ABSTRACT

Background/Significance

In the last two years, our system has seen a 15% increase in patient safety events linked to clinical skills (e.g., intramuscular injection). Evidence suggests staff need more training and practice due to changes in equipment and staff turnover.

Model

This project will use the Johns Hopkins model for Evidence-Based Practice in Nursing and Healthcare. To guide us through evidence appraisal, project planning, implementation, and dissemination.

Purpose Statement/PICOT question

Our PICOT question is: Does the addition of a mobile simulation lab improve skill retention among primary care nursing staff (RN, LPN, MA, Tech) compared with computer-based competencies and homemade simulation equipment?

Evidence

An initial review of internal evidence has identified injection landmarking, administration technique and nasopharyngeal specimen collection as the most problematic skills. Our review of literature identified simulation as the best method to develop competency in these skills. In ambulatory care settings, mobile simulation labs are supported by the literature as a mechanism to overcome training challenges caused by dispersion of clinic sites.

Proposed Change & Measures

A mobile simulation lab will be created. Clinical educators will schedule simulation skills days, offering training at each clinic location at least twice in the six months after implementation. Measures include the percent success on competency checklists from Elsevier Clinical Skills and the Simulation Effectiveness Tool-modified (SET-m).

Outcome Evaluation

Pre-Post assessment of percent success on competency checklists will be analyzed using paired t-test for normally distributed data and Mann-Whitney test for non-normally distributed data.

Descriptive statistics will be provided for results of the SET-m for each of the four sub-scales.

General themes will be reported based on feedback from monthly leadership meetings and any e-mail traffic related to the skills lab to project members.

EBP PROJECT PROPOSAL

Background & Problem:

Competency in performing clinical skills such as vaccine administration or specimen collection is crucial for effective patient care in the ambulatory care environment. Data from the Vaccine Adverse Event Reporting System (VAERS) for 2023 recorded more than 106,101 adverse events and the vast majority of these were due to user errors.[1] Similarly, one study found that errors were associated with 6.3% of laboratory samples.[2] Patient care staff in our system administer more than 100,000 doses of vaccine and other injectables annually and collect hundreds of thousands of specimens (internal evidence, unpublished). Performing these skills accurately is critically important for accurate diagnosis and treatment of our patients.

Over the last two years, our system has seen a 15% increase in patient safety events linked to clinical skills (e.g., intramuscular injection, nasopharyngeal swabbing). This follows a period of heavy turnover during the global pandemic which is believed to have resulted in an overall decrease in the clinical experience of our workforce. Current equipment to practice skills is often “homemade” and significantly limits skill fidelity when checking competencies or when deliberate practice is attempted, see Figure 1. As our event reports have increased, many staff have reported feeling unprepared to perform clinical skills. At the same time, our clinics are serving record numbers of patients with multiple staff vacancies, making it very difficult to remove any team members from staffing to attend training. This evidence-based practice initiative is being proposed to address the need for improved training and competency verification of clinic staff, while minimizing disruption to clinic workflows.

EBP Model

We chose the Johns Hopkins model for evidence-based practice in nursing and health care due to team knowledge and experience with it (Dang et al., 2020). This model provides a systematic approach for synthesizing the best available evidence with clinician expertise and patient (or in this project, employee) preferences.

Aim or Purpose

The purpose of this evidence-based practice initiative is to increase nursing staff engagement with the competency process, increase opportunities for deliberate practice in a low-risk environment, and ensure increased fidelity during competency verification of clinic staff without disrupting patient care. The PICO question that will guide this project is: Does the addition of a mobile simulation lab improve skill retention among primary care nursing staff (RN, LPN, MA, Tech) compared with computer-based competencies and homemade simulation equipment?

Evidence, internal and external

Internal evidence

Maintaining nursing competencies is key to ensuring safe care is provided to patients. Currently, the [name redacted] completes an initial competency for all new hires followed by annual competency validation of selected skills. The initial competency is done by the assigned preceptor for the new employees. The preceptor is chosen by the supervisor and can be any nurse in the clinic. The competencies are often done in a busy environment during patient care. After the initial competency, [name redacted] has an annual skills fair that includes assigned internet-based training and in-person skills check-off. The skill stations are determined by the supervisors and the individuals signing off the skills are nurses from the department who are chosen by the supervisor. The equipment used to validate skills is often created by the staff member signing off on the competency, resulting in considerable variation between validators. The ambulatory care education team has requested equipment from hospital education but has had little success in acquiring items needed because they are not part of the equipment used in the centrally located simulation lab. Although [organization name

redacted] has the skill fair yearly, in 2022 there were still a reported 22 medication errors on skills that were validated at the skills fair, one of which led to patient harm.

