR values for all items were ≥0.75, indicating that all items met the inclusion criteria [26]. In addition, the I-CVI values for both relevance and clarity exceeded 0.74 for all items, confirming their relevance and clarity [29]. The modified κ coefficients were 1.00 for all items, indicating a high level of agreement among the experts [58]. At the scale level, both the S-CVI/Ave and S-CVI/UA for relevance were 1.00, and those for clarity were also 1.00. Furthermore, the proportion of agreement for comprehensiveness was 100% for the overall scale. Based on these results, no items met the criteria for deletion proposed by Polit and Beck [29].

Table 6. CVR[a] of the ACORP[b] scale assessed by the expert panel (n=7).

Item	Ne[c]	CVR	Interpretation[d]
1	7	1.00	Remained
2	7	1.00	Remained
3	7	1.00	Remained
4	7	1.00	Remained
5	7	1.00	Remained
6	7	1.00	Remained
7	7	1.00	Remained
8	7	1.00	Remained
9	7	1.00	Remained
10	7	1.00	Remained
11	7	1.00	Remained
12	7	1.00	Remained
13	7	1.00	Remained
14	7	1.00	Remained
15	7	1.00	Remained
16	7	1.00	Remained
17	7	1.00	Remained
18	7	1.00	Remained
19	7	1.00	Remained
20	7	1.00	Remained
21	7	1.00	Remained
22	7	1.00	Remained
23	7	1.00	Remained

[a]CVR: content validity ratio.

[b]ACORP: Attitudes and Confidence in Oral Care for Pharmacy Students Scale.

[c]Ne: number of experts that evaluated the essentiality of items.

[d]Interpretation criteria for content validity ratio: remained=content validity ratio ≥0.75; eliminated=content validity ratio <0.75.

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Table 7. Item-level content validity indices for relevance and clarity and modified κ coefficients for the ACORP[a] scale assessed by the expert panel (n=7).

Item	Relevance				Clarity			
	Agreement	I-CVI[b]	Pc[c]	K[d]	Agreement	I-CVI	Pc	K
1	7/7	1.00	0.008	1	7/7	1.00	0.008	1
2	7/7	1.00	0.008	1	7/7	1.00	0.008	1
3	7/7	1.00	0.008	1	7/7	1.00	0.008	1
4	7/7	1.00	0.008	1	7/7	1.00	0.008	1
5	7/7	1.00	0.008	1	7/7	1.00	0.008	1
6	7/7	1.00	0.008	1	7/7	1.00	0.008	1
7	7/7	1.00	0.008	1	7/7	1.00	0.008	1
8	7/7	1.00	0.008	1	7/7	1.00	0.008	1
9	7/7	1.00	0.008	1	7/7	1.00	0.008	1
10	7/7	1.00	0.008	1	7/7	1.00	0.008	1
11	7/7	1.00	0.008	1	7/7	1.00	0.008	1
12	7/7	1.00	0.008	1	7/7	1.00	0.008	1
13	7/7	1.00	0.008	1	7/7	1.00	0.008	1
14	7/7	1.00	0.008	1	7/7	1.00	0.008	1
15	7/7	1.00	0.008	1	7/7	1.00	0.008	1
16	7/7	1.00	0.008	1	7/7	1.00	0.008	1
17	7/7	1.00	0.008	1	7/7	1.00	0.008	1
18	7/7	1.00	0.008	1	7/7	1.00	0.008	1
19	7/7	1.00	0.008	1	7/7	1.00	0.008	1
20	7/7	1.00	0.008	1	7/7	1.00	0.008	1
21	7/7	1.00	0.008	1	7/7	1.00	0.008	1
22	7/7	1.00	0.008	1	7/7	1.00	0.008	1
23	7/7	1.00	0.008	1	7/7	1.00	0.008	1

[a]ACORP: Attitudes and Confidence in Oral Care for Pharmacy Students Scale.

[b]I-CVI: item-level content validity index.

[c]Pc: probability of chance agreement.

[d]K: modified κ coefficient.

Results

At the time of writing this protocol, recruitment of pharmacy student participants has not yet begun. According to the study protocol, the following procedures are planned for the subsequent stages of the study. Ethics approval for the subsequent research involving pharmacy student participants was obtained from the Hoshi University Ethics Committee (2026-01) on May 18, 2026. This study received funding in April 2025.

