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Integrating Patient Safety into Preclerkship Medical Education: A Logic Model

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Abstract

Background

Inclusion of Patient Safety Education (PSE) in the preclerkship years is important to prepare them for their roles in clinical teams, but examples of PSE for preclerkship students are scant. In this paper, we describe the development and integration of our PSE curriculum for preclerkship students using a logic model.

Methods

To integrate PSE content for our students, we reviewed existing curricula, particularly from the World Health Organization and Institute for Healthcare Improvement, which provided PSE, but which did not specify content appropriate for preclerkship. From this review and our own experience, we utilized a backwards design approach to identify what patient safety knowledge, skills and attitudes students need for day one of clerkship. We identified four major aims that corresponded to 25 learning objectives. To accomplish integration of these 25 learning objectives, we developed a logic model with activities, outputs, and outcomes.

Results

By using a logic model, we were able to identify a three-pronged approach to integrating the PSE into the curriculum. We were able to identify gaps in the curriculum that required creating new activities, enhancing current teaching activities, and signposting content that already existed to indicate the patient safety connection. We were able to create, enhance, and signpost output measures as well. This logic model was successfully integrated into the AY2025-2026 curriculum for first and second year students.

Conclusion

Integration of PSE in the preclerkship phase is important to prepare learners for their first day of clerkship as a member of a clinical team. In this paper, we outlined four major categories of relevant content that are appropriate for these learners as well as 25 specific learning objectives. The logic model shows how integration of PSE that aligns with best practices can be woven into the content-heavy preclerkship years. The logic model provides an accessible roadmap not only to medical educators, but for engaging key stakeholders and recruiting support.

Background

Effective patient safety is a well-established challenge (1, 2) and calls for the inclusion of patient safety education (PSE) into medical education have been widespread. (3, 4) As a result, the literature has

accumulated myriad examples for robust integration in graduate medical education (5, 6), and some examples in undergraduate medical education (UME) clerkship years. (7) Considerably less abundant PSE is found for the preclerkship years. (7) Meaningful shifts in patient care necessitate an integration of PSE longitudinally and across the entire medical education continuum. (5, 8) Therefore, literature that provides insights into the integration of PSE into the preclerkship curriculum is critical.

In a 2025 review of PSE across UME, Aldardeir (2025) identified 28 studies that met inclusion criteria, yet only 10 of them included first or second year UME students. (9–18) Despite recognizing the importance of cognitive integration across a medical school curriculum (19) as well as lessons from GME education that suggest PSE content is most impactful when longitudinal and integrated into existing curricula (5, 20, 21), only one of the 10 studies included in the review (11) described an integrated longitudinal curriculum for medical students. (22) Dumenco et al. (2019) used Kern's Six-Step Approach to Curriculum Design (23) to design nine activities over the first two years to enhance student's knowledge and skills of PSE. (11) Murphy et al. (2022) also reported on a longitudinal PSE curriculum, but with limited detail of specific activities and integration. (24)

Given the importance of this content and the full curricula of preclerkship years already, medical educators would benefit from additional literature examining the design and development of PSE that is longitudinal and integrated into existing curricula. One approach to this curricular design challenge is a logic model. (25–27) Logic models provide a visual roadmap that allows educators to backwards design educational activities from desired outcomes and outputs. They also afford an opportunity to acknowledge what structural barriers exist that may challenge the implementation of new learning objectives or programs. In this paper, we describe the development and integration of our PSE curriculum for preclerkship students using a logic model.

Methods

This study was determined to be curriculum development and qualified as quality improvement by the IRB review committee.

Participants

There were several key participants in the development of the logic model, including practicing clinicians, patient safety experts, and curriculum experts. These individuals have expertise across each stage of the education continuum (preclerkship, clinical/clerkship, and graduate medical learners). The primary investigator, KG, is a medical educator with patient safety expertise, experience in building patient safety curricula (6), and has designated time from the institution to develop PSE for preclerkship students. This project also involved the director of our institute's simulation program who has patient safety curriculum design expertise (ED). Other stakeholders included the curriculum dean in charge of preclerkship curriculum (JF) and members of the assessment, evaluation, and scholarship unit within the office of medical education (CS and CT).

