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# AITCS as a Reliable Instrument for Evaluating IPC (Interprofessional Collaboration): *A Systematic Review*

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**Abstract**

This study aims to summarize, evaluate, and systematically describe AITCS instruments as well as find the most appropriate collaborative practice assessment instruments for measuring IPC. A systematic literature review was conducted on 4 databases namely PubMed, Science Direct, Wiley, and Ebsco. The last 8 years of articles written in English related to the use of AITCS in evaluating/measuring IPE were gathered. Based on 8 articles analyzed, AITCS had undergone several development processes. AITCS (37 items) had been shortened to 23 items (AITCS II). AITCS had been adapted and developed in Swedish and Japanese versions. Various articles showed the overall Cronbach alpha value ranged from 0.89 to 0.98. Each item rated has a Cronbach alpha > 0.70 (*acceptable*). Thus, this study indicates that AITCS will continue to be developed in the future for it is an appropriate instrument that can be used to evaluate IPE.

Key Words*: AITCS*, IPE, instruments

## INTRODUCTION

Interprofessional Collaboration (IPC) is defined as practice and education between two or more individuals with different professional backgrounds, meeting, interacting, studying together, and practicing with clients in health care centers[1]. IPC is considered as very important by the government and health workforce organizations to provide safe, effective, and efficient health services as well as a potentially strong strategy to achieve optimal health outcomes [2] [3].

The incorporation of collaboration between professions in health care settings greatly influences the daily practice of nurses[4]. Effective interprofessional collaboration practices can improve the health service process and outcomes. Moreover, it can also support and optimize health care because there is a good collaboration partnership in IPC. Thus, it can produce better fulfillment and improve the quality of life [5].

IPC has been implemented in various countries. In South Asia, the application of IPC in the practice of health services and health institutions has been implemented in Singapore. In Indonesia, the implementation of IPC will soon be carried out. So far, the practice of health services has only been carried out through the discipline of each health worker. It has not been collaboratively implemented between health services and health education institutions yet [6] [7]. Unfortunately, the researchers had not found any related data on the application of IPC in service practices in hospitals in Indonesia.

The urgency of IPC is very high. Therefore, health workers need instruments to be able to objectively evaluate collaborative practices. Besides measuring IPC is complicated, considering the existence of several conceptualizations and measures of IPC [8]. Currently, there are many instruments developed to measure IPC that have been applied [9]. One of the IPC assessment instruments is the Assessment of Interprofessional Team Collaboration Scale (AITCS). AITCS is one of the questionnaires that aims to evaluate collaboration even though has not been widely tested. Furthermore, it has been found that most of the instruments have a specificity [10].

Thus, we conducted a systematic review of the literature aimed at summarizing, evaluating, and describing systematically the AITCS instrument to find the most appropriate collaborative practice assessment instrument to measure IPC.

## MATERIALS AND METHODS

This stud employed a systematic review (SR). SR is a systematic and critical way of thinking in examining various research articles using analytical methods, logic, arguments, evaluations, and information to produce a good literature study and evidence-based practice [11].

This systematic review used the 2009 PRISMA checklist guidelines which were analyzed in 4 stages, namely article selection, learning description, quality assessment, and review results. The PRISMA Guidelines were an evidence-based reporting guide for systematic reviews and meta-analysis. The

objective was to assist the researchers in selecting the literature obtained based on 27 items [12]. After that, the Critical Appraisal Skill Program (CASP) was used to assess the feasibility of the article [13].

A literature review was conducted in 4 databases namely PubMed, Science Direct, Wiley, and Ebsco. Structured research problems using the PICO electronic method involved patient, intervention, comparison, and outcome [14][15]. Thus, the research problem can be formulated: "How is the validity and accuracy of AITCS to measure IPC?"

Table 1. PICO description

| | |
|---|---|
| P | "interprofessional collaboration" "IPC" |
| I | "AITCS" or "instrument" or "Assessment of Interprofessional Team Collaboration Scale" |
| C | There is no comparison in this article review |
| O | "quality of care" or "professional health care" |

The article included for this literature review were articles that [1] focus on palliative care intervention, [2] were written in English, [3] were published in the last 8 years, 2012 – 2019, [4] were IPC-related research articles.

