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## Research Article

# HIV and Contact Tracing: Impact of a Virtual Patient Simulation Activity

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## KEYWORDS

HIV;  
virtual patient  
simulations;  
stigma;  
discrimination;  
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## Abstract

**Background:** People living with human immunodeficiency virus (HIV) face significant stigma and discrimination within the healthcare system.

**Method:** Using pretest-posttest non-equivalent groups design, the Health Care Provider HIV/AIDS Stigma Scale was administered to two cohorts of nursing students (N = 32) to evaluate effects of a virtual patient simulation of caring for a patient with HIV.

**Results:** No statistically significant effects were found. Clinical significance was noted in the treatment group, which demonstrated greater decreases in total score means and in discrimination and prejudice subscale means.

**Conclusions:** Findings suggest participation in a virtual simulation of a patient living with HIV can positively impact nursing students' attitudes.

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## Introduction

People living with human immunodeficiency virus (HIV) face significant stigma and discrimination that takes many forms. Stigma, a devaluation attribute that diminishes one's social status (Wagner, Hart, McShane, Margolese, & Girard, 2014; Wu et al., 2018) manifests as prejudice, discrimination, and stereotyping, which can create negative encounters, and in particular, negative healthcare experi-

ences. The purpose of this pilot study was to determine the effect of a virtual patient simulation scenario developed specifically for nursing students on healthcare provider attitudes and beliefs about providing care for a patient living with HIV.

## Literature Review

Persons living with human immunodeficiency virus (PL-HIV) face stigma and discrimination in society at large and in the healthcare system itself, despite advances in the pre-

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vention and treatment of the disease (Feyissa, Lockwood, Woldie, & Munn, 2019; Geter, Herron, & Sutton, 2018; Pulerwitz & Bongaarts, 2014; UNAIDS, 2017). There

### Key Points

- People living with HIV face stigma and discrimination which negatively impacts their experience when accessing health-care; nurses are in a position to change this.
- Educating nursing students about people living with HIV can reduce stigma and discrimination but opportunities need to be provided for interaction, learning, and self-reflection.
- Focused virtual patient simulation is a strategy to provide nursing students the opportunity to interact with and learn about patients that they would not encounter during their clinical experience.

has been significant progress in both prevention of transmission of HIV through pre-exposure prophylaxis (PrEP) and in effective management using highly active antiretroviral therapy (Smith, Van Handel, & Huggin, 2017). However, prevention and treatment are only part of the strategy when it comes to meeting the goal of the United Nations Joint Program of HIV/AIDS which aims to end HIV as a global epidemic by 2030 (Feyissa et al., 2019). Stigma, bias, and discrimination related to HIV need to be appropriately addressed so that those at higher risk for acquiring HIV infection are comfortable seeking preventive therapies like PrEP and PLHIV are able to access the healthcare system without fear of recrimination from health-care providers and staff.

HIV stigma is the prejudice, discounting, discrediting, and discrimination toward PLHIV and those they are affiliated with (Herek & Capitanio, 1998). This discrimination and bias in the healthcare system towards PLHIV manifests in many forms subtle and overt, including provider behaviors of gossip, excessive or differential precautions, poor support, and breaches of confidentiality (Feyissa et al., 2019). System level discrimination and bias manifests as delay in identifying undiagnosed people, poor quality of care (Geter et al., 2018; UNAIDS, 2017), unnecessary referrals based on the patient's sero-status, and negligence related to care (Feyissa et al., 2019). These discriminatory actions and attitudes have been shown to directly thwart behaviors that work to prevent the spread of HIV and improve disease management such as regular HIV testing, condom usage, utilization of PrEP, and adherence to treatment regimens for those who have already acquired HIV infection (Chong, Mak, Tam, Zhu, & Chung, 2017; Geter et al., 2018).

Additional discriminatory factors occur for men who have sex with men (MSM) who have acquired HIV in-

fection through sexual contact. This group has been found to face greater discrimination than persons who acquired HIV through other means such as through a blood transfusion or through in-utero transmission (Wu et al., 2018). In addition, PLHIV who are members of the MSM community may develop significant internalized stigma leading to concealment of HIV status, which can lead to negative stereotypes about the broader MSM community (Wu et al.), illustrating the complexity, and layers of stigma that this vulnerable population faces.

