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Expanding APHON's Pediatric Chemotherapy/Biotherapy Provider and Instructor Program to Spanish-speaking Countries: Pilot Series Development and Evaluation

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Abstract

Background: To address the need for standardized, comprehensive chemotherapy/biotherapy education in Latin America and Caribbean (LAC) countries, the Association of Pediatric Hematology/Oncology Nurses (APHON) Pediatric Chemotherapy/Biotherapy Provider and Instructor program courses were culturally adapted, translated to Spanish, and piloted. The process of course adaptation and implementation are described. A Context, Input, Process, Product (CIPP) model outcomes evaluation determined: 1) differences in pass rates by test version and pilot

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location, 2) predictors of pass rates, 3) course appropriateness for nurses' education and practice levels, and 4) strategies for course improvements.

Methods: The Spanish APHON Pediatric Chemotherapy/Biotherapy Provider program was piloted four times and the Instructor program twice with nurses from Mexico, Central America, the Caribbean, South America, and Spain. Statistical analysis identified factors associated with pass rates.

Results: Of the 203 students in four Spanish APHON Provider program courses, data from 108 students (three pilots) were analyzed (one unplanned pilot excluded for missing data). Significant predictors of pass rates included: pediatric oncology frontline nurses (OR = 9.86; 95% CI [2.56, 65.23]; $p = 0.004$); nurses dedicated to an inpatient or outpatient unit (non-rotating) (OR = 6.79; 95% CI [1.29, 51.98]; $p = 0.033$); and graduation from a five-year nursing program (OR = 5.92; 95% CI [1.30, 33.15]; $p = 0.028$).

Discussion: The Spanish APHON Pediatric Chemotherapy/Biotherapy program was determined appropriate for nurses' education and practice levels in LAC countries. Through the APHON Spanish-language instructor network, pediatric oncology nurses in LAC countries have increased access to standardized, comprehensive chemotherapy/biotherapy education.

Introduction

Approximately 11% of the world's newly diagnosed children and adolescents with cancer (approximately 17,000 children, 0–14 years) live in Latin American and Caribbean (LAC) countries where estimated five-year survival rates range from around 27% to 80% (Cuadrado et al., 2017; Rodriguez-Galindo et al., 2015; Ward et al., 2019). This wide survival gap reflects vast heterogeneity across the region comparable to global disparities of 20% to 80% between some low- and middle-income countries (LMIC) and high-income countries. Challenges include delayed or misdiagnosis, poor access to treatment, high out-of-pocket costs, and few personnel with subspecialty training (Frenk et al., 2010; Lam et al., 2019; World Health Organization [WHO], 2021). Nevertheless, over the last 20 years the LAC region has seen regional research collaboratives, increased survival rates and childhood cancer awareness, palliative/hospice care for patients who cannot be cured, and subspecialty medical and nursing education programs (Barr et al., 2014; Day et al., 2013; Lam et al., 2019; Torres-Roman et al., 2020; Wagner et al., 2018).

Across the world, chemotherapeutics and biotherapeutics remain the backbone of childhood cancer treatment regimens. Safe chemotherapy/biotherapy management requires accurate dosing, supportive care, and safety measures and monitoring for adverse effects to reduce the risk of errors and patient harm. As critical members of healthcare systems, nurses provide most of the direct patient care services, including administering and at times preparing chemotherapy/biotherapy. Unfortunately, a large portion of up-to-date pediatric chemotherapy/biotherapy education materials are limited to the English-language. Many LAC nurses do not speak English and there are few references in local languages. It is common that nurses in LAC countries (and many LMIC) handle chemotherapy/biotherapy without adequate and consistent supplies of personal protective equipment (PPE), biosafety cabinets, and other hazard controls (Morrissey et al., 2019). Bustos Alfaro (2019) calls for

the education and specialization of nurses in Latin America to be improved so they can fully develop and use their skills, knowledge, and experience to provide safe and quality patient care.

In 2004, the Association of Pediatric Hematology/Oncology Nurses (APHON) Pediatric Chemotherapy/Biotherapy Provider program was established to address the need for comprehensive training in the English-language. The program is based on a comprehensive education model with a Provider program course for nurses who deliver chemotherapy and an Instructor program course; Instructors trained through the Instructor program teach the APHON Chemotherapy/Biotherapy Provider program to nurses in their practice settings. It is the only national level chemotherapy/biotherapy certificate program for pediatric hematology/oncology nurses in the US. In response to the need for a comprehensive Spanish-language course in LAC countries, the APHON Pediatric Chemotherapy/Biotherapy Provider program was culturally adapted and translated to Spanish. The Spanish Provider program was piloted four times and the Instructor program twice; an APHON Spanish-language instructor network was established with graduates from the Instructor program cohorts. This paper details the course adaptation process and pilot series implementation. Finally, an outcomes evaluation was performed based on the Context, Input, Process, Product (CIPP) model.

CIPP Evaluation Model

The CIPP model (See Figure 1) provides a systematic approach to evaluate the overall quality and merit of education programs by considering the following: *Context* describes the needs, opportunities and assets related to the program; *Input* includes the program approach and budget; *Process* describes the program activities; and *Product* describes the program outcomes (Lippe & Carter, 2018; Stufflebeam, 2007). The *Context* for this project included a needs assessment (LAC nurse survey), existing opportunities (Spanish text and St. Jude Children’s Research Hospital [SJCRH] network and partnership), and assets of course participant characteristics (experienced pediatric oncology nurses). Key *Input* factors included the adapted curriculum and pilot funding. The pilot course series implementation, *Process*, was informed by participant and instructor evaluations and team debriefing sessions. *Product*, or in this case, Outcomes, included program effectiveness (quality and significance), transportability (adaptability to other settings), and sustainability (continuation over time) (Stufflebeam, 2007). In this pilot-series evaluation, outcomes (*Product*) were categorized as follows: Student (short-term), pilot series (intermediate-term), and sustainability (long-term) to reflect the various levels and associated time points of evaluation. Due to the COVID-19 pandemic, the planned post-pilot phase was postponed. Early sustainability (long-term) outcomes are reported here.

