Expanding Escape Room-Style Learning to Boost Engagement and Clinical Proficiency

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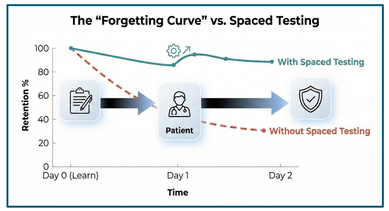
BACKGROUND

From Knowledge Exposure to Clinical Application: A Persistent Gap



- **Rapid initial loss:** Substantial learning loss occurs soon after instruction without reinforcement.[1]
- **Long-term attrition:** Without reinforcement, clinicians retain <20% of new knowledge after one month.[2]
- **Study response:** This study evaluated the expanded use of Clinical Clues, an immersive, escape room–style instructional design incorporating adult learning principles and spaced testing to support knowledge retention and clinical application.[3]

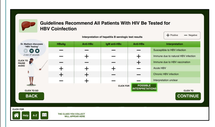
Purpose:
To evaluate the sustained impact of scaling escape room–style instructional design on learner engagement, knowledge retention, and clinical decision-making across multiple therapeutic areas in medical education.

INSTRUCTIONAL DESIGN

- Escape room–style, scenario-based learning delivered through an interactive infographic environment designed to simulate real-world clinical practice
- Sequential clinical decision points with immediate feedback and guided progression.
- Design grounded in adult learning principles emphasizing relevance, autonomy, and collaboration.
- The instructional framework was refined from three initial activities and applied across additional therapeutic areas.
- Spaced testing integrated throughout to reinforce retention and clinical application.

CLINICAL CLUES INFOGRAPHIC

HIV PrEP	HIV ART	Ulcerative Colitis	Generalized Myasthenia Gravis	Pediatric Vaccines
September 17, 2024 – September 16, 2025	December 23, 2024- December 22, 2025	December 27, 2024- December 26, 2025	March 12, 2025 – March 11, 2026	May 28, 2025 – May 27, 2026
Multi-room experience	Multi-room experience	Multi-room Experience	Single-room escape room	Single-room experience
• Incorporate PrEP into sexual wellness plans for eligible patients • Prioritize PrEP care continuity during transitions of care	• Evaluate patient profiles to select and tailor guideline-directed ART regimens based on individual needs, comorbidities, and long-term health outcomes • Select optimal ART regimens for achieving and maintaining long-term viral suppression in the setting of drug resistance • Integrate appropriate treatment strategies for patients with HIV and HBV co-infection	• Evaluate the role of newer biologics/small-molecule therapies in UC treatment algorithms. • Promote transitions from traditional to biologic/small-molecule therapy in my non-responsive or under-responsive patients with UC. • Use traditional therapies and available biologics/small-molecule therapies to optimize outcomes in my patients with IP.	• Use formal assessment of HRQoL such as the Myasthenia Gravis QoL 15-item revised (MG-QOL15r), into individualized management of my patients with gMG • Understand efficacy and safety data of FcRn antagonists as part of treatment decision-making for improving HRQoL outcomes across the continuum of gMG care in my patients • Be aware of efficacy and safety data of C5 complement inhibitors as part of treatment decision-making for improving HRQoL outcomes across the continuum of gMG care in my patients	• Identify the historical and current public health benefits of vaccines • Develop strategies that integrate vaccinology knowledge with communication techniques to improve vaccine confidence among patients, parents, and caregivers • Assess the mechanisms of vaccine-induced immune responses and herd immunity thresholds to effectively communicate vaccine efficacy and community protection to patients and their families • Evaluate the vaccine development and manufacturing process to mitigate childhood and adolescent vaccine hesitancy • Distinguish between correlation and causation regarding vaccine risks versus diseases and utilize knowledge of safety monitoring to address patient concerns effectively



METHODS

Objective
- The measures assessed include knowledge and competence retention over time related to learner engagement.

Measurement Methods
- Pretest-Posttest
- 90-day follow-up to learners and matched controls

Learners
- Learners completing an interactive, escape room-style digital activity ("Clinical Clues") featuring scenario-based clinical decision points.
- Activities required learners to make guideline-relevant diagnostic, treatment, and management decisions.
- Learners received immediate feedback.

