

Learning to Challenge Unsafe Medication Decisions: A Conceptual Framework for Developing Epistemic Agency, Speaking-Up Capability, and Accountable Clinical Judgment in Pharmacy Education

Emily Carter¹, James Whitfield^{2*}, Sarah Bennett³, Michael Tan⁴

¹Department of Pharmacy Education and Clinical Reasoning, School of Pharmacy, University of Toronto, Toronto, Canada.

²Department of Pharmacy Practice and Patient Safety, Warwick Business School, Coventry, United Kingdom.

³Department of Clinical Pharmacy and Experiential Learning, School of Pharmacy, University of Manchester, Manchester, United Kingdom.

⁴Department of Pharmacy Education and Health Professions, National University of Singapore, Singapore, Singapore.

*E-mail ✉ james.whitfield@wbs.ac.uk

Abstract

Medication safety education frequently assesses whether pharmacy students recognize medication-related problems and apply appropriate procedures, yet safe professional judgment also requires deciding when available information warrants challenging another person's decision. Recognition, interpretation, professional challenge, escalation, and accountable follow-through constitute related educational capabilities with different evidentiary and organizational requirements. This conceptual article develops an Epistemic Agency and Accountable Judgment Framework to explain these distinctions and their implications for pharmacy education. Drawing on scholarship concerning pharmacy clinical reasoning, epistemic agency, speaking up, psychological safety, simulation, and professional assessment, the framework positions warranted concern at the intersection of clinical evidence, uncertainty, professional responsibility, and opportunity for action. It distinguishes the learner's capacity to formulate a justified challenge from the interpersonal and institutional conditions governing whether that challenge receives an adequate response. The framework also differentiates educational indicators, including factual knowledge, expressed confidence, simulated behavior, and supervised workplace performance, without treating them as interchangeable evidence of clinical safety. Its contribution is an explanatory basis for designing learning experiences that connect medication-error recognition with professional voice, justified escalation, and responsibility for subsequent action. The framework requires prospective educational evaluation before claims can be made regarding sustained practice behavior or patient outcomes.

Keywords: Medication safety, Epistemic agency, Speaking up, Clinical reasoning, Experiential pharmacy education, Accountable judgment

Introduction

Pharmacy students may identify an apparent medication-related problem yet remain uncertain whether the

available evidence warrants questioning an order, requesting clarification, or escalating a concern. Such uncertainty can arise even when relevant information is accessible. A qualitative investigation of pharmacy students' reasoning during medication-error cases identified distinguishable activities involved in understanding problems and selecting responses [1]. Research examining students' experiences with simulated electronic health records likewise identified difficulties involving clinical work-up, interpretation of relevant information, and ambiguity in medication-related decisions [2]. These findings locate an important

Access this article online

<https://smerpub.com/>

Received: 25 April 2026; Accepted: 24 July 2026

Copyright CC BY-NC-SA 4.0

How to cite this article: Carter E, Whitfield J, Bennett S, Tan M. Learning to Challenge Unsafe Medication Decisions: A Conceptual Framework for Developing Epistemic Agency, Speaking-Up Capability, and Accountable Clinical Judgment in Pharmacy Education. *Ann Pharm Educ Saf Public Health Advocacy*. 2026;6(2):132-42. <https://doi.org/10.51847/DENK9ZZSVQ>

educational problem between possessing medication knowledge and exercising judgment in a specific clinical situation.

The problem becomes more complex when a learner's conclusion conflicts with a decision already made by another healthcare professional. Clinical decision-support alerts may assist recognition, but they can also shape the circumstances under which students identify a problem and recommend action. Simulation research has examined student responses to medication-related problems both with and without such alerts [3]. Educational simulations incorporating medication-error analysis have also reported changes in student knowledge, skills, and attitudes [4]. These studies establish relevant opportunities for teaching and observing aspects of medication safety; their outcomes do not establish whether learners will challenge unsafe decisions appropriately during subsequent clinical practice.

A conceptual account of this educational problem must distinguish several judgments. First, a learner needs to notice a potentially consequential medication-related discrepancy. Second, the learner must interpret the available evidence and determine whether the concern is sufficiently justified to communicate. Third, the concern must be expressed through an appropriate professional interaction. Fourth, an inadequate response may require further escalation. Finally, the learner's responsibility extends to documenting, reassessing, or otherwise following through on the concern within the limits of their role.

These activities interact, but success in one does not logically establish success in the others. The distinction is especially important in pharmacy education, where assessment can capture correct answers more readily than the conditions surrounding a justified challenge or the consequences of another professional's response.

This article develops an Epistemic Agency and Accountable Judgment Framework to explain how pharmacy curricula can address these distinct capabilities. The framework connects clinical reasoning with the authority to question, the practical ability to raise concerns, and the responsibilities that arise after a concern is expressed. It offers a conceptual basis for curricular and assessment design without claiming to report an implemented intervention, a validated educational instrument, or demonstrated reductions in medication-related patient harm.

