Fistula First:
Improving Patient Care with an Endovascular Arteriovenous Fistula Creation Program

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Purpose

An Arteriovenous fistula (AVF) is the preferred access for hemodialysis in patients with end-stage renal disease (ESRD). AVF access, made by connecting an artery to a vein, is the safest and least expensive form of hemodialysis access compared to options such as catheter dialysis and grafts. Arnot Ogden Medical Center serves a population with a high percentage of ESRD and kidney disease. These patients often receive dialysis catheters as an intermediate while waiting for a functional AVF. Historically, the only way to create an AVF was by undergoing surgery with a large incision on the arm and multiple sutures. However, since gaining FDA approval in 2018, this procedure can now be performed under ultrasound guidance with a needle puncture in a vein near the elbow. The Ellipsys Vascular Access system provides a way for the creation of minimally invasive AVFs, not requiring general anesthesia. They are created faster than surgical fistulas and have shorter maturation times which mean that patients can receive dialysis sooner than those with surgical AVFs.
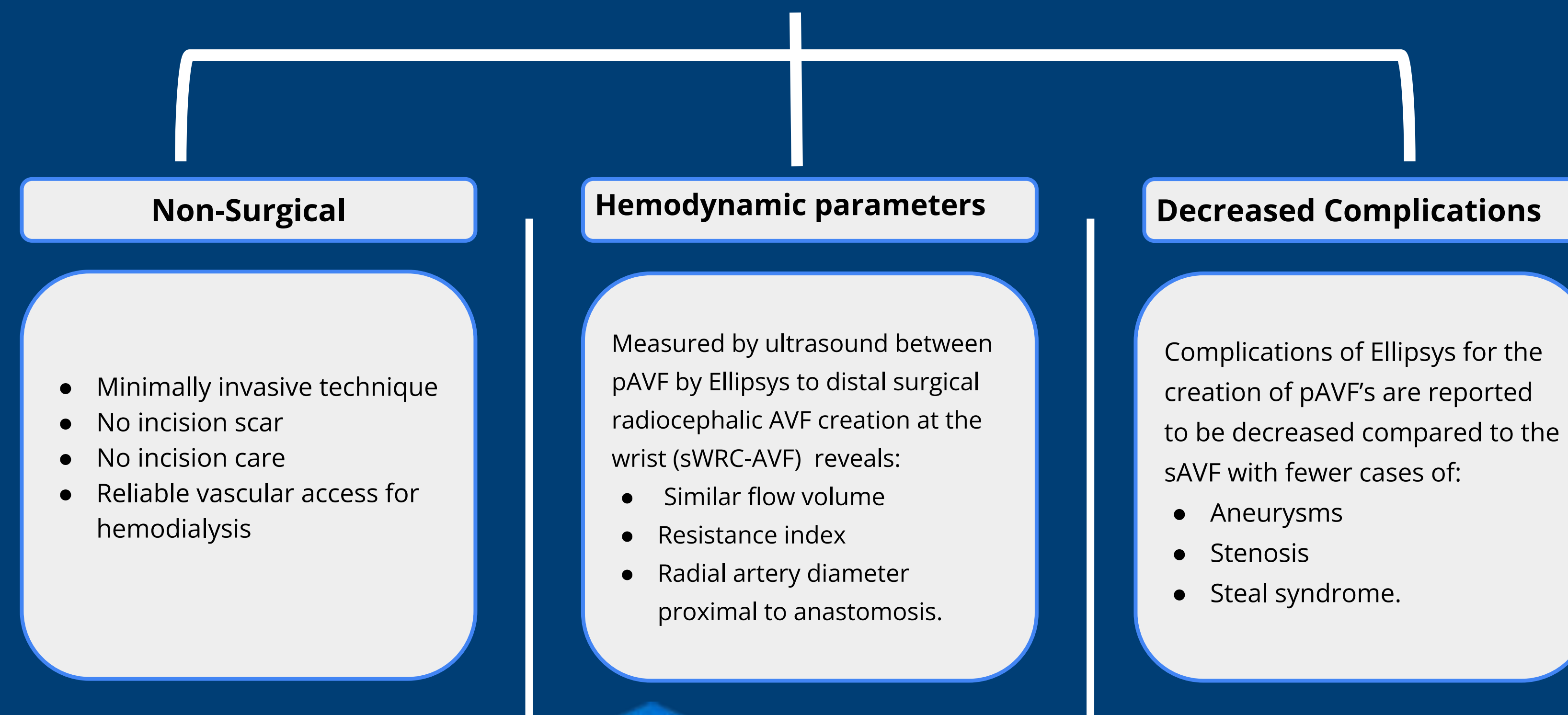
Institutional Goals

AVF access is the safest and least expensive form of hemodialysis access compared to other options such as catheter dialysis and grafts. Arnot Ogden Medical Center serves a population with a high percentage of ESRD and kidney disease. These patients often receive dialysis catheters as an intermediate while waiting to have a functional AVF. The Ellipsys system provides an expedient and cost-effective method to serve these patients.

Material and Methods

A formal literature review outlined the potential advantages and disadvantages of endovascular fistula creation versus the current method of surgical creation. Subsequently, an estimate of procedural volume for an endovascular fistula creation program with Ellipsys was conducted, utilizing total yearly numbers based on CPT codes for surgical arteriovenous fistula creations. A financial plan with break-even analysis was developed and once a suitable credentialing criteria was established, the program was initiated.

Benefits of Ellipsys Fistula Creation

Non-Surgical
- Minimally invasive technique
- No incision scar
- No incision care
- Reliable vascular access for hemodialysis

Hemodynamic parameters
Measured by ultrasound between pAVF by Ellipsys to distal surgical radiocephalic AVF creation at the wrist (sWRC-AVF) reveals:
- Similar flow volume
- Resistance index
- Radial artery diameter proximal to anastomosis.

Decreased Complications
Complications of Ellipsys for the creation of pAVF's are reported to be decreased compared to the sAVF with fewer cases of:
- Aneurysms
- Stenosis
- Steal syndrome.

Ideal Patient
- Life expectancy >1 year
- Within vascular anatomy parameters

Physical Exam Assessment
- Allen's Test- assess arterial supply to palmar arch of hand
- Blood pressure measurements- upper extremity bilaterally
- Signs of previous AV access surgery, skin irregularities (thin/aging skin, keloid scars),
- Signs of venous hypertension (ie. Collateral veins)

Ellipsys

A high body habitus ?
- Not a restriction
- Vessels more preserved due to lack of injury from difficulty cannulating during phlebotomy.
- Staged lipectomy, elevation or transposition procedure performed if the selected outflow vein is too deep prior to pAVF procedure.

Vascular Anatomy Parameters
- Patent PRA and adjacent DCV
- Each vessel greater than 2mm in diameter and within 1.5 mm of each other
- Avoid dense calcifications within arteries

Primary efficacy endpoints
- palpable fistula on physical examination
- brachial artery flow volume > 500mL/min with fistula waveform
- a target vein diameter >4mm
- flow volume > 500mL/min

Figure 1

Figure 1: In the right arm antecubital region there is a common perforator with a 5.8 mm diameter positioned just below 1.5 mm from adjacent radial artery. Ellipsys creation prefers ideal anatomy where the perforator vein is less than 1.5 mm away from the radial artery. Minimal tortuosity is also preferred.

Results and Conclusions

The Ellipsys system provides an expedient and cost-effective method to serve the patients of the Elmira community. The option now exists to create endovascular fistulas in our community that can be utilized rapidly, allowing greater adherence to a 'fistula first' initiative that involves creation of AVFs without the need for intermediate dialysis catheters.

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