Cognitive interviews with 7 pharmacy students are scheduled to be conducted from October 2026 to March 2027 to further evaluate the content validity and comprehensibility of the preliminary ACORP scale. These interviews are expected to provide additional evidence regarding the clarity, relevance, comprehensiveness, and comprehensibility of the scale, as well as to identify items requiring further refinement.

The subsequent validation study is scheduled to be conducted from April to December 2027, with approximately 500 students expected to be invited to participate. The quantitative study will evaluate the structural validity, known-groups validity, convergent validity, discriminant validity, internal consistency, and test-retest reliability of the ACORP scale. Based on these findings, the final version of the ACORP scale is expected to be established as a valid and reliable instrument for assessing pharmacy students' attitudes toward and confidence in providing oral care. Data analysis is planned for January to March 2028, and the study findings are expected to be submitted for publication between spring and summer 2028.

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Discussion

Overview

This protocol study describes the development and planned psychometric evaluation of the ACORP scale, which is designed to assess pharmacy students' attitudes and confidence toward providing oral care to patients. At the time of writing, the translation, professional adaptation, and expert-based content validation assessment have been completed, resulting in a preliminary Japanese version of the ACORP scale.

Principal Findings

At the time of writing this protocol, permission to translate and adapt the ACORN scale had been obtained from the original author, the forward- and back-translation processes had been completed, and the content validity of the preliminary ACORP scale had been assessed by an expert panel.

Particular attention was paid to ensuring that the wording was understandable to pharmacy students, including those in their first year, while preserving the conceptual meaning of the original ACORN items through back-translation. The preliminary Japanese version was further refined through expert committee discussions addressing semantic, idiomatic, experiential, and conceptual equivalence between the original and adapted versions. The expert committee reached a high level of agreement, resulting in the development of the preliminary Japanese version of the ACORP scale.

An important aspect of the adaptation process was the transition not only from English to Japanese but also from the nursing context of the original ACORN scale to the professional context of pharmacy practice. The expert panel therefore examined both the adaptation of the original ACORN items for use with pharmacy students and the content validity of the adapted items. Through expert panel discussions, the constructs of attitudes and confidence toward patients' oral care were examined from a pharmacy perspective, and the original ACORN items were adapted for pharmacy students to reflect the professional roles of pharmacists in oral care. In particular, the adapted items were designed to reflect differences between nursing and pharmacy practice, including pharmacists' roles in supporting pharmacotherapy, identifying potential oral health problems primarily through patient communication and inquiry about oral symptoms rather than direct physical care, supporting patients' oral self-care, and facilitating dental referrals when necessary. The expert panel also examined the conceptual alignment of the attitude items with the attitude component of the KAP model and the confidence items with the self-efficacy construct in SCT. Following this adaptation process, the expert panel quantitatively assessed the content validity of the adapted items, resulting in high levels of agreement among the experts and completion of the preliminary ACORP scale. Ethics approval was subsequently obtained before initiating research involving pharmacy student participants.

The uniformly high content validity scores should be interpreted in the context of both the development of the original ACORN scale and the extensive refinement undertaken during the present adaptation process. In the original ACORN study, 48 candidate items underwent content validity assessment by a 3-member expert panel, and 24 items were removed, with only items achieving an I-CVI of 1.00 retained in the final 24-item scale [19]. Thus, the ACORP adaptation began with items that had already undergone a stringent content validity assessment. In the present study, these items were further examined and refined through approximately 300 minutes of expert panel discussion addressing the constructs of attitudes and confidence toward patients' oral care, the intended meaning of the original ACORN items, and the modifications required to reflect the professional roles of pharmacists. A high level of agreement was achieved during this process before the final quantitative content validity assessment. Therefore, the uniformly high content validity index (CVI) values observed for the preliminary ACORP scale may partly reflect both the rigorous item selection undertaken during the original ACORN development and the extensive discussion and item refinement undertaken during the present adaptation process. Nevertheless, these uniformly high ratings may have limited the discriminative capacity of the content validity indices to detect subtle differences in perceived item relevance.