There are currently over a million PLHIV within the United States (Centers for Disease Control and Prevention, 2021) and 37.7 million worldwide (UNAIDS, 2021). Identifying methods for improving healthcare providers' attitudes and beliefs about PLHIV is critical to decreasing stigma and improving care, and must begin with assessment and acknowledgement of the problem. Wagner et al. (2014) developed the Health Care Provider HIV/AIDS Stigma Scale (HPASS). The validated HPASS consists of 30 items appropriated into three subscales that assess the constructs of prejudice, stereotyping, and discrimination as measures of HIV stigma among health care providers. The scale has demonstrated acceptable psychometric properties (Cronbach's alpha = 0.940) and has been translated and used as a measure of provider attitudes and beliefs about caring for PLHIV in China (Xie et al., 2019), Colombia, and Peru (Leyva-Moral, Dominguez-Cancino, Guevara-Vasquez, Edwards, & Palmieri, 2019).

Studies have shown that healthcare providers with training regarding HIV stigma demonstrate lower stigmatizing attitudes (Feyissa et al., 2019; Stringer et al., 2016). With nurses making up the largest occupational group of healthcare providers in the world (World Health Organization, 2017), and over 30% of the hospital workforce in the United States (Bureau of Labor Statistics, 2020), they have unique potential to reduce the stigma, and discrimination that PLHIV face in the healthcare system. However, with HIV now treated as a chronic illness, HIV education in prelicensure nursing programs has decreased, leaving students feeling unprepared to care for patients with HIV (Frain, 2017). A systematic review found that didactic content in nursing and other prelicensure health professions education is primarily focused on pathophysiology, pharmacology, and prevention of transmission of HIV, with less focus on the impact of care provided or stigma related to the disease, and its effect on PLHIV (Phillips et al., 2018). Training to reduce HIV stigma should begin during prelicensure nursing education through focused learning activities. The use of virtual patient simulations may be a helpful learning modality.

Virtual patients are commonly used in nursing education to provide opportunities for students to assess and care for patients they may not encounter during their clinical education (Shin, Rim, Kim, Park, & Shon, 2019), to supplement clinical hours due to decreasing clinical site availability (Díaz et al., 2021), and to serve as preparation

for clinical practice (Bryant et al., 2015). Since the landmark National Council of State Boards of Nursing Simulation Study (Hayden, Smiley, Alexander, Kardong-Edgren, & Jeffries, 2014), simulation has gained significant traction in nursing education. Innovations have included digital learning activities with virtual patients which has been shown to improve student learning outcomes, and positively impact skill acquisition, critical thinking, and self-confidence (Foronda, Fernandez-Burgos, Nadeau, Kelley, & Henry, 2020).

Virtual patient simulations use a web-based platform to teach students how to effectively collect subjective and objective data about patients, document information in electronic health records, and synthesize data to determine appropriate nursing actions. Most provide some type of scored feedback about the students' performance. Virtual patient simulation products can focus on general concepts of a content area or be situation-specific, teaching concepts in the context of a patient's needs. The present study used a virtual patient simulation in which learners encountered a 52-year-old Vietnamese-American man being diagnosed with HIV in the clinic setting. After collecting subjective data from the patient, students completed a contact tracing activity.

The purpose of this pilot study was to evaluate the effect of a virtual patient simulation focused on providing care for a PLHIV on the stigmatizing attitudes, beliefs, and behaviors of nursing students during the formative junior year of their prelicensure education (third year of a baccalaureate program). The product was available through a well-known publishing company specializing in medical and nursing content, including virtual patient simulation scenarios for undergraduate nursing education programs. The research question was: Does completing a virtual patient simulation of a PLHIV seeking care affect student nurses' stigmatizing attitudes, beliefs, and behaviors related to caring for patients with HIV?

## Method

The study received IRB approval. The HPASS, a validated instrument used to assess stigmatizing attitudes, beliefs, and behaviors of healthcare providers towards PLHIV (Wagner et al., 2014) was implemented as the measure. This 30-question assessment uses a six-point Likert scale ranging from strongly disagree to strongly agree and was provided in pretest-posttest nonequivalent groups design to two cohorts of nursing students in their third year of a baccalaureate program (junior level) at a state honors college in the mid-Atlantic region of the United States. Alchemer (formerly SurveyGizmo) served as the survey software to administer the 30 HPASS questions; one additional demographic question related to ethnicity and an open text box to collect general feedback were included with the survey to assess participant diversity.