Medication safety education beyond knowledge and procedural compliance

Medication safety knowledge includes pharmacotherapy, prescribing and dispensing requirements, interaction risks, contraindications, monitoring, and the procedures through which medication-related problems are addressed. Its application nevertheless depends on what the learner notices within a particular patient record, how competing information is interpreted, and whether further verification is considered necessary. Eye-tracking and verbal-protocol research in pharmacy education has examined the relationship between attention to relevant case information and clinical reasoning, illustrating the importance of examining how students process a problem rather than evaluating only their final response [5].

The reasoning involved in medication review can also be represented as interconnected activities rather than a fixed sequence of procedural checks. A graphical model developed for pharmacists' clinical reasoning makes explicit the relationships involved in interpreting medication-review information [6]. Educational work using electronic medical records to assess medication orders provides another context in which novice learners encounter clinical information requiring interpretation [7]. Neither a reasoning model nor successful completion of an electronic-record task independently establishes that a learner will recognize every consequential medication problem in practice.

Procedural instruction remains necessary: learners must know which information to seek, how to check an order, and what professional standards govern an intervention. Its educational limitation appears when a procedure is treated as a sufficient account of judgment. A learner may correctly complete a verification sequence while failing to recognize an atypical concern. Conversely, a deviation from a familiar procedure may be justified by patient-specific evidence. Teaching should therefore expose how students identify salient information, formulate alternative explanations, and decide what additional evidence is needed before accepting or challenging a medication decision.

Attitudes introduce another distinction. A multinational survey of pharmacy students examined patient-safety attitudes, including dimensions relevant to questioning senior professionals [8]. Such measures can inform educators about students' stated orientations toward safety, but favorable responses cannot be interpreted as proof that learners will challenge a particular decision under clinical pressure.

The educational question consequently extends beyond whether students know the correct medication-safety procedure. It concerns whether they can determine when an apparently routine decision requires further scrutiny, recognize the limits of their own understanding, and construct a defensible basis for professional action. These capabilities require explicit attention to the learner's relationship with knowledge and authority.

Epistemic agency and the recognition of unsafe medication decisions

Epistemic agency provides a conceptual basis for examining how learners evaluate, use, produce, and contribute to knowledge. In higher-education assessment, it has been developed as a way to understand learners' active participation in knowledge practices rather than treating them solely as recipients of information [9]. Applied to pharmacy education, the concept concerns a learner's capacity to examine clinical evidence, identify uncertainty, evaluate another professional's reasoning, and contribute a justified interpretation to a medication decision.

The relevant educational unit is a warranted concern: a medication-related question supported by information sufficient to justify further examination or communication, although not necessarily sufficient to establish that an error has occurred. This is an original analytical definition developed for the present framework. It allows a learner to challenge a decision responsibly without requiring certainty that the initial decision is incorrect.

Recognition and interpretation accordingly deserve separate assessment. Recognition concerns whether the learner identifies information that could make a medication decision unsafe. Interpretation concerns whether the learner can explain the concern's clinical relevance, evaluate alternative explanations, identify missing information, and determine an appropriate next action. An incorrect initial suspicion may still lead to justified verification; an accurate suspicion without an

adequate evidentiary explanation presents a different educational problem.

The credibility afforded to a learner's interpretation also matters. Conceptual scholarship on epistemic injustice in medical education describes circumstances in which power and identity-related prejudice can affect whose knowledge receives recognition [10]. Qualitative accounts from physicians who experienced remediation illustrate how educational authority can shape perceptions of credibility and participation [11]. These sources do not establish that all hierarchical disagreement is epistemically unjust. They instead identify conditions that educators should examine when a learner's clinically relevant concern is discounted without appropriate consideration.

Uncertainty must be incorporated into this account. Educational scholarship on clinical-reasoning assessment has argued for evaluating how learners work with uncertainty, including the limitations of assessments organized around a single predetermined answer [12]. A pharmacy student may have sufficient grounds to request clarification while remaining uncertain whether a medication order is erroneous. Requiring complete diagnostic or pharmacotherapeutic certainty before speaking could suppress justified inquiry; accepting unsupported suspicion as an established error would create a different safety problem.

For educational purposes, an epistemically responsible challenge should therefore communicate the observed concern, its evidentiary basis, the remaining uncertainty, and the action being requested. Whether the concern is correct and whether it is expressed appropriately are related assessment questions, but they should remain distinguishable.

The capability distinctions established here provide the analytical basis for **Table 1**. Their observable expressions identify what an educator could examine without substituting confidence, procedural completion, or a single correct answer for the broader exercise of professional judgment.

