Who decides? Analysis of decision-makers in the adoption of virtual patients for nursing education

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BACKGROUND

In the education of health professionals, faculty of all disciplines have sought to teach their students the diagnostic reasoning and communication skills, and to foster the teamwork and self-confidence, needed to provide safe and effective care in order to prevent these errors (Consorti, Mancuso, Nocioni, & Piccolo, 2012; Cook, Erwin, & Triola, 2010).

Simulation is an established and effective method of providing a safe, risk-free environment where students can practice new skills and apply new knowledge without posing a threat to actual patients (Nehring & Lashley, 2009).

Nursing education is one of the health professions fields that has made use of simulation over the past few decades, and nursing education programs are increasingly turning to virtual patient (VP) simulations due to an increased demand for professionals in the field, a shortage of nurse educators, a deficiency in the clinical hours available to nursing students, and an increasing number of online programs and nontraditional students (Dutile, Wright, & Beauchesne, 2011; Sweigart et al., 2014).

As faculty implement more simulations into their nursing curricula, it is important to understand who is being empowered to make the decision to adopt these technologies. This study analyzed data collected as part of the Virtual Patient Adoption and Integration in Nursing (VPAIN) survey distributed in 2015, in order to identify the characteristics of those empowered in the decision-making process to adopt computer-based, interactive, and asynchronous VP simulations for their courses (Kleinheksel, 2015).

METHODS

Participants: This study analyzed self-reported demographic data provided by 270 nursing faculty who participated in the 2015 VPAIN survey, which was designed to identify and measure the factors related to technology adoption and integration by nursing faculty who use computer-based, interactive, asynchronous VP simulations (Kleinheksel & Ritzhaupt, 2017).

Instrument: The VPAIN instrument was designed using existing research, along with interviews conducted with 10 content experts. The instrument was pilot tested to establish its face and content validity prior to its administration to the study participants (AERA, APA, & NCME, 2014; Dillman, Smyth, & Christian, 2014; Fishman & Galguera, 2003). Institutional Review Board approval for the study was received from the University of Florida Institutional Review Board 02 on October 2, 2014 (Protocol #2014-U-1015). The final version of the VPAIN survey instrument included four sample eligibility items, ten demographic items, seventy-one adoption items, and twenty-one integration items. The Cronbach's alpha for the complete VPAIN instrument was 0.930 (Kleinheksel & Ritzhaupt, 2017).

Procedure: The final version of the VPAIN survey instrument was open to participants February 23, 2015 through March 30, 2015. The population of nurse educators using VP simulations was identified through convenience and snowball sampling. An invitation to participate was distributed to the users of two commercial VP software programs by email, and recruitment notices were posted to simulation and nursing education forums and social networking groups. Targeted recruitment ads were also published to Twitter, Facebook, and LinkedIn.

Analysis: We conducted a multiple logistic regression analysis to predict decision-makers in the adoption of VP simulations ("Were you part of the decision-making process to adopt the VP you use in your course? 1 = Yes, 0 = No) using the following predictors:

- Institution type
- Program type
- Faculty status
- Years teaching in a nursing program
- Course delivery
- Number of semesters using a VP program
- Who currently pays for VP program

A full model was fit with all the previously detailed predictors, as existing literature identified them as being potentially relevant to best predict the likelihood of being empowered to make the decision to adopt a VP simulation. The multiple logistic regression model was fit using maximum-likelihood estimation (Agresti, 1996). AIC and deviance *D* values were used as model comparison indices between a constant only (baseline) and full models. The models were fit using the *glm* function of the package *stats* in R (R Core Team, 2015).

CONCLUSION

With the increased number of pedagogical innovations available to educators, it is important for faculty and administrators to understand who is being empowered to make the decision to implement a given technology. In the case of virtual patient simulations, the institution type at which a faculty taught, the delivery method of their course, and funding source do not affect a faculty's decision-making status. However, RN-BSN, MSN, and BSN faculty, faculty with more experience, and Clinical Assistant Professors, Instructors, Assistant Professors, and Associate Professors are more likely to have the authority to decide to adopt virtual patient simulations.

RESULTS

Faculty status	*N*	%
Assistant professor	76	28%
Instructor	49	18%
Adjunct	46	17%
Associate professor	36	13%
Clinical assistant instructor	29	11%
Clinical instructor	20	7%
Professor	14	5%

Program type	*N*	%
BSN	137	29%
MSN	117	25%
RN-BSN	86	18%
DNP	45	9%
Second degree BSN	35	7%
Post master certificate	28	6%
LPN or ADN	10	2%
DNE	8	2%
PhD	4	1%
Other	5	1%

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Call:
glm(formula = Decisionmaker ~ institution_type2 + LPN + BSN +
    MSN + RN_BSN + DNP + faculty_status2 + years_teaching2 +
    FacetoFace + WebEnhanced + Blended + FullyOnline + TraditionalSem +
    AcceleratedSem + Sem_VP_used2 + Pays_VP2, family = "binomial")

Deviance Residuals:
    Min       1Q   Median       3Q      Max
-2.5001  -0.8204   0.2898   0.8066   2.2259

