CASE STUDY

xuron

# AI Virtual-Human Simulations in Healthcare Education

## A 2024–2025 Meta-Analysis of Single-Session Outcomes

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RESPONSIBLE + REPEATABLE + OUTCOME-BASED

# Why this meta-analysis (and why now)

This paper analyzes outcome shifts from eleven single-session AI virtual-human simulation activities delivered July 2024–July 2025 (total n = 273 completers). It's designed to answer three practical questions for CME, academic medicine, and industry partners:

1. Can one session move the needle on confidence, knowledge, and performance proxies?
2. Are gains consistent across topics and learner groups?
3. What design choices make these results scalable and repeatable?

**Two system-level trends make this analysis timely:**

1. Rapid clinician adoption of AI: in 2024, use of healthcare AI among U.S. physicians rose sharply—reshaping expectations for digital learning tools.[1]
2. Medical education is moving away from simply counting time in classrooms or clinics and toward proving that learners truly gain the knowledge and skills needed for patient care, with assessments guiding their progress.[2]

## OUR STANCE:

Move beyond AI theater to repeatable, measurable training that fits real workflows and expands access outside major centers.

> "AI that builds **competence and confidence.**

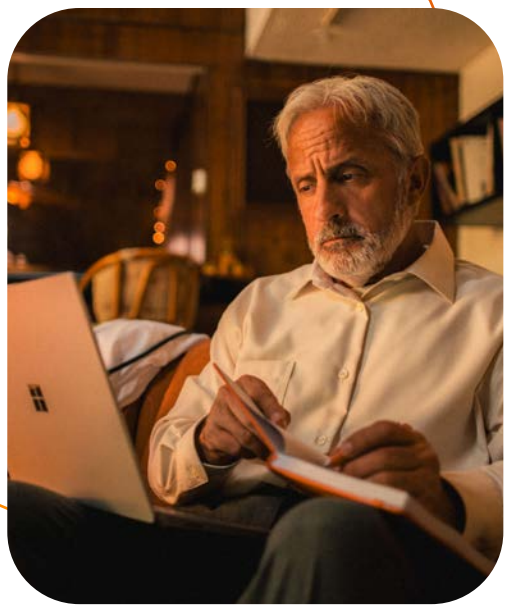
**What this report provides:**

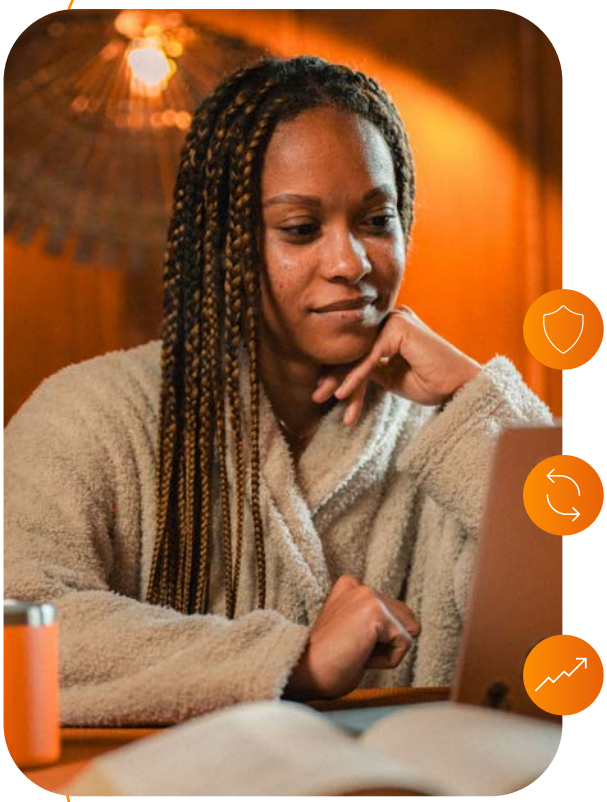
A clear read on single-session impact (e.g., confidence and knowledge deltas), how we measured it, and how to apply the same pattern—pre, micro-learning, virtual-human practice, post, personalized feedback—in your own programs at scale.