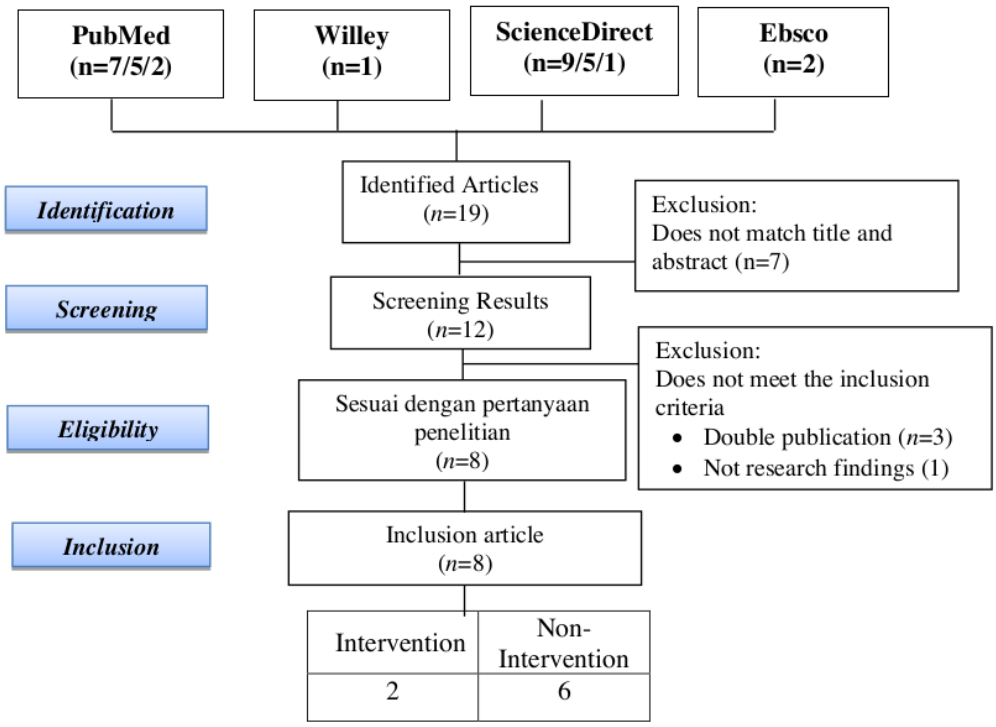


Figure 1. Article selection flowchart

## FINDINGS

**Table 2. Synthesis Grid Description Article on AITCS as an Instrument for Evaluating IPE**

| Researcher, City | Research Design | Objective | Sample Size | Intervention | Findings |
|---|---|---|---|---|---|
| **Orchard et al (2018) Canada** | Development of AITCS II instruments (Advanced assessment and revision of instruments) | Determining whether items from data collected in 2016 contained the same factors as those found in 2012 with 37-item AITCS. Determining whether items in the subscale of AITCS can be reduced while maintaining psychometric properties similar to those from the previous version of AITCS. | The 37-item AITCS was completed in 2016 by a health care professional from two hospitals (n = 744) and four community agents (health clinic) (n = 91) in Southwest Ontario, Canada. | There were no interventions in this study.<br><br>All respondents received AITCS version I (37 items) and AITCS version II (23 items) | Internal consistency value using Cronbach alpha obtained a shorter instrument with 23 items of AITCS-II. This psychometric test concludes that the AITCS-II instrument is reliable for measuring collaboration in practice-based teams. |
| **Orchard et al (2012) Canada** | Development and testing of AITCS instruments | Developing instruments to assess the collaborative results of health workers. | 47-item AITCS in 4 subscales given to 125 practitioners from 7 health care teams in 2 provinces in Canada. | There was no intervention | The main component and factor data analysis yielded 37 AITCS items. AITCS is a reliable and valid instrument. |
| **Marcussen, Norgaard, Borgnakke & Arnfred (2019) Denmark** | Prospective clinical trials with a comparative study (NON-RCT) | Investigating the impact of interprofessional training on students' readiness to collaborate with professionals in the psychiatric ward. | A total of 195 students were eligible to participate and divided into two groups, intervention group (n = 87) and control group (n = 108).<br>The instrument used was AITCS (37 items) | Students in the intervention group received interprofessional clinical training. Meanwhile, the control group received conventional clinical training. The duration of interprofessional training was 3-12 weeks. Data collection was conducted from October 2016 to March 2018. | Students' readiness for interprofessional learning and team collaboration increased after interprofessional clinical training compared to regular clinical training (control).<br>The score for AITCS was 8.11 (95% CI 2.92–13.30; p = 0.002). |

