

Gamification approach to addiction education for internal medicine residents

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Abstract

Background: People with a substance use disorder (SUD) outnumber the trained provider workforce. The Accreditation Council for Graduate Medical Education (ACGME) recognized this gap in 2022 and now requires addiction education for internal medicine (IM) residents. However, traditional lecture formats struggle to deliver education on this stigmatized condition with meaningful retention and changes in attitudes. Gamification is an evidence-based educational strategy with positive outcomes in graduate medical education, but to our knowledge, has not been used for an entire addiction curriculum. **Intervention:** This six-session IM-focused, stigma-free, interactive curriculum used published physician competencies for content selection. Games were matched to topics based on complexity and need for skill practice. Each hourly session included 10 minutes on introduction, 45 minutes on gameplay, and 5 minutes on feedback. This addiction curriculum was incorporated into existing didactics for IM residents where participants' comfort, psychological safety, and learning expectations were pre-established.

Methods: Sixteen IM residents participated in the curriculum. Curriculum evaluation was conducted using Kirkpatrick's four levels of evaluation. Resident feedback was obtained via online survey software at the conclusion of each session and behavior impact through an anonymous single-question prompt. We used descriptive statistics and summative content analysis to evaluate findings, respectively. **Results:** All residents were highly satisfied with the curriculum design and use of gamification. Residents reported high levels of engagement and learning, despite use of various games. Findings support an increase in medication prescribing and utilization of harm reduction strategies following curriculum implementation. **Conclusion:** Gamification may be a preferred educational strategy for addiction curriculum for IM residents. We plan to distribute our curriculum widely for further evaluation in health professions' programs.

Keywords: gamification, curriculum design, addiction education, internal medicine, graduate medical education

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Background:

More than 46 million Americans met criteria for a substance use disorder (SUD) in 2021,¹ more than double 2016 figures, while the physician workforce treating SUD, primarily psychiatrists, only increased by 1,000 in the same period.² Outside of psychiatry, primary care physicians also regularly see patients with SUD, yet few feel adequately prepared to care for these patients due to limited addiction exposure during residency.³⁻⁶ Recognizing the importance of expanding the competent physician workforce and preparing internal medicine (IM) residents to care for patients with addiction, the Accreditation Council for Graduate Medical Education (ACGME) began requiring

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addiction and pain management education and training for all IM residents in 2022.⁷

Although a step forward, this does not recognize the time and expertise limitations of IM faculty in creating SUD curriculum. To compound these barriers, SUDs carry a history of stigma, and while lecture-based educational strategies could adequately include addiction content, residents' retention and engagement tends to be poor with this strategy.⁸ To improve knowledge retention, some programs use interactive approaches, such as workshops and case-based discussions, to implement addiction curricula, but these formats may limit the amount of content covered.⁹⁻¹⁰ Both

approaches lack sufficient attention to learner motivation to optimize behavior change. IM faculty and residents need simple, yet complete addiction curricula delivered with engaging educational strategies to both fulfill ACGME requirements *and* impact the future physician workforce.

Intervention:

Gamification, “the use of game design elements to enhance academic performance”, offers a promising pedagogical approach for addiction curricula, combining targeted teaching points with high interactivity and learner-driven motivation.¹¹⁻¹³ Gamification has been employed in graduate medical education (GME) for many years, and one systematic review found positive results for gamification compared to control groups receiving traditional lectures in health professions education (HPE).¹² Gamification can change professional practice through better engagement with content, where traditional didactic methods fall short.¹⁴ Drawing on these findings, this curriculum used gamification, an evidence-based educational strategy, to deliver a stigma-free, interactive addiction education. This curriculum builds upon established physician competencies for addiction treatment and integrates repeated exposure of harm reduction and stigma-free principles.

Table 1 outlines the six sessions of the Gamified Addiction Curriculum for IM Residents. We used Kern’s Six Steps Framework, an evidence-based tool, to guide development.¹⁵ All learning objectives (LOs) were cross-referenced with the ACGME Internal Medicine residency requirements for addiction and pain medicine training and can be found in Table 1.^{7,16} The objective of the curriculum was to engage residents with addiction content to enhance the baseline addiction knowledge, skills, and attitudes of IM residents. Topics for the curriculum were determined through a mixed 5-point Likert scale (1 – not at all, 5 – very much) and multiple-choice content needs assessment, using language from the Association for Multidisciplinary Education and Research in Substance use and Addiction’s (AMERSA) Physician Competencies to formulate questions, and input from the program director. Overall, residents rated their knowledge and comfort as a 3/5, but most residents correctly answered the content questions. This mixed baseline may demonstrate a gap in residents implementing addiction treatment skills despite having the knowledge. Questions were reviewed by an addiction expert, an internist, and a GME expert. The curriculum was delivered August 2022 to July