## What virtual humans change

Traditional simulation is proven but hard to scale (cost, staffing, scheduling). **AI-powered virtual humans** flip the equation: on-demand, conversation-driven scenarios that let HCPs practice clinical communication, shared decision-making, and workflow skills—anywhere—with automated, rubric-based feedback after each encounter.

Recent evidence reviews back the direction of travel: the **2025 JMIR Med Educ** review finds active growth in virtual communication tools while also calling out heterogeneity and the need for higher-fidelity features—i.e., room for platforms like Xuron to lead.[3] And early clinical-education pilots are landing promising results: a **2025 Obesity Science & Practice** pilot with an AI-driven virtual human for general practitioners (GPs) reported improvements across targeted outcomes (e.g., self-efficacy and communication measures), with authors calling for larger, controlled trials.[4]





## Xuron's stance: responsible, repeatable, outcome-based

Xuron's platform is designed around three non-negotiables:

1. **Responsible AI.** Scenarios and feedback are developed with clinical oversight; models are iteratively validated against expert expectations and aligned with current guidelines.
2. **Repeatable design.** Each activity runs a consistent arc—**pre-assessment, micro-learning, virtual human tasks, post-assessment,** and a **personalized feedback report**—so programs can scale without losing instructional quality.
3. **Impact you can see.** Outcome measures are systematically designed—knowledge, confidence, and performance KPIs—so partners can compare like-for-like across topics and cohorts.

## The training gap we're closing

The demand signal is loud: clinicians cite **time** and **workload** as top barriers to CME participation—exactly the friction virtual-human sessions are built to reduce.[5]

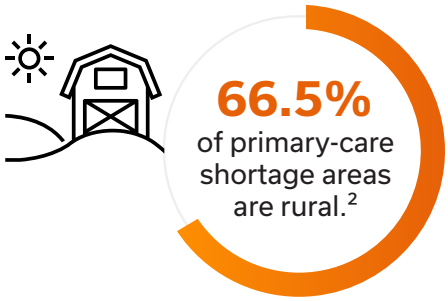
Pair those constraints with rural staffing shortages[2] and you get the central design brief for Xuron: **high-fidelity practice, delivered asynchronously, with fast, targeted feedback—at scale.**

**Top CME barriers[5]:**

**(~44.9%)** lack of time

**(~41.2%)** workload






## What the data says (and how to use this report)

This whitepaper is a meta-analysis of eleven single-session simulation activities delivered July 2024–July 2025 across diverse healthcare domains. The sample includes 273 completers and applies weighted averages across activities to normalize for size.

**Headline findings after one session:**

**Confidence:**
+28% relative increase, with a +183% jump in the share of learners reporting high confidence (Very/Extremely confident).

**Knowledge:**
+13% improvement on objective items.

**These results map to Xuron's design intent:** quick, scalable skill activation with measurable deltas in a single sitting—an approach you can compound through multi-session programs.

(See Methods in the following section for weighting and eligibility details.)

> "Use single-session simulations to 'unlock the first step' in skill change—**then stack sessions for spaced reinforcement and higher-order performance."**

## How to read the rest of this paper

1. **Methods & Cohorts**
   Quick scan for activity design, scoring, and weighting—so you can benchmark against your own programs.
2. **Results**
   KPI deltas and interpretation with visual summaries for confidence, knowledge, and performance.
3. **Discussion**
   Where Xuron's results sit within 2024–2025 literature on AI-enabled simulation (communication, empathy, self-efficacy).
4. **Limitations & Next Steps**
   What we control for today—and what we're evaluating next (multi-session trajectories, matched controls, topic-level comparisons).