Setting

Our current curriculum is a traditional four-year UME format, with a focus on basic science and knowledge in the first two years followed by full-time clerkship responsibilities in the third and fourth years. Although students have some clinical exposure in the first two years, these are generally shadowing experiences. It is not until the 3rd year that they are active members of a clinical team. At the University of Kansas, we have approximately 211 medical students across three campuses in three different cities for each academic class, two of which are considered rural areas. Some teaching activities, such as individual pre-learning with in-person learning activities ("flipped classrooms"), are presented at the main campus with tele-presentation to satellite campuses. Other teaching activities, such as small group Case Based Collaborative Learning (CBCL) and small group clinical Problem Based Learning (PBL), are presented by in-person facilitators on each campus. All learning activities described in our logic model included the entire medical school class and occurred during the first or second year.

Data collection and analysis

Step 1: Development of program goals and objectives

Figure 1 (Fig. 1: Timeline of patient safety education curriculum, from development to implementation) describes the timeline of events that occurred during the development of the logic model. For this project, we began by establishing what a medical student should be taught about patient safety before their first day of clerkship. This was developed by KG with support from others, including the office of medical education. Although we did not expect that medical students entering clerkship would have the same level of knowledge and skills as a licensed clinician, we proposed that there were core knowledge, skills and attitudes that students should have before participating in the care of patients.

To that end, we reviewed the pre-existing patient safety curriculum from the World Health Organization (WHO) and Institute for Healthcare Improvement (IHI) open school. (28, 29) Both curricula included comprehensive patient safety learning objectives; however not all were appropriate for preclerkship students. Informed by the content of WHO and IHI, we answered the question related to the eventual role of the learner, "what does a learner need to do to contribute to safe care on day one of their clerkship." Additionally, we considered what foundational concepts learners would need to continue their patient safety learning longitudinally throughout their clerkships. The specification of what a learner must be able to do once in the workplace led to the definition of four learning aims that align with topics 1–4 from the WHO curriculum, 1) culture of safety, 2) patient safety science (e.g., systems thinking, human factors), 3) teamwork, and 4) communication. Together, this drove the specification of short- and long-term outcomes for the logic model.

Using a backward design framework (30) we defined the specific knowledge, skills, and attitudes the students would need to achieve the four aims, which are represented in our short- and long-term outcomes. These 25 learning objectives were refined based on the content and objectives of the patient

safety resources provided by the AAMC, AMA, IHI, and the USMLE content outline. Bloom's taxonomy (31) was used to organize the 5–7 objectives within each of the four aims to establish foundational understanding that could then be applied to their experiences in academic and clinical learning environments.

Step 2: Creating the Logic Model: Identifying activities, outputs, and outcomes

After learning objectives were determined, we used a backwards design framework to map preclerkship student activities that would lead to our 25 learning objectives across the four aims. Assigning those learning objectives as our outputs, we worked backwards to identify appropriate teaching activities to support those outputs. To do this, we conducted a comprehensive inventory of our curriculum to identify pre-existing PSE activities and activities that included PSE-oriented learning objectives. We also identified optimal points for introducing new PSE within the current sequence. This review encompassed pre-clerkship and clerkship curricula, as well as the existing integrated, longitudinal simulation curriculum which spans across all four years. We also reviewed case-based collaborative learning (CBCL) and problem-based learning (PBL) curricula to identify opportunities for enhancement that includes PSE and curricular materials more broadly to identify existing signposting activities that could be leveraged to reinforce patient safety concepts longitudinally. This process offered an opportunity for cognitive integration and for reducing the amount of time needed for development and integration of 'new' learning activities.

To ensure institutional alignment, support, and buy-in, we met with key stakeholders throughout this process across the medical education office, including curricular deans, block directors, and directors of the CBCL and PBL programs. Additionally, the dean overseeing medical education (CT) and a member of the medical education office for assessment, evaluation and scholarship (CS) provided insight on the design of the logic model and plan for short and medium range outcomes. A final draft of the logic model was available for implementation in the spring of 2025.

Results

Learning objectives

The medical educators (KG, ED, JF) were able to identify the four general Aims, or categories, of preclerkship PSE (see Table 1). For each of these aims, 25 learning objectives described learning targets to prepare students for day one of clerkship.

