The Health Care Improvement Foundation
2019 Delaware Valley Patient Safety and Quality Award
Entry Form

1. **Hospital Name**

   Thomas Jefferson University Hospital – Jefferson Health

2. **Title Of Initiative**

   The Patient Safety Escape Room: A Novel Orientation Activity

3. **Abstract (Please limit this description to 250 words.)**

   In order effectively participate in the patient safety process, residents must understand the prevalent safety risks in their environments of care, the recommended strategies for mitigation, and the institutional methods and expectations for event reporting. We hypothesized that creating a Patient Safety Escape Room (PSER) simulation would allow us to orient new interns regarding these topics more effectively than traditional didactic strategies.

   The PSER consists of a space arranged to mimic a clinical care setting, incorporating a range of patient safety hazards in both the physical environment and within a fictionalized patient chart. During the simulation, interns identify and mitigate patient safety hazards, and in doing so uncover puzzles which lead ultimately to login information to our institutional event reporting system. In order to "escape the room," intern teams must successfully submit an event report listing the safety hazards they identify.

   Over two years, 267 interns (92% of eligible learners) have participated in the PSER during their orientation. The activity is well liked with 97% of interns reporting that it was relevant to their practice, and resulted in significant improvement in intern confidence in identifying institutional patient safety priorities. Intern demonstrated skill in finding hazards associated with all institutional safety priority areas and were able to report their findings using the online portal.

   The PSER is an innovative and effective method for orienting interns to institutional patient safety priorities, and providing hands on experience with event reporting. It has been further developed to incorporate team training, amplifying its impact.

4. **What were the goals of your initiative?**

   Every year in July a fresh cohort of medical learners joins the complex community of practice of the academic health center. Residents are on the front lines of care, positioned to both provide critical information regarding potential drivers of patient harm and to team with interprofessional peers to mitigate risk and prevent errors from reaching patients. In order to be effective in these roles, residents must understand the prevalent safety risks in their environments of care, the recommended strategies for mitigation, and the institutional methods and expectations for event reporting. It is imperative that we find effective and efficient ways to orient new learners in these areas.

Historically, resident physicians rarely submit incident reports and do not have a clear understanding of institutional safety priorities. These shortfalls are noted in the Accreditation Council for Graduate Medical Education (ACGME) Clinical Learning Environment Review (CLER) reports which suggest that few resident trainees appreciate the benefits of event reporting (Wagner et al. Detailed findings from the CLER National Report of Findings 2016. Journal of GME. 2016: 8 (2s1)). The traditional lecture based orientation is easily forgotten as topics lack context and fail to address the immediate perceived needs of the learner – Where do I need to be tomorrow? Am I prepared? Who will make sure that my patients and I are safe?

We hypothesized that creating a Patient Safety Escape Room (PSER) simulation would allow us to orient learners more effectively through the incorporation of active learning, gamification, and adult learning theory. Commercial Escape Rooms create scenarios where teams work together to solve a series of puzzles, challenging them to escape from a locked room within a time limit. We designed a similar immersive problem solving experience where interns from multiple clinical specialties work together in order to identify and mitigate patient safety hazards, revealing clues that ultimately allow them to enter an event report and thus escape the room.

The PSER simulation was designed around a set of nine patient safety priority areas, determined by the PSER work group in collaboration with patient safety leadership (Figure 1). Within each priority area there are a range of contributing hazards which we incorporated into a simulated hospital room and patient chart (Figure 2). Consider the example of venous thromboembolism prevention, a safety priority area. Associated hazards include improper or absent risk stratification, failure to apply ordered intermittent pneumatic compression devices (IPCs), missed doses of pharmacologic prophylaxis, and others.

This high-fidelity simulation was designed around the following learning objectives:
1. Identify and mitigate common patient safety hazards;
2. Enter an event report using an online event reporting system; and
3. Apply teamwork skills to address patient safety issues

We anticipate that successful orientation and onboarding meeting these objectives will lead to improved intern ability to identify institutional patient safety priorities and their associated hazards, an increased number of event reports entered by residents, and improved patient safety culture in regards to teamwork across specialties.