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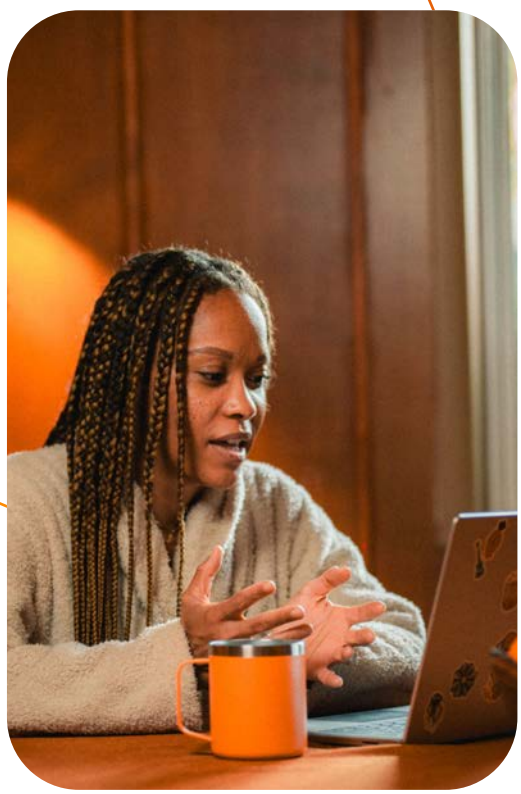
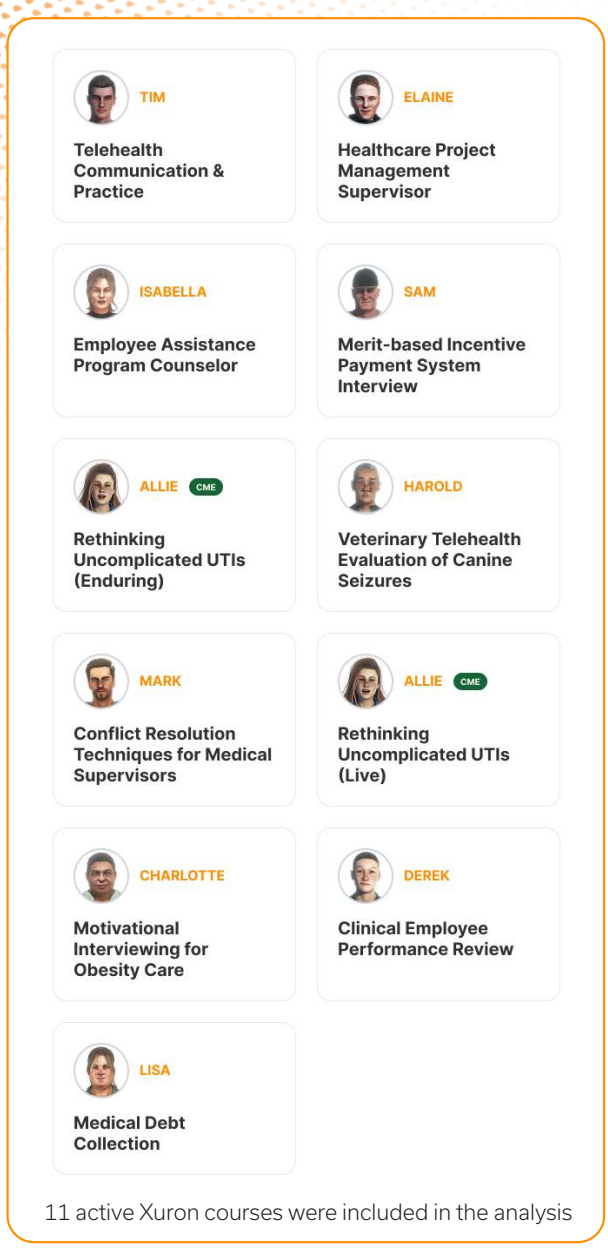
# Introduction

Effective communication is central to safe, patient-centered health care.

Breakdowns in information exchange contribute to diagnostic errors, poor adherence and reduced trust. Simulation-based education provides a controlled setting in which clinicians can practice history-taking, empathy and shared decision-making without risking harm. Traditional manikin or actor-based simulations are resource-intensive, prompting interest in AI-powered virtual humans that can converse naturally and provide automated feedback. Recent systematic reviews and scoping studies highlight the potential of these tools.[3,6]



For example, a **2025** review identified 35 studies across 24 virtual patient platforms and concluded that available systems vary widely and would benefit from more advanced features and scenario diversity.[3] Another **2023** scoping review found only 12 eligible studies, noting that limited case authenticity and unnatural language remain barriers.[6] Furthermore, pilot studies using lifelike avatars for end-of-life discussions show measurable gains in empathy and clarity.[7] These findings frame the present meta-analysis of single-session simulation activities using a single AI-powered virtual-human platform across eleven unique courses.