Coefficients:
                                                    Estimate Std. Error z value Pr(>|z|)
(Intercept)                                        -4.54774    1.31266  -3.465 0.000531 ***
institution_type2Private, nonprofit doctorate-granting university   0.52318    0.49206   1.063 0.287666
institution_type2For-profit doctorate-granting university          0.32592    0.83527   0.390 0.696393
institution_type2Public master's college or university             0.53851    0.62194   0.866 0.386571
institution_type2Private, nonprofit master's college or university  1.24830    0.78690   1.586 0.112660
institution_type2Public baccalaureate college                     -0.08996    0.69947  -0.129 0.897662
institution_type2Private, nonprofit baccalaureate college         -0.61959    0.68684  -0.902 0.367008
institution_type2For-profit baccalaureate college                 -1.74604    0.94934  -1.839 0.065882 .
institution_type2Public associates college                         0.23846    0.88026   0.271 0.786472
LPN                                                               -1.66488    1.10411  -1.508 0.131582
BSN                                                               -1.42660    0.47694  -2.991 0.002779 **
MSN                                                               -1.25043    0.44680  -2.799 0.005132 **
RN_BSN                                                             1.01533    0.42988   2.362 0.018184 *
DNP                                                                0.09457    0.49062   0.193 0.847159
faculty_status2Clinical Instructor                                 1.40288    0.79068   1.774 0.076017 .
faculty_status2Clinical Assistant Professor                        2.00369    0.68128   2.941 0.003271 **
faculty_status2Instructor                                          1.89283    0.57289   3.304 0.000953 ***
faculty_status2Assistant Professor                                 2.24555    0.55319   4.059 4.92e-05 ***
faculty_status2Associate Professor                                 1.27764    0.63717   2.005 0.044945 *
faculty_status2Professor                                           0.78853    0.84221   0.936 0.349141
years_teaching22-4 years                                           2.22779    0.80438   2.770 0.005613 **
years_teaching25-7 years                                           2.24379    0.82568   2.717 0.006578 **
years_teaching28-10 years                                          2.28525    0.84961   2.690 0.007150 **
years_teaching211-15 years                                         2.62277    0.89501   2.930 0.003385 **
years_teaching216-20 years                                         2.69737    1.00461   2.685 0.007253 **
years_teaching221-25 years                                         4.37601    1.30155   3.362 0.000773 ***
years_teaching226-30 years                                         2.19067    1.08424   2.020 0.043335 *
FacetoFace                                                         0.58743    0.39651   1.482 0.138473
WebEnhanced                                                        0.32455    0.37024   0.877 0.380702
Blended                                                            0.52033    0.37207   1.398 0.161967
FullyOnline                                                        0.68543    0.42020   1.631 0.102845
TraditionalSem                                                    -0.08348    0.67470  -0.124 0.901532
AcceleratedSem                                                     0.07842    0.50684   0.155 0.877041
Sem_VP_used22 semesters                                            0.63402    0.43614   1.454 0.146023
Sem_VP_used23 semesters                                            1.29645    0.49848   2.601 0.009301 **
Sem_VP_used24 semesters                                            1.41191    0.65051   2.170 0.029972 *
Sem_VP_used2More than 4 semesters                                  1.39055    0.60548   2.297 0.021642 *
Pays_VP2The students, through a lab fee                           -0.17128    0.54850  -0.312 0.754830
Pays_VP2The students, by direct purchase                           0.65000    0.49123   1.323 0.185766
Pays_VP2The nursing program, using grant funding                  -0.49672    0.82996  -0.598 0.549511
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Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

(Dispersion parameter for binomial family taken to be 1)

    Null deviance: 370.01  on 269  degrees of freedom
Residual deviance: 259.42  on 230  degrees of freedom
AIC: 339.42
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The baseline model had an AIC value of 372 and a deviance *D* value of 370.01. The full model including all predictors had an AIC value of 339.42 and a deviance *D* value of 259.42, which indicated better model fit in comparison to the baseline model.

The table above shows that teaching in an RN-to-BSN program (log odds = 1.015) leads to higher odds of being a decision-maker, compared to teaching in a Master of Science in Nursing program (MSN) (log odds = -1.250) or teaching in a Bachelor of Science in Nursing program (BSN) (log odds = -1.427). All three program types were significantly associated with being a decision-maker, controlling for all other variables in the model ($p < .05$).

Regarding faculty status, holding a positions as a Assistant Professor (log odds = 2.246), Clinical Assistant Professor (log odds = 2.004), Instructor (log odds = 1.893), or Associate Professor (log odds = 1.277) were significantly associated with being a decision-maker, controlling for all other variables in the model ($p < .05$). Years of teaching experience also had a significant effect. Model results showed that the more experience the faculty had, the higher the odds of being a decision-maker (log odds ranging from 2.228 for 2 and 4 years to 4.376 for between 21 and 25 years). In addition, compared to having used the virtual patient program for one semester, faculty who had been using it for three semesters (log odds = 1.296), four semesters (log odds = 1.412) or more than four semesters (log odds = 1.391) were more likely to be a decision-maker in adopting.

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