Table 1
Aims and Learning Objectives

Aim 1: Prepare students to contribute to a culture of patient safety. **Patient safety is dependent on the culture of the organization. As students care for patients, they will participate and contribute to that culture. These learning objectives represent the knowledge, skills, and attitude students need to effectively participate in safe care for patients and positively contribute to a culture of patient safety.**	
Learning Objectives:	
001	Summarize the scope of the problem of harm to patients within the healthcare system.
002	Evaluate the impact of preventable adverse events in healthcare on patients, families, students, and professionals.
003	Describe the connection of the discipline of patient safety and the delivery of safe, reliable, effective patient care.
004	Summarize the key elements of a patient safety culture.
005	Illustrate the connection between the key elements of a patient safety culture, patient outcomes, and the well-being of health care professionals.
006	Foster psychological safety within a group or team.
007	Connect factors that contribute to the complexity of the health care system to the risk of harm for patients.
AIM 2: Prepare students to apply safety thinking to patient care. Patient safety utilizes knowledge and understanding from a broader field of safety thinking. Knowledge of foundational safety topics such as complexity, human factors, and high reliability is essential to understanding patient safety.	
008	Apply a systems approach to understanding preventable harm in health care.
009	Describe the role of human factors in preventing patient harm and designing safer health care systems.
010	Incorporate human factors strategies into case-based discussion, simulated, or clinical patient encounters.
011	Apply key principles of high reliability organizations to the delivery of safe, effective care.
012	Apply a methodical, standardized approach to promote safety in complex healthcare situations.
AIM 3: Prepare students to work in teams for patient safety. All patient care experiences will occur in the context of one of the many forms of teams found in health care. These learning objectives represent a foundation of knowledge and individual skills required for students to participate in care teams that advance patient safety.	
013	Identify features of team functioning that are critical to protect patients from harm.
014	Discuss strategies to overcome barriers to effective teamwork in health care.

Aim 1: Prepare students to contribute to a culture of patient safety. **Patient safety is dependent on the culture of the organization. As students care for patients, they will participate and contribute to that culture. These learning objectives represent the knowledge, skills, and attitude students need to effectively participate in safe care for patients and positively contribute to a culture of patient safety.**	
Learning Objectives:	
015	Justify the inclusion of the patient and family as a member of the healthcare team.
016	Describe the features of strong leadership that are essential to safe patient care.
017	Demonstrate the features of strong leadership that are essential for safe patient care.
018	Describe the features of strong followership that are essential to safe patient care.
019	Demonstrate the features of strong followership that are essential for safe patient care.
020	Demonstrate collaborative clinical reasoning skills to support team decision making.
AIM 4: Prepare students to communicate effectively for patient safety. Communication issues are one of the most common and frequent causes of medical errors. These learning objectives provide students with the knowledge and skills to combat communication issues that can contribute to patient safety events.	
021	Assess the contribution of communication failures to common types of adverse events in healthcare.
022	Justify the use of structured communication to ensure reliable, safe, effective care.
023	Evaluate the appropriate communication type for specific patient care instances.
024	Demonstrate the use of structured communication to discuss the care of patients.
025	Demonstrate communication that facilitates shared decision making to ensure safe, reliable, effective care.

Components of the Logic Model

The developed logic model can be found in Fig. 2 (Fig. 2: Logic Model). We considered several components when building our logic model, including the inputs, outputs, and development of activities within the constraints of our existing curriculum and limited time of our students and faculty.

Inputs

The inputs required for our PSE curriculum were necessary for its success. We were able to identify key stakeholders to engage by outlining the resource needs, including staffing, curricular approvals, and support, such as protected time.

Activities

Our backwards design framework ensured that we began with learning objectives to identify relevant PSE activities that would support them (32). For this, we used information gleaned from our curriculum inventory. The results of our curriculum inventory revealed three key pieces of information: 1) several PSE learning objectives were not represented in the curriculum, 2) some curricular content already being presented aligned with the PSE learning objectives, and 3) some of our PSE aims were being taught but not explicitly labeled or identified as patient safety content.

With all this in mind, we were able to approach the activities that supported our learning goals/outcomes with a three-pronged approach:

1-Creating: We created new learning activities to cover patient safety topics not included in curriculum.

2-Enhancing: We identified opportunities where we could build on certain learning activities with a patient safety competency. For example, we added a patient safety case to an already existing CBCL.

3-Signposting: In several existing opportunities, PSE existed but was not labeled as such. We highlighted these existing elements of the curriculum to be explicit about the patient safety principles they incorporated. For example, we explicitly framed “teamwork skills” as patient safety skills and mapped relevant learning objectives to this pre-existing content.

Creating, enhancing, and signposting allowed us to integrate all 25 learning objectives into teaching activities across the curriculum without excessive burden on the system.