According to the study protocol, the next phase of the study will involve cognitive interviews with pharmacy students using an interview guide developed based on previous research. These interviews will assess the clarity, relevance, comprehensiveness, and comprehensibility of the preliminary ACORP scale from the perspective of the target population and will be used to identify any remaining ambiguities and further refine the items as necessary. Subsequently, quantitative psychometric evaluation will be conducted among pharmacy students. Item-level analyses will examine ceiling and floor effects, as well as item-total and item-remainder correlations. Construct validity will be examined through assessment of structural validity, known-groups validity, convergent validity, and discriminant validity. Structural validity will be assessed using exploratory and CFAs. Reliability will be evaluated through assessment of internal consistency and test-retest reliability.

Particular attention will be paid to the interpretation of the factor structure and construct validity of the ACORP scale. Because the ACORP scale has been professionally adapted from a nursing context to a pharmacy context, the factor structure identified among pharmacy students may not necessarily replicate the factor structure of the original ACORN scale. Therefore, alternative factor solutions will be evaluated using multiple criteria, including parallel analysis, factor loadings, cross-loadings, factor interpretability, and consistency with the theoretically defined constructs. In addition, the HU-DBI assesses students' personal oral health–related attitudes and behaviors rather than their professional attitudes and confidence toward patients' oral care. Therefore, associations between the HU-DBI and ACORP scores will be interpreted as evidence of relationships between theoretically related but conceptually distinct constructs, rather than as evidence that the 2 instruments measure equivalent constructs.

Comparison With Prior Work

Internationally, studies involving students in the health professions have examined knowledge, attitudes, and behaviors related to oral health, as well as confidence in providing oral

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care. A systematic review and meta-analysis of dental students found that although oral health knowledge was relatively well developed, attitudes and behaviors were comparatively less favorable, suggesting that higher levels of knowledge do not necessarily translate into positive attitudes or appropriate oral health behaviors [57]. These findings underscore the importance of assessing multiple domains of oral health-related competence rather than knowledge score alone, including attitudes and practice-related behaviors, when evaluating the outcomes of oral health education.

These issues may be particularly relevant for health professions students whose primary field of study is outside oral health care. A systematic review of nursing students reported limited oral health knowledge and considerable variation in attitudes toward oral health care across studies [59]. Similar challenges have been reported in Japan, where nursing students have demonstrated limited knowledge of and interest in oral health [60]. Furthermore, a study comparing nursing, dental, and dental hygiene students found that nursing students tended to have lower levels of oral care–related knowledge and less favorable attitudes than dental and dental hygiene students [60]. Taken together, these findings suggest that oral health education for nondental health professions students should extend beyond knowledge acquisition to address how students perceive oral care as part of their professional role and how confident they feel in fulfilling that role.

Against this background, the ACORN scale was recently developed to assess nursing students' attitudes toward and confidence in providing oral care to patients [19]. Unlike measures that focus primarily on oral health knowledge or students' personal oral health behaviors, the ACORN scale focuses on students' attitudes toward providing oral care to patients and their confidence in doing so. However, nurses and pharmacists have different professional roles and approaches to supporting patients' oral health. Therefore, directly applying the ACORN scale, which was developed for nursing students, to pharmacy students may not adequately capture the specific roles and responsibilities of pharmacists in oral health care.

Previous studies involving pharmacy students have also examined their attitudes toward oral health and their confidence in addressing patients' oral health concerns. A recent study of pharmacy students in France found that more than half reported feeling uncomfortable when managing patients who presented to a pharmacy with oral health complaints or conditions [61]. This finding suggests that although pharmacy students may recognize the importance of oral health, they may not necessarily feel adequately confident in supporting patients' oral health. However, to our knowledge, no standardized, psychometrically validated instrument has been established specifically to systematically assess pharmacy students' professional attitudes toward and confidence in providing oral care to patients.

The need to assess these attitudes and confidence among pharmacy students is further supported by the roles that pharmacists are expected to play in promoting and supporting patients' oral health. Internationally, pharmacists are expected to support patients' oral health by addressing oral symptoms and adverse effects related to pharmacotherapy, providing oral health information, supporting patients' self-care, facilitating the early identification of oral health problems, and recommending referral to dental care when appropriate [11,62]. Community pharmacists, in particular, have frequent contact with patients and members of the public and are therefore well-positioned to provide oral health support, including to individuals who do not regularly access dental care [11,62]. Indeed, a pilot study conducted in the United Kingdom reported that, following an intervention by community pharmacists, patients demonstrated improved oral health knowledge and greater motivation to change their oral health care practices [63]. In addition, a questionnaire survey of community pharmacists' attitudes and practices regarding oral health care in Malaysia reported that approximately half of the pharmacists provided oral health consultations 2 to 5 times per week and recommended 2 to 5 types of over-the-counter oral health products per week [64]. However, previous studies have identified several potential barriers to pharmacists fulfilling these responsibilities, including insufficient oral health education and knowledge, lack of confidence, and limited recognition of oral health support as part of the pharmacists' professional role [11,62].