Description of Process or Innovation

CIPP Context: Opportunities, Assets, and Needs Assessment

Opportunities and Assets—In 2014, the APHON Board of Directors charged its volunteer APHON International Task Force to explore how to effectively serve international pediatric hematology/oncology nurses. A project to initiate the APHON

Pediatric Chemotherapy/Biotherapy Provider and Instructor program in LAC countries was conceptualized (see Figure 2 for project timeline). The APHON Provider and Instructor program was already a successful model in the US. In 2014, a grant from Boston Children's Hospital provided funding to translate the APHON Pediatric Chemotherapy/Biotherapy Curriculum (3rd ed.) text to Spanish. In addition, SJCRH had established a network of nurse educators and partner hospitals across Latin America through its international program and was willing to partner with APHON in the pilot series (Sullivan et al., 2021).

Needs Assessment—The need for and interest in a comprehensive, standardized Spanish-language chemotherapy/biotherapy course in LAC countries was confirmed through an exploratory electronic survey (snowball methodology) of 39 nurses/physicians from 19 hospitals in 14 countries. Although most reported having basic chemotherapy/biotherapy education (e.g., pharmacology, safe handling/administration, side effect/toxicity management), gaps included navigating research protocols, psychosocial issues, legal and ethical issues, late effects, carcinogenesis, cancer genetics and biotherapies. APHON's Pediatric Chemotherapy/Biotherapy Provider program addresses all these topics, thus it could serve as a more comprehensive chemotherapy/biotherapy course in LAC countries. To establish the Spanish APHON Pediatric Chemotherapy/Biotherapy Provider and Instructor program courses throughout LAC countries, APHON and SJCRH officially partnered in a series of pilot courses.

CIPP Input: Curriculum and Funding

Spanish APHON Pediatric Chemotherapy/Biotherapy Provider Program Development and Adaptation—As a first step, two experienced pediatric oncology nurse educators who lead a SJCRH Latin American nurse educator training center in Chile were invited to take the English APHON Pediatric Chemotherapy/Biotherapy Provider program course (3rd ed.) at SJCRH in 2015. They provided feedback on whether the course was appropriate for LAC nurses and made recommendations for cultural modifications. These educators have years of experience training pediatric oncology nurses across LAC countries and are aware of disparate practice levels. The APHON International Task Force, Chemotherapy/Biotherapy Provider Program Committee, Board liaisons and senior staff reviewed and approved the suggested modifications.

Over the next year, the APHON Pediatric Chemotherapy/Biotherapy Provider program content (via PowerPoint presentations) went through an iterative process of review and cultural adaptation prior to professional translation to Spanish, funded by SJCRH. A Spanish course working group was developed within the APHON International Task Force, and together the task force, working group members and APHON Pediatric Chemotherapy/Biotherapy Provider Program Committee liaison prepared the course materials. The Spanish translation was reviewed and finalized by Spanish-fluent working group members.

Spanish APHON Pediatric Chemotherapy/Biotherapy Instructor Program Development and Adaptation—The Spanish APHON Pediatric Chemotherapy/Biotherapy Instructor program course content was adapted from the English APHON Instructor program course and expanded upon. Spanish APHON Instructor program course

translation was performed by working group members, with a certification of the translation supported by SJCRH.

Spanish APHON Pediatric Chemotherapy/Biotherapy Provider Program

Design—The Spanish APHON Pediatric Chemotherapy/Biotherapy Provider program course was based on the two-day English course (3rd ed.) with minor cultural modifications. Spanish APHON Provider program pilot courses were designed to be delivered over three-to-four-day in-person workshops. Course eligibility included at least one year of experience in pediatric oncology nursing, Spanish fluency, graduation from a three-year (or longer) nursing program, and supervisor approval.

Table 1 outlines the Spanish APHON Pediatric Chemotherapy/Biotherapy Provider program course components with 12 modules (>700 PowerPoint slides). Interactive learning activities were added to reinforce content. Additional course materials included a Spanish-language curriculum textbook and printed and bound version of the PowerPoint slides as handouts for taking notes.

Post-course knowledge assessment consisted of a 50-item paper-based multiple choice, open-book test over 90 minutes. Test versions “A” and “B” were adapted from English-language tests for random distribution to students. An 80% or greater passing score was required with one remediation attempt permitted using the alternate test version. Student evaluation forms for the course overall and instructor performance were developed with quantitative (Likert-type scale 1 [*strongly disagree*] to 5 [*strongly agree*]) and qualitative items (open comments). Instructor evaluation forms were utilized to inform ongoing course improvement related to course logistics and materials. APHON furnished a certificate of achievement to award students who successfully completed the course as demonstrated by attendance and exam score. Nurses who were unsuccessful were given a letter of attendance. Nursing professional development contact hours were provided through the American Nurses Credentialing Center.

Spanish APHON Pediatric Chemotherapy/Biotherapy Instructor Program Design

First English Instructor Program Pilot Course Design.: Overall, the inaugural APHON Pediatric Chemotherapy/Biotherapy Instructor program pilot curriculum mirrored the one-day English course and was taught in English to bilingual LAC nurses. Bilingual APHON Instructor program pilot course eligibility included pediatric oncology nursing experience (at least two years preferred), Spanish-fluency, graduation from a three-year (or longer) nursing program, successful completion of a Spanish APHON Chemotherapy/Biotherapy Provider program course within the past two years, APHON membership, supervisor approval, and experience in nursing education/teaching (preferred). English-fluent nurses were encouraged to attain certification as a pediatric hematology/oncology nurse (CPHON[®]), but this was not required. Content focused on adult learning theory, teaching strategies, and review of the APHON Pediatric Chemotherapy/Biotherapy Provider program course materials. Minor adaptations were made, such as excluding instructions for requesting to teach a course given the pilot-stage.

Second Spanish Instructor Program Pilot Course Design.: Based on feedback from the inaugural English APHON Pediatric Chemotherapy/Biotherapy Instructor program course for LAC nurses, a Spanish APHON Pediatric Chemotherapy/Biotherapy Instructor program course was expanded to two days with a teach-back session on the second day. LAC Instructor students were assigned Provider course content to teach-back on day two. Paired mentorship teams were formed with senior Spanish APHON Provider program instructors and LAC Instructor students, and online mentorship meetings were held before the second Spanish APHON Instructor program pilot course. A peer-review checklist was created to evaluate LAC Instructor student teach-back presentations. The peer-review checklist evaluated LAC instructor delivery and mastery of the content. Evaluation forms for both LAC instructor students and the Spanish APHON Instructor program instructors were created with Likert-type and open-ended items to inform ongoing course improvement.