Table 1. Distinguishing the educational capabilities involved in recognizing and challenging medication decisions

Capability or action unit	Observable expression in a medication case	Condition governing justified use	Assessment limitation
Medication-safety knowledge	Identifies relevant medication facts, standards, and verification requirements	Information must be applicable to the patient and decision	Correct recall does not demonstrate contextual recognition
Concern recognition	Identifies a medication-related discrepancy or possible hazard	The concern must be linked to clinically relevant information	Detection alone does not establish that an error occurred

Epistemic interpretation	Explains the evidence, uncertainty, and plausible alternative explanations	The learner must distinguish established information from inference	A correct final answer can conceal inadequate reasoning
Warranted professional challenge	Communicates a justified concern to an appropriate professional	The concern must be expressed with a defensible rationale and appropriate request	Confidence or stated intention does not demonstrate enacted challenge
Escalation judgment	Identifies when an unresolved concern requires another response or recipient	Further action depends on urgency, available authority, and adequacy of the initial response	Escalation frequency alone cannot establish appropriateness
Accountable follow-through	Reassesses the concern and documents or communicates its disposition within the learner's role	Action remains conditional on responsibility, access, and supervision	Simulated completion does not demonstrate workplace transfer or patient benefit

Note: The distinctions constitute the article's proposed conceptual synthesis. Observable expressions are educational assessment possibilities, not validated criteria or quantitative performance thresholds.

Speaking-up capability under hierarchy, uncertainty, and professional risk

Recognizing a potentially unsafe medication decision does not establish that the learner can communicate the concern in a clinical team. Speaking up requires an interaction in which information about a perceived problem reaches someone positioned to address it. A systematic review of speaking-up definitions demonstrated substantial variation in how the behavior has been conceptualized and measured across healthcare research [13]. For this framework, speaking up denotes an expressed medication-related concern directed toward a recipient who can consider or facilitate an appropriate response. The definition does not presume that the concern is accepted or resolved.

The ability to speak up depends partly on the relationship between the individual and the clinical environment. A systematic review of hospital speaking-up behavior identified influencing factors across personal, relational, and organizational levels [14]. Literature concerning preregistration nursing students further highlights the motivational and learning conditions associated with raising safety concerns during work-integrated education [15]. These findings are relevant to pharmacy placements but require professional and contextual qualification. A pharmacy learner's clinical knowledge, role expectations, access to supervisors, and perceived consequences of questioning a decision may differ from those of other healthcare trainees.

The distinction between recognizing a concern and expressing it is supported by research examining speaking up and withholding voice among healthcare students. In a cross-sectional investigation involving trainees in Colombia, Mexico, and Spain, reported concerns, speaking-up behavior, withholding voice, and

safety climate were examined as distinguishable constructs [16]. Research involving medical interns and residents also identified differences in responses to conventional patient-safety threats and professionalism-related threats [17]. These findings caution against assuming that a learner who expresses concern in one type of scenario will respond similarly when the perceived professional or interpersonal risk changes.

For pharmacy education, the practical challenge is to make speaking-up capability observable without reducing it to assertiveness. An appropriate challenge should communicate relevant evidence, identify the medication decision requiring attention, acknowledge uncertainty where necessary, and seek a response proportionate to the concern. The learner may require clarification, correction, additional review, or immediate supervisory intervention.

Hierarchy can influence each of these actions. A student may identify an unsafe decision made by an experienced clinician but lack formal authority to amend it. Conversely, a student may have access to information unavailable to the original decision-maker. The educational response must therefore distinguish the learner's responsibility to communicate a justified concern from the authority to make or authorize the subsequent clinical decision.

Escalation adds a further capability. When the initial recipient does not adequately address a consequential concern, the learner needs to recognize whether another professional, supervisor, or institutional pathway should become involved. Escalation is conditional on urgency, role, available procedures, and the adequacy of the response already received. It is neither a routine requirement after every disagreement nor evidence of

success simply because an additional person was contacted.

An educational account restricted to speaking confidence would miss these distinctions. A learner must be able to exercise justified professional voice, interpret the response, and determine whether responsibility for the unresolved concern requires further action. These activities create the basis for an account of clinical judgment that includes both individual agency and institutional response.

Development of the epistemic agency and accountable judgment framework

The Epistemic Agency and Accountable Judgment Framework integrates five educational capabilities: recognition, interpretation, professional challenge, escalation, and accountable follow-through. Their relationship is conditional and potentially iterative. A learner may seek clarification before forming a definitive interpretation; a response from another professional may reveal missing information; an unresolved concern may require escalation; and subsequent evidence may require the learner to revise the original judgment.

The framework's primary explanatory distinction concerns three interacting conditions: epistemic warrant, opportunity for professional voice, and response accountability. Epistemic warrant concerns whether the evidence justifies questioning a medication decision. Opportunity for voice concerns whether the learner has a usable means of expressing that concern. Response accountability concerns whether the receiving professional or institution provides an appropriate route for consideration, action, and review.

Evidence from hospital nursing research associates different safety-management approaches and safety-climate conditions with willingness to speak up [18]. This supports attention to supervisory and organizational circumstances, although cross-sectional associations do not demonstrate that a particular management intervention causes a learner to challenge an unsafe medication order.

