TRANSFORMING RENAL CARE

IMPROVING PATIENT CARE BY LEVERAGING AI INSIGHTS

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DELOREAN AI

Abstract

The healthcare industry is evolving rapidly with the adoption of artificial intelligence (AI) in areas such as screening and diagnostics, drug and therapy, and administration. However, AI's impact on the industry can only be maximized once expanded beyond single-point use cases to directly address outcome-focused patient care.

This white paper describes the transformative capabilities of Medical AI, a DeLorean AI (DAI) solution, piloted in seventeen (17) Innovative Renal Care (IRC) dialysis centers over a 3-month period. The following will highlight the AI solution's capacity to predict missed treatments, hospitalizations due to fluid overload, as well as other key measures such as adequate clearance and anemia management. By integrating Medical AI into daily workflows of clinical staff, IRC improved patient outcomes, enhanced treatment adherence, and optimized resource allocation.

DeLorean Artificial Intelligence's Medical AI has achieved demonstrable benefits after being deployed within IRC centers. Benefits include predicting missed treatments and upcoming hospitalizations, enhancing patient outcomes, and reducing healthcare costs. In addition to direct use for managing patient risk at the point of care, results are also being used to inform treatment and care planning as well as Quality Assurance and Process Improvement (QAPI) retrospectives.

Problem Statement

End-Stage Renal Disease (ESRD) is both highly deleterious to health and costly to individuals and the economy. Dialysis costs contribute to 80% of ESRD Medicare[1] expenditure and comprise ~7% of all Medicare spending for 0.2% of the US population.[2] Individuals and private insurance must assume the costs until Medicare begins covering care, costing up to $6,785 more PMPM[3] until that time. The 5-year survival rate for those on hemodialysis is 41.4% and 46.9% for those on peritoneal dialysis.[4] Each comorbid health factor such as Type 2 Diabetes, Cardiovascular Disease, etc. increases complications and costs. Each decision point in the care process for dialysis patients contributes to the health and financial outcomes.

In 6 years, the World Health Organization is predicting a global shortage of 18 million healthcare workers including 5 million doctors.[5] With significant shortages, both now and pending,[6] healthcare employees are challenged to provide high-level care while managing with less support and resources. Additional strain is introduced when care is high-touch and dependent on patient partnering in care, either through high-volume treatments or increased/continued education to ensure patients are knowledgeable, compliant, and engaged.

When applying the latest technology and innovations to ESRD, existing solutions have only achieved minimal benefits with predictive analytics and basic machine learning algorithms. Most solutions are focused on either early chronic kidney disease (CKD) stages or end-stage renal disease, not the entire renal spectrum. Solutions which do focus on the full renal spectrum have limited accuracy and capabilities to address the comprehensive concerns present in caring for renal patients. Other standalone solutions focus on supporting clinicians in their care efforts and planning, offering basic insights most of which were already known, thus only confirming information but adding little actionable care. Regardless of their goals, their current scopes, either relegated to the single chronic illness, or limited inclusion of other comorbidities and interconnected chronic illnesses, prevent comprehensive, real-time care. Without breaking the barrier of the past and present and engaging in a future-focused, inclusive solution, moving the needle on patient care and costs will fail to keep pace with the rising care and cost needs within the renal patient community.

Background

Innovative Renal Care (IRC), a comprehensive kidney care company, sought to employ an innovative, artificial intelligence solution to deliver results to an initial seventeen (17) dialysis clinics. IRC partnered with DeLorean Artificial Intelligence (DAI) to deploy its Medical AI solution. The key goals of applying AI in the clinics were to address the biggest contributors to adverse health events, such as missed treatments and hospitalizations due to fluid overload.

Offered as the corporate product, InnovAltive™ Action Center (IAC), an artificial intelligence decision support tool, IAC provides timely alerts and next best action insights for healthcare professionals. It enables early intervention, personalized treatment plans, and the ability to avert negative health outcomes thus allowing for improved patient outcomes and decreased healthcare costs. The initially delivered suite of predictions included risk stratification, future risk, and predictions paired with suggested actions. The AI solution is capable of the following with probabilities:

1. **Risk Stratification:** Identifying patients as low- or high-risk to provide oversight and the targeted ability to move, at minimum, 10% of high-risk patients to a lower-risk group.

2. **Future Risk:** Predicting which low-risk patients will progress to a high-risk state indicating a health change or near-term major event.

3. **Predictions & Suggested Actions:** Predicting key measures affecting patient health including:

   a. Hospitalizations due to fluid overload
   b. Missed treatments
   c. Adequacy (KT/V)
   d. Estimated dry weight changes
   e. Mircera dosing
   f. Venofer dosing

For each prediction, suggested actions, visible to all clinical staff including nephrologists, facility managers, nurses, dieticians, social workers, etc. allow preventive interventions and raise the efficacy of treatment.

   a. Suggested actions, or recommendations, are personalized to the individual patient.
   b. Personalization provides the ability to better anticipate both expected and unexpected events allowing for actionable, evidence-based, and data-driven interventions to prevent an adverse event.

