WHITE PAPER

The Case for AI Competency in PharmD Education

Why Tomorrow's Pharmacists Must Learn to Supervise, Audit, and Override the Systems That Will Define Their Practice

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EXECUTIVE SUMMARY

Artificial intelligence is no longer a speculative technology in pharmacy practice. AI-powered clinical decision support systems are already deployed in hospital pharmacies across the United States, from automated medication verification to predictive models for adverse drug events. Yet the vast majority of Doctor of Pharmacy programs continue to graduate students without structured training in how these systems work, when they fail, and how to exercise clinical judgment in an AI-augmented environment.

This paper argues that AI competency training is not a curricular luxury or a forward-looking aspiration. It is an emerging professional necessity. The pharmacists graduating from CNU's accelerated three-year PharmD program in 2028 and 2029 will enter clinical environments where AI-driven dosing algorithms, predictive risk models, pharmacogenomic decision engines, and automated dispensing systems are standard infrastructure. Their ability to supervise, audit, and override these systems will directly determine patient safety outcomes, their professional value within interdisciplinary teams, and their long-term career resilience.

This paper examines the clinical, professional, and institutional rationale for integrating AI competency training into CNU's existing PharmD curriculum. It is structured around five core arguments: the transformation of the pharmacist's clinical role, the patient safety imperative, the shifting standard of care and liability landscape, the career and workforce implications for graduates, and the strategic positioning opportunity for CNU as an institution.

1. THE PROFESSION IS BEING REDEFINED

Pharmacy is experiencing a structural transformation driven by the convergence of artificial intelligence, electronic health records, and automation technologies. This transformation is compressing the pharmacist's traditional value proposition from two directions simultaneously.

On one side, AI systems are automating the cognitive tasks that historically justified the pharmacist's clinical role. Drug interaction screening, dosage verification, therapy selection, and formulary management are increasingly performed or augmented by machine learning algorithms integrated into hospital information systems. Clinical decision support systems now analyze a patient's complete medication history, flag contraindications, and recommend dosing adjustments with speed and consistency that exceed what any individual clinician can maintain across a high-volume patient panel.

On the other side, pharmacy technicians and robotic dispensing systems are absorbing more of the operational workflow. Centralized robotic fulfillment centers are now processing prescriptions at scale, and automated dispensing cabinets are standard in hospital settings. The dispensing function, once central to the pharmacist's daily work, is increasingly mechanized.

The pharmacists who will thrive in this environment are not those who attempt to compete with algorithms on speed and accuracy. They will lose that competition. The pharmacists who remain indispensable are those who can sit above the technology as clinical supervisors: the human-in-the-loop that healthcare systems are legally, ethically, and practically required to maintain. This is the role that Version 2 of our proposed curriculum is designed to prepare students for.

> *The most dangerous pharmacist in 2028 is not the one who refuses to use AI. It is the one who trusts it without understanding it.*

2. THE PATIENT SAFETY IMPERATIVE

The case for AI competency in pharmacy education is, at its foundation, a patient safety argument. AI systems in clinical settings are powerful but imperfect. They operate on data that may be incomplete, stale, or unrepresentative. Their recommendations are only as reliable as the training data and algorithmic logic underpinning them. When these systems err, the consequences are clinical, not theoretical.

Where AI Systems Fail

Consider the clinical scenarios that a V2-trained pharmacist would be equipped to navigate. When a hospital's AI flags a patient for venous thromboembolism risk based on predictive modeling, a pharmacist must be able to evaluate whether that recommendation is appropriate for this particular patient with these specific comorbidities and this medication history. The algorithm may not account for a recent procedure, an undocumented allergy, or a contraindicated drug combination that exists outside the structured data fields it was trained on.

When a smart infusion pump suggests a flow rate based on a renal dosing algorithm, someone must be capable of recognizing when the creatinine clearance value feeding that algorithm is based on a lab draw taken before a significant clinical change. When a pharmacogenomic platform recommends a specific RAAS inhibitor based on genotype data, a clinician must understand the limitations of the evidence base supporting that recommendation and recognize when the algorithm's confidence level does not justify the clinical decision.

