Teaching Ethical Use of AI

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Objectives

- Describe the limitations of artificial intelligence (AI)-generated content, including hallucinations, bias, outdated data, and fabricated references.
- Identify authoritative drug information sources for checking the accuracy of AI-generated content.
- Explain how the four ethical principles (autonomy, beneficence, non-maleficence, justice) apply to privacy, accountability and content integrity concerns with AI in pharmacy practice.
- Discuss a pharmacy program's obligation to teach AI use, including what to teach and how to assess it.
- Classify uses of AI in pharmacy education and drug information as appropriate, cautionary or inappropriate based on academic integrity standards.



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Financial Disclosure

Austin T. Mondloch declares that he has not had a relevant affiliation or financial arrangement with any ineligible companies that may have a direct interest in the subject matter of this continuing pharmacy education activity within the past 24 months.

Additionally, members of the District 4 Planning Committee and NABP staff involved in the planning of this activity do not have any current affiliation or financial arrangement with any ineligible companies that may have a direct interest in the subject matter of NABP's CPE program within the last 24 months.

AI Disclosure:

The Claude add-on in PowerPoint was utilized for formatting and design while the PowerPoint was being developed in September 2026.



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Describe the limitations of AI-generated content, including hallucinations, bias, outdated data and fabricated references, and verify AI output against authoritative drug information sources



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Ethical Use of AI

Hallucinations	Bias	Mediocre quality
Intellectual property	No accountability	Lack of values
Not current	Resource hungry	Security risks



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Limitations of AI-generated information

Can you recall any specific experiences where you encountered difficulties with AI in the past?

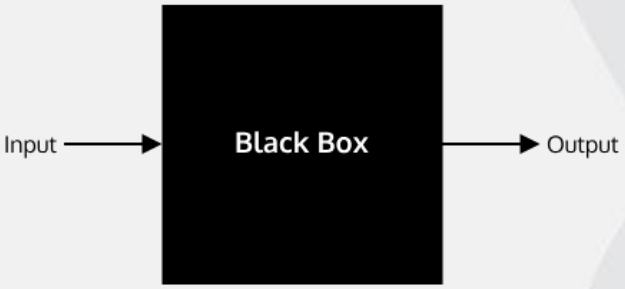
Bias:	models pick up common patterns from the internet
Cut-off dates:	information may already be out of date
Hallucinations:	imaginary answers, stated confidently
Referencing:	some models cannot supply sources at all
Accuracy:	incomplete or general answers are not a replacement for clinical judgment
Validation:	confirm against Lexidrug, Micromedex or professional guidelines

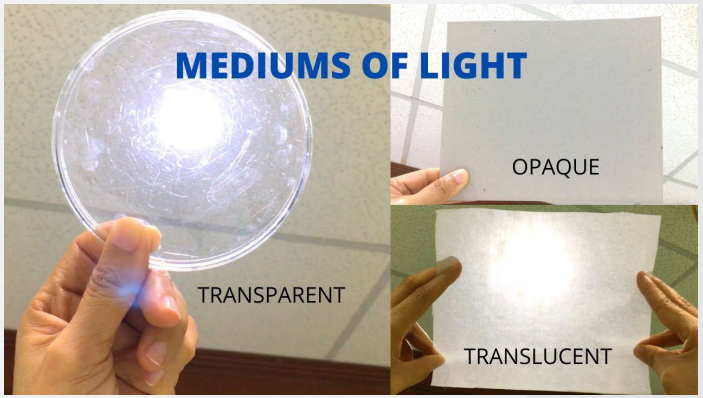
Black Box Algorithm

"…, a black box algorithm is opaque, meaning that the physician cannot offer an account of how the algorithm came to its recommendation or diagnosis."

"… even if recommendations provided by the medical AI system are trusted because the algorithm itself is reliable, these should not be followed blindly without further assessment."

"If the algorithm makes a mistake, for example, by making the wrong diagnosis or recommending the wrong treatment, who should be responsible for these mistakes?"