The framework consequently assigns responsibility across actors. The learner is responsible for examining available evidence, expressing a justified concern, and

pursuing appropriate follow-through within their role. The receiving professional is responsible for considering the concern and communicating an appropriate response. The supervisor or institution must provide accessible escalation procedures, clarify relevant decision rights, and support review when concerns remain unresolved.

Educational interventions alone cannot be assumed to secure these conditions. A systematic review of interventions targeting psychological safety and speaking up reported heterogeneous approaches and outcomes, with limitations in objective measurement [19]. Evidence synthesis concerning psychological safety similarly identified variation in healthcare contexts and the instruments used to examine the construct [20]. These findings support treating organizational receptiveness as a contextual condition, while leaving the specific relationships proposed here open to empirical evaluation. The framework also distinguishes educational performance from the consequences of a completed clinical decision. Pharmacist behavioral-marker development has identified observable dimensions involving situational awareness, decision-making, teamwork, and speaking up or escalation [21]. Such distinctions inform the construction of assessment tasks, but content validity for behavioral markers does not establish the validity of this integrated conceptual framework or demonstrate improved patient outcomes.

A learner may therefore demonstrate justified recognition and communication even when a receiving professional rejects the concern. Whether that rejection is defensible depends on the evidence and circumstances; the learner's responsibility may continue when a serious concern remains unaddressed. Conversely, a successful correction does not automatically demonstrate that the learner independently recognized the original hazard or exercised appropriate reasoning.

The framework treats these possibilities as different configurations of epistemic, interpersonal, and institutional performance. It also allows feedback to change the learner's interpretation and future behavior. A documented response can provide material for reflective learning, whereas an unresolved concern may reveal limitations in the educational environment, supervisory arrangements, or available escalation opportunities.

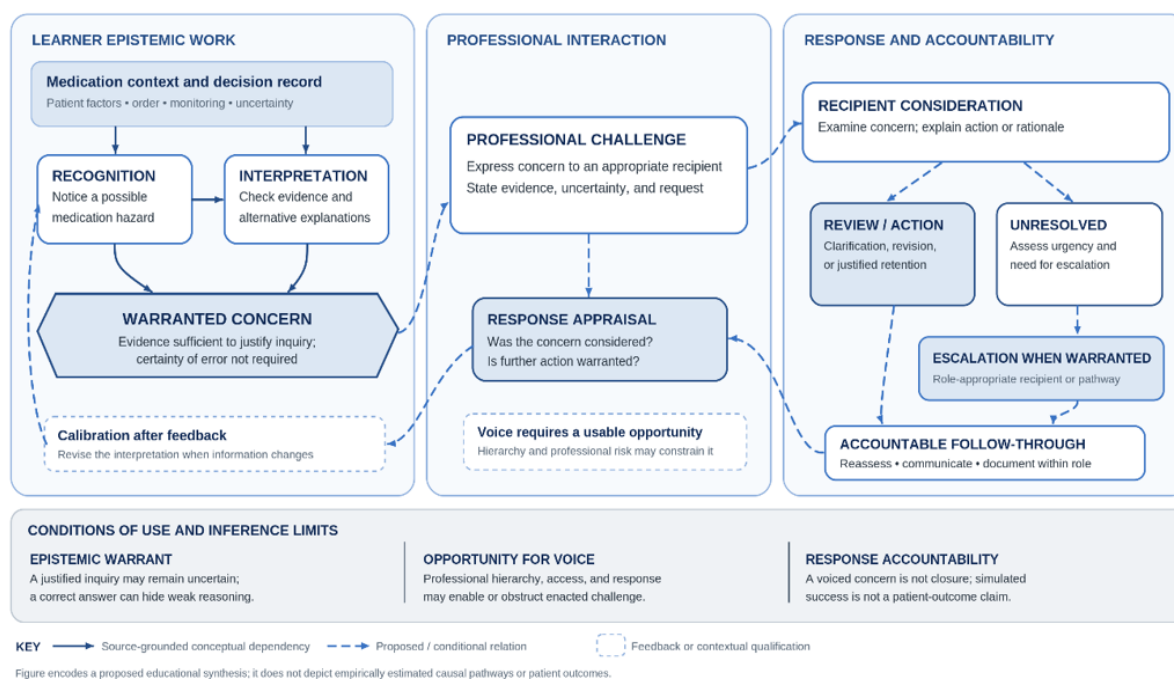


Figure 1. A justified medication concern across learning, voice, and clinical responsibility

Educational strategies for recognizing, challenging, and escalating unsafe decisions

Educational activities should require students to exercise the distinct capabilities identified in the framework. Case-based instruction can initially focus on recognizing medication-related concerns and explaining their clinical significance. Subsequent encounters should introduce incomplete information, conflicting interpretations, and professional disagreement, requiring learners to decide whether clarification, challenge, or escalation is justified. Communication training provides one component of this progression. A systematic review and meta-analysis of assertive communication training in nursing reported improvements in measured speaking-up behavior [22]. These findings support examining communication practice as an educational strategy, although equivalent effects cannot be assumed for pharmacy students.