Both the pretest and the posttest contained the consent statement as the first item, with a check-off box to agree to participate or an opt out box to decline participation. If the student chose to participate, the HPASS questions appeared. If the student chose to opt out, the Alchemer survey closed immediately. Either choice prompted a notation that the pretest or posttest was complete so the PI would not know which students participated or which did not. All information in Alchemer was de-identified but coded by a psychometrician so that each pretest and posttest could be matched. Opting out of the study via the pretest or posttest did not interfere with the students' virtual patient simulation experience as all students were provided the opportunity to participate as a course learning activity.

The study was explained to students in two different sections of an adult health chronic illness course at the beginning of the semester; students were told of the option to participate or opt out without penalty. One course section served as the treatment group and the other as the control group. Students in both the treatment group and the control group were invited to participate in the pretest during the week before their scheduled lecture about HIV/AIDS nursing care. The treatment group had the theory lecture about HIV/AIDS care, and completed the HIV virtual patient simulation scenario as a lab assignment in the week that followed. At completion of the virtual patient simulation scenario, they were immediately invited to participate in the posttest which was identical to the pretest. Students in the control group had the theory lecture about HIV/AIDS care and completed the posttest immediately after class; they were assigned the HIV virtual patient simulation scenario one week later. The timing of the posttest for each group allowed measurement of the impact of the virtual patient simulation on stigmatizing attitudes, beliefs, and behaviors of nursing students.

## Sample

Participants were 62 students enrolled in one of two course sections described above. One course section of 30 students served as the treatment group and one course section of 32 students served as the control group. The same instructor taught both sections. Inclusion criteria was that participants were English speakers and were enrolled in the adult health chronic illness course taught by the principal investigator.

## Data Collection

Data collection occurred for a two-week period via Alchemer. All 62 students were invited to complete the pretest during the week prior to the class lecture entitled Caring for patients with HIV/AIDS. After the lecture, the 30 students in the treatment group were assigned to complete the PLHIV virtual patient simulation activity during the week. The invitation to participate in the posttest was

**Table 1** Descriptive Statistics for HPASS Total Score and Subscales

Score	Control (n = 16)				Experimental (n = 16)			
	Pretest		Posttest		Pretest		Posttest	
	M	SD	M	SD	M	SD	M	SD
HPASS total score	64.01	20.74	59.57	23.09	78.19	17.12	69.56	21.94
Discrimination subscale	12.13	4.86	11.38	5.51	16.13	5.03	12.81	5.48
Prejudice subscale	27.75	10.92	26.19	11.76	34.06	9.18	30.69	10.03
Stereotyping subscale	24.13	7.34	22.00	8.25	28.00	8.73	26.06	10.21

Note. *M* and *SD* represent mean and standard deviation, respectively

attached to the end of the virtual patient simulation activity. For the 32 students in the control group, immediately following the lecture, students were invited to complete the posttest by accessing a link to the survey in Alchemer; the students in the control group completed the virtual patient simulation activity one week later. All data were de-identified, coded, and exported to a spreadsheet for further analysis.

## Analysis

Data were loaded into R, a statistical analysis package (R Core Team, 2021). For both treatment and control groups, summary statistics were calculated at the individual item, subscale score, and total score levels. A one-way ANCOVA was conducted to examine the effect of the virtual patient simulation scenario on the HPASS total posttest scores after adjusting for observed differences on the pretest. Separate one-way ANCOVA models were examined for each HPASS subscale. Assumptions of linearity, homogeneity of regression slopes, and normality of residuals were assessed.