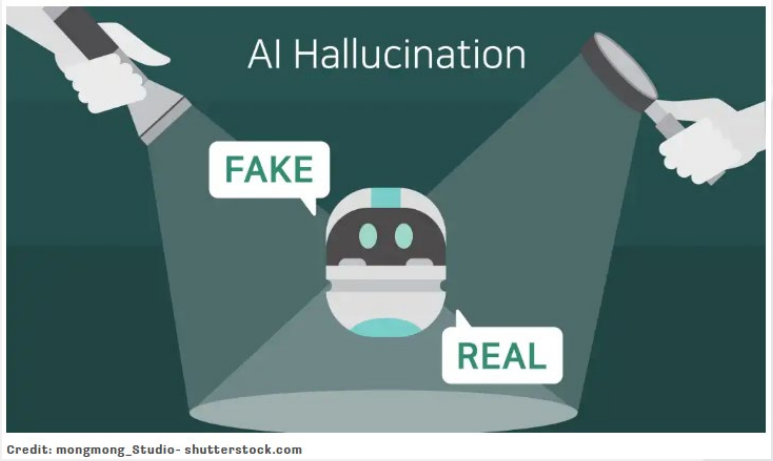
Durán JM, Jongsma KR. Who is afraid of black box algorithms? On the epistemological and ethical basis of trust in medical AI. *J Med Ethics*. Published online March 18, 2021. doi:10.1136/medethics-2020-106820

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OpenAI Admits…

"Large language models will always produce plausible but false outputs, even with perfect data, due to fundamental statistical and computational limits — mathematically inevitable, not just engineering flaws."

- Benchmarks reward confident answers and barely penalise wrong ones, or admissions of uncertainty
- Performance optimisation pulls against factual reliability
- "Hallucination" stigmatises both AI systems and people who experience hallucinations, and propose "AI misinformation" instead



Swain G. Computerworld. September 18, 2025.
Hatem R, Simmons B, Thornton JE. Cureus. 2023;15(9):e44720.

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Fabricated citations in the literature rose 12-fold in three years

12-fold

rise in fake citations per 10,000 papers in PubMed Central, from about 4 through 2023 to about 57 by early 2026

40–50% of AI-generated citations are fabricated

Over 80% named-entity error rate in some models

Up to 95% hallucination rate from vague prompts

- An audit of 2.5 million papers and 97.1 million references found 4,046 fabricated citations across 2,810 papers
- Detection tools help, but the authors conclude human verification cannot be replaced

Giray L, et al. *Naunyn Schmiedebergs Arch Pharmacol*. 2026;399(11):16827-16839.

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Case-report

What ChatGPT-4o read
- Rheumatoid arthritis, not osteoarthritis
- Marginal erosions
- Periarticular osteopenia
- Ulnar deviation and subluxation

Labs
- Rheumatoid factor = negative
- Anti-CCP = negative
- ANA = negative
- ESR 12 mm/h
- hsCRP 0.1 mg/dL

What radiology read
- Periarticular osteopenia
- Degenerative change, IP joints
- No rheumatoid arthritis

Asked why, the AI gave three reasons of its own
- **Bias in training data:** rheumatoid cases overrepresented, or visually close to degenerative ones
- **No clinical context:** it never saw age, symptom duration, or inflammatory markers
- **Plausible fabrication:** it picks the likeliest continuation, not the verified fact

Asked to treat, the AI recommended methotrexate. The physician prescribed an NSAID.
Asked whether it had hallucinated, ChatGPT-4o called that “highly probable.”

Kim DH. *Korean J Fam Med*. 2026;47(2):178-181.

Six risk areas to check in an AI-assisted response

Clinical question analysis	Did the AI answer the main question at hand?
Literature search strategy	Did the AI hallucinate references?
Plagiarism Concerns	Was the response copied and pasted directly from AI?
Accurate Information	Was the resource the AI used accurate?
Evaluation of study quality	Do students know what to look for to assess quality?
Formulating evidence-based conclusions	Did the AI only agreeing with the author?



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Analyze the four ethical principles (autonomy, beneficence, non-maleficence, justice) as applied to AI in pharmacy practice, and identify safeguards for privacy, accountability and content integrity



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Four Principles, and What Clinicians Say

Non-Maleficence
Do not inflict harm
Privacy and data protection – 107 papers
Safety, automation bias, skill erosion
Clinicians: error reaches the patient

Respect for Autonomy
Respect patients' own choices
Transparency – 93 papers
Informed consent, confidentiality, clarity
Clinicians: overreliance dulls judgment

Justice
Distribute benefits fairly
Bias and discrimination – 80 papers
Unequal performance across patient groups
Clinicians: bias in diagnosis

Beneficence
Act to improve patient welfare
Accuracy and efficiency – 75 papers
Quality assurance
Clinicians: limits on complex cases

Clinicians also say responsibility is unclear when AI contributes to error, and there is no single clinician view.

Gorelik AJ, et al. *Front Digit Health*. 2025;7:1662642.
Hasan HE, et al. *BMC Med Ethics*. 2024.
Hou J, et al. *Nurs Ethics*. 2026;33(2):428-449.