2023 to 16 IM residents – six PGY-1’s, eight PGY-2’s, and four PGY-3’s; ages ranged between 26 and 31 and gender was split 8 male, 8 female. Each session was facilitated by the same single clinical pharmacist with addiction expertise, although sessions were purposely designed for any primary care provider who cares for patients with substance use disorder to be able to deliver. Gamification drove educational design and required no additional resources outside of Microsoft PowerPoint and Word. Each topic was matched to a game style that was best suited to the content and LOs. Content topics requiring greater detail, like stimulant use and smoking cessation, were matched to games with multiple categories, like Family Feud™ and Jeopardy™. Skills-based topics, like interpreting urine drug screens and initiating medications for alcohol use disorder (AUD) required active problem-solving through role playing and cases. Competition was embedded within each game: splitting residents into teams, using points for scoring and prizes for winners. As residents progressed through the game, the facilitator would provide coaching as needed, with opportunity for residents to ask clarifying questions. Communication skill-building was integrated through cases and simulations with facilitator feedback provided as needed.

This addiction curriculum was incorporated into an existing didactic schedule for IM residents at our medical site where participants’ comfort, psychological safety, and learning expectations were pre-established. The curriculum’s six sessions were delivered over one year to reinforce addiction content longitudinally.¹⁷ Session parameters were set a-priori: one-hour, conference room with white board, one facilitator. Each session was identical in format: 10-minute introduction and game instructions, 45-minute gameplay, and five-minute feedback.

Methods:

This curriculum evaluation was deemed quality improvement by the local review board. We used continuous quality improvement and resident feedback to implement, evaluate, and adapt the curriculum. We focused on the first three levels of the Kirkpatrick evaluation model: reactions and satisfaction; learning; and behavior.¹⁸ All residents were required to attend all sessions, so resident satisfaction with the course and knowledge of content was gathered using a brief online survey at the end of each session; data was collected for resident perceived effectiveness of the gamified

Table 1: Curriculum Sessions with Corresponding Learning Objectives and Gamification Strategy

Session Topic	Learning Objectives	Gamification Strategy
Smoking Cessation	<ul style="list-style-type: none"> -Select appropriate dosing of pharmacotherapies -List the harms and benefits of e-cigarettes -Recognize free resources for patients and clinicians -Formulate basic treatment plans based on patient characteristics/preferences 	Jeopardy™ - a classroom modified version of the classic television game with categories related to smoking cessation treatment. Residents were split into two teams and points were tracked to determine the winner.
Urine Drug Screen (UDS) Interpretation and Clinical Decision Making	<ul style="list-style-type: none"> -Compare and contrast screening and confirmatory testing, identify situations where confirmatory testing is necessary -Recognize common false positives and drug-drug interactions that can skew UDS results -Develop patient-centered care plans based on aberrant UDS results -Apply principles of harm reduction for aberrant UDS 	Role playing – scenarios with provider and patient prompts were created; roles were randomly selected by pulling out of a hat. Partnered patient-provider would go through prompts with coaching from facilitator.
Alcohol Use Disorder (AUD) Pharmacotherapy	<ul style="list-style-type: none"> -Practice how to discuss AUDIT-C screening results with patients -Categorize pharmacotherapy for AUD based on a variety of drug properties from dosing and FDA-approval to adverse effect profiles and contraindications -Recommend a medication (with dose and directions for use) based on patient characteristics in given case examples 	Category sorting – drug-specific information like dosing, side effects, and monitoring flashed on the screen and residents had to determine which medication it belonged to. They each had a printed table with the five medications discussed.
Cannabis Use and CBD Products	<ul style="list-style-type: none"> -Review basic history and known components of cannabis -Explain the timeline for cannabis withdrawal and symptoms -Make at least 3 recommendations to patients who use cannabis (medication or harm reduction) 	Two Truths and a Lie – Residents were in pairs; slides were created with two true statements regarding a topic and one false statement. Residents had to choose which was the false statement.
Stimulant Use Disorder	<ul style="list-style-type: none"> -Describe pharmacologic mechanisms of action of methamphetamine and cocaine -Predict medical complications from chronic stimulant use -Recommend treatment for people with stimulant use disorder -Provide harm reduction recommendations to patients who use stimulants 	Family Feud™ - cohort of residents was split into two teams. This was a PowerPoint modified version of the television gameshow. Each team had two wrong answers before the other team could “steal” the question.
Final Review of Previous Sessions	<ul style="list-style-type: none"> -Identify knowledge retention of previously taught material -Summarize key addiction treatment takeaways 	Jeopardy