When an AI-generated dose calculation contains a rounding error or a decimal-point misplacement in a pediatric or neonatal context, the pharmacist is the last line of defense before that error reaches the patient. These are not hypothetical scenarios. Published literature documents that AI systems in healthcare can produce incorrect drug recommendations, dosing errors, and missed interactions when models are inadequately trained, tested, or monitored.

The Supervision Gap

The core problem is straightforward. Clinical AI systems require human oversight to function safely. That oversight requires specific knowledge and skills that current PharmD curricula do not systematically teach. A pharmacist who understands cardiovascular pharmacology but has never been trained to interpret the logic of a predictive risk model, validate an automated dosing recommendation, or identify algorithmic bias in a clinical decision support engine is not equipped to provide meaningful oversight of these systems.

V2 closes this gap. It does not replace clinical pharmacology education. It adds the competency layer required to exercise that pharmacology knowledge within the technological infrastructure that now mediates how clinical decisions are made and delivered.

3. THE EVOLVING STANDARD OF CARE

The legal and regulatory environment surrounding AI in clinical practice is developing rapidly, and the direction is clear. As AI tools become standard in hospital pharmacy operations, the professional expectation for competent engagement with those tools will follow.

Liability in an AI-Augmented Practice

Legal scholarship and regulatory bodies are converging on a principle that has significant implications for pharmacy education: clinicians who use AI tools bear professional responsibility for the outputs of those tools. A pharmacist who fails to catch an algorithmic error will not be shielded by the argument that the system, not the clinician, made the decision. Courts evaluating medical liability in AI-augmented care have begun examining whether clinicians exercised appropriate oversight of automated systems, not merely whether they followed the system's recommendations.

The Federation of State Medical Boards has published guidance emphasizing human accountability in AI-assisted clinical care, noting that professional responsibilities remain the same regardless of the technology used. The International Pharmaceutical Federation has issued a formal policy statement calling for pharmacist education to include AI competency, with specific emphasis on the ability to supervise, evaluate, and interpret AI-generated clinical outputs. The American College of Clinical Pharmacy has similarly identified AI oversight as an emerging professional competency area.

For CNU graduates entering practice in the late 2020s, this trajectory means that competency in AI oversight is heading toward being a professional obligation, not a differentiating skill. The pharmacist who cannot explain why an automated dosing recommendation is inappropriate for a given patient may face not just a clinical error but a professional liability exposure. V2 curriculum content directly addresses this by training students to audit, validate, and exercise override judgment over AI-generated clinical recommendations.

Accreditation Alignment

The ACPE Standards 2025, effective July 1, 2025, emphasize practice-readiness, competency-based education, and continuous quality improvement. While the standards do not yet mandate specific AI competencies, they explicitly encourage programs to innovate within their curricula to reflect advances in knowledge and practice. Programs that proactively integrate AI literacy position themselves favorably for future accreditation cycles, where AI competency requirements are widely expected to emerge. CNU has an opportunity to lead rather than react.

4. CAREER RESILIENCE AND WORKFORCE VALUE

Beyond patient safety and professional liability, there is a pragmatic career argument for AI competency that matters directly to students and their families making significant investments in a PharmD education.

The Employment Landscape Is Shifting

Health systems are investing heavily in AI infrastructure. Hospitals are deploying AI-driven analytics for order verification, robotic compounding systems, predictive models for readmission and adverse events, and pharmacogenomic platforms for precision medicine. The pharmacy workforce these institutions are hiring into is one where digital fluency is not optional. A pharmacist who can interpret a predictive AKI risk model, validate

an AI-generated anticoagulation protocol, or evaluate the clinical logic of a decision-support engine is measurably more valuable than one who cannot.

This is already reflected in hiring patterns. Health systems are creating roles at the intersection of clinical pharmacy and informatics. Clinical pharmacy specialists are increasingly expected to participate in the governance, validation, and monitoring of automated systems. Residency programs are beginning to incorporate technology competencies into their training expectations. The pharmacist who graduates with these skills embedded in their clinical education has a tangible advantage in residency matching, job placement, and career advancement.