5. **What were the baseline data and the results of your initiative?**

In our institutional 2015 CLER report approximately two-thirds of interviewed residents reported that they knew the institution's patient safety priorities. When asked to define these priorities though, the overlap between areas identified by residents, faculty, and leadership was poor. Despite over 90% of resident stating they had received formal

training in patient safety, CLER walk rounds suggested that less than 10% recognized the value in reporting. This is consistent with observed rates of resident event reporting. Over the last 4 years despite educational efforts only 2% of total reports are from housestaff. A survey of incoming interns prior to the PSER in 2018 revealed that only 44 (41% of respondents) previously received training in event reporting, and 5 (5%) had previously entered an event report.

In addition to event reporting, teamwork in the care environment is integral to patient safety. Since 2014, we have invested significant energy in training clinical leadership in TeamSTEPPS. However, implementing and sustaining robust TeamSTEPPS training at the housestaff level has been challenging, especially in regards to teamwork across specialties and professions. Team training can be difficult to coordinate, and requires continued reeducation and reinforcement during clinical practice. Illustrating this point, our 2018 Agency for Healthcare Research and Quality (AHRQ) Hospital Survey on Patient Safety Culture (HSOPS) survey of housestaff revealed an 82% favorable response (range 48% to 98%) regarding teamwork within units, but was only 61% favorable regarding teamwork across units (range 27% to 83%) reflecting challenges when cross-specialty groups must work together.

We implemented the PSER during our 2018 institutional intern orientation with 130 interns, and repeated the simulation in 2019 with 137 interns. Through this simulation, 267 learners (30% of our total housestaff population, and 92% of eligible interns) have now been trained to identify and report patient safety hazards in 9 priority areas, and have gained hands on experience with our institution's event reporting. In our implementation, each intern completes two different PSERs as a member of a mixed-specialty team. We include opportunities for reflection and debriefing regarding teamwork behaviors, safety priority area knowledge, and translating learnings into action plans within the clinical learning environment.

In 2018, all teams successfully entered an event report in each of their two PSERs (32 event reports total). Teams identified between 13 to 29 safety hazards per PSER. 97 (95%) of the 102 interns completing a pre/post survey (78% completion rate) reported that the PSER was relevant to highly relevant to their practice. Mean confidence in identifying patient safety priorities improved from 6.35 to 8.0 on a 10 point scale (p<0.001). Qualitative feedback was obtained through the use of the Critical Incident Questionnaire (CIQ). Interns reported they were engaged by the active learning format, and through the discovery and exploration of safety hazards. They reported they were most distanced by the actual online error reporting process and by some degree of confusion regarding the instructions. They reported that role assignment and communication within the team were the most helpful actions to completing the PSER, and were overall surprised by the success of the educational intervention. (Zhang et al. "Finding the 'QR' to Patient Safety: Applying Gamification to Incorporate Patient Safety Priorities Through a Simulated 'Escape Room' Experience." Cureus 11.2 (2019).)

Observer rated teamwork scores as measured with a validated teamwork assessment guide for the first PSER completed by each team ranged from 30 to 50 with a mean of 41.5 (SD=5.18), whereas learner rated teamwork scores for the same PSER ranged from 36.62 to 53.67 with a mean of 45.92 (SD=3.89), indicating significantly higher self-assessed team-work skills by learners (p=0.01). Highest and lowest scoring teamwork domains by observers and learners respectively are shown in table 1. Observer rated teamwork assessments for the second PSER demonstrated a nonsignificant trend towards improvement (Mean 44.62, SD 6.15, p=0.13).

During the 2019 training, 31 event reports were received reflecting a 97% success rate in submitting a report. At least one hazard was identified in each priority area in over 90% of PSERS completed, with the exception of Electronic Health Record/Documentation, where a hazard was only reported by teams 84% of the time. (Table 2) All teams demonstrated the ability to speak up when faced with a confederate provider exhibiting unsafe behaviors, however the design of the simulation forced this behavior explaining the very high performance rate.