In Japan, pharmacists are also expected to identify oral symptoms through routine communication with patients, such as during medication counseling, and to address oral problems associated with pharmacotherapy, support patients in maintaining their oral self-care, and recommend dental consultation when clinically appropriate. Furthermore, as part of efforts to promote lifelong dental checkups, model projects have been initiated to deliver oral health promotion through community pharmacies [65]. Indeed, a study of community pharmacists in Japan reported that pharmacists provided advice on oral care and recommended dental consultation in response to patients' oral health concerns, in addition to addressing oral adverse effects associated with medications [66]. Furthermore, the Japanese Model Core Curriculum for Pharmacy Education (2022 Revision) incorporates oral care into learning objectives related to maintaining and promoting the health of community residents and the provision of pharmacotherapy, highlighting the importance of oral health education in pharmacy curricula [14]. Thus, as oral health support is increasingly recognized as part of pharmacists' professional roles, it is important for pharmacy education to understand how pharmacy students perceive their responsibilities for supporting patients' oral health within their future professional role and how confident they are in carrying out these responsibilities.

Furthermore, pharmacists' involvement in oral health support is important from a broader public health perspective. Oral diseases impose a substantial global burden, and oral health is associated not only with eating, communication, social participation, and QoL but also overall health and well-being [2-4]. Accordingly, oral health should not be viewed solely as a matter of dental care but should be integrated into primary health care and multidisciplinary health services [2]. Although pharmacists are not substitutes for dental professionals, their routine contact with patients may enable them to provide complementary oral health support alongside dental professionals by providing oral health information, supporting

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self-care, facilitating the early identification of potential oral health problems, and facilitating patients' access to appropriate dental care.

Taken together, the existing literature, the professional roles expected of pharmacists, and the broader public health context indicate that the significance of the ACORP scale extends beyond the linguistic translation of the ACORN scale into Japanese. The ACORP scale involves adaptation across 2 distinct health professions, from nursing to pharmacy, and is designed to systematically assess pharmacy students' attitudes toward and confidence in providing oral care to patients while incorporating the profession-specific roles of pharmacists in oral health support. If its reliability and validity are established, the ACORP scale may provide a standardized measure for identifying pharmacy students' educational needs, determining priority areas for oral health education, and evaluating learning outcomes following educational interventions. Furthermore, strengthening oral health education in pharmacy curricula through such assessment may contribute to establishing an educational foundation for preparing future pharmacists to support patients' oral health in collaboration with dental professionals and other health care professionals.

Strengths and Limitations

This study has several strengths. First, to our knowledge, the ACORP scale is the first instrument specifically designed to assess pharmacy students' attitudes and confidence in providing oral care to patients, addressing an important measurement gap in pharmacy education research. Second, the ACORP scale was systematically adapted from the ACORN scale, an established instrument developed for nursing students with demonstrated psychometric properties. Building on an established instrument provides a methodologically grounded starting point for scale development, while the linguistic and professional adaptation process enabled the items to be tailored to the professional roles of pharmacists in oral care within Japanese pharmacy education. Third, the scale is theoretically grounded in the KAP model and SCT, with the attitude items conceptually aligned with the attitude component of the KAP model and the confidence items conceptually aligned with self-efficacy in SCT. This theoretical foundation provides a coherent framework for assessing attitudes and confidence as distinct but related constructs. Fourth, the ACORP scale assesses both attitudes and confidence, enabling the identification of whether educational needs relate primarily to students' perceptions of pharmacists' professional roles in oral care or to their confidence in performing oral care–related activities. Such information may help identify what aspects of oral care education should be prioritized and inform the development and refinement of targeted educational interventions. Fifth, this study uses a rigorous multistage development and validation process, including translation and professional adaptation, expert review, cognitive interviews with pharmacy students, and subsequent quantitative psychometric evaluation. Multiple aspects of validity and reliability will be examined, including content validity, structural validity, known-groups validity, convergent and discriminant validity, internal consistency, and test-retest reliability. This comprehensive approach will enable the psychometric properties of the ACORP scale to be evaluated across multiple dimensions of validity and reliability. Sixth, the study incorporates diverse expertise from both pharmacy education and clinical practice. The expert panel included external experts from multiple universities with extensive experience in pharmacy education, as well as pharmacists actively engaged in clinical practice. In addition, the multidisciplinary research team includes researchers with expertise in pharmacy education, oral care, behavior change, health communication, and health professions education. The complementary expertise of these professionals strengthens the scale development process by integrating diverse educational, clinical, and behavioral perspectives. Finally, if its reliability and validity are established through the planned psychometric evaluation, the ACORP scale may provide a standardized tool for identifying educational needs and quantitatively evaluating the effects of educational interventions aimed at improving pharmacy students' attitudes and confidence in providing oral care. In Japan, where the Model Core Curriculum for Pharmacy Education recognizes the importance of oral health–related competencies but provides limited guidance on the specific content and priorities of oral care education, the ACORP scale may also provide empirical evidence to help identify and prioritize areas of oral care education requiring further development within pharmacy curricula.