11 active Xuron courses were included in the analysis

## 1 Meta-analysis of Single-Session Simulations

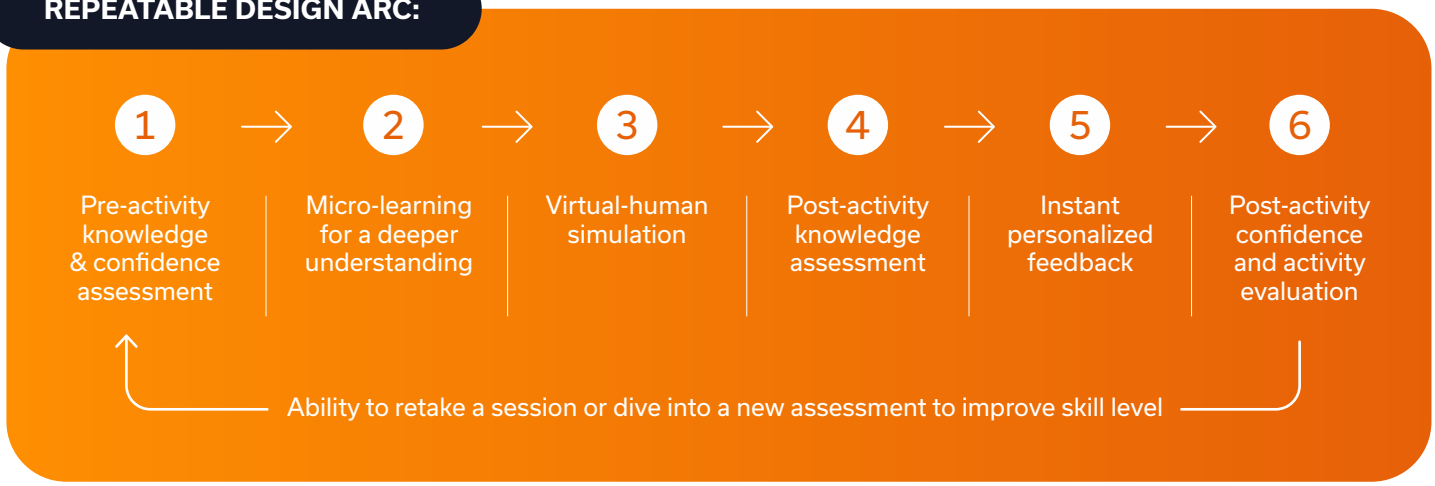
This analysis aggregates data from eleven online simulation activities delivered between **July 2024** and **July 2025** across multiple healthcare domains (continuing medical education, as well as courses in healthcare teamwork skills, communication, and management training).

Each activity followed a structured learning journey: a pre-activity assessment, multimedia micro-modules, an AI-driven virtual-patient encounter (six to twelve tasks), a post-activity assessment and an automated feedback report. All activities incorporated both knowledge-based questions and interpersonal communications skills tasks aligned with communication objectives.

The data set includes only those participants who completed the entire first session; there were **273** completers across the eleven activities. Weighted averages were calculated for each metric to accommodate differing sample sizes across activities.

"Single session impact—**measured immediately post simulation.**"

**REPEATABLE DESIGN ARC:**




All included courses followed the following learning journey consisting of six main steps.

# 2 Results

## Key performance indicators (weighted averages)

The table below summarizes the weighted averages for the 273 completers. Learner performance was measured on a 1–5 scale for simulation tasks, confidence was self-reported on a 1–5 scale, and knowledge scores were reported as percentages of correct answers.