Outcomes Data
- Baseline (Pre-test)
- Immediate knowledge and competence (Post-test)
- Retention (3-month follow-up of completers with a matched control sample)
- Engagement (Post-activity self-report surveys)

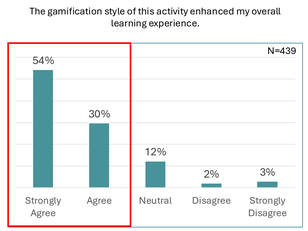
Statistical Analysis
- Outcomes were compared descriptively across activities to examine relationships between interaction density, engagement, and learning performance.
- Thematic analysis of qualitative responses

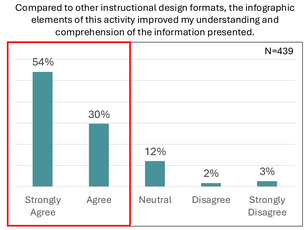
RESULTS

18,261 Learners

6,558 Completers

Learner Satisfaction





EDUCATIONAL OUTCOMES

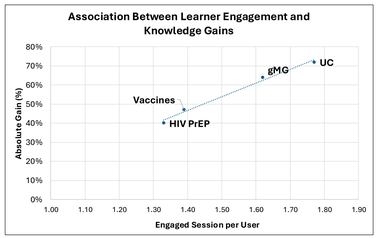
Overall Gains	Knowledge Gains	Competence Gains
~50% Absolute Gain	~50% absolute gain	~50% absolute gain
33% → 89% (Pre to Post)	38% → 88% (pre to post)	40% → 90% (pre to post)
63% Retention	56% Retention	56% Retention

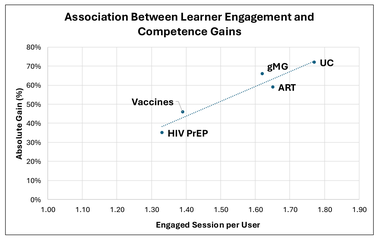
- *Learning performance defined as overall gains in knowledge and competence, knowledge gains, and competence gains.*
- *Follow-up is a demonstration of retention of knowledge and competence.*
- *Follow-up includes activities in HIV PrEP, HIV ART, and UC. gMG and Pediatric Vaccines are still ongoing.*

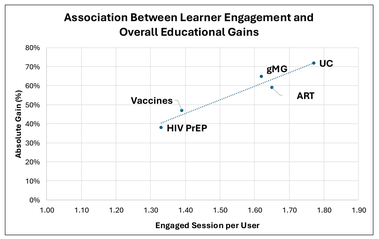
Learner Engagement

Activity	HIV PrEP	HIV ART	UC	gMG	Pediatric Vaccines
Learner Completion	83%	100%	100%	79%	100%
Learner Engagement by Activity‡	1.33	1.65	1.77	1.62	1.39
Overall Gains	38%	59%	72%	65%	47%
Knowledge Gains	40%	N/A	72%	64%	47%
Competence Gains	35%	59%	72%	66%	46%

- *Overall learner engagement calculated as the proportion of unique users generating at least one engaged session during the activity period.*
- *Engaged session is defined as ≥ 2 pageviews or a conversion event.*
- *Learner engagement by activity determined using infograph-ed analytics, defined as the proportion of unique learners generating at least one engaged session during the activity period.*







- Learner engagement was consistently high across activities, indicating sustained participation with the escape room–style instructional format.
- Activities with **higher engaged sessions** per learner demonstrated **larger absolute gains in knowledge and competence**. Programs averaging **≥ 1.6 engaged sessions** per user achieved **absolute gains of 59–72%,** whereas activities with ~1.3–1.4 engaged sessions per user showed more modest gains (38–47%).

RESULTS

Learner Engagement

Activity	HIV PrEP	HIV ART	UC	gMG	Pediatric Vaccines
Learning-Objective Decision Events	1,284	1,725	1,184	1,872	8,832
Unique Learners	326	375	382	302	1,244
Mean Decision-Point Interactions per learner	3.9	4.6	3.1	6.2	7.1

Decision-point interactions per learner quantify active engagement by measuring how often learners make learning-objective–linked clinical decisions within an activity. Decision-point interactions per learner reflect how learners cognitively engaged with the instructional content.

