

RESEARCH ARTICLE

Evaluating student pharmacist knowledge, attitudes, and confidence in caring for paediatric patients with HIV

Kimberly C. McKeirnan¹ , Sorosh Kherghehpoush² , Kavva Vaitla¹ , Rustin D. Crutchley¹ , Angie Gladchuk¹ 

¹ Washington State University College of Pharmacy and Pharmaceutical Sciences, Spokane, Washington, United States

² University of California Davis Health Medical Center, Sacramento, California, United States

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Correspondence

Kimberly C. McKeirnan
Washington State University College of
Pharmacy and Pharmaceutical Sciences
Spokane
Washington
United States
kimberly.mckeirnan@wsu.edu

Abstract

Background: Despite advances in the management of human immunodeficiency virus (HIV), people living with HIV (PLWH) experience stigma that impacts the healthcare they receive. Numerous studies demonstrate that provider education regarding HIV helps alleviate bias. Pharmacy schools significantly vary in their curriculum surrounding HIV education, with a limited focus on HIV in the paediatric population. Being one of the most accessible healthcare providers, improving pharmacist education and attitudes could positively impact treatment outcomes for children living with HIV. **Method:** An Advanced HIV Elective course that included content in the management of children living with HIV (CLWH) was developed and implemented by faculty at a Doctor of Pharmacy program in the United States. Student pharmacist knowledge, confidence, and perceptions of providing care for this population were assessed before and after the didactic module. **Results:** The incorporation of a paediatric HIV module increased the knowledge and confidence of student pharmacists in the management of PLWH and CLWH. Areas of improvement include the selection of antiretroviral therapy (ART), ART medication counselling, and paediatric immunisations. However, a significant difference in attitudes and perceptions towards PLWH and CLWH was not observed. **Conclusion:** Although improvement in student pharmacist knowledge and confidence was seen after the implementation of a paediatric HIV module, innovative ways to address bias, stigma, and misinformation are needed to promote positive health outcomes for marginalised communities, including those living with HIV.

Introduction

The World Health Organisation's (WHO) data on human immunodeficiency virus (HIV) show that approximately 38.4 million people globally were living with HIV in 2021. An estimated 2.73 million were children under the age of 19 (WHO, 2020; UNICEF, 2022b). In 2021, of the 650,000 people who died of AIDS-related illness, 17% were under the age of 20 (UNICEF, 2022b). More than 90% of paediatric HIV infections occur through vertical or mother-to-child transmission (MTCT), where the mother does not have a suppressed viral load or is not receiving antiretroviral therapy (ART) during

pregnancy or breastfeeding (UNAIDS, 2022). The risk of HIV transmission increases with a higher viral load, highlighting the importance of ensuring access to ART for all individuals living with HIV (Elizabeth Glaser Pediatric Aids Foundation, n.d.). While the incidence of new HIV infections in children has declined significantly with MTCT prevention initiatives over the past decade, only 54% of children living with HIV (CLWH) in 2020 were receiving appropriate ART. This percentage is well below the goal set by the United Nations Programme on HIV/AIDS (UNAIDS) of achieving 90% of individuals diagnosed with HIV receiving sustained ART by 2030 (UNAIDS, 2014; UNAIDS, 2019; UNICEF, 2022a).

Outside the United States (US), healthcare provider stigma towards CLWH negatively impacts patient care and treatment outcomes (Bond, Chase & Aggleton, 2002; Nguyen *et al.*, 2009; Thomas, Nyamathi & Swaminathan, 2009; Rahangdale *et al.*, 2010; Wagner *et al.*, 2010; Subramaniyan *et al.*, 2013; Arias-Colmenero *et al.*, 2020). A study of urban health facilities in India, for example, found that the majority of healthcare providers were willing to prevent women living with HIV from having children and believed those who acquired HIV through sexual contact or drug use deserved to have HIV (Ekstrand *et al.*, 2013). Similarly, in Bangladesh, many providers showed discriminatory behaviour towards people living with HIV (PLWH), and despite being aware of the mechanism of transmission of HIV, they did not fully believe it internally (Ahsan Ullah, 2011). Patient reports of healthcare provider stigma have led some pregnant PLWH to avoid seeking care (Thomas, Nyamathi & Swaminathan, 2009; Rahangdale *et al.*, 2010), while many others reported lying to their healthcare providers (Arias-Colmenero *et al.*, 2020). Driving factors for this underlying stigma are numerous and may include a lack of awareness of potential stigmatising actions and their impact on patients, a belief that HIV infection is a result of immoral behaviours based on religious or sociocultural values (Nyblade *et al.*, 2009; Fauk *et al.*, 2021), and prior biases against marginalised groups at higher risk for acquiring HIV (Ekstrand *et al.*, 2020). Several studies suggest that educating healthcare providers on HIV/AIDS and HIV transmission is critical to increasing awareness, reducing fear, and addressing personal biases (Nyblade *et al.*, 2009; McHenry *et al.*, 2017; Fauk *et al.*, 2021).