The outputs of Medical AI are visualized using comprehensive dashboards, which were collaboratively built with dedicated IRC user groups including nephrologists and clinical managers. This was done strategically to ensure results were delivered in a concise, efficient, and familiar manner allowing users to understand which patients are at the greatest risk and need priority intervention.

Clinical-level views contain future predictions and up-to-date retrospective data organized in a clinically useful way. Longitudinal views of hospitalizations, missed treatments, dry weight, adequacy, and anemia are included to provide at-your-fingertip visuals and offer meaningful context to understand the patient's overall health. This facilitates the decision-making process to help clinical staff accept or decline a suggested next best action. Additionally, views were created for executives and managers to drive quick understanding of the high-level organizational risk and quickly drill-down to the patient level.

Once deployed, the IAC was continuously curated to meet IRC's specific needs. As new needs were identified based on quality-driven measures and aligning results with business goals, additional capabilities were developed such as predictions for readmissions, vascular access, blood infection, eligibility for home-based dialysis, eligibility for transplant, etc. Additionally, with the full renal-care spectrum from Chronic Kidney Disease (CKD) to End-Stage Renal Disease (ESRD), as well as the comorbid diseases (cardiovascular, diabetes), included in the solution, Medical AI can be deployed at nephrology practices for earlier disease detection, comorbidity management, disease and health transitions, and uncovering undiagnosed conditions.

Image: Patient Detail providing personalized predictions, next-best-action suggestions, and patient history. Note, this image does not contain PHI and is representative of what is currently in use. All data used is synthetic data.

Solution

Artificial intelligence, designed as a decision-support tool for clinicians, offers safe, timely, actionable predictions that can prevent adverse health events. The primary objectives are to provide risk stratification and deliver proactive predictions for future risk, health changes, and major health events. However, additional material benefits were realized including the potential to change to corporate protocols for anemia management, enhancing care planning sessions, and assessing quality measures.

Clinical Outcomes

Fundamentally, an AI solution must deliver on its intended goals. Within three (3) months of deployment, each of the predictions yielded impactful, statistically meaningful results, with the highest yield being from missed treatments and prevented hospitalizations due to fluid overload.

Hospitalizations Due to Fluid Overload

A 27% decrease in hospitalizations due to fluid overload was observed in the pilot clinics. The prediction was paired with suggested actions, which escalate based on the rise in a patient's risk. When a suggested action was performed for a patient at risk for hospitalization due to fluid overload, there was 100% hospital avoidance. Also, the extra treatment rate for the pilot centers increased at a greater rate (58%) as compared to the control group.

"Preventing one hospitalization a month pays for the solution,"

Kevin Highland, Director of Acute Services.

$ 2M

In hospital cost avoidance for fluid overload.

=

$ 250M

Annualized in cost avoidance for payers for just for fluid overload

Save **$100** PMPM on average

To summarize, when a hospitalization due to fluid overload was predicted and a suggested action was taken it resulted in the patient not requiring hospitalization. Since implementation, the AI solution has delivered ~$2M in hospital cost avoidance for fluid overload. Annualized this is ~$18M cost avoidance for payers for just for fluid overload, or approximately $100PMPM.

Missed Treatments

Of those patients who had a prediction for missed treatment, 75% missed their treatments. Advanced warning of missed treatments shifts the ability to perform outreach and intervention from day-of to before the appointment preventing missed treatments and increasing clinic efficiency and utilization. The missed treatment rate was more than 2x greater for the control group as compared to the pilot group.

Adequacy

When predicting if a patient will or will not meet the K(clearance)t(time)/V(volume) requirements, a number used to measure the effectiveness of dialysis treatments, there was a 4% increase in the adequate population after the AI solution was deployed in the pilot group. The prediction allows clinicians to know which patients are at risk of not meeting the treatment target and take appropriate clinical actions to ensure they will meet the target.

Operational Outcomes

Effective artificial intelligence solutions offer benefits to strengthen operations and serve as a 'team player' and an extra resource to enhance operational efficiencies.

Staffing Impacts

Providing consistent risk stratification and predictive risk management creates a unique opportunity to readily visualize the impacts of decreased staffing and less-than-adequate clinic management. This then offers a solution to assist staff in maintaining excellence in care during hardships.

For example, in a leading clinic, the risk for all patients consistently increased with no attributable cause for several consecutive weeks. The AI solution identified a problem and alerted the staff. After a comprehensive root cause analysis, the cause was identified as a clinic management issue. Once resolved, the clinic's patient risk scores normalized.

Oversight Enhancements

Monitoring solution performance, measuring solution efficacy, and providing management-level oversight were essential components in creating a well-rounded AI solution. These features offer a succinct and continuous way for users to quickly review solution performance and understand the usage and impact within clinics.

For example, the AI solution identified key team members who required additional training to maximize the solution's optimal potential, resulting in improved clinic efficiency and patient care.