6. **Describe the interventions that were instrumental in achieving the results for your initiative.**

   Multiple prior interventions informed to our decision to design and implement the PSER as a means to onboard interns regarding institutional safety priorities. Example strategies previously attempted include a 20 minute lecture during intern orientation, program director engagement during an annual retreat, and e mail blasts regarding high priority safety issues. These approaches did not dramatically improve intern understanding of or engagement in patient safety, lacked hands-on practice of relevant skills, and did not impact cross departmental teamwork or safety culture.

   In 2018 we started the PSER, which worked as follows:

   - Incoming interns were divided into 16 cross-specialty teams (~140 total learners).
   - Two different cases were designed by the PSER workgroup. Each case incorporated a range of patient safety hazards manifesting in both the physical environment and throughout the patient's chart. (Figure 2)
   - Four simulation rooms were arranged (two for each case), and each ran eight times (32 total simulations) in order for each of the 16 intern teams to complete both of the cases. Teams had 20 minutes to escape each room. The entire training took 5 hours and required 12 facilitators. (Figure 3)
   - During the simulation, interns identified and mitigated patient safety hazards. Hazard mitigation (for example, lowering a bed, raising hand rales, or applying IPCs) revealed QR codes which linked to safety priority information sheets. Several of the sheets contained the login information for the event reporting system.
   - Using the login information they discovered, teams entered an event report in our institutional event reporting system. Completing this action "unlocked" the door, ending the simulation.

- Interns debriefed for 10 minutes regarding teamwork after their first simulation, using the validated teamwork assessment guide to prompt reflection and discussion. A facilitator who had observed their efforts within the room also assessed teamwork and guided the debrief.
- After the second simulation, interns debriefed for 20 minutes regarding the 9 patient safety priorities and they generated ideas for future action within the clinical environment. This debrief was facilitated by a pair of institutional leaders with expertise in patient safety, teamwork, and medical education.

Quantitative results as already reported, and a qualitative analysis of learner feedback led to several targets for improvement in design and implementation. In 2019 we made the following changes:

- The difference between a priority area and a hazard was not clear, and the cases contained too many hazards with unclear linkage to the priority areas:

  We restructured our entire implementation around the communication of 9 patient safety priorities, including case design, supporting materials, and debriefing structure. We revised the cases so that every hazard in the room or chart mapped to a specific safety priority. Instead of asking interns to "find all the hazards," we gave them a worksheet instructing them to record both the hazard and priority area, and to enter these pairs in their event report. We used an infographic of the safety priorities to structure the final team debriefing. The infographic, including QR codes linked to clinical information sheets, was also printed as a pocket card to provide a durable reference. We believe this restructuring contributed to a more organized "cognitive map" of patient safety priorities and associated hazards, making information easier to recall, organize, and act upon.

- The PSER became more like a scavenger hunt once interns realized they just needed to find the QR codes:

  We improved the "gamification" of the cases in our second year, modeling one on a bingo game, and using an actual puzzle to structure the second. We increased the number of steps in each part of the game (for example, find puzzle pieces by identifying hazard, put together puzzle to reveal phone number, "call attending for help" to get a clue) to encourage teamwork and problem solving. We also added a confederate who played a physician from another team exhibiting unsafe behaviors (ie – not washing hands, non-sterile technique, etc). Teams had to speak up to the confederate in order to receive a clue. These changes increased engagement and reduced the redundancy between the two simulations. Teams had to figure out the rules a-fresh for each case, more closely mirroring the uncertainty of clinical care.

- There was confusion regarding activity instructions:

  In the qualitative analysis 14% of participants felt distanced by confusion regarding instructions. We aimed to clarify instructions through a more structured team introduction with a PSER facilitator prior to the exercise. However, given the nature of the game, where participants are intended to figure out for themselves what puzzles they must solve in order to escape the room, it was not our goal to provide step by step instructions. Instead we chose to address the feeling of task uncertainty in the debriefing. This reinforced "speak up" as a tool to use when instructions are unclear, a vital safety lesson for the first weeks of internship. We also used this as a way to introduce briefs and huddles as methods for creating shared mental models on teams when "the rules" governing a clinical scenario shift or are uncertain.