Outputs

We defined our outputs as the direct results of the specific teaching activities. (33) By working with members of the medical education office for assessment, evaluation, and scholarship, we applied the same three-pronged approach of creating, enhancing, and signposting for the outputs. First, new activities required the creation of new assessment tools to measure learner knowledge and attitudes (e.g., multiple-choice questions). Second, we enhanced pre-existing assessments to measure student engagement (e.g. PBL faculty surveys). Third, we leveraged pre-existing assessments to gather student and faculty feedback (e.g., CBCL faculty surveys).

Outcomes

We defined short term outcomes as the impact on students’ general PSE learning as well as change in behaviors. Our long-term outcomes were students’ ability to apply PSE to their clinical performance, as defined by our four aims. Although we have not yet measured increases in short and long-term outcomes, we plan to track and evaluate the extent to which our PSE curriculum in the preclerkship years results in more salient and positive attitudes towards PSE in the clerkship years.

Assumptions and External Factors

The Patient Safety Logic Model is a living document to be reviewed annually and revised as required. It is important to also identify the assumptions and external factors that could impact future iterations of this

curriculum. We assume that financial support and interest from the institution will persist for this PSE curriculum. Although there are many external factors that influence students' learning, one salient factor is the extent that PSE content is assessed. Students may be more willing to engage with PSE content earlier if there are summative expectations of PSE content integration and awareness. Other factors, like faculty attitudes and role modeling of PSE behaviors, may influence students' adoption of PSE knowledge, skills, and attitudes. Existing efforts and attitudes among faculty are appropriate considerations for developing, implementing, and maintaining a PSE curriculum.

Discussion

This paper describes the development of a logic model to facilitate the integration of PSE into the preclerkship phase of our UME curriculum. This logic model offers a practical framework for medical educators seeking to both identify and incorporate PSE into their preclerkship curriculum by acknowledging and addressing the many constraints, including a lack of accepted preclerkship-oriented material and lack of available curriculum time in the preclerkship phase. Specifically, we identified three concrete strategies that set our students up to meet all 25 of our learning objectives; the opportunity to not just add new activities but to also enhance existing activities and to signpost towards PSE content across the curriculum. Although significant patient safety learning continues throughout the clerkship years and beyond, establishing foundational knowledge, skills, and attitudes during the preclerkship years better prepares students for day one of their clinical practice in clerkship. Such thinking aligns with the clinical skills integration that most UME curricula already employ (19).

By using a backwards design approach and thinking through the lens of "what do students need on day one of clerkship" we were able to identify the four primary aims and subsequent learning objectives that establish a foundation of patient safety education for preclerkship learners. While the WHO patient safety curriculum provides a comprehensive approach to patient safety, their topics do not delineate a preclerkship learner from those actively involved in care teams.

Although clerkship learners do not have a medical license, they are an active part of the team and witness the direct care of patients. Our aims prepare them for this role. Learners must understand that they are entering a high-risk environment and be introduced to ways that they may contribute to a culture of patient safety (Aim 1). They also need a basic understanding of human limitations and human factors principles to understand why we must design and engage in systems and processes to protect patients (Aim 2). Although students will not be completing tasks such as writing orders, they will be interviewing patients, conveying information, and working in an interprofessional team, necessitating understanding of basic communication and teamwork skills (Aims 3 and 4).

By identifying the four key foundational topics and their learning objectives, we provided a feasible approach for medical educators to establish a plan for early integration that can be expanded across the curriculum. Designing a curriculum that allows for cognitive integration and provides preclerkship students the foundational knowledge, skills, and attitudes of patient safety prepares learners for their

role in the care team. We believe this infrastructure also prepares them to better conceptualize and integrate patient safety principles in their future roles as physicians.

Although there are different curricular approaches, there are several advantages to using a logic model. First, the visual design of a logic model, which includes inputs/resources and mapping of activities to outcomes, was very helpful in communicating and engaging with other stakeholders. The visual map helped other educators understand that even with a robust curriculum of 25 learning objectives, integrating patient safety was not going to add a significant amount of time to the curriculum. Using the three-pronged approach helped clearly identify both where the PSE gaps existed as well as opportunities to leverage PSE with less effort.

