Saskatchewan's First Percutaneous Arteriovenous Fistula Program: Outcomes of a Multidisciplinary Model Delivering Innovative Hemodialysis Access in a Smaller Canadian Province

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ABSTRACT

Background

Chronic kidney disease (CKD) carries significant morbidity and mortality, and durable hemodialysis access is essential for survival. Saskatchewan provides renal care to Central and Northern Saskatchewan and parts of Northern Manitoba, serving a geographically large catchment of approximately 700,000 people, including patients receiving maintenance hemodialysis. Demand for vascular access is high, while surgical resources and operating room availability are constrained.

Percutaneous arteriovenous fistula (pAVF) creation represents a clinically innovative, minimally invasive alternative to surgical AVFs, with reported advantages including reduced tissue trauma, favorable maturation, and expanded anatomical access options. However, pAVF outcomes are highly dependent on precise anatomical selection, technical execution, and structured follow-up, making multidisciplinary collaboration critical. Prior to 2020, pAVF programs in Canada were limited to large urban centres in British Columbia and Ontario. No percutaneous fistula program existed in Saskatchewan.

Methods

In 2020, Saskatchewan's first pAVF program was initiated using the WavelinQ™ system through a formal interdisciplinary model involving nephrology, interventional radiology, vascular surgery, and specialized dialysis access nurses. Patients with advanced CKD or established hemodialysis needs were screened through a dedicated Dialysis Access Clinic.

Initial screening included clinical assessment and detailed ultrasound mapping to determine suitability for surgical versus percutaneous access in vascular surgery-nephrology combined clinics. Confirmatory imaging by interventional radiology ensured appropriate arterial–venous proximity and vessel caliber prior to pAVF creation. Procedures were performed as day cases in the interventional radiology suite. Post-procedural surveillance included standardized ultrasound at 4–6 weeks, with ongoing evaluation during monthly interdisciplinary dialysis access rounds focused on maturation and cannulation readiness. Interdisciplinary rounds facilitated timely recognition and management of maturation issues, optimizing access outcomes.

Results

Patients were identified as potential pAVF candidates through the program. Most successfully created fistulas matured to functional cannulation with limited secondary interventions. Interdisciplinary rounds facilitated timely recognition and management of maturation issues, optimizing access outcomes. As program experience increased, patient selection accuracy and maturation outcomes improved. Despite its smaller population base, Saskatchewan is now emerging as one of the higher-volume Canadian centres for pAVF creation.

Conclusion

This study demonstrates that a percutaneous AVF program can be successfully initiated in a smaller Canadian centre through intentional interdisciplinary collaboration. Multispecialty patient selection, coordinated procedural planning, and structured follow-up are essential to program success. This model expands hemodialysis access options for CKD patients and highlights the central role of team-based care in advancing vascular access innovation. This program demonstrates that innovative dialysis access technologies are scalable beyond major urban centres when supported by coordinated multispecialty care.

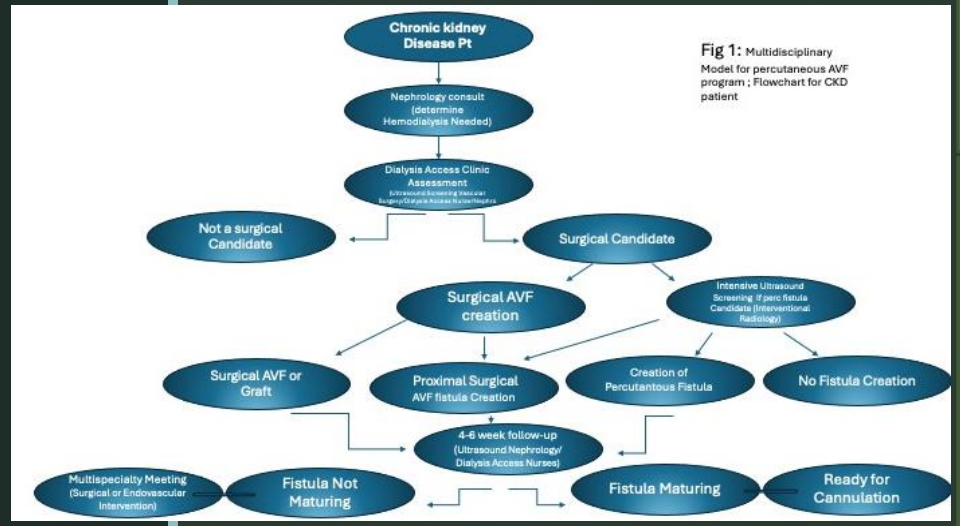

Fig 1: Multidisciplinary Model for percutaneous AVF program ; Flowchart for CKD patient

INTRODUCTION

Saskatchewan is a geographically expansive province in western Canada, with a population of approximately 1.2 million. Saskatoon serves as the tertiary referral centre for central and northern regions, supporting a dialysis catchment of approximately 700,000 individuals across a distributed network of sites including Prince Albert, North Battleford, Meadow Lake and others.

