

*Clinical Practice Enhanced by Artificial Intelligence (AI) Grand Rounds 2025-2026*

# Using AI in Simulation and Experiential Learning to Enhance Educational Modalities



Interprofessional  
Continuing Education Partnership  
UNIVERSITY OF WISCONSIN-MADISON

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*Clinical Practice Enhanced by AI Grand Rounds*

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*We do not have relevant financial relationships with ineligible companies to disclose.*

# Learning Objectives

As a result of participation in this educational session, learners as members of healthcare or research team will improve their ability to:

1. Describe the foundational principles of experiential learning and simulation-based education.
2. Explain simulation curriculum design and current applications of simulation used at the UW Health Clinical Simulation Program.
3. Discuss emerging and potential applications of artificial intelligence in immersive scenario-based and procedural simulations.

# Foundations of Experiential Learning and Simulation-Based Education

# Purpose and Scope of Healthcare Simulation

## **Safe Clinical Practice**

Simulation provides a risk-free environment for learners to practice and learn from mistakes without harming patients.

## **Varied Simulation Modalities**

Healthcare simulation includes task trainers, standardized patients, high-fidelity manikins, virtual reality, and immersive scenarios.

## **Interprofessional Education**

Simulation fosters teamwork and communication among physicians, nurses, and other healthcare professionals.

## **Systems Testing and Safety**

Simulation helps test clinical workflows and identify safety threats before patient impact.

# Experiential Learning Theory and Adult Learning Principles

## **Experiential Learning Cycle**

Learning occurs through experience, reflection, conceptualization, and active experimentation.

## **Adult Learner Characteristics**

Adult learners are self-directed, goal-oriented, and motivated by relevance to real-world practice.

## **Simulation-Based Engagement**

Simulation immerses learners in realistic clinical scenarios enhancing skills and decision-making.

## **Reflection and Debriefing**

Structured debriefing helps learners analyze actions and connect experiences to clinical concepts.

# Kolb's Experiential Learning Cycle in Simulation

## **Concrete Experience in Simulation**

Learners engage actively in simulated clinical scenarios, experiencing hands-on practice with realistic patient care challenges.

## **Reflective Observation During Debrief**

Post-scenario reflection helps learners analyze emotions, decisions, and team performance guided by facilitators.

## **Abstract Conceptualization**

Learners connect experiences to clinical theory and best practices, refining mental models for future care.

## **Active Experimentation**

Applying new knowledge and strategies in subsequent simulations or real practice to enhance skills and decision-making.

# Core Principles of Simulation-Based Education

## Psychological Safety

Learners must feel respected and supported to engage fully and take risks during simulation training.

## Clear Learning Objectives

Each simulation is anchored by objectives that guide scenario design, facilitation, and assessment.

## Fidelity and Realism

Realism is calibrated to learner level and goals; appropriate fidelity enhances engagement and learning transfer.

## Deliberate Practice and Feedback

Focused repetition with specific, timely feedback improves skills more than exposure alone.

## Debriefing Importance

Debriefing transforms experience into learning through structured reflection and discussion.

## Standardization and Consistency

Consistent simulation approaches ensure reliable assessment and competency validation.

# Simulation Modalities and Educational Use Cases

## **Procedural Skill Practice**

Task trainers and part-task simulators help learners practice specific procedural skills such as airway management and suturing precisely.

## **Communication Training**

Standardized patients, trained actors simulating clinical roles, improve skills in communication, history-taking, and professionalism.

## **Acute Event Simulation**

High-fidelity manikins simulate complex physiological responses for team management of events like sepsis or cardiac arrest.

## **Virtual and Hybrid Simulation**

Virtual reality and hybrid simulations provide scalable, realistic scenarios for cognitive and rare event training.

# Role of Debriefing in Experiential Learning

## **Essence of Debriefing**

Debriefing is a reflective discussion that helps learners analyze their actions during simulations for deeper understanding.

## **Structured Debriefing Frameworks**

Frameworks like plus-delta, advocacy-inquiry, and PEARLS guide structured reflection to explore reasoning and teamwork effectively.

## **Psychological Safety Importance**

Creating psychological safety encourages open discussion of errors and uncertainties for optimal learning outcomes.

## **Faculty Skill Development**

Investing in faculty training enhances debriefing quality, which significantly impacts learner performance and education success.