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Input, System, Application

AI can reinforce biases from unrepresentative datasets

Reproducibility is often limited by proprietary algorithms and datasets

Ethical challenges include accountability, transparency, and explainability

Researchers must adopt fairness frameworks and emphasize algorithm auditing

Hoffmann B. Biases in AI systems: Input, system, and application-level considerations. *Front Digit Health*. 2025;2:1614105. doi:10.3389/fdgth.2025.1614105

You are accountable, not the AI

Because it is a learning language model, it tells you what you want to hear!

If you make a decision based on information provided from AI, and that patient is harmed, you are the one in trouble, not the AI.

Trust, Scrutiny, or Collaboration?

14 points

lower diagnostic reasoning scores for physicians given 50% erroneous LLM suggestions

Randomized trial, Qazi et al.

What the trial found

- Consultation was voluntary
- Participants had finished a 20-hour AI literacy program
- More experienced physicians were more susceptible

Why it matters

- If following AI were inherently biased, the fix would be blanket skepticism
- The fix is trust calibration: knowing when the AI is right
- Match the strategy to whose errors are worse — follow the human, follow the AI, or check each other

Zwaan L, Rodman A, Shimizu T. *NEJM AI*. 2026;3(5).

Safeguards

Safeguards

- **Data quality:** diverse, representative datasets
- **Oversight:** a human in the loop on every critical decision
- **Compliance:** professional, ethical and regulatory alignment
- **Education:** train on the risks, not just the uses

What they answer to

- **Patient safety and privacy:** HIPAA, GDPR
- **Accountability:** authorship and reporting
- **Discipline guidelines:** FDA, IMDRF, ISMP
- **Integrity:** plagiarism and fabricated content

Hoffmann B. Front Digit Health. 2025;2:1614105.
Zhang Y, Li H, Wu J. arXiv. 2023. doi:10.48550/arXiv.2309.1217
Khalifa M, Albadawy M. Comput Methods Programs Biomed Update. 2024;5:100145.

Evaluate a program's obligation to teach AI use, including what to teach and how to assess it



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Are programs obligated to train students to use AI?

Yes

- AI is already embedded in evidence-based decision support
- Graduates enter practice where AI is in the workflow
- The Oath carries a professional and ethical responsibility
- Someone must train and correct these models, including their bias

Not yet

- The timing is premature while platforms change monthly
- Reliance risks undermining critical thinking and professionalism
- Ethical, regulatory and liability questions are unresolved
- Curricular room has to come from somewhere

- Debated by two Academic Leadership Fellows Program teams at the AACP Interim Meeting, February 2024
- Neither side disputed that academic integrity work has to run alongside it

Nagel AK, Diaz-Cruz E, Edwards KL, et al. Am J Pharm Educ. 2026;90(3):101951.
Mortlock R, Lucas C. Explor Res Clin Soc Pharm. 2024;15:100481.

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Cheating is not the problem; preparing students for AI practice is

Where AI helps faculty

- Draft problem-based cases and exam questions
- Build discussions around the literature
- First drafts of syllabi, outlines, letters
- Set AI answers against student answers, then critique both

What AI cannot do

- Know which questions to ask, and why
- Give reliable moral advice
- Supply an expert's nuanced judgment

Augmented intelligence: pharmacist plus AI. Their call: run faculty workshops on the pedagogical and ethical issues, and revise curricula now, or others will plan the profession's AI future without us.

Cain J, Malcom DR, Aungst TD. *Am J Pharm Educ.* 2023;87(10):100135.

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What to teach, how to teach it, how to assess it

Teach this

- Anticipated harms, starting with bias
- The basic principles of medical ethics
- Data protection in clinical use
- User liability when AI is wrong

Teach it this way

- Real cases, not abstractions
- Small groups
- Interactive seminars
- Theory paired with hands-on use

Assess differently

- AI as idea generator only
- Rubrics rewarding source verification
- Rationale for clinical decisions
- Documented thought process

The gap: reviews agree curricula need AI skills, pharmaceutical science, ethics and regulatory literacy together, but no empirically validated programme exists, and reported interventions go unevaluated.

Weidener L, Fischer M. Perspect Med Educ. 2023;12(1):399-410.
Arshad K. J Ethics Entrep Technol. 2026;6(1):38-55.