The Compounding Effect Over a Career

The value of AI competency training is not limited to a graduate's first job. The pharmacist who enters practice understanding how predictive models work, how to evaluate algorithmic bias, and how to audit decision-support systems possesses a foundational literacy that will compound over a thirty-year career. As these systems evolve, as new modalities emerge, as regulatory requirements tighten, that foundational understanding becomes the basis for continuous professional adaptation.

The pharmacist who lacks this foundation will be perpetually catching up, dependent on whatever vendor training or continuing education their employer provides, always one step behind the technology that increasingly defines their practice environment. Given CNU's accelerated three-year timeline, there is no post-graduation runway to acquire these competencies informally. If they are not built into the curriculum, they are left to chance.

> *V1 teaches students to be excellent pharmacists today. V2 teaches them to remain relevant pharmacists for the next three decades.*

5. PROFESSIONAL IDENTITY AND CONFIDENCE

There is a dimension of this argument that is less often discussed in white papers but that pharmacy faculty understand intuitively. Students entering pharmacy programs right now are anxious about whether their profession is being automated away. Headlines about AI replacing healthcare workers, projections about job displacement, and visible automation in retail pharmacy settings all contribute to a sense of professional uncertainty that affects recruitment, retention, and student engagement.

V2 curriculum content directly addresses this anxiety, not through reassurance, but through competence. Students who are trained to understand how AI systems function in clinical pharmacy do not experience those systems as threats. They experience them as tools they are qualified to supervise. This is a meaningful psychological and professional shift. It changes how students see their own role, how they carry themselves in interdisciplinary clinical teams, and how they communicate their value to employers, colleagues, and patients.

The narrative shifts from "AI will replace pharmacists" to "Pharmacists are the clinical oversight layer that makes AI safe." That reframing is not marketing. It is an accurate description of the emerging professional reality, and V2 equips students to inhabit that reality with confidence.

6. STRATEGIC POSITIONING FOR CNU

California Northstate University has already demonstrated institutional willingness to lead. CNU launched the nation's first 3+4 PharmD-MD and PharmD-DMD dual-degree pathways, establishing a precedent for curricular innovation that competitors have followed. Integrating AI competency training through ArthurAI ULE represents a natural extension of that leadership.

Recruitment and Differentiation

In a competitive landscape for PharmD enrollment, program differentiation matters. Prospective students and their families are evaluating return on investment with increasing scrutiny. A program that can demonstrably state that its graduates are trained not only in clinical pharmacology but in AI-augmented clinical practice carries a distinct recruiting advantage. This is particularly true for students drawn to CNU's accelerated model, who are by nature seeking efficiency and competitive positioning.

Accreditation and Institutional Reputation

Programs that proactively embed emerging competencies into their curricula are better positioned for accreditation reviews and institutional reputation. As ACPE and professional organizations move toward formalizing AI competency expectations, early adopters will be cited as models rather than scrambling to comply. CNU's existing reputation for innovation provides a natural platform for this leadership.

Zero Disruption, Maximum Upside

Critically, the proposed integration model is designed to require no disruption to CNU's existing curriculum, faculty ownership, or assessment structures. Version 1 of each course preserves the current syllabus, pedagogical approach, and team-based learning format entirely. Version 2 adds an AI competency layer on top of that foundation. Faculty are not asked to change what they teach. They are offered a tool that enhances what their students learn.

CONCLUSION

The question facing CNU's College of Pharmacy is not whether AI will reshape clinical pharmacy practice. It already is. The question is whether CNU's graduates will enter that transformed practice environment prepared or unprepared.

The patient safety argument is clear: AI systems require competent human oversight, and that oversight requires specific training. The professional liability argument is emerging: the standard of care is moving toward expecting clinicians to exercise informed judgment over AI-generated recommendations. The career argument is practical: graduates with AI competency training are more employable, more valuable, and more resilient over the arc of a thirty-year career. And the institutional argument is strategic: CNU has an opportunity to extend its established leadership in curricular innovation into the most consequential technological shift in pharmacy education in a generation.

ArthurAI ULE provides the platform. The proposed three-course integration provides the pathway. The decision to lead belongs to CNU.

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