In the US, the Accreditation Council for Pharmacy Education (ACPE) provides standards for schools of pharmacy across the nation in developing and maintaining their pharmacy curriculum to prepare future pharmacy professionals to provide collaborative, patient-centred care upon graduation (ACPE, 2015). The established elements of the didactic Doctor of Pharmacy programme are broad and can lead to variability in the amount of time, duration, and delivery method for content covered. The Paediatrics Practice and Research Network of the American College of Clinical Pharmacy suggested that all pharmacy programmes include at minimum 25 contact hours of didactic material in paediatrics and 16-32 hours within elective course material (ACCP, n.d.). However, a 2013 survey of US pharmacy programmes showed that a median of only 16 contact hours was taught in core curricula, and only 61% of pharmacy programmes offered an elective in paediatrics at all. A paediatric pharmacy task force was formed in 2020 to address this gap and recommended that paediatric content be

covered in the curriculum, including paediatric HIV for infectious disease topics. In 2020, a cross-sectional survey of US schools and colleges of pharmacy evaluating the number of classroom hours dedicated to HIV-related topics found that Doctor of Pharmacy programmes reported an average time of about 75 hours dedicated to infectious disease, with only 9.8 hours spent on HIV-related topics (Rathbun *et al.*, 2020). Several studies have shown suboptimal competence and confidence of pharmacists in caring for PLWH when translating into practice (Jodlowski *et al.*, 2010; Davis Pate *et al.*, 2012; Kibicho, Pinkerton & Owczarzak, 2014), with a lack of didactic training being the primary contributor. Given the rare occurrence of perinatal transmission of HIV in developed countries, including the US (CDC, n.d.), it is unlikely that much time is devoted to paediatric HIV in pharmacy curricula despite the recommendations previously discussed. However, there may be a greater need for pharmacist awareness, education, and training in developing countries, such as those located in Sub-Saharan Africa, which houses the overwhelming majority of CLWH (Slogrove *et al.*, 2019). Studies within the United States have shown that expanded HIV training of pharmacists can improve ART access and adherence while diminishing the impact of associated stigma (Heelon *et al.*, 2007; Balfour *et al.*, 2010; Ma *et al.*, 2010; Henderson *et al.*, 2011). Training pharmacists to take on a larger role in the HIV care continuum in developing countries may lead to reduced MTCT of HIV and improve health outcomes for CLWH.

This study aimed to evaluate the knowledge and attitudes of student pharmacists taking an elective Advanced HIV didactic course, including content on paediatric HIV, and assess their confidence in providing holistic patient care for this population as they enter practice.

Methods

Description of course and module

An elective Advanced HIV course was implemented for professional-year two (PY2) and professional-year 3 (PY3) students in the Doctor of Pharmacy programme at Washington State University College of Pharmacy and Pharmaceutical Sciences (WSU CPPS) in Fall 2018 (Crutchley *et al.*, 2022). This elective is a two-credit-hour course delivered as a one two-hour in-person class session each week during the 16-week term. WSU CPPS utilises an active learning pedagogical model (Rensberg *et al.*, 2017), where students are expected to watch pre-recorded lectures and complete recommended reading assignments before coming to

the in-person class. Pre-class material is intended to provide foundational knowledge so that in-class time can be dedicated to active learning activities designed to build on and apply the pre-class material.