curriculum, defined as “all LOs addressed”, if material was relevant to primary care practice, if it was a psychologically safe space, the level of engagement with the games, and key takeaways. We reviewed responses to feedback surveys immediately following each session. We assessed

overall practice change and implementation of addiction knowledge at the end of the sixth (final) session by asking a single-item prompt, “What, if any, practice changing moments in either the outpatient or inpatient setting did you have because of this curriculum?” If a resident did not have an

example to cite, they left the card blank. Summative content analysis drove our review of written responses.¹⁹

Ethical Considerations:

Participation in didactics is a required part of the residency program and this is understood upon entering the program. This curriculum was incorporated into that existing education and did not put any further burden on trainees. Residents' psychological safety and comfort in the space was a top priority and guided the ground rules reviewed prior to commencing each session. All feedback surveys were voluntary, and participants were consented and made aware that their responses could be used to assess the curriculum. To maintain anonymity, survey data was deidentified and the facilitator was not present during collection of the writing prompt. The facilitator did not hold any supervisory role over participants and stated at the start of each session that participation did not impact training evaluations.

Results:

Most residents felt the curriculum effectively addressed each learning objective. Residents found content was relevant and interactive and was taught in a psychologically safe environment (cumulative survey averages all >4.4/5). Standard deviations were less than one. Residents' perceived effectiveness of the gamification strategies was high, averaging 4.55 out of 5.

Thirty-seven responses listed one thing residents learned throughout the curriculum; the most frequently cited categories included harm reduction strategies, followed by medication information. Screening tools and general resources were less cited. Harm reduction examples varied from learning new strategies like, "Recommend patients who smoke cannabis switch to edibles to reduce lung damage," to repurposing old strategies in new ways, "I now know I can provide fentanyl test strips to patients who use cocaine, not just opioids." Examples of medication information takeaways included, "if discontinuing topiramate, it needs to be tapered to avoid withdrawal symptoms."

Among the 22 suggestions for improvement, three categories emerged in content analysis: time management, content amount, and game modifications. The most cited area for improvement was to better manage session time (11/22, 50%).

Two-thirds of residents (66%) responded to the single-question prompt with a practice changing example. Eight behaviors were related to AUD pharmacotherapy, four to both smoking cessation and cannabis/CBD products, and one response related to the stimulant session. Some residents cited more than one behavior, but none mentioned interpreting drug screens. We categorized behaviors into recommended harm reduction, ordered pharmacotherapy, and referred to external resources. Residents had more changes in prescribing pharmacotherapy (n=12) than the other two categories combined. Five harm reduction recommendations were cited, and four residents referred patients to new resources. Below are sample responses.

Resident 1: Thanks to this curriculum I was able to start a patient on varenicline for smoking cessation. It was also helpful to learn about marijuana from an education standpoint.

Resident 2: I had a patient nearing discharge and I engaged him on his alcohol use disorder. We agreed to start naltrexone before discharge, rather than telling him to follow-up with his PCP to prescribe it, like I used to.

Resident 3: I advised a patient to use edibles rather than smoking marijuana for harm reduction and recommended using them later in the day. I also felt comfortable prescribing naltrexone for the first time for a patient with alcohol use disorder.

Discussion:

Gamification is an evidence-based educational strategy for GME. Addiction education and training can expand the IM physician workforce capable of treating people who use substances. Due to associated societal stigma, residents may present to addiction lectures with established biases on the disorders. Although lectures can cover key addiction content, the passivity of this educational method has poor outcomes in changing attitudes and behavior.¹¹⁻¹⁴ Gamification, to our knowledge, has never been used as the sole educational strategy for an entire GME curriculum, but can better engage learners, necessary for delivering impactful addiction content.

Gamification is a globally understood concept. Although the games we adapted for this curriculum may not be internationally known, most are familiar with competition and gameplay as a general concept. We use these games as examples of how few resources are needed to deliver interactive GME.

Most residents cited examples of applying the addiction content in practice, demonstrating a potential effect of this curriculum on skill-building. Medication prescribing and harm reduction strategies were frequently mentioned, which may mean they are the most practical for IM residents to learn and are topics effectively retained through gamification. This may also demonstrate residents' understanding and acceptance of non-abstinence-based models for addiction treatment, a potential opportunity to improve the stigma landscape of addiction treatment. No one cited interpreting urine drug screen (UDS); this could mean residents were already familiar with this skill or it is less relevant to everyday primary care practice.