Although the present study reveals important findings, it has several limitations. First, some members involved in the translation and reconciliation process also participated in the expert panel for content validity assessment. Consequently, the content validity assessment was not entirely independent of the translation and adaptation process, which may have introduced a potential risk of circularity bias. To mitigate this potential bias, the adaptation process incorporated multiple levels of review, including independent back-translation and evaluation by an expert panel comprising members with diverse educational and clinical backgrounds. Nevertheless, complete independence between the translation and content validity assessment processes could not be ensured. Second, the adapted items were based on the original ACORN items that had already undergone rigorous content validity assessment and were subsequently subjected to extensive discussion and refinement before the quantitative content validity assessment in the present study. Nevertheless, the possibility of social desirability bias or consensus bias among expert panel members cannot be excluded. Third, because the cognitive interviews will be conducted by faculty members with students, there is a potential for social desirability bias. To mitigate this, efforts will be made to establish sufficient rapport before the interviews, and participants will be clearly informed that their responses will not affect faculty evaluations or interpersonal relationships, thereby ensuring an environment in which students can express their views freely. Fourth, because convenience sampling will be used to recruit participants for the assessment of the scale's reliability and validity, there is a possibility of selection bias. To partially mitigate this limitation, students from multiple academic years will be recruited, and participant characteristics will be reported in detail to facilitate evaluation of the sample representativeness. Nevertheless, students who choose to participate may differ systematically from those who do not participate, particularly with respect to their interest in oral

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health. Fifth, this study will use convenience sampling from a single institution, which may limit the generalizability of the findings. To partially mitigate this limitation, students across multiple academic years will be recruited, and participant characteristics will be reported in detail. In addition, the scale development process incorporated perspectives from experts with diverse educational and clinical backgrounds, including pharmacy educators from multiple universities and pharmacists engaged in clinical practice, which may increase the broader applicability of the scale. Nevertheless, future multicenter studies involving institutions with varying curricula and geographic settings will be needed to further evaluate the external validity of the ACORP scale. Sixth, because the known-groups validity analysis will be based on cross-sectional data, any observed between-group differences should be interpreted as supporting the discriminative capacity of the ACORP scale rather than as evidence of causal relationships. Despite these limitations, this study represents the first attempt to examine the reliability and validity of a scale designed to measure pharmacy students' attitudes and confidence toward patients' oral care and therefore makes an important academic contribution.

Future Directions

Once the reliability and validity of the ACORP scale have been established, future studies could use the scale to characterize pharmacy students' attitudes toward and confidence in providing oral care and identify demographic, educational, and experiential factors associated with variation in ACORP scores. Such studies may help identify groups with greater educational needs and determine specific areas that should be prioritized in oral care education.

In addition, qualitative studies involving students with relatively high and low ACORP scores could explore the factors that underlie differences in attitudes and confidence toward oral care. Understanding these facilitators and barriers could provide a basis for designing targeted educational interventions.

Future studies should also examine the responsiveness and practical applicability of the ACORP scale as an outcome measure for oral care education. Specifically, changes in ACORP scores before and after educational interventions could be used to evaluate changes in students' attitudes and confidence as educational outcomes.

Longitudinal studies could further examine whether improvements in ACORP scores are associated with subsequent oral care–related behaviors during experiential learning.