# Simulation Curriculum Design and UW Health Applications

# Principles of Simulation Curriculum Design

## **Identifying Learner Needs**

Determine gaps in knowledge and skills using clinical data and stakeholder input to tailor simulations effectively.

## **Developing Learning Objectives**

Create clear, measurable objectives that specify desired learner outcomes after simulations.

## **Scenario and Curriculum Design**

Align scenarios with learning objectives incorporating realistic clinical contexts and appropriate complexity.

## **Assessment and Evaluation**

Use assessments matched to objectives and evaluate curriculum with feedback and clinical outcomes.

# Needs Assessment and Stakeholder Engagement

## **Importance of Needs Assessment**

Needs assessment identifies gaps between current and desired performance at individual, team, and system levels. It forms the foundation of effective simulation curriculum design.

## **Diverse Data Sources**

Data sources include incident reports, quality metrics, learner self-assessments, and regulatory requirements to inform curriculum needs.

## **Engaging Stakeholders**

Engaging clinical leaders, educators, and frontline staff ensures simulation addresses real-world priorities and gains institutional support.

## **Aligning with Organizational Goals**

Stakeholder engagement helps align simulation initiatives with patient safety, new clinical programs, and system-wide improvements.

# Scenario Design and Facilitation Strategies

## **Scenario Design Elements**

Design includes patient history, clinical progression, interventions, and potential learner errors.

## **Facilitator Roles and Skills**

Facilitators anticipate learner actions, manage pacing, provide cues, and maintain realism.

## **Pre-briefing Importance**

Pre-briefing sets expectations, fosters psychological safety, and orients learners to environment.

## **Collaboration for Realism**

Educators collaborate with clinical experts to ensure scenarios reflect current practice and protocols.

# UW Health Clinical Simulation Program Overview

## **Diverse Learner Audience**

The program serves medical students, residents, nurses, and interprofessional teams to enhance clinical skills and teamwork.

## **Comprehensive Simulation Activities**

Includes onboarding, continuing education, competency validation, and quality improvement through realistic clinical scenarios.

## **Facilities and In Situ Simulation**

Simulation occurs both in dedicated centers and real clinical environments to maximize learning relevance and impact.

## **Focus on Patient Safety and Innovation**

The program emphasizes evidence-based practices, faculty development, and collaboration to improve patient safety and healthcare education.

# Current Simulation Applications at UW Health

## **Clinical and Educational Simulations**

UW Health uses simulation for resuscitation, procedural skills, teamwork, and communication training to enhance clinical education.

## **Systems Testing and Workflow Analysis**

Simulation supports new equipment and protocol implementation through systems testing and workflow evaluation in clinical settings.

## **Safety Threat Identification**

In situ simulations help detect latent safety threats like communication failures and equipment issues before affecting patients.

## **Learner Assessment and Remediation**

Simulation provides structured opportunities for learners to demonstrate competence and receive targeted remediation as needed.

# Evaluation and Continuous Improvement in Simulation Programs

## **Comprehensive Program Evaluation**

Evaluation covers learner satisfaction, knowledge, skills, behavior, and clinical outcomes to assess simulation effectiveness.

## **Data-Driven Curriculum Refinement**

Simulation data guides curriculum updates, faculty development, and resource allocation for program improvement.