Broken down by content, most behaviors were AUD-related, suggesting alcohol is the most encountered substance in practice. This matches prevalence data of more than 16 million Americans reporting past-month heavy drinking in 2022.²⁰ Our findings align with national initiatives to expand prescribing of medications for AUD in primary care and showcase the utility of gamified curriculum to tackle these initiatives.²¹

Despite benefits of interactive activities, theoretically the element of competition can hamper

learning, where “winning” becomes the primary outcome.¹² Facilitators should prepare to reorient learners to the main goal of gamification as needed. We recommend balancing learning within clearly articulated competitive boundaries.²² Using validated ways to observe practice changing behavior in further studies, like chart review or direct observation to confirm residents self-reported behaviors, is also recommended.

Conclusions:

Gamification is an evidence-based educational methodology but has not been utilized for addiction education. This curriculum capitalizes on the effectiveness of combining addiction content with interactive educational methods for SUD skill-building.^{8, 25-29} Participants found sessions to be engaging, psychologically safe, and encouraging to change practice behavior, implementing new skills. Alcohol and harm reduction content was most impactful for residents' practice behavior. We are developing a revolving three-year curriculum to align with traditional IM residency programs' three year duration, and plan to expand addiction education in this trainee population.

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References

1. DHHS. SAMHSA Announces National Survey on Drug Use and Health Results Detailing Mental Illness and Substance Use Levels in 2021. Published 2023. Accessed April 22, 2024. <https://www.hhs.gov/about/news/2023/01/04/samhsa-announces-national-survey-drug-use-health-results-detailing-mental-illness-substance-use-levels-2021.html>.
2. Association of American Medical Colleges. Physician Specialty Data Report. AAMC.org. 2008-2022, Accessed April 20, 2024. <https://www.aamc.org/data-reports/workforce/report/physician-specialty-data-report>.
3. Anderson P, Laurant M, Kaner E, Wensing M, Grol R. Engaging general practitioners in the management of hazardous and harmful alcohol consumption: results of a meta-analysis. *Journal of Studies on Alcohol*. 2004;65(2):191-199. <https://doi.org/10.15288/jsa.2004.65.191>
4. Anderson P, Jané-Llopis E. How can we increase the involvement of primary health care in the treatment of tobacco dependence? A meta-analysis. *Addiction*. 2004;99(3):299-312. <https://doi.org/10.1111/j.1360-0443.2003.00672.x>
5. Deehan A, Templeton L, Taylor C, Drummond C, Strang J. Low detection rates, negative attitudes and the failure to meet the “Health of the Nation” alcohol targets: Findings from a national survey of GPs in England and Wales. *Drug and Alcohol Review*. 1998;17(3):249-258. <https://doi.org/10.1080/09595239800187081>
6. Roche AM. Increasing Primary Care Providers' Willingness to Intervene in Alcohol- and Drug-Related Problems: A Review. *Substance Abuse*. 1996;17(4):201-217. <https://doi.org/10.1080/08897079609444750>