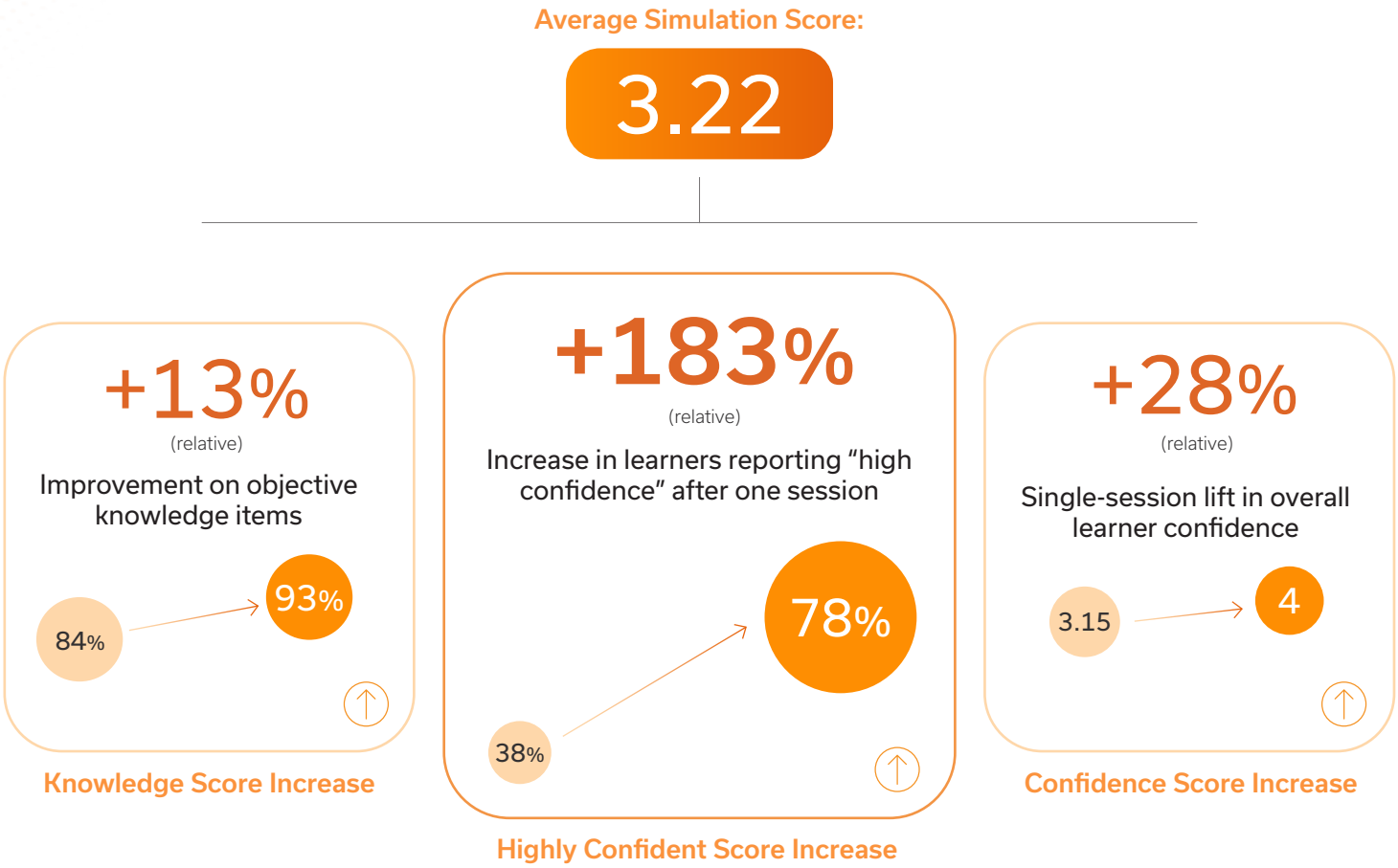



Figure 1. Weighted average performance indicators after one simulation session (n = 273). Scores on 1–5 scales were converted to percentages for comparability. 4-5 Confidence scores = Very-Extremely Confident.