In 2020-2022, [name redacted] lost more than 300 clinic personnel with several departments experiencing 100% turnover. The stress from constant hiring and precepting since the pandemic has led to an additional staff loss and resulted in challenges with providing adequate orientation and competency management in our organization. At the same time, patient care needs have continued to increase in the communities we serve, rendering even more difficult for staff to leave the clinic to attend training.

As a leadership team, we discussed the department training process. One of the main barriers identified is the lack of equipment to assist training staff in a controlled environment. Staff have no safe area to freshen-up on skills, conduct in-services or train on the correct processes. Another training concern is the consistency in preceptors. The department used to send the preceptors to a class in hospital education, but it was inpatient-centric and did not provide a consistent approach to outpatient skills or processes. Developing a standardized approach to training preceptors and staff is key to providing staff the support and resources for success.

External evidence

The literature contains several articles highlighting the need for efficient, effective competency verification.[4-6] The literature supports use of simulation using higher-fidelity equipment to improve skill acquisition and retention compared with use of lower fidelity equipment.[7] or use of online self-study modules.[8] A systematic review of randomized controlled trials and quasi-experimental studies found that use of higher fidelity or more realistic simulation mannequins contributes to better psychomotor skill acquisition and retention compared with less realistic simulation equipment.[7] This supports the need for realistic equipment for primary care nursing staff to improve and maintain psychomotor skills (e.g. IV insertion, injections). Another study found skills lab training is better for long-term skill retention compared to the “see one, do one” approach.[9] This suggests a need for new staff to deliberately practice skills in a low-risk environment rather than in the live patient care environment during onboarding. The randomized controlled trial showing superiority of simulation over self-

study modules[8] is particularly important for our project because our current process utilizes online self-study for validation of some skill competencies. Please see table 1 for our table of evidence.

Proposed change and measures

The project we are proposing is a mobile hands-on skills lab to be used for clinical skill practice and simulation at all primary care clinic locations. This change will address the current a lack of ambulatory specific simulation equipment across our organization and the geographically disparate locations of our five clinics that made deliberate practice in a stationary skills lab challenging. Equipment used in this project will be transported between clinics on a regular schedule to allow deliberate practice and simulation in a low-risk environment with minimal disruption to staffing and clinic workflow. The specific skills to be addressed include but are not limited to administering intramuscular (deltoid and ventrogluteal), subcutaneous, and intradermal injections, collecting nasopharyngeal specimens, completing visual acuity screenings, and measuring blood pressure. These skills were identified based on adverse event reporting data and staff interviews. Below is a description of key steps for the project.

1. Communicate planned launch of mobile skills lab dates. Ask clinic leaders to plan to allow staff time for hands-on practice during scheduled administrative time for the several weeks each group of equipment will be at their site.
2. Develop preceptor training for each skill, using existing organization-approved procedures, and ensure adequate inter-rater reliability before preceptors are eligible to sign off staff using standardized video recordings.
3. Identify consistent skills validators/preceptors.
    a. Clinic leaders will be asked to identify at least one primary and one alternate preceptor for each clinic. Depending on the skill mix at a clinic, preceptors could include RNs, LVNs, Technicians, and Medical Assistants.
    b. Preceptors will be validated on each skill within their scope of practice by an ambulatory care educator.

   c. After validation, preceptors will be authorized to validate competency for colleagues using the mobile skills lab equipment. The initial training will serve as a re-set for preceptors and create a common understanding of expectations.

4. Obtain equipment to support realistic simulation of the following skills:
   a. Blood pressure auscultation – already available at each clinic.
   b. Specimen collection from nose and throat – to be purchased with grant money, if funded
   c. Intramuscular injection – to be purchased with grant money, if funded
   d. Subcutaneous injection – to be purchased with grant money, if funded
   e. Intradermal injection / Tuberculosis testing – to be purchased with grant money, if funded
   f. Visual Acuity screening tools – additional eye charts will enable staff to practice with trainees outside of view of patient care.
   g. EpiPen administration – to be purchased with grant money, if funded
   h. ECG lead placement simulator- to be purchased with grant money, if funded
5. In consultation with clinic leaders, develop a rotation for skills lab equipment to be on site at each clinic for practice, leveraging natural variations in clinic workflow to maximize staff availability (for example, avoiding Monday/Wednesday at primary care sites that have allergy shot clinics on those days, while taking advantage of the delayed start to clinic on Wednesdays which is designated training / administrative time).
6. Evaluate effectiveness and staff satisfaction post-implementation.