Scenario design should also expose learners to the consequences of uncertainty and differences in perceived authority. A quasi-experimental medical-student simulation study examined speaking-up behavior and personalized debriefing across medication-error scenarios [23]. The reported observations support the educational relevance of structured practice and feedback, while differences in scenario severity and

sequencing limit conclusions about durable behavioral change.

Interprofessional encounters allow learners to examine how medication concerns are communicated and resolved across professional responsibilities. A mixed-methods educational study evaluated an interprofessional medical-error disclosure simulation [24]. Another study used telehealth medication-error disclosure exercises incorporating learner surveys and faculty-rated pharmacy performance [25]. Such activities can develop communication and role understanding, but post-error disclosure must remain distinguishable from challenging a potentially unsafe decision before harm occurs.

The learning sequence should extend to documentation and reconsideration of the response received. An interprofessional MedWatch exercise examined the completeness and accuracy of simulated medication-error reports [26]. This offers a relevant educational precedent for making follow-through observable. A complete simulated report, however, cannot independently establish that the learner prevented an unsafe clinical decision.

Authentic learning encounters should therefore vary the available evidence, urgency, professional relationship, and adequacy of the initial response. Debriefing should examine not only whether the learner spoke, but whether

the concern was justified, directed appropriately, considered by the recipient, and pursued further when circumstances warranted.

Assessment of clinical judgment, speaking-up performance, and reflective accountability

Assessment requires separate evidence for knowledge, clinical reasoning, enacted communication, and follow-through. Confidence may inform educators about learners' perceived readiness, but it cannot serve as a substitute for observed capability. A systematic review of simulation in pharmacy education specifically examined students' confidence in performing clinical pharmacy activities [27]. Its outcome domain illustrates why confidence should remain distinct from medication-safety performance.

Authentic assessment introduces additional considerations. A systematic review of pharmacy students' perceptions of high-fidelity assessment identified factors relevant to learners' experiences of assessment tasks [28]. Acceptability and perceived realism matter for implementation, although favorable perceptions do not establish that an instrument predicts performance in clinical practice.

Workplace assessment introduces a different evidentiary setting. Qualitative research examining preceptor

perspectives on entrustable professional activity assessments identified implementation challenges, including interpretation of assessment expectations [29]. Accordingly, judgments about a learner's capability should specify the task observed, the supervision available, and the extent of independent responsibility.

Assessment of reasoning can also benefit from information about how a decision was reached. Development and pilot testing of a data-rich clinical-reasoning assessment tool in medical education illustrates an approach to capturing reasoning processes [30]. Adaptation to pharmacy would require separate evaluation rather than an assumption of equivalent validity.

The proposed assessment approach therefore treats educational outcomes as distinguishable observations. A learner may recognize a medication problem without expressing a concern, communicate effectively without independently identifying the problem, or complete a simulated escalation without encountering comparable opportunities in practice.

Table 2 aligns educational encounters with observable actions while preserving these inferential distinctions. Its categories describe proposed assessment applications, not established scoring thresholds or a validated composite instrument.

Table 2. Linking medication-challenge learning encounters to observable educational evidence

Instructional encounter	Learner task	Observable decision or action	Retention or transfer qualification
Ambiguous medication-order review	Identify a possible hazard and examine alternative explanations	Evidence-based concern and stated uncertainty	Correct recognition in one case does not establish generalizable performance
Hierarchical disagreement simulation	Challenge a decision made by a more senior professional	Directed concern, supporting rationale, and appropriate request	Simulated speech does not establish workplace voice
Unresolved-concern encounter	Evaluate an inadequate or incomplete response	Justified decision to clarify, reconsider, or escalate	Escalation must be appropriate to urgency and role
Interprofessional medication-error exercise	Coordinate communication and documentation	Observed contribution to team response and report completion	Team performance does not prove individual independent capability
Supervised experiential encounter	Respond to an authentic medication-related concern	Preceptor-observed reasoning, communication, and follow-through	Opportunity, supervision, context, and repeated observation must be considered
Reflective reassessment	Reconsider an initial interpretation after feedback	Documented explanation of what changed and why	Reflection alone cannot demonstrate subsequent behavioral transfer

Note: The educational alignment is original proposed synthesis. Each assessment outcome requires interpretation within its particular task, setting, and observation method.

Figure 2 extends this distinction to the conditions governing transfer. It separates educational performance from opportunities to act in clinical practice and from the

responses of other professionals. Its conditional relationships prevent a successful simulation, confidence

rating, or isolated workplace observation from being interpreted as demonstrated patient benefit.