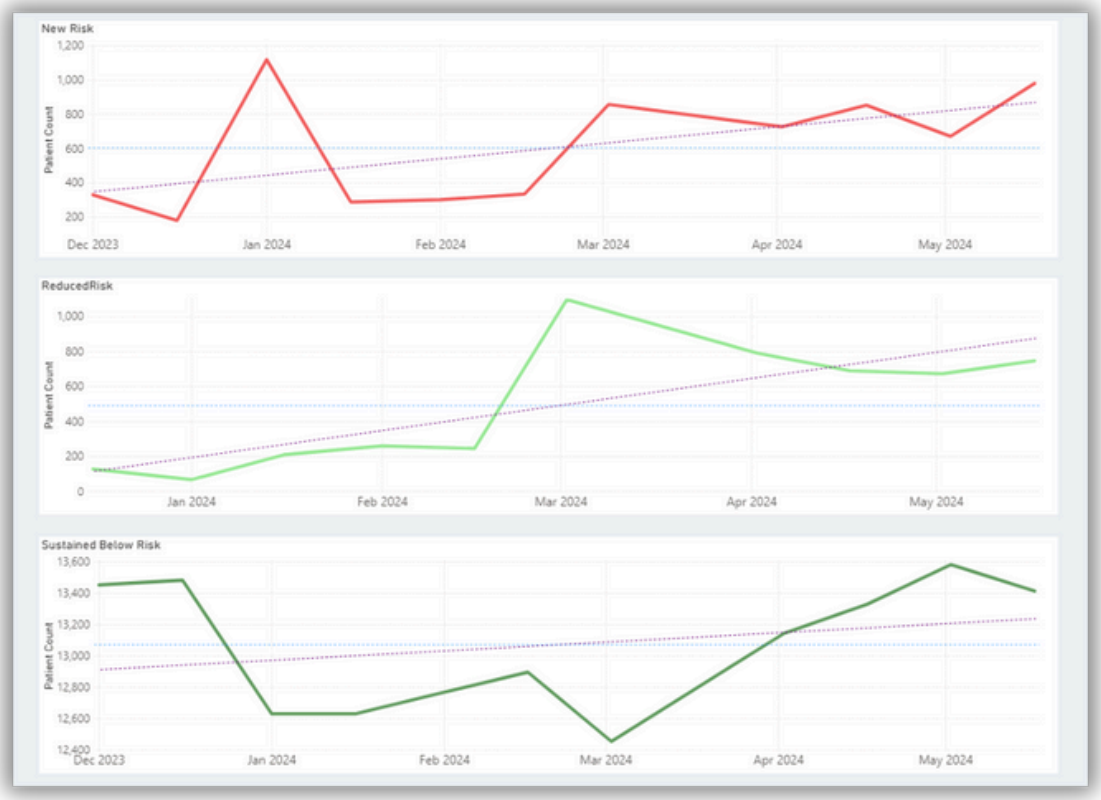

Image: Medical management views to monitor hospitalization potential and patient risk types. Note, this image does not contain PHI and is representative of what is currently in use. All data used is synthetic data.

Operational Gains

The AI solution allows for standardization of care best practices across large systems and increases accountability. The anemia management predictions, Mircera and Venofer, uncovered an opportunity to change 33% of current dosing strategies. The data-driven analysis provided outcomes to support protocol changes and standardization specifically to decrease costly erythropoiesis-stimulating agents (ESA). The results included a 10% overall reduction in Mircera dosing, translating to ~$2,000 (averaging a 50mcg dose) savings per clinic per quarter.

Business Outcomes

The true mark of a useful tool is when its use grows beyond the original need and becomes embedded in the culture of the organization, alleviating resource stressors, and allowing medical professionals to perform at the top of their licenses, improving patient care and lowering associated costs.

Reputation and Patient Retention

Leveraging advanced technology for better patient care can enhance IRC's reputation as the dialysis center of choice. Implementing AI to support operations has allowed IRC to position itself as differentiated and competitive, able to offer cutting-edge solutions to attract new business.

Care Planning

Personalized, proactive care improves patient outcomes and both provider and patient satisfaction. Predictions provide new insights to be integrated while creating or updating patient care plans. IAC insights are being used in both prospective care planning sessions and retrospective QAPI meetings.

Patient Engagement

Bringing predictions and insights to the patient raises awareness of what will take place and allow them to engage more fully in their care. Bridging predictions with patient education creates care touchpoints and calls to action for patients, as well as offers helpful reminders.

Conclusion

Clinicians in the end-stage renal space know their patients thoroughly. At minimum, predictions confirm the medical professional's knowledge and clinical judgment regarding adverse events. At the pinnacle of its efficacy, artificial intelligence alerts clinicians to unexpected future events allowing for timely and impactful interventions. The integration of DAI's Medical AI solution in the IRC environment has significantly enhanced the ability of clinicians to proactively improve patient outcomes and operational efficiency.

Innovative Renal Care exemplifies its innovative nature by deploying cutting-edge technology to better care for its patients. They have achieved significant results during the pilot such as a 4% increase in patients meeting adequacy targets, demonstrating a potential for $2,000 savings per clinic from changing Mircera dosing strategies, and realizing $2M in savings from hospital cost avoidance. DeLorean AI's Medical AI solution will continue to facilitate IRC's innovative goals by applying the solution to the full spectrum of chronic kidney disease from stage one to end-stage along with inherent comorbidities expanding the predictive capabilities driving higher levels of measurable excellence.

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