## **Continuous Stakeholder Feedback**

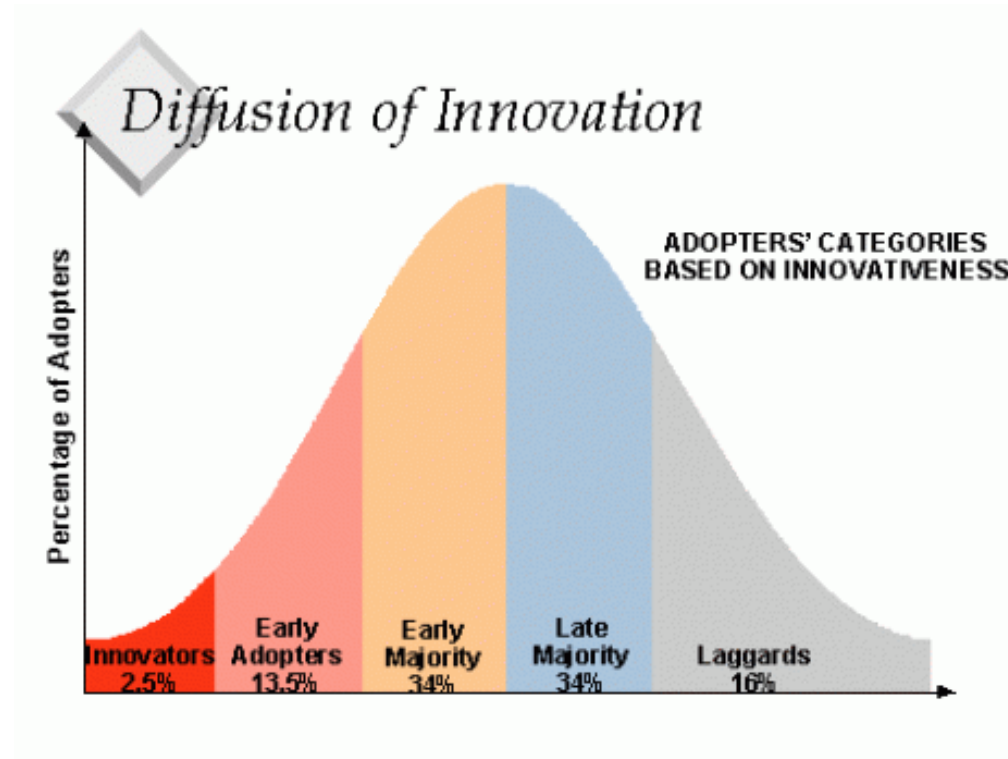
Regular feedback from stakeholders aligns simulation with quality and safety goals, supporting ongoing program enhancement.

## **Demonstrating Value and Adaptability**

Systematic evaluation justifies investment and ensures simulation adapts to evolving educational and clinical needs.

# Artificial Intelligence in Healthcare Simulation

# Additional Disclosure



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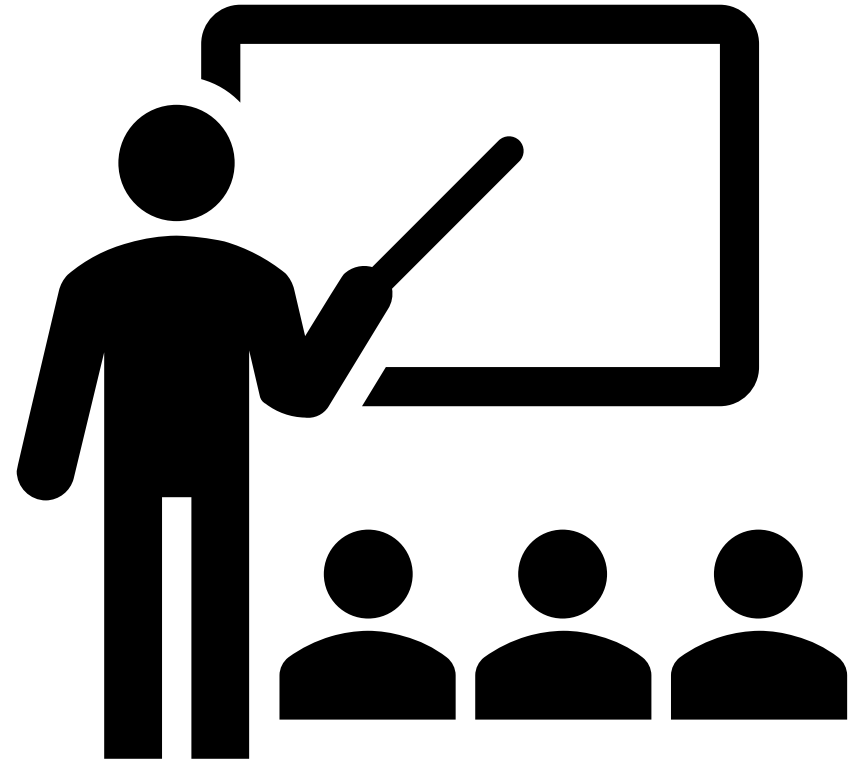