Funding—Funding for the four Spanish APHON Pediatric Chemotherapy/Biotherapy Provider program and two Instructor program pilot courses came from several sources identified in Figure 1.

Project Objectives

Objectives guiding an analysis of short- and intermediate-term outcomes (i.e., student and pilot course series outcomes) of the Spanish APHON Pediatric Chemotherapy/Biotherapy Provider program were to: 1) determine if there was a difference in pass rates by test version (A or B) (*effectiveness*) and pilot course location (*transportability*); 2) determine if nurse demographics and hospital/pilot characteristics were significant predictors of pass rates (*effectiveness and transportability*); 3) evaluate course appropriateness for nurses' education and practice levels (*effectiveness*); and 4) elucidate strategies for course improvement (*effectiveness*).

CIPP Process: LAC Pilot Course Series Implementation

Spanish APHON Pediatric Chemotherapy/Biotherapy Provider Program Pilot Courses

Chile Spanish Provider Program Pilot.: The inaugural Spanish APHON Pediatric Chemotherapy/Biotherapy Provider program course was held at Hospital Luis Calvo Mackenna in Santiago, Chile in April and May 2016, with two cohorts. Two Spanish-fluent US APHON Pediatric Chemotherapy/Biotherapy program instructors taught the content and were supported by two local nurse educators and one visiting US APHON International Task Force member from SJCRH who acted as course coordinators.

Asociación de Hemato-Oncología Pediátrica de Centro America Spanish Provider Program Pilot.: This course was followed in February 2017, by a second Spanish APHON Provider program pilot taught at SJCRH in the US just prior to the annual *Asociación de Hemato-Oncología Pediátrica de Centro America* [AHOPCA or Pediatric Hemato-Oncology Association of Central America] meeting. The Spanish APHON Provider program course was taught by two Spanish-fluent APHON US instructors and coordinated by two Task Force members (one from SJCRH). Additional administrative support was provided by SJCRH staff.

Sociedad Latinoamericana de Oncología Pediátrica Spanish Provider Program

Pilot.: Although not originally part of the pilot series plan, an invitation was extended to teach a third Spanish APHON Provider program pilot course as the nursing track of the *Sociedad Latinoamericana de Oncología Pediátrica* (SLAOP) annual Congress in Buenos Aires, Argentina in April 2017. Three Spanish APHON Pediatric Chemotherapy/Biotherapy program instructors from the newly formed Spanish-language instructor network: the Chilean nurse educators and a nurse educator from Guadalajara, Mexico, provided instruction. Two APHON US Task Force members (one from SJCRH) provided course coordination.

Mexico Spanish Provider Program Pilot.: The fourth and final Spanish APHON Provider program pilot course was held at Hospital Civil de Guadalajara in Guadalajara, Mexico, in May 2017. Course instructors comprised five of the first cohort of Spanish-language instructors. Two APHON US Task Force members (one from SJCRH) coordinated the course.

English and Spanish APHON Pediatric Chemotherapy/Biotherapy Instructor Program Pilot Courses

First English Instructor Program Pilot Course.: The first LAC pilot APHON Pediatric Chemotherapy/Biotherapy Instructor program course was taught in English the day after the AHOPCA Spanish APHON Pediatric Chemotherapy/Biotherapy Provider program pilot course at SJCRH (February 2017). Six bilingual nurses from Mexico, Chile, and Costa Rica participated. Two US APHON Pediatric Chemotherapy/Biotherapy Instructor program instructors taught the one-day English APHON Instructor program course.

Second Spanish Instructor Program Pilot Course.: The inaugural two-day Spanish APHON Pediatric Chemotherapy/Biotherapy Instructor program pilot course was held at SJCRH in September 2018. Eleven LAC nurses from seven countries participated. The Spanish APHON Instructor program course was taught by two senior Spanish-fluent APHON qualified instructors from the US and three bilingual English APHON Instructor program pilot participants from Chile and Mexico. Table 2 describes the location, dates, and student, instructor and course coordinator profiles for each of the four pilots of the Spanish APHON Pediatric Chemotherapy/Biotherapy Provider program and the two pilots of the Instructor program course. Instructor program participants from the first and second cohorts formed the APHON Spanish-language instructor network.

Data Sources and Variables of Interest

Student test scores and course evaluations were extracted from the original paper forms and recorded in an Excel database for each Spanish APHON Chemotherapy/Biotherapy Provider program pilot course by instructors and coordinators. Nurse demographics and pilot characteristics were collected for each course and stored in a master Excel database. These data were accessible only to project team members and APHON staff. Predictor variables were derived from nurse, hospital, and pilot characteristics obtained from pilot course databases. Nurse and hospital characteristics included years of nursing school, years working as a nurse, years as a pediatric oncology nurse, unit type, and position. Pilot

characteristics included practice country and pilot location. Other variables of interest were test version and test scores.

Data Analysis

Quantitative Analysis—Descriptive statistics were calculated for nurse, hospital, and pilot characteristics (*M/Mdn* and *SD* for continuous variables; frequency and proportion for categorical variables), missed test items by test version (frequency and proportion), pass rates (frequency and proportion), and five-point Likert-type scale student evaluation scores (1 [*strongly disagree*] to 5 [*strongly agree*]); *Mdn*). Wilcoxon and Fisher Exact tests were applied to identify the difference between pass rates by pilot location and test version. Logistic regression models were developed to study the association between above factors and pass rates.

Qualitative Analysis—Open-ended student feedback from the Spanish APHON Pediatric Chemotherapy/Biotherapy Provider program pilot courses was translated from Spanish to English by course bilingual instructors/coordinators. Main themes were identified through thematic content analysis by two bilingual doctoral-prepared qualitative researchers and representative quotes selected.

Results

Population

Of the 203 nurses that participated in the four Spanish APHON Pediatric Chemotherapy/Biotherapy Provider program pilot courses, complete data was available for 108 pediatric oncology nurses from the first (Chile), second (AHOPCA) and fourth (Mexico) pilot courses and included in the analysis. Nurses who did not complete the pilot course (Chile, $n = 1$), non-Spanish-fluent auditors (AHOPCA, $n = 2$ [Haitian, Creole-fluent]), without pediatric oncology experience (Mexico, $n = 3$), and missing all demographics (SLAOP pilot, $n = 89$) were excluded from the analysis. Thus, 94 nurses' results (and one missing final Chilean test result) were excluded from analysis.