A module was developed in 2019 for the Advanced HIV elective course to train student pharmacists in managing the treatment of CLWH. This module included pre-class material and an in-person 105-minute active learning in-class session. The learning objectives for this module included: (1) recall when to start treatment in CLWH; (2) identify factors to consider when selecting initial antiretroviral (ARV) therapy for CLWH; (3) recall the age-limit and weight-limit cut-offs for using common ARV fixed-dose combinations; (4) identify, determine, and construct appropriate ARV therapy regimens for treatment-naïve and treatment-experienced CLWH; and (5) recall appropriate monitoring parameters for CLWH on ARV therapy. These learning objectives were developed in accordance with the US Paediatric HIV guidelines (Panel on Antiretroviral Therapy and Medical Management of Children Living with HIV, 2023) and the recommended child and adolescent immunisation schedule for ages 18 years or younger (CDC, 2022). Students also watched a 31-minute pre-recorded video created by the course's lead instructor. The active learning in-class session was designed to reinforce and apply concepts taught in the pre-class material. During the active learning session, students were provided numerous opportunities to apply therapeutic principles to different patient case scenarios regarding the treatment of CLWH. In-class activities concluded with an audience reporting device quiz comprising a total of ten questions; the purpose of this activity was to summarise major teaching points related to the learning objectives of the lecture. Table I provides an overview of the delivery of the active learning session content.

Evaluation of student knowledge, confidence, and perceptions

WSU CPPS uses a competency-based grading model that requires students to demonstrate achievement of learning objectives by achieving a score of at least an 80% on an examination. Students not reaching 80% competency in the initial attempt are required to meet with the instructor, re-engage with the learning material, and take a remediation attempt examination one week later. The questions on the remediation examination are similar to those on the initial examination, with items covering the same learning objectives. Student pharmacists were required to meet competency on a course examination administered in class using a computer-based testing platform to evaluate their knowledge of treating CLWH after

completing the Paediatric HIV module. Examination questions for the treatment of CLWH content were in multiple-choice format.

Table I: Active learning session content and approximate time spent on each activity

Class content	Time
Complete pre-class survey	10 minutes
Discuss answers to 5 questions relating to learning objectives embedded in pre-class recording	10 minutes
Instructions, introduction of first case	5 minutes
Students discuss comprehensive Paediatric Case 1 in small, breakout groups	15 minutes
Large group discussion of Paediatric Case 1	15 minutes
Students discuss comprehensive Paediatric Case 2 in small, breakout groups	10 minutes
Large group discussion of Paediatric Case 2	10 minutes
Quiz	15 minutes
Student question and answer time, group discussion	5 minutes
Students complete post-class survey	10 minutes
Total	105 minutes

A 15-question survey was developed in the Fall of 2020 to evaluate student pharmacist confidence and attitudes regarding the treatment of CLWH. Students were asked to respond to five Likert scale questions regarding their confidence in providing comprehensive treatment services to CLWH and ten Likert scale questions regarding attitudes, beliefs, and stigma towards various aspects of paediatric HIV management. Confidence-related survey questions about providing care to CLWH were developed based on the practical responsibilities of pharmacists involved in the care of CLWH in the US. Attitude and stigma-related questions were developed based on the existing literature on healthcare provider perceptions towards mothers and children living with HIV globally. The survey questions were developed by two HIV expert pharmacists who had achieved the American Academy of HIV Pharmacist credentials (National HIV Curriculum, n.d.) and beta-tested by a separate HIV pharmacist, who was asked to provide feedback. Questions were edited to incorporate expert recommendations. The survey was administered before and after the paediatric module using the Qualtrics XM Survey Platform (Qualtrics, Provo, UT). For the pre-class survey, a link was posted in the class learning management software, Blackboard (Blackboard Learn Inc., Washington DC). Students were informed that completion of the survey was optional, anonymous, and would take approximately ten minutes. They were asked to complete the survey

before accessing any of the pre-class material to determine baseline knowledge, confidence, and perceptions. Students were given a separate link and asked to complete the post-class survey immediately following the conclusion of the in-class activities of the paediatric HIV module.