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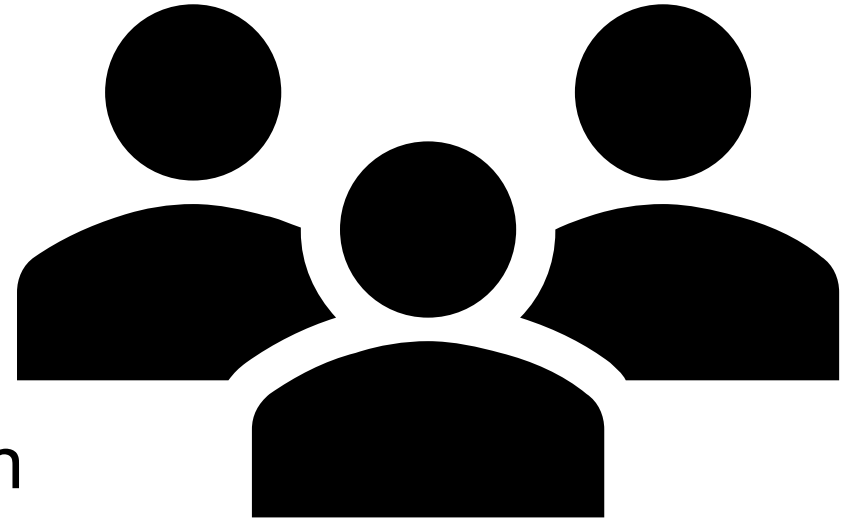
# Introduction to Artificial Intelligence in Simulation

- Enhance training experience
  - Immersive Training
  - Procedural Training
- Support facilitators
- Promote operational efficiency



# Enhancing Training Experience

- Increased realism (fidelity)
- Targeted training
- Adaptive learning and personalization



# Adaptive Learning and Personalization

- Tailored learning experiences
- Competency-based progression
- Data-driven insights and feedback



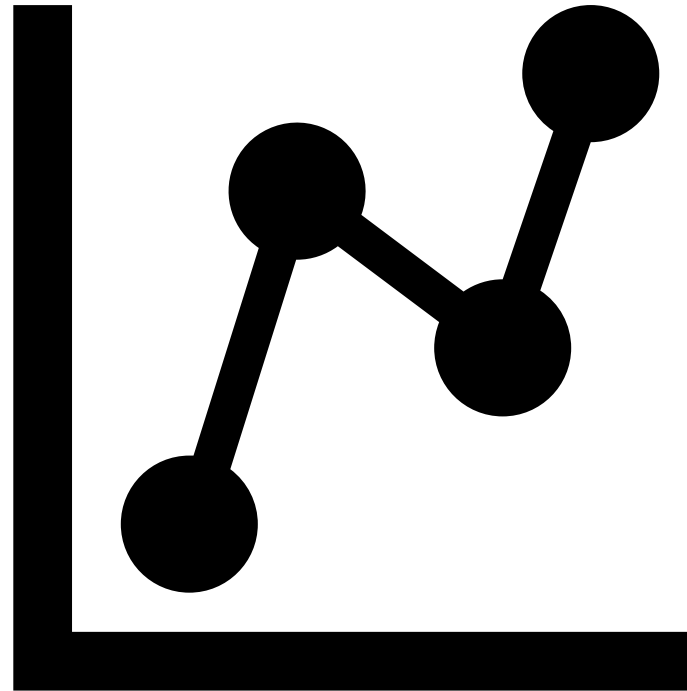
# Procedural Simulation

- Real-time guidance and performance feedback with error analysis
- Personalized learning and practice with assessment and feedback
- Model creation



# Assessment and Feedback

- Automated skill scoring
- Personalized feedback
- Data-driven insights for educators



# AI in action

- Prompt: Can you give me model creation ideas to teach incision and drainage?
- Response: **Incision & Drainage Simulation Model Ideas**

## 1. Gelatin / Ballistic Gel Abscess Model

A simple, inexpensive model that feels realistic for novices.

### Concept:

Create a multilayer block using gelatin or ballistic gel, embedding

### Materials to simulate:

- Skin layer → tinted ballistic gel, silicone sheet, or latex
- Abscess cavity → balloon, thin plastic film, or small bag
- Purulent material → hair gel + lotion + food coloring

### Why it works:

- Good for teaching depth perception and tissue handling
- Cavity can be refilled and reused

## ▶ 2. Silicone “Skin” Abscess Dome

### 3. Sponge-Based Abscess Model

Ultra low-cost and quick to construct.