CIPP Product (Outcomes): Evaluation Findings

Missed Test Items—Fifty percent or more of students missed four unique test questions in test version “A” and one unique test question in test version “B” (Table S1).

Pass Rates—Across the three selected pilot courses, pass rates of 77% (AHOPCA), 100% (Chile), and 69% (Mexico) were achieved (Table 3). A significant difference ($p < 0.001$) was found in pass rates by pilot location across the three pilot locations. After removing the Chile pilot, there was no significant difference in pass rates between AHOPCA and Mexico pilots ($p = 0.6$) (Table 3). When evaluating pass rates by test version, no significant differences were found (Table 4).

Predictors of Pass Rates—See Table 5 for participant characteristics by passing the test. After adjusting for years of nursing education, pediatric oncology frontline nurses were 10 times more likely (OR = 9.86; 95% CI [2.56, 65.23]; $p = 0.004$) to pass compared to nurses

who were not practicing at the bedside. In a subgroup of frontline nurses ($n = 71$), the results of a multivariate logistic regression (with graduation from a five-year nursing program and position as predictors) showed that nurses dedicated to an inpatient pediatric oncology/bone marrow transplant unit *or* outpatient pediatric oncology/bone marrow transplant unit were seven times more likely (OR = 6.79; 95% CI [1.29, 51.98]; $p = 0.033$) to pass the exam than nurses rotating between inpatient and outpatient oncology/transplant units. Frontline nurses who graduated from a five-year program were six times more likely (OR = 5.92; 95% CI [1.30, 33.15]; $p = 0.028$) to pass than nurses graduating from a shorter program.

Quantitative Evaluations—Students from all Spanish APHON Pediatric Chemotherapy/Biotherapy Provider program pilot courses strongly agreed ($Mdn = 5$; range = 3 to 5) that the course was at an appropriate level to complement their nursing practice, and that the information presented was applicable to their nursing practice ($Mdn = 5$; range = 4 to 5). No nurse student rated the level of the course content as too low or simple. Students also strongly agreed ($Mdn = 5$; range = 4 to 5) that they felt better prepared to care for patients receiving chemotherapy/biotherapy after participating in the course, and that the course was effective for teaching important aspects related to caring for children with cancer who are receiving chemotherapy/biotherapy ($Mdn = 5$; range = 4 to 5). Finally, students reported that the course would help them apply new knowledge to their practice ($Mdn = 5$; range = 4 to 5).

Qualitative Evaluations—Positive comments about the course focused on instructor authority, comprehensive nature of the program, and gratitude for the opportunity to participate. For example, “It has highly qualified and trained people [instructors] for the development of the course, both in practical experience in care and in knowledge” (Guatemala). “Instructors enriched discussion because US instructors came from different areas/institutions” (Chile). A nurse mentioned, “The course strengthened my knowledge and much more than I expected” (Mexico), while another stated, “[The course] contributes to professionalization of nursing practice [and] builds competent professionals”. Finally, a nurse mentioned a shared sentiment across all pilots, “Thank you for the opportunity. It is an excellent course, they thought about all the points that are important for the management of hemato-oncological patient” (Dominican Republic). The nurses believed the Spanish Pediatric APHON Chemotherapy/Biotherapy Provider program course content would be useful to share with colleagues and helpful to create guidelines for nursing practice. For example, “Talk about [course] topics to my co-workers so that we all use the same concepts and care” (Panama) and “Making changes to incorrect procedures applying what is established by APHON” (El Salvador).

Students mentioned that the heavy use of PowerPoint slides was a difficult learning methodology and recommended complementing this approach with more clinical case discussions and real-life examples. One example was, “Increase participation for those who take the course, for example, workshops of clinical cases and solve them in a group and then present the interventions according to the case. Active participation makes the class more enjoyable and reduces the concentration of many hours in one” (Panama). Additional suggested improvements included adding days to the course (all countries), and limiting

redundancies. For example, a nurse mentioned, “You want it [the course] to be over more time, not in hours, but in days” (Honduras), while another noted, “Don’t repeat the same subjects/points so much.” (Chile).

Discussion

Formative Course Improvements

The APHON Pediatric Chemotherapy/Biotherapy Provider and Instructor program courses were successfully adapted, translated to Spanish, and piloted with LAC nurses. Course evaluations and project team debriefing sessions effectively informed formative improvements throughout the pilot series. For example, adding a fourth day for testing after the SLAOP Spanish APHON Pediatric Chemotherapy/Biotherapy Provider program course helped to reduce students’ mental and physical strain experienced from testing at the end of the third course day. Other modifications such as alternating instructors per module also helped to reduce instructor and student fatigue. Although learning reinforcement activities were added to the Spanish APHON Provider program course, nurses from all pilot courses requested more interactivity. This is not surprising given that the course is comprehensive and adherence to APHON quality standards requires that it be taught in its entirety. Even though APHON allows for flexible course scheduling, staffing needs and instructor availability must be considered when scheduling courses. Thus, the Spanish APHON Pediatric Chemotherapy/Biotherapy Provider program pilot courses were taught over consecutive days, as is common with the English-language courses.

The Spanish APHON Pediatric Chemotherapy/Biotherapy Instructor program course was essential to local sustainability by establishing a cohort of expert LAC nurses qualified to teach the Spanish APHON Provider program course. In addition to expanding the Spanish APHON Pediatric Chemotherapy/Biotherapy Instructor program course to two days, through a mentored approach new instructors were provided the opportunity to teach in the AHOPCA, SLAOP, and Mexico Spanish APHON Provider program pilot courses. Seasoned bilingual APHON instructors provided mentorship and support to new instructors. This formal mentored approach was unique to the Spanish APHON Instructor program courses and helped build the network of support for novice instructors.

Course Appropriateness for LAC Nurse Students

Overall, the Spanish APHON Pediatric Chemotherapy/Biotherapy Provider program course was determined to be appropriate for LAC nurse participants’ education and practice levels based on pass rates and student evaluations. Pass rates were not affected by test version, indicating a similarity in the effectiveness of each test version to measure students’ learning. Test questions missed by at least 50% of students were reviewed by the APHON International Task Force Spanish-speaking working group members for problematic language and revised for post-pilot series course improvements.