| | | | | | |
|---|---|---|---|---|---|
| **Hellman, Jensen, Orchard & Bergstrom (2016) Sweden** | Preliminary testing | Translating and adapting instruments in Swedish culture as well as determining the reliability and validity of the instruments used in Sweden. | 349 participants who worked in team-based pain rehabilitation were involved in this study. The instrument used was the Swedish version of AITCS (AITCS-S). | There were no interventions in this study. | Internal consistency was varied from 0.79 to 0.96 and was considered acceptable to be very good. The Swedish version of AITCS is a reliable and valid instrument. |
| **Haruta, Ozone Goto (2019) Japan** | Cross-sectional Study on the use of Assessment of Interprofessional Team Collaboration Scale (AITCS). | Exploring the factors associated with interprofessional collaboration score self-assessment in community hospitals. | Data from 325 of the 630 participants were analyzed. The participants included all staff in three hospitals from July to October 2018. | There was no intervention. | The average AITCS total score was 117.6 (ranged 37 – 185). IPC scores were associated with younger age, the nursing profession, better relationships with neighboring facilities, and greater job satisfaction. |
| **Treadwell et al (2015) Houston, USA** | An experimental study with cluster design | Exploring whether evidence-based education and experience interventions to develop team skills in medical homes positively influence team members' perceptions of 'interprofessional collaboration'. | A sample of 328 participants, with a population consisting of 254 medical home sites, was involved in the study conducted from August 2013 to June 2014. | Participants came from 50 practice sites. In the intervention group, 25 places led by case managers were designed to improve IPC and 25 received health education sessions led by workers who were not associated with IPC. The study was conducted for 12 weeks. | Individual team members in the medical home who received the intervention were significantly higher reporting positive perceptions from team collaboration compared to the control group. |
| **Prentice et al (2016) Canada** | Descriptive cross-sectional study | Obtaining basic information about staff attitudes and perceptions interprofessional collaboration in the newly formed interprofessional education unit. | A total of 54 members of the interprofessional team in an interprofessional education (IPE) unit with 30 beds were involved. | There was no intervention | 19 out of 54 staff members completed the AITCS which resulted in a response rate of 35%. Data shows that team members respect each other. However, there is an urge for more support organizations to further develop team skills. |

| | | | | | |
|---|---|---|---|---|---|
| **Yamamoto & Haruta (2019) Japan** | Development of AITCS (Instrument Adaptation) | Developing the Japanese version of AITCS from AITCS-II (J-AITCS-II) and testing its cultural validity and adaptation. | A total of 558 responses were analyzed | There was no intervention | The Japanese version of AITCS-II (J-AITCS-II) is a reliable and valid instrument. Further research is required to confirm its robustness and usefulness to improve IPC. |

Several studies had been conducted to develop and test the feasibility of using AITCS as an appropriate instrument in measuring interprofessional collaboration in hospitals. The researchers summarized 8 articles that were relevant and meet the inclusion criteria regarding the development and use of AITCS in interprofessional collaboration practices. The article had published in the last 8 years (2012-2019) and was in English. From 8 selected articles, there were 5 types of designs used, namely the development of the AITCS instrument (n = 4) each carried out in Canada, Sweden, and Japan, prospective study (n=1) conducted in Denmark, Cross-sectional (n = 2) conducted in Japan and Canada, and experimental study (cluster design (n = 1) conducted in Houston, United States.

Out of the 8 articles analyzed, samples in a study conducted by Orchard, King, Khalili, & Bezzina (2012) concluded that to develop the AITCS version I instrument, 24 interprofessional education experts (IPE) were required to determine the validity of the instrument consent. Furthermore, instrument testing was tested on 125 practitioners from 7 types of health care in 2 provinces in Canada. Whereas, a study conducted [17] had developed and tested AITCS version II sampled from 926 respondents (Those who answer 80% of 37-Item AITCS) and 676 respondents (Those who answered 100% of 37-Item AITCS). Furthermore, Yamamoto & Haruta (2019) distributed the Japanese version of AITCS (23 items) to all department x hospitals and welfare facilities in their study. There were a total of 689 respondents and data analysis of 558 respondents (missing were excluded).