Outcome evaluation

Project performance will be evaluated through several measures. Leading indicators will include feedback solicited from clinic leaders during monthly clinic managers meetings and charge nurse meetings. Feedback will also be solicited from staff during leader rounding. Lagging indicators will include rates of adverse event reports related to the skills covered, particularly injections and nasopharyngeal specimen collection, as well as staff retention. Due to known challenges with entering adverse events / near-misses in our central repository and

the multi-factorial nature of staff turn-over we will follow these data. However, we will use changes in percent success on checklists and SET-m results to measure project benefit.

More specifically, we will measure project benefit using a pre-post percent success for each skill. As staff use the skills lab they will be scored as a percent success for a skill checklist derived from the Elsevier skills portal before and after receiving instruction. Staff will be asked to perform each skill and receive a pre-instruction percent success, following which a preceptor will provide instruction. After the best-practice instruction the staff member will then perform the skill again and receive a post-instruction percent completion. We will test percent success data for normality using the Shapiro-wilk test. Pre-Post assessment of percent success on competency checklists will be analyzed using paired t-test for normally distributed data and Mann-Whitney test for non-normally distributed data. Descriptive statistics will be provided for results of the SET-m for each of the four sub-scales. General themes will be reported based on feedback from monthly leadership meetings and any e-mail traffic related to the skills lab to project members.

We will create a video recording for each skill and have all identified preceptors grade the video prior to assessing other staff. Preceptors will need to achieve a percent agreement of at least 90% with the training video standard as assessed by [redacted] or department process improvement coordinator. All competency checklists will be completed on paper. Project team members will be responsible for overseeing data collection including storage of completed competency checklists in a locked space once complete. Results from the paper checklists will be transcribed into an excel spreadsheet for statistical analysis. Hard copies will be maintained until dissemination efforts including any potential manuscripts have been accepted for publication. Once ongoing dissemination efforts are complete hard copies will be destroyed.

We will also ask participants to complete a paper version of the Simulation-Effectiveness Tool (SET-m). This validated tool will allow project leads to assess how well the simulation is meeting the needs of the staff and help identify if any changes may be needed. For example, if SET-m results for the pre-brief scale are low then

that may indicate that the script used by preceptors may need to be adjusted. If any changes are made to materials used by preceptors in the skills lab those will be annotated by the project team to identify potential causes to changes in data as the program progresses.

Timeline

Timeline

Task	Q1	Q2	Q3	Q4	Q5	Q6
IRB determination of non-research	x					
Create training materials	x					
Clinic skills rotations		x	x	x		
Data collection		x	x	x		
Formative evaluation		x	x	x		
Summative data analysis				x		
Dissemination					x	x

Dissemination

Dissemination Plan:

We plan to share our results both internally and externally. We will share results with clinic staff and leaders early in 2026. Then we will submit abstracts to our internal symposium, American Academy of Ambulatory Care Nurses, and Association for Nursing Professional Development. Following conference presentations, we will submit one or more manuscripts for publication.

Possible manuscripts and target journals include:

- Educational design and delivery in the clinic setting, *Journal for Nurses in Professional Development*
- Improvement of patient care through evidence-based practice, *Journal of Ambulatory Care Nursing*

References

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FIGURES

Figure 1. Example of current homemade equipment for simulation of oral / nasopharyngeal swabs.

TABLES

EBP Question: In congenital heart patients 15 years and greater, that have had Fontan palliation surgery - What are the effects of CHD education on patient satisfaction.