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Apply academic integrity standards and distinguish appropriate, caution and inappropriate uses of AI in pharmacy education and drug information



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Ethical Standards

Apply the highest ethical standards when using AI

- Ensure all work submitted is your own, representing your unique voice and ideas
- Follow your professors' and your institution's rules for acknowledging or citing AI use
- Any information you share with an AI tool is no longer private

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General Guidance

Good

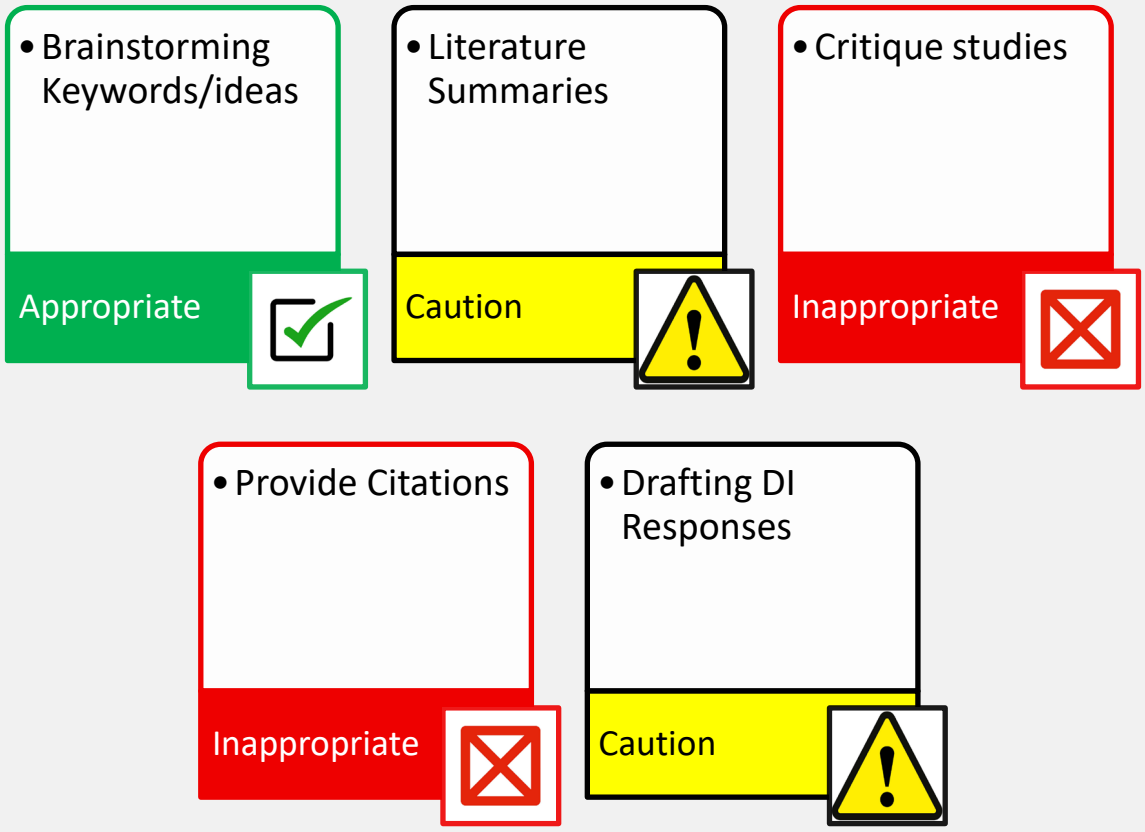
- Clarify concepts
- Summaries of articles
- Suggestions on writing
- Brainstorm

Be Careful

- Ask for advice, not for it to do it for you
- Always paraphrase, do not copy/paste
- Revise work independently

Anderson A, Case B, Evans A, et al. Sample Syllabus Statements and Activities for Using AI in School. Course Hero. https://facultyclub.coursehero.com/teaching-with-technology/sample-syllabus-statements-and-activities-for-using-ai/

How Students are Using AI



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Navigating AI use

A few musts…

If students ask AI a clinical question

- Must identify where the AI is pulling the information

If students ask AI to critique literature

- AI typically agrees with the authors' conclusion
- Will harm critical thinking skills moving forward

If students ask AI for literature

- AI may miss many relevant articles
- Must complete their own literature search to check results

If students ask AI to perform a calculation

- Must complete their own calculation to check results



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Self-Assessment Question

A student uses AI to critique a journal article for journal club. What is the main concern with relying on its critique?

1. AI tends to be overly critical of study methods
2. AI cannot evaluate statistical analyses
3. None, as long as the AI tool is cited
4. AI tends to agree with the authors' conclusions

Self-Assessment Answer

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Self-Assessment Question

Newer AI models fabricate references less often than earlier versions. How should that change a pharmacist's verification workflow?

1. Spot-checking a sample of the citations is sufficient once a current model is used
2. It should not change: every citation still requires verification against the primary source
3. Verification can be left to the journal's peer reviewers
4. Verification is needed only for clinical questions, not for background reading

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Self-Assessment Question

A hospital uses an AI tool to flag patients for pharmacist medication review. An audit shows it flags fewer high-risk patients from groups underrepresented in its training data. Which ethical principle does this most directly challenge?

1. Respect for autonomy
2. Beneficence
3. Justice
4. Non-maleficence

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Thank you!!

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