Additionally, a study conducted by [19] involved a sample of 195 students who were running a mental clinic practice. Meanwhile, a study conducted by [10] involved 349 participants who worked in team-based pain rehabilitation. There was also a study conducted using a sample of 328 participants [20] from the total population of 354 medical home sites located in Houston, United States.

A study conducted by [21] involved a total of 54 members of the interprofessional team in the interprofessional education unit (IPE). Around 19 of the 54 staff members completed the AITCS which obtain the response rate of 35%. Meanwhile, a study conducted by [22] analyzed 325 of the 630 respondents. Respondents included all staff in three hospitals, not including those who did not participate in providing health services to patients.

**The output of Various Articles**

A study conducted by [16] developed AITCS with 47 items with 4 subscales (partnership, coordination, cooperation, and decision making). The results of the main components and factor analysis of the data that had been carried out produced 37 items by containing 3 factors (partnership/decision making, cooperation, and coordination). Internal consistency estimates for the validity of each subscale range from 0.80 to 0.97, with the overall reliability of 0.98. The psychometric analysis results of this study concluded that AITCS supports its value in measuring interprofessional collaboration.

One of the studies conducted developed and revised AITCS which was developed in 2012 [17]. A total of 676 respondents entered the CFA (confirmatory factor analysis) phase. Then, the data assessed internal consistency using Cronbach alpha obtained a shorter instrument with 23 items of AITCS-II. The reduction in instrument items increased the ranking of the partnership factor from 0.94 to 0.90 as well as cooperated from 0.93 to 0.92 while coordination remained at 0.90. The internal consistency of AITCS-II maintained its reliability with the Cronbach alpha overall coefficients reported across the AITCS II scale of 0.849 (range from 0.898 to 0.924) compared to AITCS (37 items) from 0.933 (ranging from 0.894 to 0.937). This psychometric test concluded that the AITCS II instrument is reliable for measuring collaboration in practice-based teams. AITCS-II is currently used with practitioner respondents only.

A study conducted by [10] concluded that the Swedish version of AITCS is a reliable and valid questionnaire. Internal consistency varied from 0.79 to 0.96 which indicated a very good value. Furthermore, the development of AITCS II was carried out by [18] in the Japanese version by adapting the instrument and measuring the validity and reliability of the instrument. Data from 558 respondents were analyzed. Factor analysis of the Japanese version of AITCS-II (23 items) yielded two factors: "Patient-centered collaborative care" and "Teamwork among health professionals" with $\alpha > 0.7$ Cronbach for all items and subscales.

A study conducted by [20] was measured the impact of comparison of perceptions of medical team members in IPC services. After an intervention by case managers designed to improve IPE was carried out for 12 weeks. Furthermore, it was measured using AITCS version 37 items. The p-value for 32 medical services was $p = 0.003$ with a z score being – 2.93, indicating a higher total score measure in intervention practice than control practice. A similar study conducted by Marcussen et al (2019) providing inter-professional clinical training interventions (3-12 weeks duration). A total of 195 respondents were divided into intervention groups ($n = 87$) and controls ($n = 108$) which were then measured in terms of the level of interprofessional collaboration using AITCS version 37 items. Students' readiness for interprofessional learning and team collaboration increases after interprofessional clinical training, compared to regular clinical training in the control group.

Cross-sectional studies conducted by 2 other researchers also employed AITCS as an instrument to measure IPE. A study by [22] used AITCS version 37 items. The average total of the AITCS score was 117.6 (ranged from 37 – 185). IPC scores were associated with younger age, the nursing profession, better relationships with neighboring facilities, and greater job satisfaction. A study by [21] also used AITCS version 37 items. The data of the study showed that team members respect each other but they need more supportive organizations to further develop team skills.

## DISCUSSION

AITCS is excellent and recommended as an instrument that can be used to measure IPE. AITCS measures collaboration in interprofessional teams by involving patients in collaborative practice[17]. Some findings of the literature reviewed indicate that the results of the instrument feasibility test were good and were accepted to evaluate IPE.