Data analysis

At the end of the term, the course instructor exported the data related to examination results without identifiable student information. These results were analysed using descriptive statistics. Pre- and post-course survey data were exported into Microsoft Excel. The Mann-Whitney U test was used to calculate the statistical significance of the changes in responses between pre- and post-survey confidence and attitude questions. Data analyses for this study were performed using IBM SPSS Version 26 (Chicago, IL).

This study received exempt status from the Washington State University Institutional Review Board (#18524-001).

Results

Knowledge Results

All 60 students enrolled in the course took the Paediatric HIV module examination. Fifty-eight met

competency on the first attempt. Student performance on examination questions for the course learning objectives was as follows: (1) recall when to start treatment in CLWH: 95% (57/60) of students had correct examination responses; (2) identify factors to consider when selecting initial antiretroviral (ARV) therapy for CLWH: 100% (60/60); (3) recall the age-limit and weight-limit cut-offs for using common ARV fixed-dose combinations: 95% (57/60); (4) identify, determine, and construct appropriate ARV therapy regimens for treatment-naïve and treatment-experienced CLWH: 83% (50/60); and (5) recall appropriate monitoring parameters for CLWH on ARV therapy: 95% (57/60). The two students who did not meet competency on the first attempt met with the course instructor to review the material and then met competency on the remediation attempt one week after the first examination.

Confidence and Attitudes Results

Of the 60 enrolled student pharmacists, 49 (81%) completed the pre-class survey, and 28 (47%) completed the post-class survey. A statistically significant increase in self-reported confidence was seen on all five questions from before class to after class, as shown in Table II. There was no statistically significant change on any of the attitude questions, as shown in Table III.

Table II: Student pharmacist responses to the pre- and post-class survey confidence questions

Question	Survey	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	p-value
1. I am confident in ordering the correct testing studies for identifying infants with suspected HIV infection.	Pre	0 (0%)	4 (8%)	9 (18%)	18 (37%)	18 (37%)	<0.001
	Post	4 (14%)	20 (71%)	3 (10%)	1 (4%)	0 (0%)	
2. I am confident in providing Advisory Committee on Immunization Practices (ACIP) recommended immunizations for paediatric patients living with HIV.	Pre	0 (0%)	4 (8%)	10 (20%)	19 (39%)	16 (33%)	<0.001
	Post	3 (11%)	18 (64%)	7 (25%)	0 (0%)	0 (0%)	
3. I am confident in identifying factors to consider when selecting initial antiretroviral (ARV) therapy for CLWH.	Pre	1 (2%)	5 (10%)	9 (18%)	19 (39%)	15 (31%)	<0.001
	Post	3 (11%)	20 (71%)	5 (18%)	0 (0%)	0 (0%)	
4. I am confident in providing counselling for paediatric patients living with HIV including education on counselling, side effects, transmission and monitoring.	Pre	1 (2%)	6 (12%)	13 (27%)	15 (31%)	14 (29%)	<0.001
	Post	4 (14%)	19 (68%)	5 (18%)	0 (0%)	0 (0%)	
5. I am confident in recommending appropriate antiretroviral agents for paediatric patients living with HIV who have experienced virologic failure (i.e. failed to achieve virologic suppression with initial antiretroviral therapy).	Pre	0 (0%)	4 (8%)	10 (20%)	18 (37%)	17 (35%)	<0.001
	Post	3 (11%)	17 (61%)	8 (28%)	0 (0%)	0 (0%)	

Table III: Student pharmacist responses to the pre- and post-class survey attitude questions