Second, a logic model fits well with our curricular backwards design approach. (30) A backwards design approach is appropriate for this topic because we had the end in mind (what do learners need to know by day one of clerkship). Because the core activities, or required content, for a preclerkship PSE are not universally established, a “bottom up” approach such as Kern’s six step approach would not have been as helpful. (23) We hope that our presentation of this logic model provides other medical educators interested in including PSE in their preclerkship curriculum as a framework to reference and a guide for their potential efforts.

There are several challenges with integrating new content into the preclerkship phase. Primarily, there is very limited extra time in the curriculum. With the amount of material that must be covered in the preclerkship phase, curriculum experts must be cognizant of how to efficiently integrate new additions. By taking a three-pronged approach of creating new activities, enhancing, and signposting within existing activities, we provide medical educators with a feasible approach to integrating PSE into an already busy curriculum. Of note, some curricula integrate Quality Improvement (QI) with patient safety. Our logic model is primarily focused on PS alone. Additional considerations would need to be considered to add QI to the logic model presented in this paper.

Limitations

One limitation of this work is the limited long-term assessment for the PSE activities included in our Patient Safety Logic Model. In PSE, there are fewer measurable long-term outcomes outside of clinical care. Therefore, we are unable to know if our proposed amount of PSE education here is adequate for a measurable transfer of learning to the clinical environment. While long-term individual outcomes from the effectiveness of PSE are challenging to measure (34), the correlation between individual performance and type of training program published nearly 20 years ago (35) helped catapult the argument for robust PSE across medical education. (36) To that end, our explication of critical PSE learning objectives as desired outputs followed by the creation and alignment of activities towards these outputs aligns with best practice in competency-based medical education (37) and provides a critical starting point for medical educators seeking to integrate more PSE.

Conclusion

Physicians must apply patient safety principles in almost every care task they complete, so PSE must be embedded in learning experiences across the longitudinal journey from matriculation in medical school to independent practice. Nonetheless, challenges abound related to expertise and resources, especially in the preclerkship years when competition with biomedical learning is fierce. The development of a logic model that uses the activities required in the workplace to define learning aims and then objectives for clerkship students illuminates the throughline needed for curricular and cognitive integration of PSE. The specification of the inputs, activities, assumptions, and external factors forecast key considerations related to the design and launch of a comprehensive patient safety curriculum. Taken together, the logic model serves as a roadmap for an integrated, longitudinal learning plan that is also feasible in the context of ever-increasing complexity and resources constraints in medical education.

We present our learning objectives and Patient Safety Logic Model to serve as a framework and helpful resource for other medical educators looking to incorporate patient safety in the preclerkship curriculum. Our goal is ultimately to help prepare our learners with the patient safety knowledge, skills, and attitudes needed for day one of clerkship.

Declarations

Ethics Approval and consent to participate: This study was determined to be curriculum development and qualified as quality improvement by the University of Kansas Medical Center Institutional Review Board Sept 5th, 2025. The need for ethics approval and consent was waived by the University of Kansas Medical Center Institutional Review Board. This manuscript describes the development and implementation of an educational curriculum. It does not report human subjects research, involve experimental procedures, or use human biological specimens. The work is limited to curriculum design and educational program description. Therefore, this project does not meet the definition of research involving human subjects and was determined to be exempt by the University of Kansas Medical Center Institutional Review Board.

Consent for publication: Not Applicable.

Availability of data and materials: The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing Interests: I declare that the authors have no competing interests as defined by BMC, or other interests that might be perceived to influence the results and/or discussion reported in this paper.

