AI-Prioritized Pharmacist Review to Reduce Preventable Hospital Readmissions in Diabetes Care

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Abstract: Hospital pharmacists cannot personally review every discharging patient for medication-related readmission risk; time is limited and risk is unevenly distributed. This paper presents an AI prioritization model, trained on 101,766 real hospital encounters from 130 US hospitals, that identifies the 20% of patients most likely to be readmitted within 30 days. This flagged group has a 19.54% readmission rate versus 11.16% overall (a 1.75x concentration of risk) and captures 35.0% of all readmissions despite being only one-fifth of patients. Flagged patients also carry a higher medication burden (16.9 vs 15.9 medications on average) and more prior hospitalizations, both directly actionable by a pharmacist at discharge. Combining this targeting with a published reduction in readmissions from pharmacist-led discharge medication reconciliation (27%) and the AHRQ-reported average cost of a 30-day readmission (USD 16,300), this framework suggests an estimated USD 1.72M to USD 13.75M in avoided annual cost depending on regional patient volume. Limitations and an implementation plan are discussed.

Index Terms: clinical pharmacy, hospital readmission, medication reconciliation, risk prediction, healthcare cost avoidance

I. INTRODUCTION

A hospital pharmacist reviewing medications at discharge can meaningfully reduce a patient's chance of being readmitted, but cannot do this for every patient given limited staff time. The practical question is not whether medication review helps, published evidence already shows it does, but which patients should receive it first. This paper presents an AI model that answers that question directly: it ranks discharging patients by readmission risk so that a pharmacist's limited time is spent on the patients most likely to benefit.

The analysis uses real hospital encounter data rather than a simulated scenario, and connects the resulting risk ranking to a published, real-world estimate of how effective pharmacist intervention actually is, so that the projected impact is grounded in evidence rather than assumption.

II. RELATED WORK

Multiple studies report that pharmacist-led discharge medication reconciliation reduces 30-day hospital readmissions, with a Yale-New Haven Hospital study reporting a 27% reduction [1] and a more recent evaluation reporting reductions as high as 44% [2]. A scoping review found that the large majority of studies on pharmacist-led transitions-of-care interventions demonstrated reduced readmission rates [3]. Separately, machine learning models trained on administrative and claims data have been shown to meaningfully predict 30-day readmission risk in diabetes patients [4], and the well-established Diabetes 130-US Hospitals dataset has been used extensively in the literature to study readmission prediction [5], [6].

III. DATA AND METHODOLOGY

A. Data Source

This study uses the Diabetes 130-US Hospitals dataset, a real, publicly available record of 101,766 inpatient encounters across 130 US hospitals and integrated delivery networks between 1999 and 2008 [7]. Each record includes patient demographics, length of stay, number of medications, prior utilization (outpatient, emergency, and inpatient visits), diagnoses, and whether the patient was readmitted within 30 days, between 30 and 90 days, or not readmitted.

B. Risk Prediction Model

A Random Forest classifier was trained to predict 30-day readmission using clinically and operationally available features: length of stay, number of lab procedures and procedures, number of medications, prior outpatient/emergency/inpatient visit counts, number of diagnoses, age band, diabetes medication status, whether medication was changed, insulin status, and glucose/A1C test results. The model was evaluated on a held-out 25% test split (25,442 encounters).

C. From Risk Score to Pharmacist Action

Rather than treating the model output as a black-box score, this study evaluates a directly actionable policy: flag the top 20% highest-risk patients at discharge for priority pharmacist medication review, consistent with realistic pharmacist staffing capacity. The value of this policy is then estimated using the published effectiveness of pharmacist-led medication reconciliation, applied only to the flagged group, rather than assuming an unvalidated effect.

IV. RESULTS

A. Risk Concentration

Table I and Fig. 1 show that the overall 30-day readmission rate in this dataset is 11.16%, while the top 20% of patients flagged by the model have a 19.54% readmission

rate, a 1.75x concentration of risk. Fig. 2 shows that this flagged group, despite being only one-fifth of all patients, accounts for 35.0% of all 30-day readmissions in the dataset (AUC = 0.644).