### Concept:

A makeup sponge or automotive sponge is wrapped in latex/ pseudo-skin surface with a fluid-filled core.

### Enhancements:

- Add thicker silicone for “cellulitic” appearance
- Color the surface for erythema simulation

### Why it works:

- Great for large-group teaching
- Easy to scale and customize

## 3. Sponge-Based Abscess Model

Ultra low-cost and quick to construct.

### Concept:

A makeup sponge or automotive sponge is wrapped in latex/silicone to form a pseudo-skin surface with a fluid-filled core.

### Enhancements:

- Add thicker silicone for “cellulitic” appearance
- Color the surface for erythema simulation

### Why it works:

- Great for large-group teaching
- Easy to scale and customize

# AI in action

- Prompt: Can you give me a step by step assembly instructions for the gelatin model
- Response: **Model Construction Instructions**

## Materials Needed

(All materials are non-clinical and readily available)

### For the “tissue block”

- Unflavored gelatin powder (large box or multiple packets)
- Water
- Food coloring (optional—to tint the “skin” layer)
- Mixing bowl
- Saucepan
- Container or mold (plastic or silicone baking dish works well)

### For the “abscess pocket”

- Small balloon, glove fingertip, or thin plastic baggie
- “Purulent” filler (choose any of these):
  - Hair gel mixed with lotion
  - Vanilla pudding + water
  - Shampoo mixed with cornstarch
  - Any opaque gel-like substance
- Food coloring (yellow, tan, or green tones—optional)

### Optional Enhancements

- Silicone sheet or latex sheet to imitate a skin layer
- Makeup sponges for underlying “firmness”
- Coloring the top layer to look like erythema
- A small piece of yarn or sponge to simulate “induration”

## STEP-BY-STEP ASSEMBLY

### STEP 1 — Prepare the Mold/Base

1. Choose a container that is at least **2-3 inches deep**.
2. Lightly spray the inside with **cooking spray** so the model releases easily later.
3. Set aside.

### STEP 2 — Create the “Abscess Pocket”

1. Take a **small balloon** or glove fingertip.
2. Fill it with your chosen **gel mixture** (e.g., hair gel + lotion) until it forms a **squishy, grape-sized pouch**.
3. Tie off the balloon so it’s sealed and won’t leak.
4. Dry **the outside** so gelatin will adhere around it.

#### Tip:

Aim for a shape that creates a **fluctuant** feel when pressed through the gelatin.

### STEP 3 — Make the Gelatin Base

1. Heat water in a saucepan until warm (not boiling).
2. Slowly whisk in **unflavored gelatin** according to packaging **instructions, but double the amount of gelatin** to make the block firmer and more “tissue-like.”
3. Add a few drops of **food coloring** if you want a skin-tinted appearance.
4. Stir until the mixture is smooth and fully dissolved.

### STEP 4 — Pour the First Layer

1. Pour about **1 inch** of the gelatin mixture into the mold.
2. Place the mold in the refrigerator for **10-20 minutes**, until it becomes *slightly tacky but not fully set*.
  - This creates a stable **base** so the abscess pocket doesn’t sink.

## Teaching Advantages of This Model

- Very inexpensive to produce
- Easy to reset or rebuild for multiple classes
- Ideal for palpation skills, communication, and simulation scenarios
- Highly customizable (size, firmness, depth, location)

If you want, I can also provide:  A printable instructor sheet

A student-facing handout

Variations for different skill levels

Troubleshooting tips (e.g., if gelatin cracks, pocket floats, etc.)