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Figures

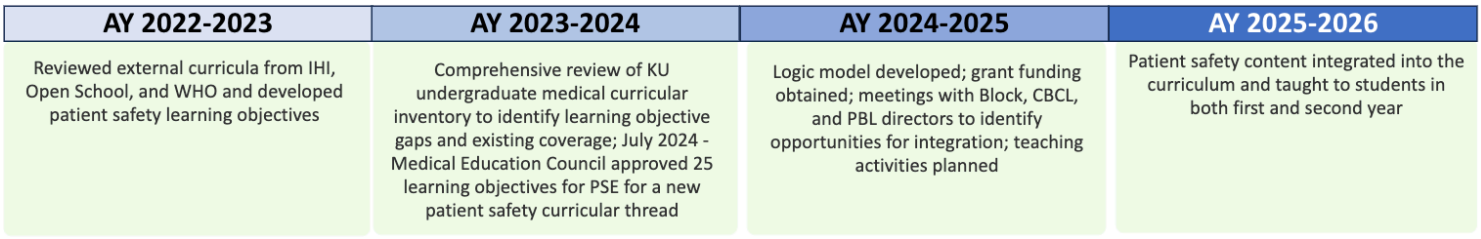
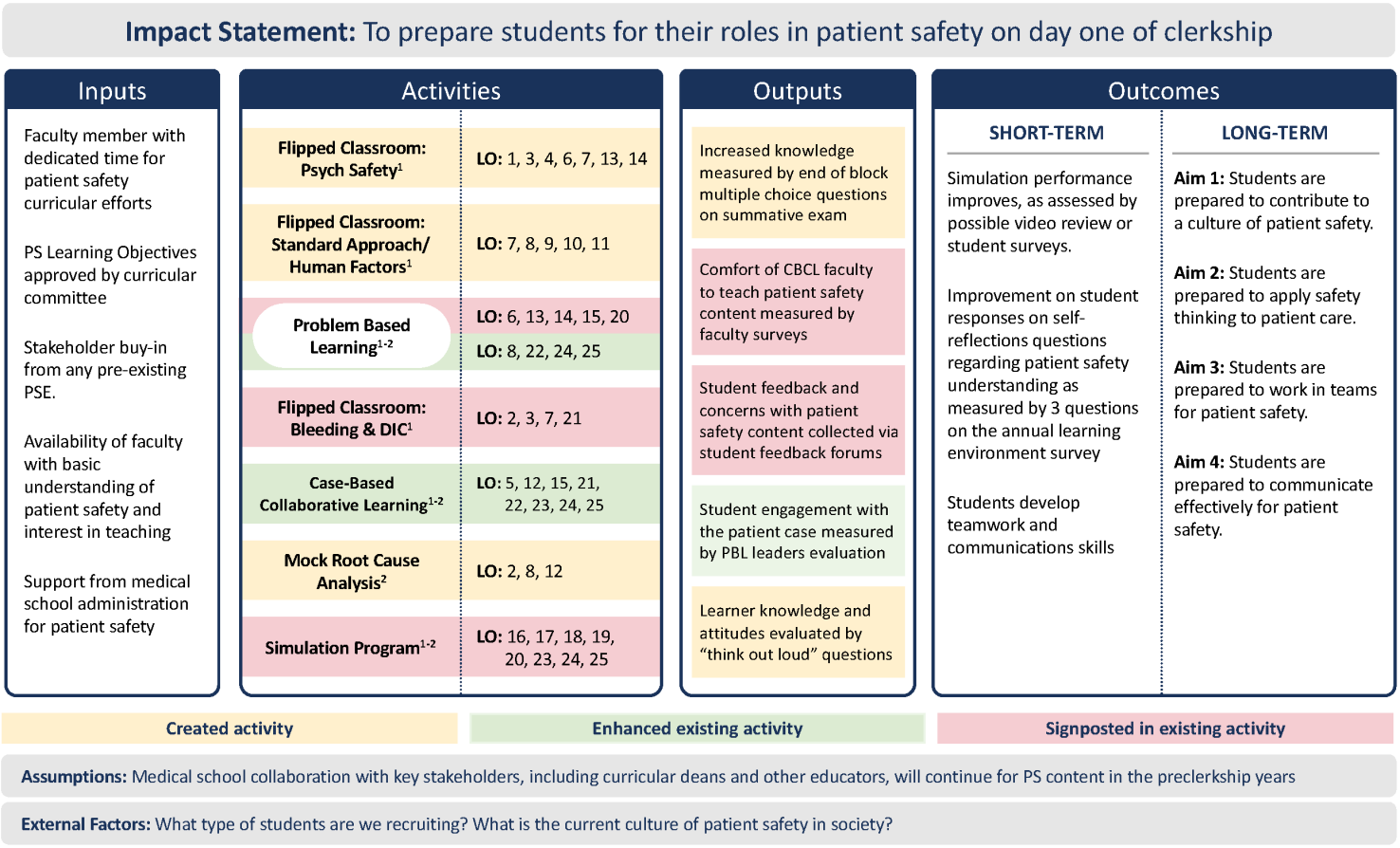


Figure 1

Legend not included with this version.



Notes: LO = Learning Objectives, defined in table 1; Curricular themes include leadership, followership, and the use of cognitive aids during urgent/emergent situations. [1]Attendance for the activity included first year students on all campuses; [1-2]All first and second-year students on all campuses; [2]All second-year students on all campuses

Figure 2

Legend not included with this version.