Such studies could also examine theoretically informed pathways derived from the KAP model and SCT, such as whether improvements in knowledge contribute to more positive attitudes and whether increased self-efficacy is associated with greater engagement in oral care–related behaviors. This approach would extend the use of the ACORP scale from assessing students' current attitudes and confidence to identifying educational needs, informing targeted intervention development, and evaluating learning outcomes and the effectiveness of oral care education.

Dissemination Plan

The findings of this study will be disseminated through multiple channels targeting academic and educational stakeholders. Academic dissemination will include publication in peer-reviewed journals focusing on pharmacy education, oral health, and health professions education, as well as presentations at relevant national and international conferences.

To facilitate the translation of the findings into pharmacy education, the results will also be shared with pharmacy educators and other stakeholders involved in oral health education. The findings may inform the identification of educational needs and guide the development or refinement of educational programs designed to strengthen pharmacy students' attitudes toward and confidence in providing oral care to patients.

If the reliability and validity of the ACORP scale are established through the planned psychometric evaluation, the scale may be used in future studies to quantitatively assess pharmacy students' attitudes toward and confidence in providing oral care and to evaluate the effectiveness of educational interventions. Future multicenter studies involving pharmacy schools with diverse curricula and geographic settings will also be encouraged to further examine the external validity and applicability of the ACORP scale across different educational contexts.

Conclusions

This study describes the development of the preliminary ACORP scale and the protocol for its subsequent psychometric evaluation to assess pharmacy students' attitudes toward and confidence in providing oral care to patients. Through systematic translation, cross-professional adaptation, expert review, and content validity assessment, a preliminary version of the ACORP scale has been developed to reflect the professional roles of pharmacists in oral care, with a high level of agreement among experts regarding its content validity. According to the study protocol, cognitive interviews will first be conducted to further refine the preliminary scale, followed by quantitative psychometric evaluation of its reliability and validity. If its psychometric properties are established through these planned procedures, the ACORP scale may provide a standardized tool for identifying educational needs and evaluating educational outcomes and interventions, thereby contributing to the development and refinement of oral care education in pharmacy curricula.

Acknowledgments

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Data Availability

The data that support the findings of this study are available from the corresponding author (RY) upon reasonable request. The data are not publicly available because of ethical considerations.

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Generative AI Use

The authors declare that generative AI was used in the creation of this manuscript. During the preparation of this paper, the authors used ChatGPT (version GPT-5.5; OpenAI) for language refinement, correction, and editing to improve this paper's clarity and overall language quality. The authors verified all outputs of the tool(s) used in the preparation of this manuscript and take full responsibility for the final content of the manuscript.

Authors' Contributions

Conceptualization: TS, RY, MI
Data curation: TS, RY
Formal analysis: TS, RY, MI, HO, SS, T Okada, T Okuhara
Funding acquisition: TS, T Okuhara, RY
Investigation: TS, RY
Methodology: TS, RY, MI
Project administration: TS, RY, MI
Resources: TS, RY
Supervision: T Okuhara
Validation: TS, RY, MI
Visualization: TS, RY
Writing – original draft preparation: TS, RY
Writing – review and editing: MI, HO, SS, T Okada, T Okuhara
All authors have read and agreed to the published version of this paper.

Conflicts of Interest

None declared.

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Abbreviations

ACORN: Attitudes and Confidence in Oral Care for Nursing Students Scale
ACORP: Attitudes and Confidence in Oral Care for Pharmacy Students Scale
AGFI: adjusted goodness-of-fit index
CFA: confirmatory factor analysis
CFI: comparative fit index
CVI: content validity index
CVR: content validity ratio
EFA: exploratory factor analysis
GFI: goodness-of-fit index
HU-DBI: Hiroshima University–Dental Behavioral Inventory
I-CVI: item-level content validity index
ICC: intraclass correlation coefficient
KAP: knowledge-attitude-practice
ML: maximum likelihood
NFI: normed fit index
QoL: quality of life
RMSEA: root mean square error of approximation
S-CVI/Ave: scale-level content validity index based on the average method
S-CVI/UA: scale-level content validity index based on universal agreement
SCT: social cognitive theory
SRMR: standardized root mean square residual
TLI: Tucker-Lewis index
WHO: World Health Organization
WLS: weighted least squares
χ^2/df: chi-square statistic to degrees of freedom ratio

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