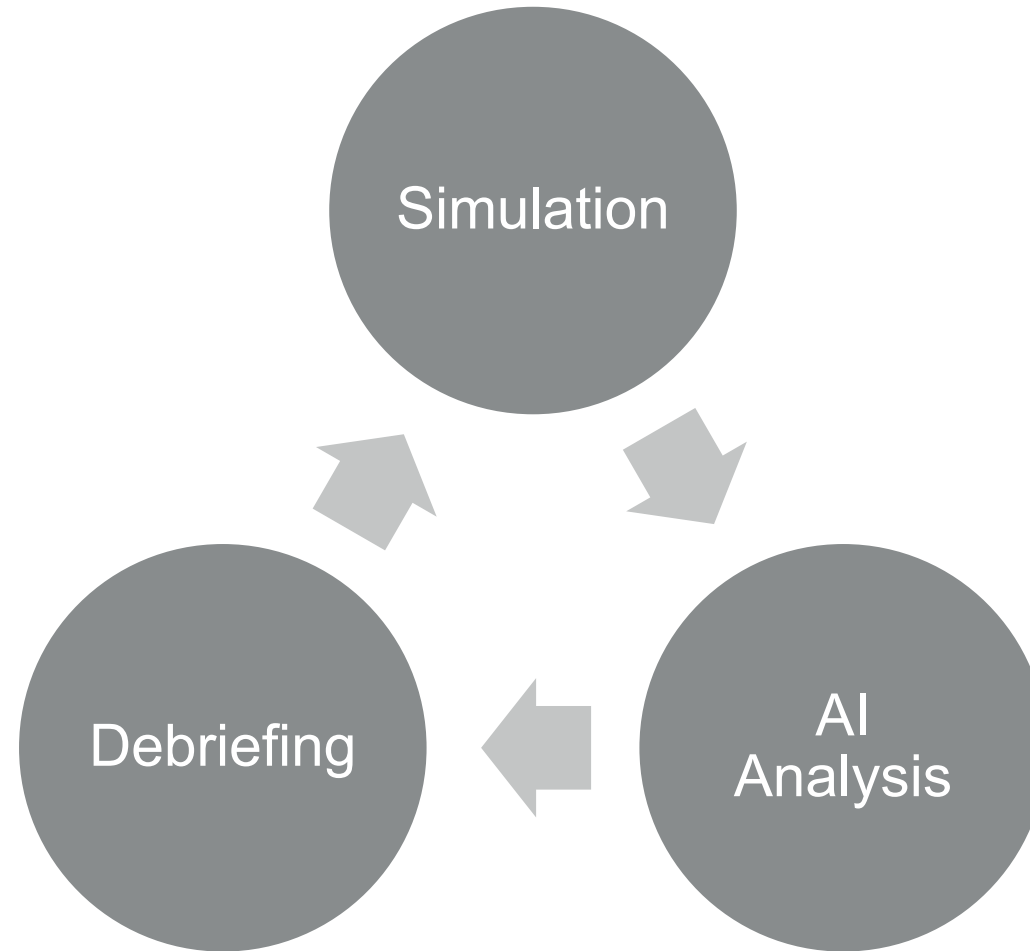
Would you like any of those?

# Supporting Facilitators

- Scenario generation
- Debriefing support
- Quantitative/qualitative data analysis