## Results

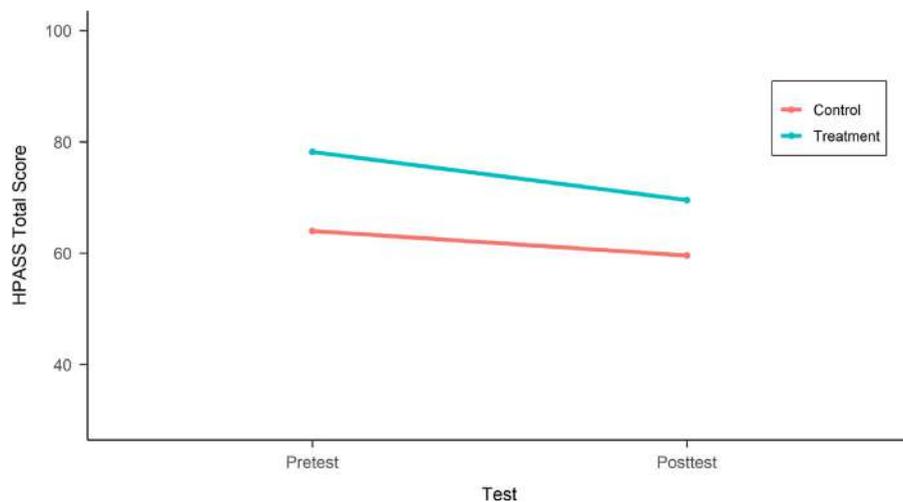
Thirty-nine students (63%) completed the pretest. The posttest was completed by 16 students of the 30 in the treatment group (53%) and 16 students of the 32 in the control group (50%), resulting in 16 matched sets of pretest and posttest scores from both the control and the treatment group. Demographic description for the treatment group was 75% reporting as White or Caucasian and 25% reporting as other. Demographic description for the control group was 69% reporting as White or Caucasian and 31% reporting as other. Other was offered to prevent students from being identified by their description of themselves.

Table 1 illustrates descriptive statistics for HPASS total and subscale scores for both control and treatment

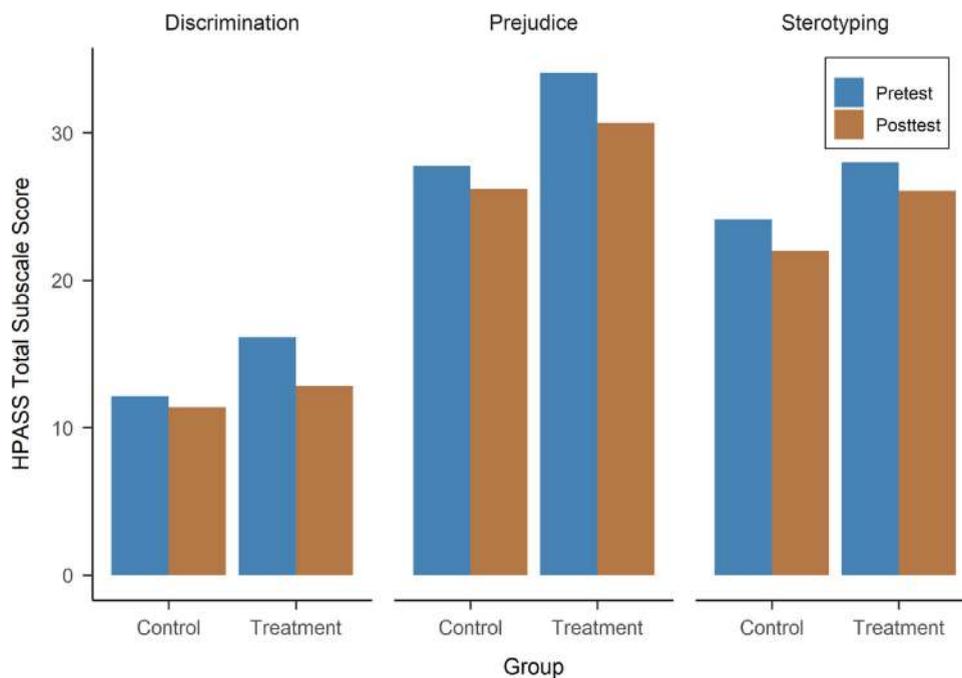
groups across the pretest and posttest. The treatment group had a higher HPASS total score mean on the pretest ( $M = 78.19$ ) compared to the control group ( $M = 64.00$ ) with higher scores on the pretest for all three HPASS subscales (discrimination, prejudice, and stereotyping). A one-way ANCOVA including the group by pretest interaction to check for the homogeneity of regression slopes assumption yielded no statistical significance for interaction effects. After controlling for the pretest, no statistically significant effect of the virtual patient simulation scenario on the HPASS total posttest scores was found,  $F(1,19) = 0.27$ ,  $p = .605$ . However, clinical significance was evident. Both control and treatment groups showed a decrease in their HPASS total score mean from the pretest to the posttest, with the treatment group having a greater slope (Figure 1). Additionally, both control, and treatment groups showed a decrease in all HPASS subscale score means from the pretest to the posttest (Figure 2), with the treatment group demonstrating a greater decrease in overall total score means and in the subscales of discrimination and prejudice (Table 1).