7. ACGME. ACGME Program Requirements for Graduate Medical Education in Internal Medicine . Published July 1, 2022. Accessed September 1, 2022. https://www.acgme.org/globalassets/pfassets/programrequirements/140_internalmedicine_2022v4.pdf
8. El-Guebaly N, Toews J, Lockyer J, Armstrong S, Hodgins D. Medical education in substance-related disorders: components and outcome. *Addiction*. 2000;95(6):949-957. <https://doi.org/10.1046/j.1360-0443.2000.95694911.x>
9. Cantone RE, Hanneman NS, Chan MG, Rdesinski R. Effects of Implementing an Interactive Substance Use Disorders Workshop on a Family Medicine Clerkship. *Family Medicine*. 2021;53(4):295-299. <https://doi.org/10.22454/fammed.2021.399314>
10. Muzyk A, Mullan P, Andolsek K, et al. A Pilot Interprofessional Course on Substance Use Disorders to Improve Students' Empathy and Counseling Skills. *American Journal of Pharmaceutical Education*. 2019;84(4):7415. <https://doi.org/10.5688/ajpe7415>
11. Deterding S, Khaled R, Nacke L, Dixon D. Gamification: Toward a Definition. *CHI*. Published online May 7, 2011. Accessed September 12, 2023. <http://gamification-research.org/wp-content/uploads/2011/04/02-Deterding-Khaled-Nacke-Dixon.pdf>
12. van Gaalen AEJ, Brouwer J, Schönrock-Adema J, Bouwkamp-Timmer T, Jaarsma ADC, Georgiadis JR. Gamification of health professions education: a systematic review. *Advances in Health Sciences Education*. 2020;26(2). <https://doi.org/10.1007/s10459-020-10000-3>
13. Kim J, Castelli DM. Effects of gamification on behavioral change in education: a meta-analysis. *International Journal of Environmental Research and Public Health*. 2021;18(7):3550. <https://doi.org/10.3390/ijerph18073550>
14. O'Brien MA, Freemantle N, Oxman A, Wolf F, Davis D, Herrin J. Continuing education meetings and workshops: effects on professional practice and health care outcomes. *BMC News and views*. 2001;1(S3). <https://doi.org/10.1186/2048-4623-1-s3-pe118>
15. Thomas PA, Kern DE, Hughes MT, Chen BY. *Curriculum Development for Medical Education: A Six-Step Approach*. Johns Hopkins University Press; 2016.
16. Mountain-Ray S, Simeone C, Hadland SE, Finnell DS, Northup R, MacLane-Baeder D. Challenges and new horizons in substance use and addictions: Overview of the 2019 conference of the Association of Multidisciplinary Education and Research in Substance use and Addiction (AMERSA). *Substance Abuse*. 2019;40(4):389-391. <https://doi.org/10.1080/08897077.2019.1695039>
17. McSparron JI, Vanka A, Smith CC. Cognitive learning theory for clinical teaching. *The Clinical Teacher*. 2018;16(2):96-100. <https://doi.org/10.1111/tct.12781>
18. Kirkpatrick, D. Evaluating Human Relations Programs for Industrial Foreman and Supervisors. The University of Wisconsin – Madison; 1954.
19. Hsieh HF, Shannon SE. Three Approaches to Qualitative Content Analysis. *Qualitative Health Research*. 2005;15(9):1277-1288. <https://doi.org/10.1177/1049732305276687>
20. Section 2 PE Tables – Results from the 2021 National Survey on Drug Use and Health: Detailed Tables, SAMHSA, CBHSQ. Samhsa.gov. Published 2021. Accessed March 15, 2024. <https://www.samhsa.gov/data/sites/default/files/reports/rpt39441/NSDUHDetailedTabs2021/NSDUHDetailedTabs2021/NSDUHDefTabsSect2pe2021.htm#tab2.29atistics>
21. Health (OASH) O of the AS for. The U.S. Department of Health and Human Services Is Taking Action to Strengthen Primary Care. www.hhs.gov. Published November 7, 2023. <https://www.hhs.gov/blog/2023/11/07/us-department-health-and-human-services-taking-action-strengthen-primary-care.html>
22. Buja LM. Medical education today: all that glitters is not gold. *BMC Medical Education*. 2019;19(1). <https://doi.org/10.1186/s12909-019-1535-9>
23. McCoy L, Lewis JH, Dalton D. Gamification and multimedia for medical education: a landscape review. *The Journal of the American Osteopathic Association*. 2016;116(1):22. <https://doi.org/10.7556/jaoa.2016.003>
24. Johnson L, Adams Becker S, Estrada V, Freeman A. *NMC Horizon Report: 2015 Higher Education Edition*. Austin, TX: The New Media Consortium; 2015. Accessed November 19, 2023. <http://cdn.nmc.org/media/2015-nmc-horizon-report-HE-EN.pdf>
25. Schwartzstein RM, Roberts DH. Saying goodbye to lectures in medical school — paradigm shift or passing fad? *New England Journal of Medicine*. 2017;377(7):605-607. <https://doi.org/10.1056/nejmp1706474>

26. AW. Screening for alcoholism by life-style risk assessment in a community hospital. *Archives of Internal Medicine*. 1991;151(5):958. <https://doi.org/10.1001/archinte.1991.00400050102019>
27. Davis DA. Evidence for the effectiveness of CME. A review of 50 randomized controlled trials. *JAMA: The Journal of the American Medical Association*. 1992;268(9):1111-1117. <https://doi.org/10.1001/jama.268.9.1111>
28. Davis DA. Changing physician performance. A systematic review of the effect of continuing medical education strategies. *JAMA: The Journal of the American Medical Association*. 1995;274(9):700-705. <https://doi.org/10.1001/jama.274.9.700>
29. T, Newton WP. Promoting active learning in residency didactic sessions. *Family Medicine*. Published online May 26, 2021. <https://doi.org/10.22454/fammed.2021.894932>