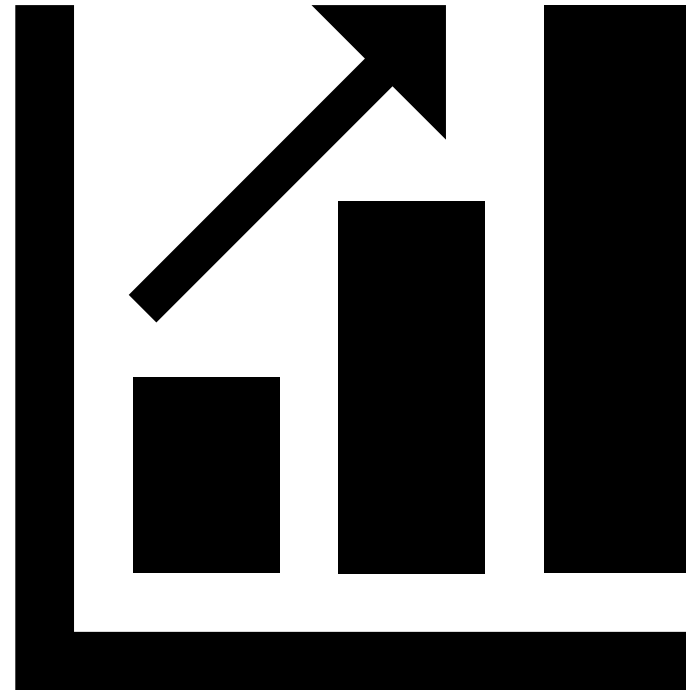


# AI in action



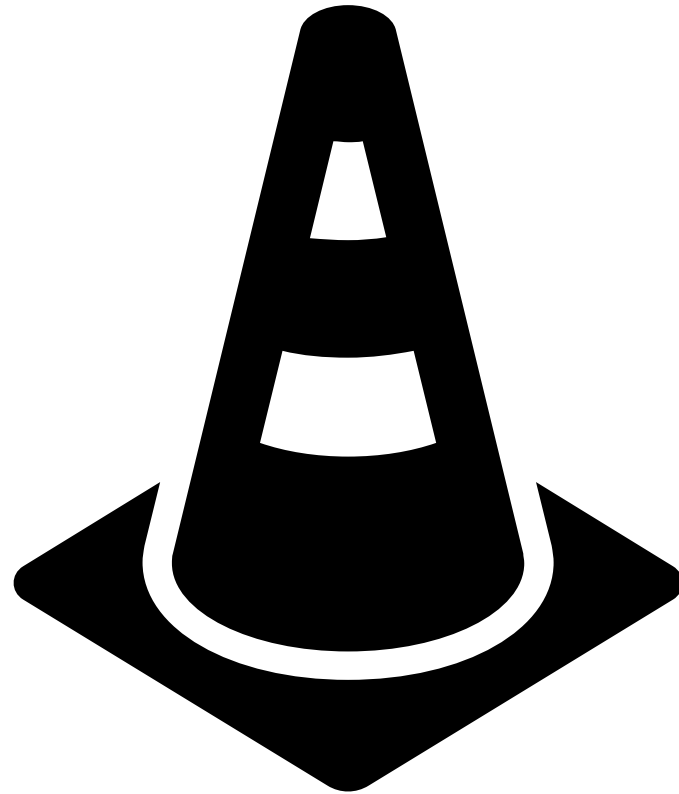
# Promote Operational Efficiency

- Efficiency of resource utilization
- Data analysis for value/ROI
- Scalability



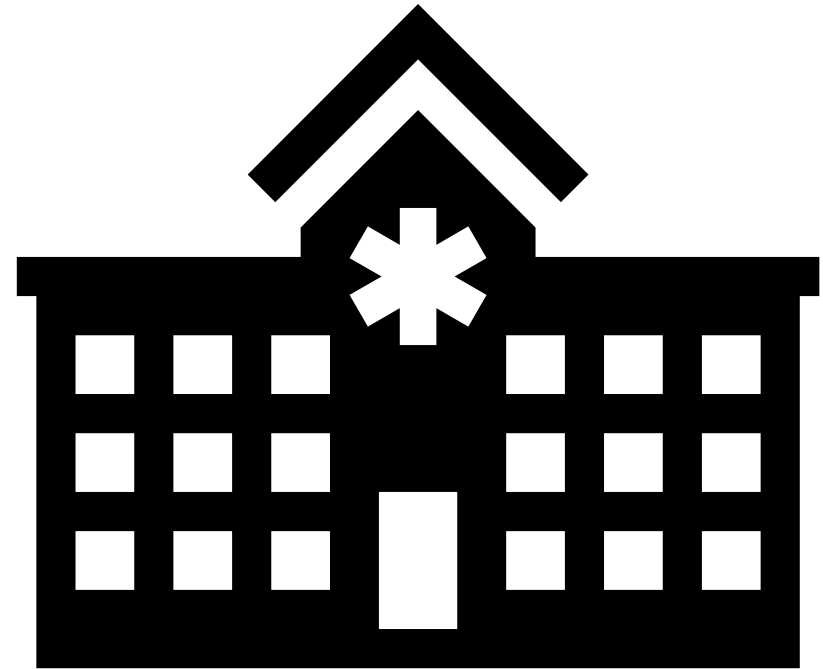
# Cautions

- Data privacy and transparency
- Avoiding algorithmic bias
- Governance and human oversight
- Preserving human judgment



# Implementation

- Cost and technical infrastructure needs
- Faculty and simulation staff training
- Leadership support and organizational collaboration



# Imagining the (Near) Future

- Fully immersive, realistic, and scalable in-person, virtual, or mixed-reality environments for communication training with multiple AI agents
- Rapidly developed adaptive scenarios with dynamic physiology, linked to learner-specific targeted curricular needs for high quality patient care
- Debriefing augmentation with tailored prompts based on quantitative and qualitative analysis of performance
- Procedural simulation with automated skill scoring, progressive difficulty, and personalized feedback

Thank you!