## Discussion

The HPASS is a psychometrically validated instrument designed to measure HIV stigma in healthcare providers (Wagner et al., 2014; Xie et al., 2019) and while it has been used with nursing faculty (Leyva-Moral et al., 2019), it has not been used with nursing students. The questions of the HPASS are designed as a self-reflection vehicle; answers to the questions do not pertain to expertise or skill, making it an ideal measure for inexperienced nursing students. The three subscales (stereotyping, discrimination, and prejudice) of the HPASS are aligned with the HIV stigma framework developed by Earnshaw and Chaudoir (2009), which proposed that HIV stigma is differentiated into 3 categories, (a) internalized stigma, the feelings one has about self having HIV, (b) enacted stigma, the individual's lived experience of stigma, and (c) anticipated



**Figure 1** HPASS pretest and posttest total scores.



**Figure 2** HPASS pretest and posttest subscale scores.

stigma, the individual's expectation that others will stigmatize based on an individual's HIV status, thus providing theory-based support for the instrument.

While there were no statistically significant findings with regard to the overall scores on HPASS or in the three subscales of stereotyping, discrimination, and prejudice, there were trends at the individual item level that merit further discussion (Table 2). Specific to the discrimination subscale, in the posttest, all item mean scores decreased more for students in the treatment group than for students in the control group. In questions that dealt directly with the healthcare provider's ability to refuse to provide care to a patient with HIV or make other directly discriminatory decisions, the posttest scores showed a greater decrease in

the treatment group than the control group. The question "I believe I have the right to refuse to treat HIV positive patients for the safety of other patients" demonstrated the greatest change with the treatment group decreasing 29% in the posttest and the control group actually increasing by 19% in the posttest. These findings suggest that students' ethical perception of the standard of care for PLHIV may have been affected by the virtual patient simulation, impacting the perceived allowable actions in the treatment group.

In the stereotyping subscale, stigma related to substance abuse being likely in patients with HIV infection reflected a 12% decrease in the posttest for the treatment group, as opposed to the control group where posttest scores for