TABLE I: READMISSION RISK CONCENTRATION

Metric	All Patients	Top 20% Flagged
30-day readmission rate	11.16%	19.54%
Share of all readmissions captured	100%	35.0%

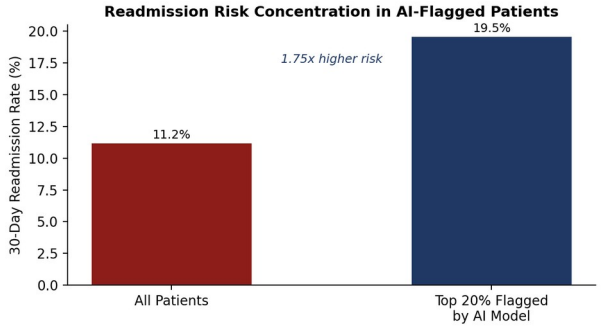

Fig. 1. 30-day readmission rate: all patients versus the top 20% flagged by the model.

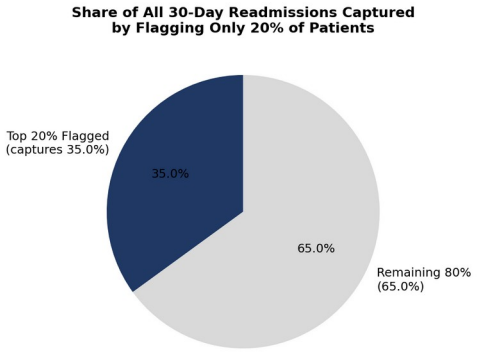

Fig. 2. Share of all 30-day readmissions captured by flagging only the highest-risk 20% of patients.

B. Why This Is Actionable by a Pharmacist

Fig. 3 shows that flagged, higher-risk patients also carry a higher medication burden (16.9 vs 15.9 medications on average) and substantially more prior hospitalizations (1.22 vs 0.56 inpatient visits on average) than lower-risk patients. Both factors, polypharmacy and prior utilization, are exactly the information a pharmacist uses during discharge medication reconciliation, meaning the model's output aligns with, rather than replaces, existing pharmacist judgment.

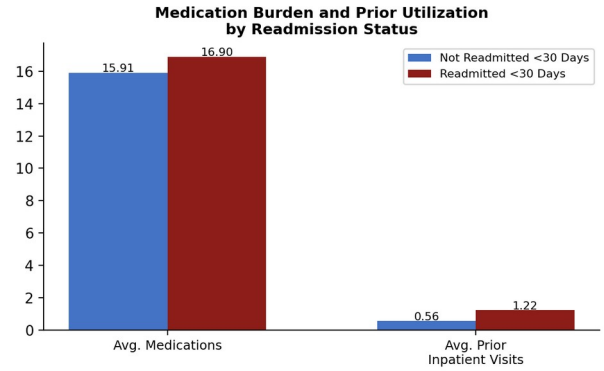

Fig. 3. Average medication count and prior inpatient visits, by 30-day readmission status.

C. Estimated Cost Avoided

Applying the published 27% reduction in readmissions from pharmacist-led discharge medication reconciliation [1] to the readmissions captured within the flagged 20% group, and valuing each avoided readmission at the AHRQ-reported average 30-day readmission cost of USD 16,300 [8], Table II and Fig. 4 estimate annual cost avoided across three regional diabetic discharge volume scenarios.