- The reporting system is time consuming and not intuitive:

  This is similar to feedback we receive from providers in the clinical environment, and has compelled an enterprise search for a more user-friendly reporting platform. We believe that the hands on experience gained through the PSER in an effective introduction to the system, but that the interface of the system itself can discourage residents from reporting. To combat this we used the introduction to the PSER as an opportunity to demonstrate "tips and tricks" for reporting that cut down on administrative effort and increase reporting efficiency.

7. **Describe the key steps required to successfully replicate this initiative throughout the region. (Please limit this description to 100 words.)**

   Anyone can do this! Along with the above description of the PSER simulation, these additional planning steps are important:
   - Convene a diverse working group with experts in patient safety and medical education.
   - The patient safety priorities must be finite, agreed upon by the working group, and easy to communicate to the learner.
   - Topic experts should identify the most prevalent and high-risk safety hazards for inclusion in PSER cases.
   - Pilot the PSER prior to implementation! We refined our plan after a small pilot, and used a second pilot to train facilitators.

8. **Explain how the initiative demonstrates innovation (Please limit this description to 100 words.)**

   This ambitious simulation educates interns in patient safety through active learning and gamification. We successfully implemented the PSER at scale, engaging almost all our interns in a topic ordinarily taught through passive content delivery methods. The model of co-localizing team training with patient safety content in a cross-specialty orientation is also novel.

The PSER employs low-tech augmented reality for just-in-time learning through the use of QR codes that embed educational material within the room. This approach emphasizes problem solving over knowledge recall, signaling that saying "I don't know" is acceptable but should be followed by a process of inquiry/discovery.

9. How does this initiative demonstrate collaboration with other providers within the continuum of care? (Please limit this description to 100 words.)

Graduate medical education remains siloed. At its worst, specialties relate as adversaries. Creating opportunities for residents to learn together expands the social network of the clinical environment, improving psychological safety and perhaps impacting wellbeing. Cross specialty learning most often occurs during shared clinical conferences and rarely in simulations, where cultural tropes may continue unexamined. The PSER unsettles these norms by asking learners to solve a problem together as equals with unknown rules, forcing them to create situational teams. We aim to explore the addition of learners and staff from other health professions as a simple modification further enriching this dynamic.

10. Explain ways in which senior leadership exhibited commitment to the initiative (Please limit this description to 100 words.)

Delivery of the PSER content could be "checked off" through a much simpler, but less effective, didactic lecture. Hospital and University administration committed significant resources and effort in the form of space, materials, and man-hours for both the design and delivery of this simulation.

The PSER was developed in the context of a mature working relationship between patient safety and medical education leaders. The development of a funded Medical Director for GME Clinical Learning Environment Improvement position has contributed to this partnership, and demonstrates leadership commitment to ongoing innovation in resident engagement in the health system's clinical mission.
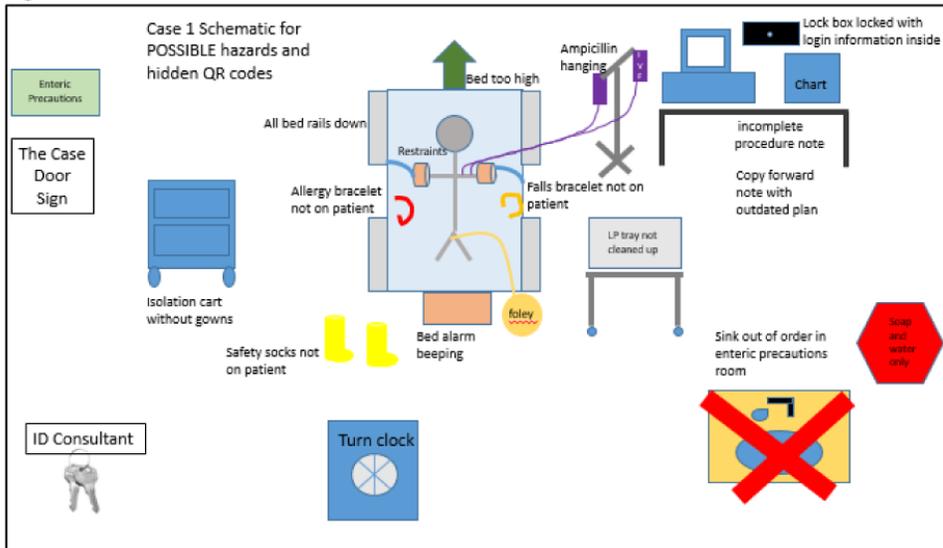
11. Appendices (i.e., tables and graphs)