Separate simulated enactment, an actual opportunity to act, team response, and responsibility

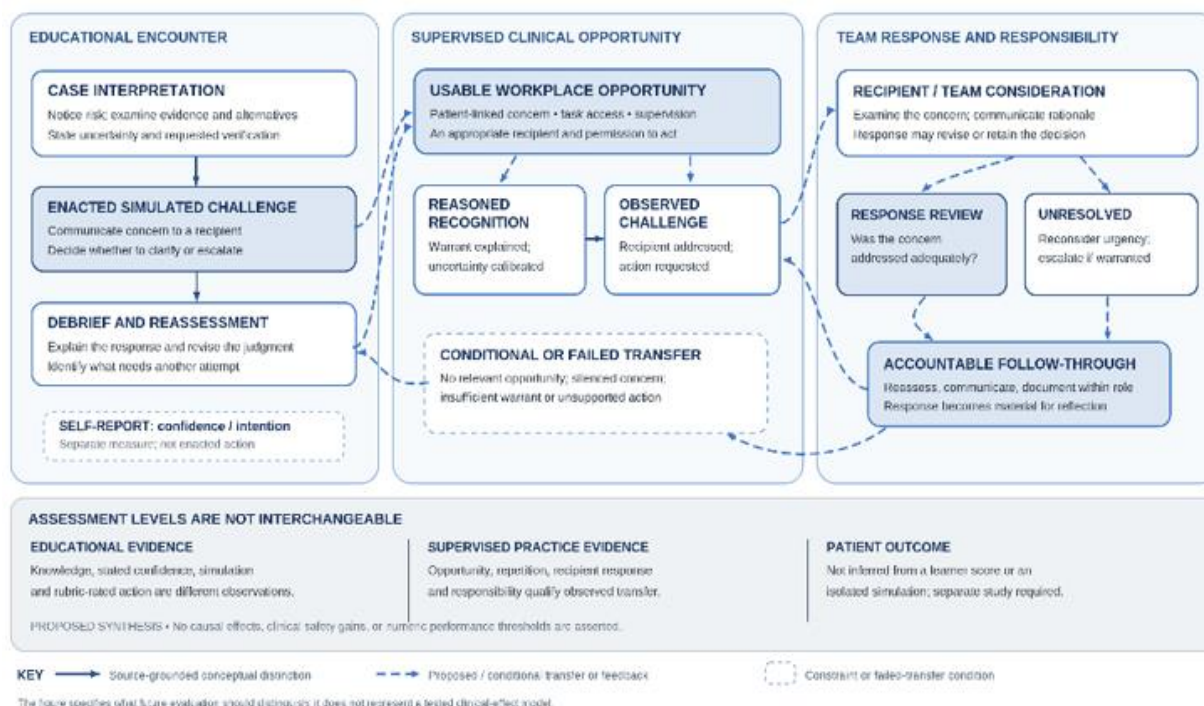


Figure 2. When a learned challenge can become clinical action

Implications for pharmacy curricula and experiential education

Curricular implementation requires learning opportunities in which recognizing a concern, explaining its warrant, voicing it, and evaluating the response are individually visible. Early instruction can emphasize medication-case interpretation; later activities should introduce professional disagreement and unresolved concerns. Experiential placements should then provide supervised opportunities to exercise these capabilities in authentic decisions.

This progression depends on preceptor preparation. Preceptors need shared expectations concerning acceptable challenges, decision rights, escalation procedures, and documentation. Learners should know whom to approach when an initial concern remains unresolved. Feedback should address the quality of the reasoning and subsequent action, including circumstances in which the learner appropriately revises an initial suspicion.

Transition-to-practice research involving pharmacy graduates identifies professional dilemmas and variation

in the support available during early practice [31]. The proposed curricular response is to connect educational assessment with explicit supervisory responsibilities and repeated opportunities for observation. Institutions should evaluate whether their placement environments permit learners to exercise the capabilities being assessed. An absence of observed speaking up may reflect limited opportunity as well as learner capability.

Results and Discussion

The framework explains medication-safety education through interacting epistemic, interpersonal, and institutional conditions. Its principal contribution is the distinction between forming a justified concern, expressing it, obtaining an appropriate response, and remaining accountable for subsequent action. These capabilities have related educational purposes, but their assessment requires different observations.

A training-only explanation would attribute unsuccessful challenge primarily to deficits in learner knowledge or communication. Intervention evidence demonstrates why this interpretation is incomplete: organizational

conditions and psychological safety vary, while educational intervention findings remain heterogeneous [19]. Although communication training and simulation provide relevant educational approaches, performance observed within a training encounter cannot independently establish durable workplace behavior [22]. Scenario characteristics and debriefing also affect interpretation of simulated speaking-up observations [23].

Equity of voice presents a further qualification. Learners may possess relevant clinical evidence without receiving equivalent credibility or opportunities to challenge established decisions. Epistemic-injustice scholarship clarifies the importance of power and credibility [10], while trainee research identifies variation in reported voice and responses to different safety concerns [16]. Implementation must therefore examine both learner performance and the responses made possible by the educational environment.