## Interpretation

These data suggest that a single exposure to an AI-driven simulation can meaningfully enhance learner confidence and knowledge. The 28% relative increase in confidence and the 183% increase in the proportion of learners reporting Very/Extremely confident align with gains reported in external research.[4,7] The knowledge improvement of 13% is comparable to effects observed in studies comparing AI-powered virtual-reality simulations with human-controlled sessions.[8]

# 3 Discussion

## Comparison with existing evidence

The observed improvements support growing evidence that AI-powered virtual humans can enhance conversation-based training. These tools provide accessible, standardized practice opportunities and may overcome scheduling barriers.[3] Furthermore, there are reported gains in empathy, clarity and self-efficacy,[4,7] however, heterogeneity across platforms and small sample sizes limit generalizability.[8]

Our meta-analysis adds to this literature by aggregating data from 273 completers across diverse healthcare scenarios. The results are consistent with the broader trend: learners exhibit marked improvements in both knowledge and communication-based skills after a single AI-mediated practice session.

# 4 Limitations

## Several factors temper interpretation.

First, while activities spanned multiple domains, they were all brief and asynchronous; more complex scenarios may yield different results. Also, comparison of similar activity types/topics would offer richer insights.

Second, no control groups were available, so causality cannot be established.

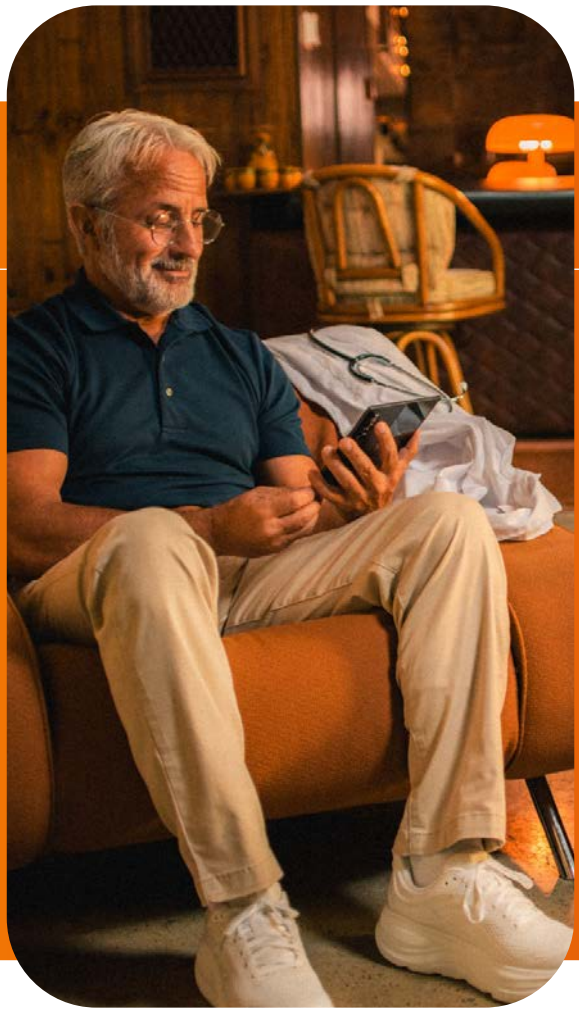
Third, though both knowledge and interpersonal communications skills components were present in every activity, we could not disentangle their individual contributions.

# Conclusion

Across 11 simulation activities, **273 completers demonstrated significant gains in confidence and knowledge after a single AI-mediated session.**

These findings complement emerging literature on virtual-human simulations and underscore their potential to enhance communication training.

While limitations exist, the evidence supports further investment in high-fidelity virtual patients and rigorous evaluation of their impact on clinician performance and patient care.



**Boris Rozendfeld, MD**
Chief Learning Officer at Xuron

Boris has over 11 years of experience in medical education and currently serves as Chief Learning Officer at Xuron, specializing in AI-powered conversational simulations for teaching interpersonal, communication, and clinical reasoning skills.

**Ian Nott**
CEO of Xuron

Ian has leveraged nearly a decade of experience in spatial computing and software development to lead innovations in AI-powered virtual human simulations formedical training.

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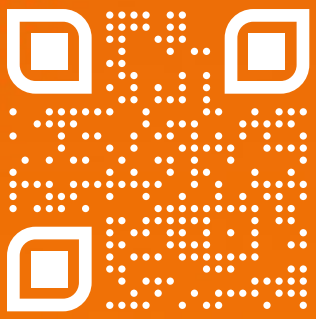

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