No student evaluation noted that the level of the Spanish APHON Provider program course material was too low or inappropriate for their setting. Given the diversity of nursing education in the region (Cassiani et al., 2017), this was a welcome finding. In LAC

countries, entry-to-practice requirements may range from auxiliary (1 to 1.5 years) to technical (1.5 to 3 year program) to licensed professional nurses (4 to 5 year program) (Cassiani et al., 2018). In some settings, auxiliary, technical, and licensed nurses are hired to perform the same responsibilities. Knowing the diversity of entry-to-practice levels in LAC countries, the project team had established a minimum Provider course eligibility criterion at three years of nursing school.

Five-year Nursing Program

In LAC, nurses who have had five years of training (one year beyond a bachelors) have *Licenciatura* [no direct translation] status. In this study, those nurses were more likely to pass the Spanish APHON Pediatric Chemotherapy/Biotherapy Provider program course compared to those who had less preparation. While this was not an unexpected finding, it demonstrates that additional foundational training in general nursing may provide a knowledge base for advanced understanding of specialized nursing as well. Benner (2012) found that many nurses are “undereducated” for today’s practice demands and join other respected researchers and organizations in recommending baccalaureate entry-level requirement. Kendall-Gallagher and colleagues (2011) found an association between baccalaureate-prepared nurses and specialty certification with improved patient outcomes, while certification of non-baccalaureate prepared nurses showed no effect on outcomes. This may also help to explain the 100% Chile pilot pass rate, since all nurse participants had attended a five-year nursing program. Since the five-year nursing training is not available across all LAC countries, the Spanish APHON Provider program course serves as a resource to bolster nurses’ subspecialty education and patient safety in the region.

Rotation within Hematology/Oncology Hospital Settings

The finding that rotation within pediatric oncology hospital settings (between inpatient and outpatient) negatively affected exam scores (less likely to pass) is particularly salient since we often look at rotation outside of hematology/oncology units and across specialties and not within (Day et al., 2014; Pergert et al., 2020). It is important to note that the types of antineoplastic agents delivered in inpatient and outpatient settings may differ, along with monitoring and supportive care requirements. This may indicate a need for further chemotherapy/biotherapy education and training of nurses rotating between inpatient and outpatient pediatric oncology and bone marrow transplant settings. It may also warrant the consideration of permanently assigning nurses to either inpatient or outpatient units. The International Society of Paediatric Oncology Baseline Standards for Pediatric Oncology Nursing in LMIC recommend that nurses be dedicated to pediatric oncology units to help foster and retain expertise, which likely translates to better care quality and patient safety (Day et al., 2015; Day et al., 2014).

Subspecialized Education and Recognition as a Subspecialty

The Spanish APHON Pediatric Chemotherapy/Biotherapy Provider program course met a need for standardized and comprehensive chemotherapy/biotherapy nursing education in LAC countries. The course builds upon local and regional nursing foundational programs, such as those that have been established by unit-based pediatric oncology nurse educators (Day et al., 2013; Sullivan et al., 2021) and other regional hospital education programs

for new nurses. These programs generally include introductory and ongoing chemotherapy/biotherapy education and skills competencies. However, the chemotherapy/biotherapy curriculum in these programs is often not as comprehensive as the Spanish APHON Provider program course.

Online offerings with chemotherapy/biotherapy content are available in the region, such as the adult oncology resources: *e-oncología* (2021) and the Argentinian government's virtual "Introduction to Oncology Nursing Cancer Human Resources Training Program" (Instituto Nacional del Cancer, 2020). Free basic Spanish-language chemotherapy/biotherapy self-paced and instructor-led lectures are available for pediatric oncology nurses on [Cure4Kids.org](https://www.cure4kids.org) (SJCRH website). The four short SJCRH online seminars are taught by two Chilean APHON International Task Force working group members and Spanish APHON Pediatric Chemotherapy/Biotherapy program instructors. This chemotherapy basics course is now recommended as a primer for LAC nurses prior to taking the comprehensive Spanish APHON Provider program course.

Formalized subspecialty education programs, such as the Spanish APHON Pediatric Chemotherapy/Biotherapy Provider program course, contribute to the recognition of pediatric oncology as a subspecialty and support the need for specialist career paths in many nations around the world. Subspecialty education should be available across the career and education continuum, from novice to expert levels (Pergert et al., 2020; Sullivan et al., 2020). Many undergraduate nursing programs worldwide have limited or no pediatric oncology content, shifting the burden of subspecialty education onto clinical practice settings. Although there are multiple graduate-level nursing specialization programs in LAC countries (master's degrees and doctorates), access and career advancement opportunities for nursing personnel who provide direct care are limited. The limited number of graduate-level prepared nurses in the region is evident in a Pan American Health Organization (PAHO) survey of 246 nursing schools from 25 countries. It showed that only 31.3% of schools had doctoral level nursing faculty (8.3% when Brazil was excluded) and 33.6% had master's prepared full-time faculty (44% of these were Brazilian) (Cassiani et al., 2017). Aside from academia, nursing professionals with a graduate level of specialization generally hold hospital managerial and administrative positions, which does not necessarily translate into an improvement in the direct care of patients (Zug et al., 2016). Thus, subspecialty education programs and the creation of advanced specialist clinical and research roles are needed across LAC (Pergert et al., 2020).

Nurse Position

Nurse position was predictive of pass rates, with frontline nurses being more likely to pass than non-frontline nurses. This finding is understandable given the clinical nature of the Spanish APHON Pediatric Chemotherapy/Biotherapy Provider program course. It may also have contributed to the 100% pass rate in the Chile pilot. The majority of students in the Chile pilot were practicing frontline nurses who regularly administer chemotherapy/biotherapy as a part of their job responsibilities.

Standards for Practice

Since the Spanish APHON Pediatric Chemotherapy/Biotherapy Provider program course provides a standard for nursing practice in the administration of chemotherapy and biotherapy, we expect it may increase patient and nursing safety as documented in other LMIC. For example, in Yogyakarta, Indonesia a chemotherapy safety education intervention with 343 nurses resulted in the improved adherence to standards in chemotherapy documentation, administration, and monitoring (Mulatsih et al., (2018). In the Spanish APHON Pediatric Chemotherapy/Biotherapy Provider program student evaluations, nurses reported that the content would help create nursing guidelines for practice. When implemented appropriately, these guidelines would likely improve patient- and nurse-safety and outcomes.