Attitude questions	Describe your level of agreement with the following statements regarding children living with HIV						
	Survey	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	p-value
1. Women living with HIV should not be allowed to give birth and put their child at risk for acquiring HIV	Pre	1 (2%)	6 (12%)	3 (6%)	15 (31%)	24 (49%)	0.184
	Post	1 (4%)	0 (0%)	2 (7%)	7 (25%)	18 (64%)	
2. Women living with HIV should not be allowed to adopt children since it would put them at unnecessary risk for acquiring HIV	Pre	0 (0%)	5 (10%)	1 (2%)	9 (18%)	34 (69%)	0.824
	Post	1 (4%)	0 (0%)	1 (4%)	7 (24%)	19 (68%)	
3. Women living with HIV who are of child-bearing age should have mandated birth control/contraception to avoid giving birth to children with HIV	Pre	0 (0%)	5 (10%)	6 (12%)	11 (23%)	27 (55%)	0.433
	Post	1 (4%)	0 (0%)	2 (7%)	8 (29%)	17 (61%)	
4. Women living with HIV should not be allowed to breastfeed their newborns given the potential for HIV transmission	Pre	3 (6%)	17 (35%)	9 (18%)	12 (24%)	8 (17%)	0.415
	Post	4 (14%)	8 (29%)	7 (25%)	4 (14%)	5 (18%)	
5. CLWH should not be allowed to attend school with the general public since they are putting their peers at risk for acquiring HIV	Pre	0 (0%)	2 (4%)	4 (8%)	12 (24%)	31 (64%)	0.680
	Post	1 (4%)	0 (0%)	1 (4%)	6 (21%)	20 (71%)	
6. CLWH should have to disclose their HIV status to their peers so the appropriate caution can be in place to limit the risk of transmission	Pre	0 (0%)	4 (8%)	10 (20%)	19 (39%)	16 (33%)	0.896
	Post	1 (4%)	2 (7%)	3 (11%)	11 (39%)	11 (39%)	
7. CLWH should be homeschooled.	Pre	0 (0%)	1 (2%)	3 (6%)	15 (31%)	29 (60%)	0.790
	Post	1 (4%)	0 (0%)	2 (7%)	7 (25%)	18 (64%)	
8. CLWH should not be allowed to play contact sports such as wrestling, football or basketball since it would put their peers at risk for acquiring HIV	Pre	0 (0%)	1 (2%)	8 (16%)	19 (39%)	21 (43%)	0.992
	Post	1 (4%)	0 (0%)	3 (11%)	11 (39%)	13 (46%)	
9. CLWH should be closely monitored by faculty during free-time and recess to limit potentially hazardous activity with their peers	Pre	1 (2%)	6 (12%)	12 (24%)	9 (19%)	21 (43%)	0.355
	Post	1 (4%)	1 (4%)	2 (7%)	13 (46%)	11 (39%)	
10. CLWH should be looked at differently than adults with HIV since they likely did not acquire HIV from risky sexual or drug use behaviours	Pre	0 (0%)	7 (14%)	13 (27%)	12 (24%)	17 (35%)	0.835
	Post	1 (4%)	2 (7%)	7 (25%)	7 (25%)	11 (39%)	

Discussion

This project provided training for PY2 and PY3 student pharmacists regarding the care of paediatric patients with HIV and evaluated the impact of student knowledge, attitudes, and confidence in caring for this population. Results showed that this brief module significantly improved student confidence in selecting appropriate ARV therapy for CLWH, knowing when to start treatment, and understanding proper monitoring parameters. Future pharmacists who are prepared to provide quality care for CLWH may contribute to reducing MTCT and improving health outcomes. Previously published literature has highlighted the impact of pharmacists on PLWH (March, Mak & Louie, 2007; Balfour *et al.*, 2010; Rickles *et al.*, 2016; Ware, 2020). Enhancing the education of student pharmacists with HIV-specific training in the developing world is a priority to promote positive health outcomes for PLWH and CLWH.

As observed from the responses to attitude questions, residual stigma was associated with paediatric HIV

despite having been provided with the knowledge to address inaccurate information, consistent with previous findings (Rickles *et al.*, 2016, Ware, 2020). The majority of student pharmacists had favourable attitudes towards caring for PLWH, and although some non-statistically significant decreases in stigmatising views, the persistence of personal biases is troubling.

Of note, approximately 40% of the responses to the pre- and post-class survey attitude questions showed some level of agreement with the statement "Women living with HIV should not be allowed to breastfeed their newborns given the potential for HIV transmission", highlighting an important area that may be perceived differently in other countries. For example, the most recent perinatal guidelines recommend replacing breastfeeding with formula or banked pasteurised donor human milk for people with HIV, who are not on ART and/or do not have an undetectable viral load during pregnancy (especially throughout the third trimester), and at the time of delivery to eliminate the risk of HIV transmission through breastfeeding (Panel on Treatment of HIV

During Pregnancy and Prevention of Perinatal Transmission, 2023). However, the panel recommends that individuals with HIV who are on ART, have a sustained undetectable viral load, and choose to breastfeed should be supported in this decision. The Guidelines from the South African National Department of Health (2019) state that, for all women, exclusive breastfeeding is recommended for the first six months of an infant's life, with continuation for two years or longer. These guidelines do emphasise that HIV virologic suppression is paramount to prevent MTCT through breastfeeding and that breastfeeding is not recommended in women who are failing second and third-line ART regimens.