From the results of the analysis, the dominant method of various articles collected was the AITCS instrument development research design. Development of AITCS instruments such as language and cultural adaptation of the (cross-country) instrument and development of a short version of AITCS instruments. The instrument development research design was carried out to further develop an instrument. Instrument development was in the form of developing a short version of AITCS (AITCS II) 23 items. Language adaptation carried out in Sweden (AITCS-S) 37 items and Japanese (J-AITCS II) 23 items. This supports a study that explains that the adaptation of an instrument needs to be done for differences in population and culture in various countries. The adaptation process consisted of several stages, starting from the translation of instruments into the target language to the pilot testing stage [23].

The results of the literature study found that the AITCS instrument development study was conducted a try out with a sample of at least 125 health practitioners and the most 1602 health practitioners. This supports the theory which states that there is no provision regarding the size of the tryout. Some recommend a sample size of 100, while others recommend a size with multiples (ranging from 5 to 30) of the number of items [24].

One of the studies [16] produced AITCS version 37 items containing 3 factors (partnership/decision making, collaboration, and coordination). A subsequent study [17]) redeveloped a shortened version of the AITCS instrument (37 items) into AITCS II (23 items) containing 3 factors (partnership/decision making, collaboration, and coordination). This is in line with the theory which states that a questionnaire has to be at least presented as short and as clearly as possible [25]. Some reasons include being able to reduce the effects of fatigue for respondents which can cause a decrease in data quality. Thus, respondents will be more willing to participate which enables the sample to represent and reduce the length of the questionnaire filling process [26].

Furthermore, the development of the AITCS instrument was later developed in the Swedish version (AITCS-S) by [10] and Japanese version (J-AICTS II) 23 items by [18] by adapting the language used and adjusting to the local culture, as well as conducting small scale studies. This is following a study which concluded that after a questionnaire has been developed, it needs to be tested/validated by a panel of experts before it is used in the real subjects. Two main things that were tested validity and reliability. Validity assessed whether the questionnaire measures what is intended to be measured, while reliability evaluates its ability to provide consistent results [24]. It helps researchers assess an instrument to be corrected before the main study is carried out [25].

**Table 3. AITCS reliability (based on Cronbach alpha) from Various Articles (research)**

| Research/Year | Type of AITCS | Sub Scale Reliability | | | AITCS Reliability |
|---|---|---|---|---|---|
| | | Partnership/ Decision Making | Collaboration | Coordination | |
| Orchard et al (2012) | AITCS 37 items | 0.97 | 0.94 | 0.80 | 0.98 |
| Orchard et al (2018) | AITCS II 23 items | 0.89 | 0.92 | 0.89 | 0.89 |
| Hellman et al (2016) | AITCS-S 37 items (Swedish version) | 0.91 | 0.95 | 0.79 | 0.96 |
| | | Patient-centered collaboration | | Professional Collaboration | |
| Yamamoto & Haruta (2019) | J-AITCS II 23 item (Japanese version) | 0,952 | | 0.923 | 0,96 |

The main objective of developing an instrument in research is to obtain relevant information reliably and validly. Thus, the accuracy and consistency of the instrument form a significant aspect of the research methodology known as validity and reliability [27]. The value of instrument reliability is the basis for further instrument development.

The Cronbach Alpha value reflects the reliability of an indicator. Cronbach alpha coefficient value > 0.07 is considered acceptable for use in multi-item scales in making comparisons between groups [28]. Cronbach alpha values will be acceptable in the range of 0.70 to 0.95. Some references recommend a maximum Cronbach alpha value of 0.90. Value > 0.90 indicates the number of repetitions/ extravagance indicating the length of the test has to be shortened [29]. The table above indicates that the reliability values from various AITCS studies are good. Further study will continue to be carried out in the development of this instrument [30][31]. This supports the recommendations of various articles above which want further development of this instrument. AITCS is quite good and recommended in measuring IPE in service practices.

## CONCLUSION

This study concludes that from several analyzed liquidations, the overall Cronbach alpha values ranged from 0.89 to 0.98. This finding indicates that AITCS will continue to be developed in the future. Moreover, AITCS is feasible and can be used to evaluate IPE.

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