Chronic kidney disease (CKD) represents a growing burden, with the majority of patients requiring **in-centre hemodialysis**. Durable vascular access is essential, with **autogenous arteriovenous fistulas (AVFs)** representing the gold standard. However, access creation has been limited by:

- Operating room constraints
- Geographic barriers
- COVID-19–related delays

Percutaneous AVF (pAVF) creation using the WavelinQ system offers a minimally invasive alternative. Its success is highly dependent on:

- **Strict anatomical selection**
- **Procedural precision**
- **Structured multidisciplinary care**

OBJECTIVE

To describe the development, implementation, and early outcomes of Saskatchewan's first **interdisciplinary percutaneous AVF program**, with emphasis on:

- Interprofessional collaboration
- Anatomical selection
- Clinical usability for hemodialysis

METHODS

Interdisciplinary Model

A coordinated program integrating:

- Nephrology (patient identification, longitudinal care)
- Vascular Surgery (access strategy, initial ultrasound)
- Interventional Radiology (advanced imaging + pAVF creation)
- Dialysis Access Nurses (coordination, surveillance)

Patient Selection Pathway

Patients with:

- Advanced CKD
- Catheter dependence
- Failed prior access

Underwent:

1. **Access Clinic Assessment**
   - Clinical evaluation
   - Duplex ultrasound
2. **Stratification**
   - Surgical AVF candidates
   - pAVF candidates
3. **Radiology Mapping**
   - Vessel diameter
   - Arterial–venous proximity
   - Perforator vein adequacy
   - Calcification assessment

Procedural Technique

- Performed in interventional radiology
- suite
- Endovascular creation of AVF using
- thermal fusion
- Same-day discharge

Post-Procedural Care

- Nurse-led surveillance
- Ultrasound at 4–6 weeks
- Trial cannulation

Interdisciplinary Access Rounds

Monthly case review for:

- Non-maturing fistulas
- Complex access issues

Interventions included:

- Angioplasty
- Vein ligation
- Superficialization
- Surgical revision

RESULTS

Key Findings

- Early failures driven by:
  - Poor arterial–venous alignment
  - Inadequate perforator size
  - Vessel mismatch
- Transition to **radiology-led anatomical selection** improved:
  - Technical success
  - Maturation rates
- Majority of successful pAVFs:
  - Progressed to functional hemodialysis use
  - Required **minimal adjunctive intervention**
- Some required:
  - Angioplasty
  - Vein ligation
  - Superficialization

CONCLUSION

This study demonstrates that a **percutaneous AVF program can be successfully implemented in a smaller, resource-constrained healthcare system** through deliberate interdisciplinary collaboration.

Key determinants of success include:

- **Rigorous anatomical selection**
- **Dedicated imaging pathways**
- **Coordinated longitudinal surveillance**
- **Integrated multidisciplinary decision-making**

This model:

- Expands vascular access options
- Reduces reliance on central venous catheters
- Provides a **reproducible framework** for other jurisdictions

WHY THIS MATTERS

Advanced vascular access innovation is often limited to major centres. This program demonstrates that:

- **Geography is not a barrier to innovation**
- **Collaboration enables scalability**
- **Patients benefit from expanded access options**

Figure 1: Saskatchewan: a prairie province in Canada. Its population is 1.26 million. Saskatoon, a city within Saskatchewan, is a significant population for renal care.

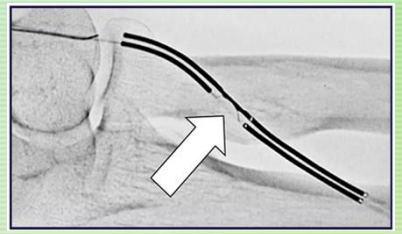

Figure 2: Example of Percutaneous Fistula creation (Dalmatch B et al. JVIR ; 36.12.2025)

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KEY INSIGHTS

1. **Anatomy is the Primary Determinant of Success**
   - Vessel geometry and perforator integrity are critical
   - Selection outweighs technical execution
2. **Interprofessional Care is Essential**
   - Each specialty contributes distinct expertise
   - Integrated workflow improves outcomes
3. **Nursing is Central to Program Success**
   - Early detection of dysfunction
   - Coordination of multidisciplinary care
4. **Iterative Learning Improves Outcomes**
   - Clear programmatic learning curve
   - Refinement of selection criteria over time