Given the higher incidence of paediatric HIV infection globally and the known impacts of stigma on PLWH, there may also be utility in modifying content material to further support diversity, equity, and inclusion efforts while acknowledging the social determinants of health to ensure that negative impacts of stigma and personal biases are adequately addressed. Further assessment of stigma before and after the delivery of this elective may also be valuable in extending this elective to other schools of pharmacy globally to ascertain the impact of stigma in pharmacy care. Numerous studies have assessed the effects of healthcare provider stigma (Bond, Chase & Aggleton, 2002; Nguyen *et al.*, 2009; Thomas, Nyamathi & Swaminathan, 2009; Rahangdale *et al.*, 2010; Wagner *et al.*, 2010, Subramaniyan *et al.*, 2013; Arias-Colmenero *et al.*, 2020), none, to our knowledge, has explicitly targeted pharmacy professionals and their influence on public perceptions of care. Thus, a broader recommendation to expand this elective to other schools of pharmacy, with an emphasis on paediatric HIV stigma, can be made to further promote optimal care and public sentiment.

The upcoming agenda involves collecting survey responses on knowledge, confidence, and attitudes from international student pharmacists. Specifically, students enrolled in the Master of Clinical Pharmacy programme at the University of Western Cape School of Pharmacy in Cape Town, South Africa, who are currently taking the Advanced HIV elective course alongside WSU CPPS students, will be administered a similar survey (Crutchley *et al.*, 2022). These data will be significant, given the differences in the treatment management of CLWH between the US and South Africa. In addition, follow-up assessments related to the treatment of CLWH will be obtained from WSU CPPS students who completed both the elective didactic course and the Advanced Pharmacy Practice Experience HIV/precision medicine rotation in South Africa (Crutchley *et al.*, 2022). This measure will help inform appropriate revisions to the structure and

content of the current paediatric HIV lecture, where necessary, providing valuable insight that aligns with the promotion of cultural competence for students.

Limitations

This study has limitations. It was conducted at a single university located in the United States, a country with relatively few cases of paediatric HIV compared with many other countries. Another limitation is that this study includes data analyses involving unpaired pre- and post-survey responses from students, which could influence the overall validity of study findings. Results may differ in studies conducted in areas where paediatric HIV and HIV, in general, are more prevalent. Additionally, this work was conducted with both PY2 and PY3 student pharmacists. Since student pharmacists at WSU CPPS study infectious diseases, including HIV, during the third year pharmacotherapy course, baseline knowledge, exposure to pharmacy practice, and study findings may vary between PY2 and PY3 student cohorts.

Conclusion

Student pharmacist knowledge and confidence in caring for children living with HIV have improved after the implementation of a didactic module on paediatric HIV. This improvement in confidence was observed regarding knowledge related to ordering laboratory testing for infants suspected of HIV infection, recommending immunisations, selecting initial ARV therapy, recommending ARV for treatment-experienced paediatric patients, and providing medication counselling. Schools of pharmacy may consider implementing similar HIV paediatric modules to equip students for the care of CLWH, particularly in regions with a higher prevalence of the HIV epidemic and existing or planned interactions with this population.

Stigma, misinformation, and healthcare provider bias towards people living with HIV can be significant barriers to accessing care. Despite this module addressing common misunderstandings that lead to bias, no statistically significant changes were observed in the perceptions of children living with HIV. Due to their widespread availability, pharmacists hold a crucial role as easily accessible healthcare providers who can make a substantial difference in delivering care to this vulnerable population. Residual stigma may be an obstacle to achieving optimal patient outcomes. Schools of pharmacy may benefit from incorporating additional course materials, specifically targeting bias and negative perceptions of marginalised communities, including PLWH, to address the stigma issue.

Conflict of interest

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