**Table 2** HPASS mean scores for Treatment and Control Groups

HPASS Item	Treatment Group Pretest	Treatment Group Posttest	+ or -	Control Group Pretest	Control Group Posttest	+ or -
<b>Stereotyping Subscale</b>						
1. I believe most HIV+ patients acquired the virus through risky behaviour.	2.88	2.56	0.32	2.81	2.44	0.37
2. I think HIV+ patients have engaged in risky activities despite knowing these risks	2.75	2.00	0.75	2.31	2.06	0.25
4. I think people would not get HIV if they had sex with fewer people.	2.31	2.25	0.06	1.63	1.56	0.07
9. I think if people act responsibly they will not contract HIV.	3.00	2.94	0.06	2.81	2.44	0.37
10. HIV+ patients tend to have numerous sexual partners.	2.81	2.19	0.62	2.13	1.94	0.37
16. I think many HIV+ patients likely have substance abuse problems.	2.56	2.25	0.31	2.19	2.38	+0.19
19. HIV+ patients should accept responsibility for acquiring the virus.	2.31	2.69	+0.38	2.44	2.00	0.44
21. I often think HIV+ patients have caused their own health problems.	2.38	2.19	0.19	1.75	1.69	0.06
27. HIV+ patients who have acquired HIV through injection drug use are more at fault for contracting HIV than HIV+ patients who have acquired HIV through a blood transfusion.	2.75	2.75	0	2.50	2.19	0.31
28. I tend to think that HIV+ patients do not share the same values as me.	1.81	1.81	0	1.44	1.25	0.19
29. HIV+ patients who have acquired HIV through sex are more at fault for contracting HIV than HIV+ patients who have acquired HIV through a blood transfusion.	2.44	2.44	0	2.13	2.06	0.07
<b>Discrimination Subscale</b>						
3. I believe I have the right to refuse to treat HIV+ patients for the safety of other patients.	2.38	1.69	0.69	1.50	1.81	+0.31
7. I believe I have the right to refuse to treat HIV+ patients if other staff members are concerned about safety.	2.38	2.06	0.32	1.81	1.69	0.12
8. I would avoid conducting certain procedures on HIV+ patients.	2.75	2.19	0.56	2.25	1.81	0.44
11. I believe I have the right to refuse to treat HIV+ patients if I feel uncomfortable.	3.06	2.31	0.75	2.38	1.94	0.44
14. I believe I have the right to refuse to treat HIV+ patients to protect myself.	2.75	2.38	0.37	2.00	2.00	0
17. I believe I have the right to refuse to treat HIV+ patients if I am concerned about legal liability.	2.81	2.19	0.625	2.19	2.12	0.06
<b>Prejudice Subscale</b>						
5. HIV+ patients present a threat to my health.	2.81	2.63	0.18	2.25	2.06	0.19
6. HIV+ patients present a threat to the health of other patients.	2.88	2.38	0.50	2.25	2.00	0.25
12. I would rather not come into physical contact with HIV+ patients.	2.88	2.81	0.07	2.13	1.94	0.19
13. I would want to wear two sets of gloves when examining HIV+ patients.	3.50	3.44	0.06	3.13	3.19	+0.06
15. I would be comfortable working alongside another health care provider who has HIV.	2.06	2.31	+0.25	2.00	2.19	+0.19
18. I would rather see an HIV-negative patient than see an HIV+ patient with non-HIV-related concerns.	3.56	2.81	0.75	2.38	2.50	+0.12
20. I worry about contracting HIV from HIV+ patients.	3.19	2.69	0.50	2.81	2.19	0.62
22. HIV+ patients make me uncomfortable.	2.38	1.94	0.44	1.75	1.69	0.06
23. I would be hesitant to send HIV+ patients to get blood work done due to my fear of others' safety.	2.50	2.00	0.50	1.81	1.88	
24. It is a little scary to think I have touched HIV+ patients.	2.50	2.44	0.06	1.94	1.69	0.25
25. I worry that universal precautions are not good enough to protect me from HIV+ patients.	2.31	2.06	0.25	2.13	1.88	0.25
26. I would feel uncomfortable knowing one of my colleagues is HIV+.	2.00	1.69	0.31	1.63	1.63	0
30. It would be hard to react calmly if a patient tells me he or she is HIV+.	1.5	1.5	0	1.56	1.38	0.18

this item increased. It may be that exposure to the patient in the virtual simulation, who had never used intravenous drugs, provided a clear counterexample to that stereotype about HIV acquisition. The virtual patient simulation presented the initial diagnosis visit for a member of the MSM community who acquired HIV through unprotected sexual contact. Interestingly, stigma around the acquisition of HIV (“HIV patients should accept responsibility for acquiring the virus”) decreased in the control group by 18%, and increased by 16% in the treatment group. This movement in both directions is noteworthy and warrants further investigation. Interaction with a virtual patient that acquired HIV infection through unprotected sexual contact may have affected students’ perception differently than hearing about HIV in the more general setting of the class lecture alone.

In the prejudice subscale item regarding what type of patient the student would prefer to see (“I would rather see an HIV-negative patient than see an HIV positive patient with non-HIV related concerns”), stigma in the treatment group decreased by 21% from pretest to posttest where the control group mean posttest score increased, which may suggest that the interaction with the virtual patient made students less anxious in caring for PLHIV.

Not all items within the HPASS were relevant to the virtual patient simulation presented in this study. For example, scores for the item “HIV+ patients who have acquired HIV through injection drug use are more at fault for contracting HIV than HIV+ patients who have acquired HIV through a blood transfusion” showed no change between pretest and posttest for students in the treatment group as neither situation applied to the virtual patient. Additionally, features of the virtual patient experience may have contributed to the lack of a treatment effect on HPASS prejudice subscale scores. In the virtual patient experience, students interviewed the patient but did not need to conduct a physical examination. Therefore, students did not have to confront their beliefs around examining or performing procedures on HIV-positive patients, which may explain the minimal changes between pretest, and posttest scores in the treatment group for items such as “I would rather not come into physical contact with HIV+ patients.” Students also knew that the virtual patient was HIV-positive at the beginning of the experience, which may explain why scores in the treatment group were unchanged for the item “It would be hard to react calmly if a patient tells me he or she is HIV+”.