Future evaluation should assess whether the proposed capability distinctions can be observed reliably, whether learners retain and transfer them across settings, and how supervisory and institutional responses affect enacted challenge. Confidence outcomes [27] and reasoning-process assessment approaches [30] may contribute complementary information. Claims of improved patient outcomes would require separate clinical evaluation.

Conclusion

Pharmacy education can develop accountable clinical judgment by treating medication-error recognition, evidentiary interpretation, professional challenge, escalation, and follow-through as distinct but interacting capabilities. The framework connects these capabilities to the conditions under which a learner's justified concern can influence clinical decisions. It provides a conceptual basis for teaching and assessment while preserving the distinction between educational performance, supervised workplace action, and demonstrated patient safety. Its proposed relationships require empirical evaluation before claims of effectiveness or clinical benefit can be made.

Acknowledgments: None

Conflict of Interest: None

Financial Support: None

Ethics Statement: None

References

1. El Hajj MS, Mahdi I, Mohamed N, Kamel NH, El-Awaisi A, Stewart D. Pharmacy students' clinical reasoning and decision-making to detect and resolve medication errors. *Am J Pharm Educ.* 2025;89(8):101449. doi:10.1016/j.ajpe.2025.101449
2. Palmer RH, Chastain D, Bland CM, Phillips BB. Exploring the challenges student pharmacists confront when learning to detect medication-related problems in electronic health records: Implications for instructional design. *Am J Pharm Educ.* 2025;89(3):101371. doi:10.1016/j.ajpe.2025.101371
3. Stultz JS, Shelton CM, Kiles TM, Wheeler JS. Improvement in pharmacy student responses to medication-related problems with and without clinical decision support alerts. *Am J Pharm Educ.* 2023;87(5):100062. doi:10.1016/j.ajpe.2023.100062
4. Frenzel JE, Skoy ET, Eukel HN. Use of simulations to improve pharmacy students' knowledge, skills, and attitudes about medication errors and patient safety. *Am J Pharm Educ.* 2018;82(8):6644. doi:10.5688/ajpe6644
5. Södervik I, Hanski L, Boshuizen HPA, Katajavuori N. Clinical reasoning in pharmacy: What do eye movements and verbal protocols tell us about the processing of a case task? *Adv Health Sci Educ Theory Pract.* 2024;29(1):45-65. doi:10.1007/s10459-023-10242-x
6. Guignard B, Crevier F, Charlin B, Audétat MC. A graphical model to make explicit pharmacist clinical reasoning during medication review. *Res Social Adm Pharm.* 2024;20(12 Pt A):1142-50. doi:10.1016/j.sapharm.2024.09.005
7. Chan JH, Walker S, Lim A, Stokes E. Exploring an introduction to electronic medical record-based assessment of medication orders among novice student pharmacists. *Am J Pharm Educ.* 2025;89(9):101477. doi:10.1016/j.ajpe.2025.101477
8. Naser AY, Alsairafi ZK, Awaisu A, Alwafi H, Awwad O, Dahmash EZ, et al. Attitudes of pharmacy students towards patient safety: A cross-sectional study from six developing countries. *BMJ*