Reviewer	Article #	Author, date, and title	Type of evidence	Population, size, and setting	Intervention	Findings that help answer the EBP	Measures used	Limitations	Evidence level
EF	1	Clapper, 2012, Using deliberate practice and simulation to improve	narrative	n/a	deliberate practice and simulation	frequent and deliberate practice support clinical skill competency	n/a	Article is older than desired.	5, A
EF	2	Durkin, 2019, Implemention and evaluation of Wright's competency model	QI	1 large children's hospital	implementation of Wright model, including skills validation on unit rather than in skills lab	efficiency of competency assessment		Article is focused more on implementation of a competency model than evaluating specific methods for achieving competency.	5, A
KS	3	Herrmann-Werner et al., 2013, "Best practice" skills lab training...	RCT	94 medical students	comparison of simulation with traditional skills education	improved long-term retention with simulation	Objective Structured Clinical Exam	All skill assessment was done in training, so transfer to patient care cannot be guaranteed. Article is older.	1, A
KS	4	Ostrander, 2019, "One hospital's experience with implementing on-demand annual competencies for	QI	single hospital		real time competency assessment		Low level of evidence.	5, B
KS	5	Rutherford-Hemming et al., 2016, Multisite single-blind RC study of transfer and retention...	RCT	multisite	comparison of simulation with online self-study modules	increased transfer of skills in nurses who received simulation education	Neurologic Knowledge Assessment	Study was limited to OB skills	1, A
KS	6	Sherwood and Francis, 2018, The effect of mannequin fidelity on achievement of learning outcomes...	systematic review of RCTs and quasi-experimental	18 articles, representing approximately 1192 participants.	higher-fidelity mannequin use in simulation	higher-fidelity equipment may lead to improved learning of skills	see individual articles	inadequate research was found to address repeated interventions/long term effects	2, B

Table 1. Evidence Table

Personal Statement

I am a PhD prepared nurse scientist, certified in both nursing professional development and evidence-based practice. I have more than 10 years of experience implementing and guiding education initiatives in ambulatory care settings. I enthusiastically support the proposed EBP initiative titled “Implementation of mobile skill simulation lab to increase skill retention among primary care nursing personnel”. This work is directly related to my program of research on nursing professional development in ambulatory care. My knowledge of and experience leading education and competency initiatives in the ambulatory care environment will help guide project efforts in the clinic setting.

BUDGET FORM

	Justification	Amount Requested
PERSONNEL - Include all personnel with a planned FTE dedicated to this work. Consultation, clerical support & research assistant/associate expenses should include an estimate of the number of hours planned and an hourly rate of pay. For personnel not funded by this proposal the amount requested will be $0.	Process Improvement Coordinator (.1 FTE) Clinic preceptors (.05 FTE each) Statistician: 3 hours at flat rate of $70/ hour Department Chief Nurse (.05 FTE)	$0 $0 $210 $0
SUPPLIES - Items with a unit cost of under $500. Photocopying, telephone, postage, etc., should be listed here. Training materials	EpiPen Trainer (2@ $11 each) (EpiPen Trainer by Dey 500-00, Current Model: Science Lab First Aid Supplies: Amazon.com: Industrial & Scientific) IM, SQ, ID Injection Simulator Practice Tool (2 @$30 each) (Amazon.com: Medarchitect Intramuscular Injection Training Pad Model with 3 Skin Layers IM, SQ, ID Injection Simulator practice tool for Medical Education to Student, Nurse, Doctor Educational Supplier : Health & Household) Gluteal Intramuscular Injection Site w/ Bones (Gluteal Intramuscular Injection Site With Bones – GTSimulators.com) Hip injection simulator (Amazon.com: SHRFC Medical Hip Injection Training Simulator,Injection Training Vivid Hip Intramuscular Anatomical Model for Nurse, Medical Students : Industrial & Scientific) Hispanic Baby Care, Male (2 @ $112 EACH) (Hispanic Baby Care, Male – GTSimulators.com) Snellen Eye Chart (3 @ $8 each) (https://www.amazon.com/Complete-Snellen-Standard-Dual-Use-Occluders/dp/B0C1GB4F83/ref=acm_sr_dp_sspa?crid=19PD59YRJIL19&keywords=PECULA%2BEye%2BChart%2C%2BSnellen%2BEye%2BChart%2C%2BWall)	$22 $60 $458 $84 $224 $24
EQUIPMENT - Items with a unit cost of $500 or more.	Specimen collection from nose and throat Intramuscular injection simulator upper arm (Intramuscular Injection Simulator - Upper Arm – GTSimulators.com) 12-Lead ECG Placement Trainer	$720 $1557 $1,130
SOFTWARE	Statistics will be done in R, which does not have an associated cost.	$0

DISSEMINATION - Only 10% of funds may be used for registration/travel costs. The most inexpensive rates for transportation and lodging should be used. Automobile expenses should be calculated at .67 cents per mile, plus tolls and parking.	Poster printing fee Partial coverage of airfare, economy Partial coverage of conference registration	$123 $200 $125
INDIRECT COSTS - If charged by an institution, these costs must be included in the total amount of funding requested, NOTE: Applications with lower indirect costs will be favored.		$0
TOTAL REQUESTED		$4,937