Other characteristics of the virtual patient simulation that may have contributed to the lack of a treatment effect on HPASS stereotyping subscale scores include that students learned during the patient interview that he contracted HIV through unprotected sex with a male partner. Afterward, students completed a contact tracing activity to identify the source of the HIV infection. This focus on unprotected sex as a source of HIV infection may have inadvertently amplified any existing biases about individual responsibility, behavior, and HIV infection. This is sug-

gested by the greater decrease from pretest to posttest for the control group over the treatment group on the item “I think if people act responsibly, they will not contract HIV”.

Both the treatment and control groups reported similar ethnic breakdown. The demographic question regarding participant ethnicity was included to evaluate the diversity of the participant cohorts in consideration of the virtual patient being a 52-year-old Vietnamese-American male immigrant without Western preconceptions about sexual orientation. Students may have perceived him as being fundamentally different from themselves, their family, friends, and different from those that they frequently interact with, which may have contributed to the static scores for the treatment group on the item “I tend to think that HIV+ patients do not share the same values as me”.

### Implications for Nursing Education

Virtual patient simulation scenarios can be an effective means of teaching nursing students about patient care issues that they may not encounter as part of their clinical education. In this study, by interacting with the virtual patient, students gained the opportunity to understand the medical needs of PLHIV, and recognize the impact of their nursing care on these patients’ lives. “Humanizing” HIV disease through interaction with a virtual patient provided the opportunity for students to think in the moment about the devastating effects of the diagnosis on the individual’s life as well as the effects on others with whom they have relationships.

This specific virtual patient simulation dealt with a disease that is associated with significant stigma (Feyissa et al., 2019; Geter et al., 2018; Pulerwitz & Bongaarts, 2014; UNAIDS, 2017) that negatively impacts patients’ experiences within the healthcare system. Benner (1984) identified that clinical practice cannot be defined by theory alone; it requires the individual to gain experiential knowledge. Interacting with the patient in this learning activity models the experience of caring for a patient in a practice setting that has a health problem that aligns with course content. Along with creating an opportunity to apply theory, this learning activity created a vehicle for participants to consider their interactions as a nursing student, and future nurse when caring for a patient with HIV, an opportunity that is not possible with didactic teaching focused on concepts.

Navigating clinical scenarios is one modality that addresses the call by the National Council of State Boards of Nursing Next Generation NCLEX for nurse educators to teach in context (Hensel & Billings, 2020). With this mode of instruction, students learn important concepts about nursing practice while making decisions about situation-appropriate care for the patient. Although theory content designed to teach concepts is an important building block in gaining knowledge of nursing practice, virtual patient

scenarios include context in which to apply that knowledge. Interacting with and responding to the needs of a virtual patient can provide meaningful learning activities that complement classroom teaching, expand students' clinical knowledge and skills, and influence student attitudes and behaviors.

## Limitations and Future Research

Although the HPASS is psychometrically sound and aligns with current theory in HIV stigma (Wagner et al., 2014; Xie et al., 2019), not all items in the scale are relevant to the virtual patient experience presented to students in the present study. Future research should consider a shortened version of the HPASS using only items aligned with the content of the virtual patient experience.

Study design prevented random assignment of students to control and treatment groups. Although the ANCOVA provided some statistical control for the non-equivalence of groups, not all sources of group differences could be known, and controlled for in the analyses. Future research should randomly assign students to either the control or treatment group. The sample size for this pilot study was relatively small and included students taking the same class with the same instructor at a single college. A larger multi-site study would provide more robust data and allow for greater detection of existing treatment effects.

## Conclusions

This study contributes to learning science to understand how virtual patient experiences may influence learner thinking and attitudes. Although there was no statistically significant treatment effect, findings suggest that participating in a virtual simulation focused on a patient living with HIV can change the attitudes, beliefs, and behaviors of nursing students. Future research is needed to increase understanding of the impact that virtual patient simulation focused on a patient living with HIV may have on provider attitudes and whether that can contribute to providing equitable care to PLHIV.

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## Declaration of Interests

The authors declare that they have no known competing financial interests or personal relationships that could

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