- Learners demonstrated **high levels of scenario-based clinical decision accuracy** across activities, with the majority selecting guideline-concordant diagnostic, treatment, and management pathways.
- Mean decision-point interactions per learner varied by activity, and higher decision-point density did not confer additional gains in learning or clinical decision accuracy.

Examples of activities and decision nodes:

HIV ART:
Representative decisions
- ART regimen selection in special populations
- Resistance testing indications
- Pregnancy management on ART

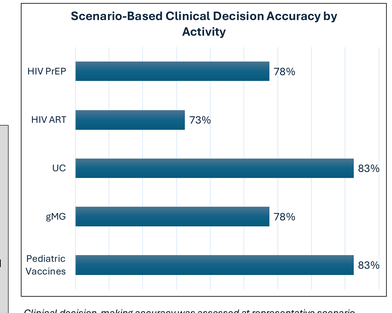
Observed accuracy
- Correct pathway selected by ~65–80% of learners on primary decisions

Interpretation
- Strong convergence on guideline-based management

Pediatric Vaccines
Representative decisions
- Presumptive vaccine recommendation strategy
- Addressing parental hesitancy with evidence-based communication

Observed accuracy
- Correct communication or management strategy selected by ~75-90% of learners

Interpretation
- Strong preference for guideline-endorsed communication approaches



Clinical decision-making accuracy was assessed at representative scenario-based decision nodes and defined as dominant selection of guideline-concordant clinical pathways.

LEARNER FEEDBACK

PrEP
- *"The most useful information I gained from this activity is understanding the importance of offering PrEP proactively to all sexually active patients by incorporating routine HIV and STI screening into standard preventive care."*
- *"I am more encouraged to inform my patients about PrEP."*
- *"The most useful information I gained from this activity is that PrEP can be prescribed by a clinician, regardless of their specialty."*

HIV ART:
- *"I learned to evaluate my patient profiles to select and tailor guideline-directed ART regimens based on individual needs, comorbidities, and long-term outcomes."*
- *"How to address treating HIV in more complex presentations, including pregnancy, resistance, and comorbidities."*
- *"Game style really helped reinforce HIV content."*
- *"This knowledge will be crucial in making informed, patient-centered decisions in real-world clinical practice."*

Ulcerative Colitis:
- *"Better able to integrate S1P therapies into the management of my patients."*
- *"I now know when and which patients to initiate biologics, testing, and monitoring for side effects."*
- *"Understanding the comprehensive lab work-up required before starting an S1P receptor modulator."*
- *"I can use measurement tools like labs used to evaluate while treating UC."*

Generalized Myasthenia Gravis (targeted therapy selection):
- *"Understanding the appropriate use of targeted therapies like complement inhibitors and FcRn antagonists in managing refractory AChR-positive gMG."*
- *"I am able to understand the treatments and the options for improvement in this patient presented in the activity."*
- *"The use of the MG QOL 15R to evaluate patients."*
- *"Realistic scenarios."*

Pediatric Vaccines (communication / hesitancy):
- *"The presumptive approach was new for me, and I will utilize it in my practice."*
- *"Improved confidence in interacting with caregivers when making recommendations for routine vaccination and providing data to support areas of concern/hesitancy."*
- *"Increased confidence regarding specific information to give when speaking with parents who are hesitant to vaccinate."*
- *"Feeling confident in how to approach vaccines."*
- *"Organized my thoughts to minimize my frustration in speaking with the hesitant."*

CONCLUSIONS

- Escape room–style, scenario-based instruction achieved consistently high learner engagement across activities.
- Learning gains were driven by instructional design efficiency, not interaction volume or session persistence.
- Activities with fewer, well-sequenced, consequential decision points produced the highest knowledge and competence gains.
- Scenario-based decision accuracy consistently converged on guideline-concordant pathways, supporting its validity as a measure of applied competence.
- High engagement alone did not explain performance differences across activities.
- Learner feedback indicated increased confidence and intent to change clinical practice.