Limitations

Limitations of this study included student heterogeneity between pilot sites, limited or missing demographic data, and funding/coordination requirements with the in-country workshop model. The Chile pilot was conducted with nurses from a single institution, while the other pilots were held with students from multiple institutions and countries. Furthermore, nurses' position varied by site with mainly frontline nurses in the Chile pilot and a mix of frontline and administrative nurses in the remaining pilots.

We did not have access to nurses' data regarding previous chemotherapy/biotherapy education or training. These data may have increased our insight into additional factors influencing student success. For the SLAOP Spanish APHON Provider program pilot in Argentina, the course was held as an invited conference session and was not originally planned as a pilot series course. Thus, we had no demographic data on the nurses and were not able to include their results in our analysis. That said, our experience in Argentina with such a large and diverse nursing cohort informed our formative course modification and several students were selected for instructor training.

Spanish APHON Pediatric Chemotherapy/Biotherapy Provider program in-country courses coordinated by US-based nurses are likely not sustainable as the primary course delivery method in the long-run since they are costly, labor intensive, and our long-term goal is to establish locally taught courses. However, an early investment of time and resources are expected with the launch of any new initiative, and our intent was to utilize in-country pilot courses as proof of concept prior to establishing a locally sustainable instructor network. The Spanish APHON Pediatric Chemotherapy/Biotherapy program instructor network will facilitate LAC instructors' teaching in their local settings with minimal logistical and funding needs when compared to international courses. At scale, this instructor network will increase pediatric oncology nurses' access to this comprehensive course across LAC countries.

Post-pilot Series Modifications, Progress and Future Implications

Pre-test and demographic screening are now required prior to course enrollment. Based on the outcomes of the four pilots, an online pre-test (10 multiple choice questions delivered online by APHON), was created based on core course topics and made mandatory. A

pre-test passing grade of 60% is required to enroll in a course. It was also clear that nurses with less than two years of experience with children with cancer were more likely to fail the course exam, so this is now also a criterion for enrolling.

Between 2019 and 2021, the Spanish APHON Pediatric Chemotherapy/Biotherapy program instructor network facilitated five post-pilot Spanish APHON Provider program courses in Mexico, Chile, Colombia, and Peru (two courses). Additional scheduled in-person Spanish APHON Provider program courses and planned Spanish APHON Instructor program courses were put on hold during the COVID-19 pandemic. At that time, Spanish APHON Provider program courses switched to a virtual platform. Virtual course complexities are regionally specific (e.g., internet connectivity, ability to attend classes without interruption, access to laptop computers) and need further refinement and attention. APHON staff has been instrumental in supporting course organization and implementation of the virtual courses.

As of December 2021, 29 Spanish instructors and more than 400 nurses from over 70 hospitals in 19 countries have been trained through the initiative. Ultimately, APHON's goal is to support local instructor-led courses in LAC hospitals and regional courses led by LAC instructors. The work described here provided the foundation to realize this objective.

APHON has continued to expand the course internationally. The 4th ed. APHON Pediatric Chemotherapy/Biotherapy Provider program course is now available in Russian and Portuguese and will be offered to nurses working with children with cancer in Eurasia and Brazil, respectively. Three virtual English APHON Provider program courses were recently (2021) held with nurses from Australia/New Zealand, Ireland, and Brazil with great success. Finally, the 4th ed. Spanish APHON Pediatric Chemotherapy/Biotherapy Provider program course and text translation are being finalized. The new version will be used in 2022 and forward. These achievements align with recommendations of the PAHO Childhood Cancer Working Group to "regionalize health workforce training and translate successful models across jurisdictions" (Denburg et al. 2017, p. 709). This train-the-trainer course is truly bringing APHON to the world.

Conclusion

APHON's Pediatric Chemotherapy/Biotherapy Provider program was successfully adapted, translated to Spanish, and piloted with nurses from Mexico, Central American/Caribbean, South America, and Spain. The Spanish APHON Provider program was appropriate for nurses' education and practice levels across multiple countries. The Spanish APHON Pediatric Chemotherapy/Biotherapy Instructor program fostered the generation of an APHON Spanish-language instructor network, which is key to program sustainability. Overall, the Spanish APHON Pediatric Chemotherapy/Biotherapy program has met a need for standardized and comprehensive chemotherapy/biotherapy education in the LAC region.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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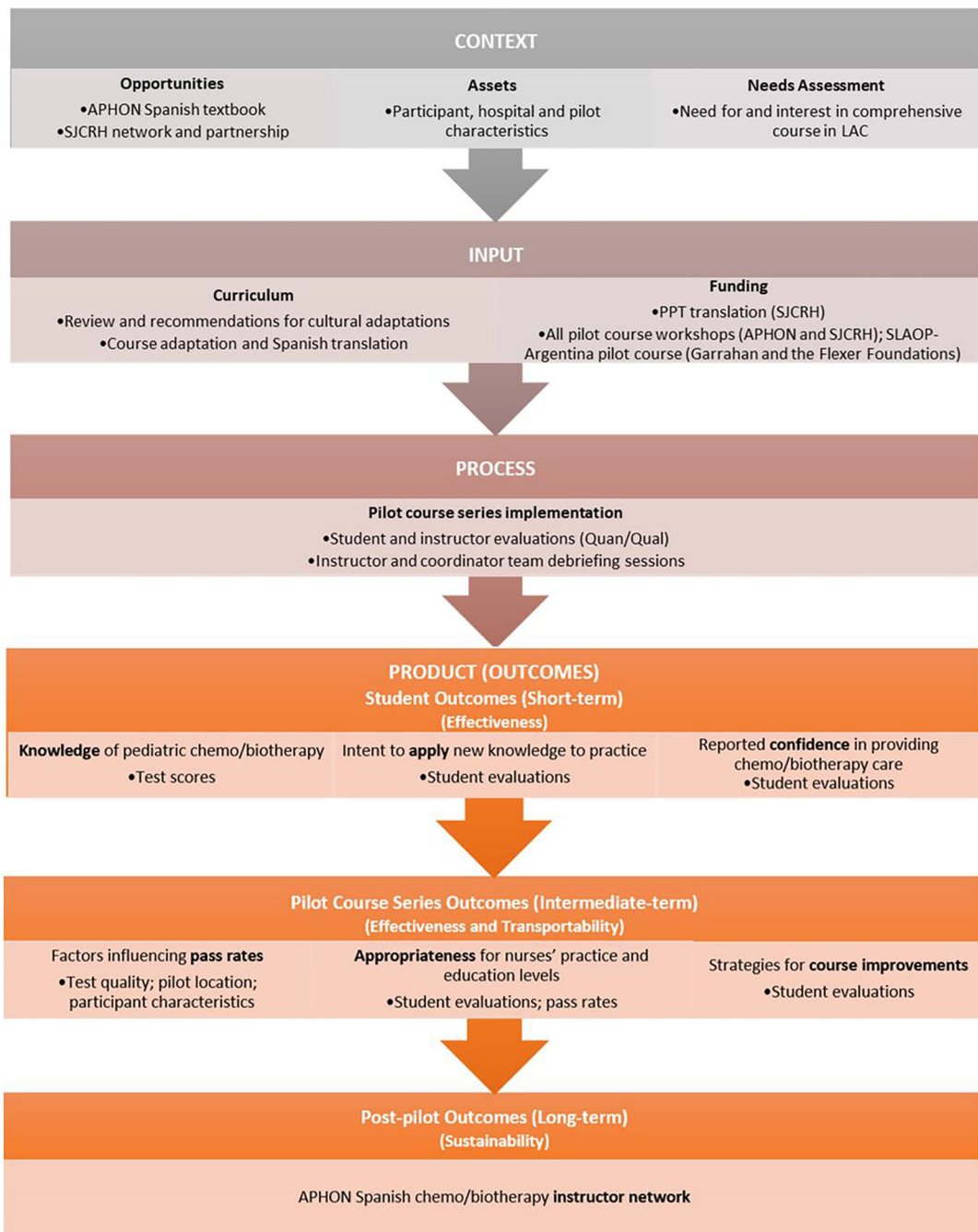