- Open. 2020;10(12):e039459. doi:10.1136/bmjopen-2020-039459
9. Nieminen JH, Ketonen L. Epistemic agency: A link between assessment, knowledge and society. *High Educ* (Dordr). 2024;88(2):777-94. doi:10.1007/s10734-023-01142-5
 10. Luong V, Ajjawi R, Burm S, Olson R, MacLeod A. Unravelling epistemic injustice in medical education: The case of the underperforming learner. *Med Educ*. 2024;58(11):1286-95. doi:10.1111/medu.15410
 11. Percival CS, Maggio LA, Wyatt TR, Martin PC. 'The program director's word ... it's stronger than the word of God': Epistemic injustice revealed through narratives of remediated graduate medical education residents. *Med Educ*. 2024;58(7):848-57. doi:10.1111/medu.15295
 12. Cooke S, Lemay JF. Transforming medical assessment: Integrating uncertainty into the evaluation of clinical reasoning in medical education. *Acad Med*. 2017;92(6):746-51. doi:10.1097/ACM.0000000000001559
 13. Kane J, Munn L, Kane SF, Srulovici E. Defining speaking up in the healthcare system: A systematic review. *J Gen Intern Med*. 2023;38(15):3406-13. doi:10.1007/s11606-023-08322-0
 14. van Dongen D, Guldenmund F, Grossmann I, Groeneweg J. Classification of influencing factors of speaking-up behaviour in hospitals: A systematic review. *BMC Health Serv Res*. 2024;24(1):1657. doi:10.1186/s12913-024-12138-x
 15. Walsh SA, Walker SB, Wirihana LA. Preregistration nursing students' motivation for speaking up for patient safety: An integrated literature review. *Nurse Educ Today*. 2024;140:106291. doi:10.1016/j.nedt.2024.106291
 16. Carrillo I, Serpa P, Landa-Ramírez E, Guilabert M, Gómez-Ayala Y, López-Pineda A, et al. Speaking up about patient safety, withholding voice and safety climate in clinical settings: A cross-sectional study among Ibero-American healthcare students. *Int J Public Health*. 2024;69:1607406. doi:10.3389/ijph.2024.1607406
 17. Martinez W, Lehmann LS, Thomas EJ, Etchegaray JM, Shelburne JT, Hickson GB, et al. Speaking up about traditional and professionalism-related patient safety threats: A national survey of interns and residents. *BMJ Qual Saf*. 2017;26(11):869-80. doi:10.1136/bmjqs-2016-006284
 18. Alingh CW, van Wijngaarden JDH, van de Voorde K, Paauwe J, Huijsman R. Speaking up about patient safety concerns: The influence of safety management approaches and climate on nurses' willingness to speak up. *BMJ Qual Saf*. 2019;28(1):39-48. doi:10.1136/bmjqs-2017-007163
 19. O'Donovan R, McAuliffe E. A systematic review exploring the content and outcomes of interventions to improve psychological safety, speaking up and voice behaviour. *BMC Health Serv Res*. 2020;20(1):101. doi:10.1186/s12913-020-4931-2
 20. Grailey KE, Murray E, Reader T, Brett SJ. The presence and potential impact of psychological safety in the healthcare setting: An evidence synthesis. *BMC Health Serv Res*. 2021;21(1):773. doi:10.1186/s12913-021-06740-6
 21. Smith SE, Kerins J, McColgan-Smith S, Stewart F, Power A, Mardon J, et al. The development of a marker system for Pharmacists' Behavioural Skills. *Int J Pharm Pract*. 2023;31(5):520-7. doi:10.1093/ijpp/riad041
 22. Chen HW, Wu JC, Kang YN, Chiu YJ, Hu SH. Assertive communication training for nurses to speak up in cases of medical errors: A systematic review and meta-analysis. *Nurse Educ Today*. 2023;126:105831. doi:10.1016/j.nedt.2023.105831
 23. Chen YC, Issenberg SB, Chiu YJ, Chen HW, Issenberg Z, Kang YN, et al. Exploration of students' reaction in medical error events and the impact of personalized training on the speaking-up behavior in medical error events. *Med Teach*. 2023;45(4):368-74. doi:10.1080/0142159X.2022.2137394
 24. Marshall C, Van Der Volgen J, Lombardo N, Hamasu C, Cardell E, Blumenthal DK. A mixed methods approach to assess the impact of an interprofessional education medical error simulation. *Am J Pharm Educ*. 2020;84(2):7133. doi:10.5688/ajpe7133
 25. Baalman A, Cowl A, Coffey C, Jernigan S, Kalender-Rich J, Sabata D, et al. Interprofessional medication error disclosure training using a telehealth consultation simulation. *Am J Pharm Educ*. 2023;87(1):ajpe8799. doi:10.5688/ajpe8799
 26. Saad AH, Bondok R, Sayeg F, Barnes BJ, Rukat CE, Garwood C, et al. Enhancing medication error reporting through interprofessional education: Analysis of MedWatch reporting accuracy and completion rates between teams and individuals.

- BMC Med Educ. 2025;25(1):756. doi:10.1186/s12909-025-07349-7
27. Huon JF, Nizet P, Tollec S, Vene E, Fronteau C, Leichnam A, et al. A systematic review of the impact of simulation on students' confidence in performing clinical pharmacy activities. *Int J Clin Pharm.* 2024;46(4):795-810. doi:10.1007/s11096-024-01715-z
 28. Singh H, Malone D, Lim AS. Shifting to authentic assessments? A systematic review of student perceptions of high-fidelity assessments in pharmacy. *Am J Pharm Educ.* 2023;87(7):100099. doi:10.1016/j.ajpe.2023.100099
 29. Elmes-Patel AT, Allen SM, Kachlic MD, Schriever AE, Driscoll TP, Tekian A, et al. Preceptor perspectives using entrustable professional activity-based assessments during advanced pharmacy practice experiences. *Am J Pharm Educ.* 2024;88(12):101332. doi:10.1016/j.ajpe.2024.101332
 30. Waechter J, Allen J, Lee CH, Zwaan L. Development and pilot testing of a data-rich clinical reasoning training and assessment tool. *Acad Med.* 2022;97(10):1484-8. doi:10.1097/ACM.0000000000004758
 31. Allinson MD, Black PE, White SJ. Professional dilemmas experienced by pharmacy graduates in the United Kingdom when transitioning to practice. *Am J Pharm Educ.* 2022;86(5):8643. doi:10.5688/ajpe8643