Figure 1

Figure 2

Case 1 Schematic for POSSIBLE hazards and hidden QR codes

Enteric Precautions

The Case Door Sign

Isolation cart without gowns

ID Consultant

Bed too high

All bed rails down

Restraints

Allergy bracelet not on patient

Safety socks not on patient

Bed alarm beeping

Turn clock

foley

Ampicillin hanging

Falls bracelet not on patient

LP tray not cleaned up

Lock box locked with login information inside

Chart

incomplete procedure note

Copy forward note with outdated plan

Sink out of order in enteric precautions room

Soap and water only

Sample room schematic of a Patient Safety Escape Room (PSER), demonstrating some of the possible safety hazards incorporated into a simulated patient room for our case.

Table 1

	Lowest Scoring Domains	Score	Highest Scoring Domains	Score
Observers	There appeared to be a team leader that coordinated the discussion	2.66	The opinions of team members were valued by other members	3.58
	Team members sought out opportunities to work with others on specific tasks	2.96	Team members appeared to have respect, confidence, and trust in one another	3.69
	Members of the team appeared to understand the roles and responsibilities of other members of the team	3.0	Team members engaged in friendly interaction with one another	3.74
Learners	There appeared to be a team leader that coordinated the discussion	2.81	The opinions of team members were valued by other members	3.62
	The team leader facilitated the discussion rather than dominated it	3.03	Team members appeared to have respect, confidence, and trust in one another	3.65
	Members of the team appeared to understand the roles and responsibilities of other members of the team	3.23	Team members engaged in friendly interaction with one another	3.70

Observer vs Learner assessment of teamwork. Top three and bottom three scoring domains are shown.

Table 2

Safety Priority	Example Hazard	Rate Reported by Teams
VTE Prevention	Compressions boots not applied	90%
Skin Integrity	Patient not turned within 2 hours	90%
Infection Control	Central line not correctly dressed	94%
Medication Safety	Patient with allergy and no bracelet	97%
Electronic Health Record/Documentation	Copy forward errors in the chart	84%
Hand Hygiene	Sink broken in enteric precaution room	90%
Procedure Safety	No timeout documented	94%
Fall Prevention	All bedrails down	94%
"Speak Up"	Unsafe behavior by confederate	100%*

Rate that teams were able to identify at least one hazard in each of the 9 priority areas, as measured by the reports submitted through the electronic event reporting portal. VTE = Venous thromboembolism.
* For "speak up" this is the rate the behavior was performed, not the rate that the "speak up" behavior was reported. Teams reported the error (ie poor hand hygiene) about which they spoke up.

Figure 3

start time	PSER case 1	PSER case 1	PSER Case 2	PSER Case 2		large group debrief	start	stop
12:30	Team 1	Team 2	Team 3	Team 4		Groups 1, 2, 3, 4	01:30	02:00
12:50	debrief					Groups 5, 6, 7, 8	02:30	03:00
01:00	3	4	1	2		Groups 9, 10, 11, 12	03:30	04:00
01:20	room set up					Groups 13, 14, 15, 16	04:30	05:00
01:30	5	6	7	8				
01:50	debrief							
02:00	7	8	5	6				
02:20	room set up					Sim = 20 min		
02:30	9	10	11	12		debrief = 10min		
02:50	debrief							
03:00	11	12	9	10				
03:20	room set up							
03:30	13	14	15	16				
03:50	debrief							
04:00	15	16	13	14				
END in rooms = 4:20								

PSER Schedule, showing how 16 teams were able to complete two simulations each during 4.5 hours