Figure 1:
Spanish APHON Pediatric Chemotherapy/Biotherapy Program Evaluation Model

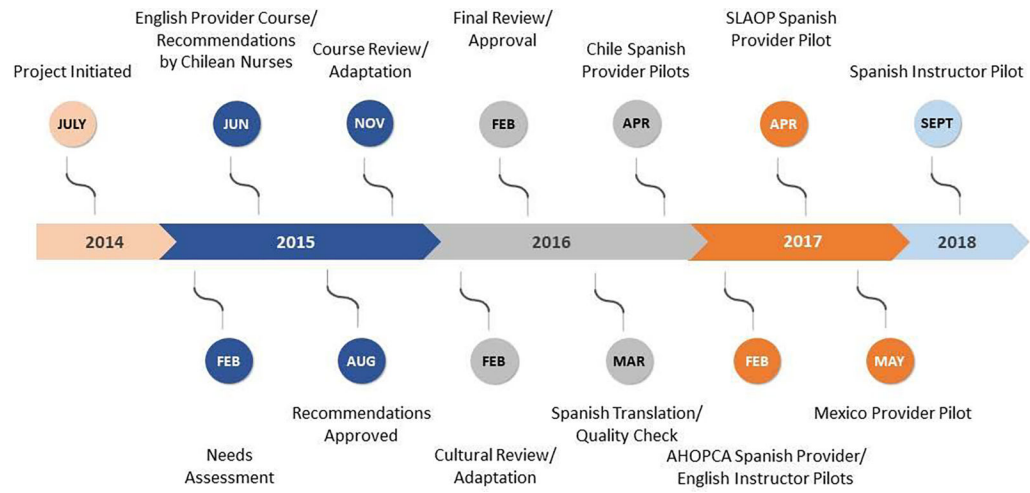


Figure 2:
Spanish APHON Pediatric Chemotherapy/Biotherapy Program Project Timeline

Table 1.

Spanish APHON Pediatric Chemotherapy/Biotherapy Provider Program Components

Course Components	Subcomponents
Content	12 PowerPoint modules (>700 slides): <ol style="list-style-type: none"> 1. Introduction and Standards 2. General Cancer Overview 3. Chemotherapy Overview 4. Principles of Chemotherapy 5. Principles of Biotherapy 6. Chemotherapy: Agents and Classifications 7. Safe Handling of Chemotherapy and Biotherapy Agents 8. Administration Considerations 9. Toxicity and Symptom Management 10. Late Effects of Chemotherapy 11. Psychosocial Issues 12. Ethical and Legal Considerations
Learning Activities	<ul style="list-style-type: none"> - Absolute Neutrophil Count and Body Surface Area calculations - “Pin the Poison” side effects/toxicity game - New case studies - Post-module quiz questions - Chemo/biotherapy administration skills checklist and demonstration
Supplemental Materials	<ul style="list-style-type: none"> - Agenda and course objectives - APHON chemo/biotherapy curriculum textbook (3rd ed.) - Printed and bound PPT slides for notes
Evaluations	<ul style="list-style-type: none"> - 50-item multiple choice open-book test (Versions A & B) - Student and instructor evaluation forms
Certificate	<ul style="list-style-type: none"> - Certificate of Achievement from APHON with ANCC contact hours
Format	<ul style="list-style-type: none"> - 3 to 4 day in-person workshop

Note. ANCC = American Nurses Credentialing Center; APHON = Association of Pediatric Hematology/Oncology Nurses.

Table 2.

Spanish APHON Pediatric Chemotherapy/Biotherapy Provider and Instructor Program Pilots

Location	Dates	Total Nurse Students	Instructors	Course Coordinators
Provider Course Pilots				
Santiago, Chile Hospital Luis Calvo Mackenna	April 25–27, 2016 May 2–4, 2016 ^a	32 Chile	2 US fluent Spanish speakers	2 Chilean nurse educators 1 US APHON Task Force/SJCRH member
Memphis, TN, USA St. Jude Children's Research Hospital	Feb 20–22, 2017	21 Central America and Caribbean (7 countries) 2 Guadalajara, Mexico 1 Santiago, Chile	2 US fluent Spanish speakers	2 US APHON Task Force members (1 from SJCRH)
Buenos Aires, Argentina SLAOP	April 4–6, 2017	89 South America and Spain ^b (7 countries)	2 Chilean nurse educators 1 Mexican nurse educator	2 US APHON Task Force members (1 from SJCRH)
Guadalajara, Mexico Hospital Civil de Guadalajara Dr. Juan I. Menchaca	May 24–26, 2017	58 Mexico (11 hospitals)	2 Chilean nurse educators 2 Mexican nurses (1 educator) 1 Costa Rican nurse educator	2 US APHON Task Force members (1 from SJCRH)
Instructor Course Pilots				
Memphis, TN, USA St. Jude Children's Research Hospital	Feb 23, 2017 ^c	6 bilingual nurses: 2 Mexico 3 Chile 1 Costa Rica	2 US English-fluent APHON Instructors	2 US APHON Task Force members (1 from SJCRH)
Memphis, TN, USA St. Jude Children's Research Hospital	Sept 19–20, 2018	11 Latin America: Argentina Bolivia Chile Dominican Rep Guatemala Mexico Uruguay	2 US Spanish-fluent APHON Instructors 2 Chilean nurse educators 1 Mexican nurse educator	2 US APHON Task Force members (1 from SJCRH) 1 US APHON Chemo/Biotherapy Committee liaison