TABLE II: ESTIMATED ANNUAL COST AVOIDED

Scenario	Annual Diabetic Discharges	Est. Cost Avoided/Year
Small region	10,000	USD 1.72M
Medium region	30,000	USD 5.16M
Large region	80,000	USD 13.75M

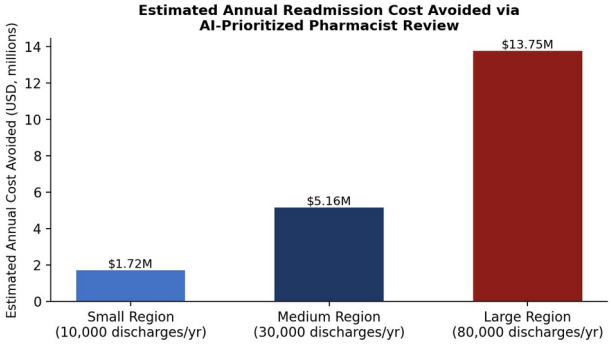

Fig. 4. Estimated annual readmission cost avoided across small, medium, and large regional discharge volumes.

V. LIMITATIONS

- The dataset spans 1999-2008; current clinical practice, medications, and discharge protocols differ, so the model would need retraining on contemporary data before deployment.
- The 27% readmission reduction is drawn from a single-institution study [1]; effectiveness may vary by hospital, patient population, and how consistently the flagged list is acted upon.

- Model AUC (0.644) reflects the limited feature set available in this administrative dataset; a production system would add real-time vitals, discharge disposition detail, and social determinants of health.
- The regional volume scenarios in Table II are illustrative, not drawn from actual regional discharge data.

VI. IMPLEMENTATION PLAN

In a regional pharmaceutical or hospital-network operations context, this framework could be implemented in three phases: (1) integrating the risk model directly into the discharge workflow so flagged patients automatically generate a pharmacist medication-review task; (2) validating the assumed 27% effectiveness against the specific patient population and pharmacist staffing model in the region, rather than relying on published literature alone; and (3) tracking realized 30-day readmission rates for flagged versus unflagged patients to continuously calibrate both the risk model and the projected cost avoided.

VII. CONCLUSION

Using real hospital data, this study shows that flagging just the riskiest 20% of discharging patients captures over a third of all 30-day readmissions, and that these patients are exactly the ones a pharmacist would want to prioritize based on medication burden and prior utilization. Combined with a published, real-world estimate of pharmacist intervention effectiveness, this translates into an estimated USD 1.72M to USD 13.75M in avoided annual cost depending on regional scale. This provides a concrete, evidence-grounded way for a Region Data Manager to help pharmacists focus limited time where it has the largest measurable impact.

REFERENCES

[1] Reducing Readmission at an Academic Medical Center: Results of a Pharmacy-Facilitated Discharge Counseling and Medication Reconciliation Program, PMC, Yale-New Haven Hospital, 2016.

[2] “Evaluation of a Pharmacist-Driven Discharge Medication Reconciliation Service,” Pharmacy Times, 2026.

[3] “Pharmacist-led interventions at hospital discharge: a scoping review of studies demonstrating reduced readmission rates,” PMC, 2025.

[4] “Predicting Hospital Readmission in Medicaid Patients With Diabetes Using Administrative and Claims Data,” AJMC, 2026.

[5] B. Strack et al., “Impact of HbA1c Measurement on Hospital Readmission Rates: Analysis of 70,000 Clinical Database Patient Records,” BioMed Research International, 2014.

[6] “Comparative Analysis of LSTM Neural Networks and Traditional Machine Learning Models for Predicting Diabetes Patient Readmission,” arXiv preprint, 2025.

[7] Diabetes 130-US Hospitals for Years 1999–2008 Data Set, UCI Machine Learning Repository, accessed via public GitHub mirror.

[8] Agency for Healthcare Research and Quality, “Hospital Admission Versus Readmission Costs, 2020,” HCUP Statistical Brief #304, 2023.

[9] “Impacts of pharmacist-led medication reconciliation on discrepancies and 30-days post-discharge health services utilization in elderly Jordanians,” PMC, 2025.

[10] Impact of pharmacist-led discharge medication reconciliation at an Academic Medical Center, JACCP, 2023.