Note. APHON = Association of Pediatric Hematology/Oncology Nurses; SJCRH = St. Jude Children's Research Hospital; SLAOP = Sociedad Latinoamericana de Oncología Pediátrica.

^aTwo distinct cohorts.

^bSome nurses had no pediatric oncology experience.

^cTaught in English language.

Table 3.

Spanish APHON Provider Program Pass Rates by Pilot Location

Test		Pilot				<i>p</i>	<i>p</i> ^a
		Combined	AHOPCA	Chile	Mexico		
		<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)		
Test 1	Pass	66 (61.11)	9 (40.91)	30 (96.77)	27 (49.09)	<0.001	0.6
	Fail	42 (38.89)	13 (59.09)	1 (3.23)	28 (50.91)		
Test 2	Pass	20 (47.62)	8 (61.54)	1 (100.00)	11 (39.29)	0.2	0.3
	Fail	22 (52.38)	5 (38.46)	0 (0.00)	17 (60.71)		
Overall	Pass	86 (79.63)	17 (77.27)	31 (100.00)	38 (69.09)	<0.001	0.6
	Fail	22 (20.37)	5 (22.73)	0 (0.00)	17 (30.91)		

^aChile pilot excluded

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Table 4.

Spanish APHON Provider Program Pass Rates by Test Version

Test		Combined	Version A	Version B	<i>p</i>
		<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	
Test 1	Pass	66 (61.11)	32 (57.14)	34 (65.38)	0.4
	Fail	42 (38.89)	24 (42.86)	18 (34.62)	
Test 2	Pass	20 (47.62)	8 (40.00)	12 (54.55)	0.4
	Fail	22 (52.38)	12 (60.00)	10 (45.45)	

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Table 5.

Spanish APHON Provider Program Participant Characteristics by Passing the Test

Characteristics	Total (N = 108)	Pass (N = 86)	Fail (N = 22)	p	
	n (%)	n (%)	n (%)		
Country	Chile	32 (29.63)	32 (37.21)	0 (0.00)	0.003
	Costa Rica	2 (1.85)	2 (2.33)	0 (0.00)	
	Dominican Republic	4 (3.70)	3 (3.49)	1 (4.55)	
	El Salvador	2 (1.85)	2 (2.33)	0 (0.00)	
	Guatemala	3 (2.78)	2 (2.33)	1 (4.55)	
	Honduras	4 (3.70)	2 (2.33)	2 (9.09)	
	Mexico	57 (52.78)	40 (46.51)	17 (77.27)	
	Nicaragua	2 (1.85)	1 (1.16)	1 (4.55)	
	Panama	2 (1.85)	2 (2.33)	0 (0.00)	
	Unit Type	BMT	14 (12.96)	14 (16.28)	
Inpatient		28 (25.93)	26 (30.23)	2 (9.09)	
Other		17 (15.74)	13 (15.12)	4 (18.18)	
Outpatient		8 (7.41)	7 (8.14)	1 (4.55)	
Inpatient/Outpatient		40 (37.04)	25 (29.07)	15 (68.18)	
Missing		1 (0.93)	1 (1.16)	0 (0.00)	
Position	Nurse Educator	11 (10.19)	9 (10.47)	2 (9.09)	0.001
	Other	52 (48.15)	34 (39.53)	18 (81.82)	
	Frontline	43 (39.81)	41 (47.67)	2 (9.09)	
	Missing	2 (1.85)	2 (2.33)	0 (0.00)	
Frontline Position Subgroup (N=71) ^a	Inpatient ^b	34 (47.89)	33 (57.89)	1 (7.14)	<0.001
	Inpatient/Outpatient	28 (39.44)	16 (28.07)	12 (85.71)	
	Outpatient ^b	9 (12.68)	8 (14.04)	1 (7.14)	
Total Years Nursing School	M (SD)	4.85 (0.79)	4.89 (0.62)	4.67 (1.28)	0.009
	Mdn (Range)	5 (3~8)	5 (4~7)	4 (3~8)	
Total Years Work as a Nurse	M (SD)	12.24 (9.12)	10.94 (8.84)	17.57 (8.45)	0.002
	Mdn (Range)	10 (0.5~40)	9 (0.5~37)	20 (5~40)	
Total Years Work with Children with Cancer	M (SD)	6.86 (5.58)	6.69 (5.71)	7.55 (5.09)	0.318
	Mdn (Range)	5 (0.5~23)	5 (0.5~23)	5 (0.5~15)	
Total Years Nursing School	<5 Years	33 (30.56)	20 (23.26)	13 (59.09)	<0.001
	>=5 Years	74 (68.52)	66 (76.74)	8 (36.36)	
	Missing (%)	1 (0.93)	0 (0.00)	1 (4.55)	
Total Years Work with Children with Cancer	< 2 Years	21 (19.44)	20 (23.26)	1 (4.55)	0.068

Characteristics	Total (N = 108)	Pass (N = 86)	Fail (N = 22)	p
	n (%)	n (%)	n (%)	
>= 2 Years	86 (79.63)	66 (76.74)	20 (90.91)	
Missing (%)	1 (0.93)	0 (0.00)	1 (4.55)	
Total Years Work with Children with Cancer				0.177
< 1 Year	11 (10.19)	10 (11.63)	1 (4.55)	
>= 1 Year	96 (88.89)	76 (88.37)	20 (90.91)	
Missing (%)	1 (0.93)	0 (0.00)	1 (4.55)	

Note. BMT = (Bone Marrow Transplant).

^aThe subgroup of position included frontline nurses from inpatient, outpatient, and those rotating between inpatient and outpatient units.

^bBMT included.

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