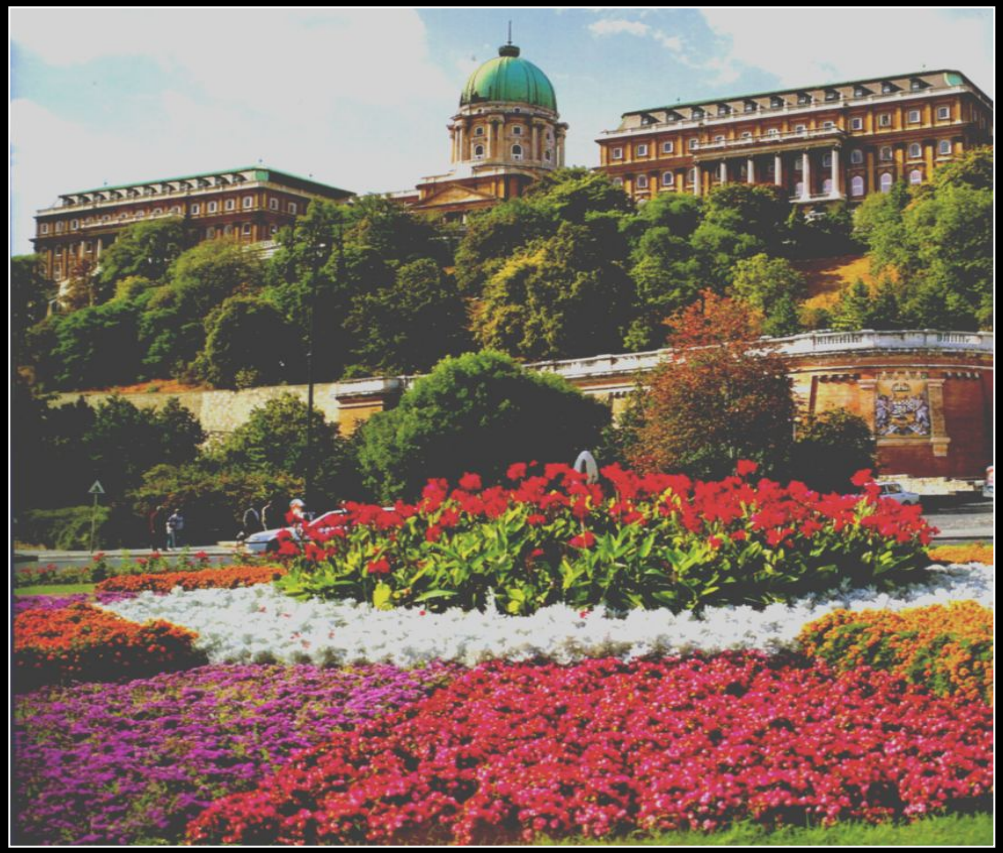
HEMODIALYSIS ACCESS FOR NURSES 2008



Things that we are doing great on….

- Crude Mortality rate: 9.8 (85pc) vs 24% US average
- Standardized Mortality ratio: 0.8 (2006)
- Serum Albumin: 67 (78 pc) vs 50% US average
- Serum Hemoglobin: 82 (42) vs 68.5 in 9/2007
- Treatment time: 106/126 ≥4h vs 3.5h US average

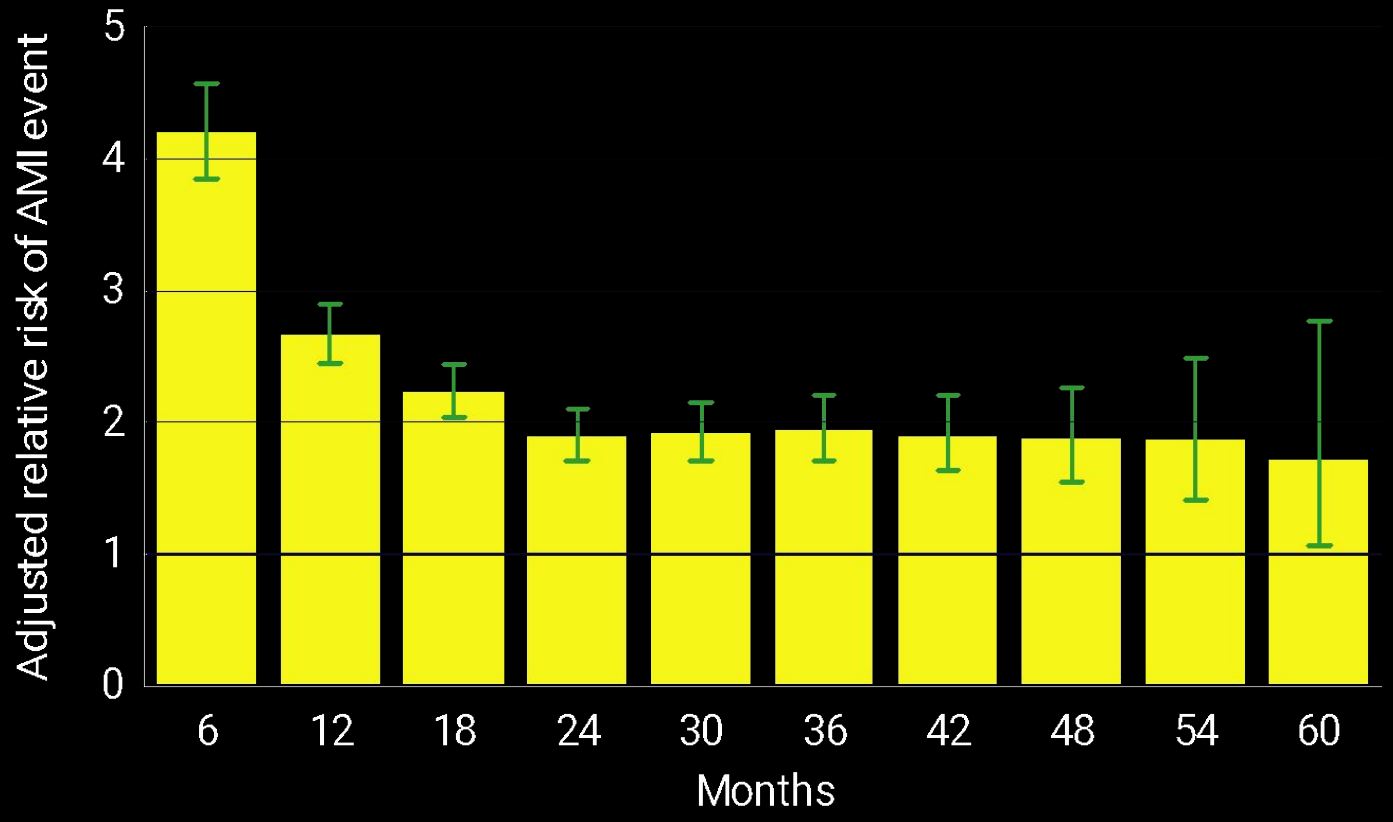
Things that we are doing not so great on….

- Serum Phosphorus: 55 (30 pc)
- Serum PTH: 16 (0 pc)
- Unexcused absences: 70 (13 pc)
- **Native Fistulae: 41 (16 pc)**
- **Permanent catheters: 25 (40 pc)**

Why do we not like catheters?

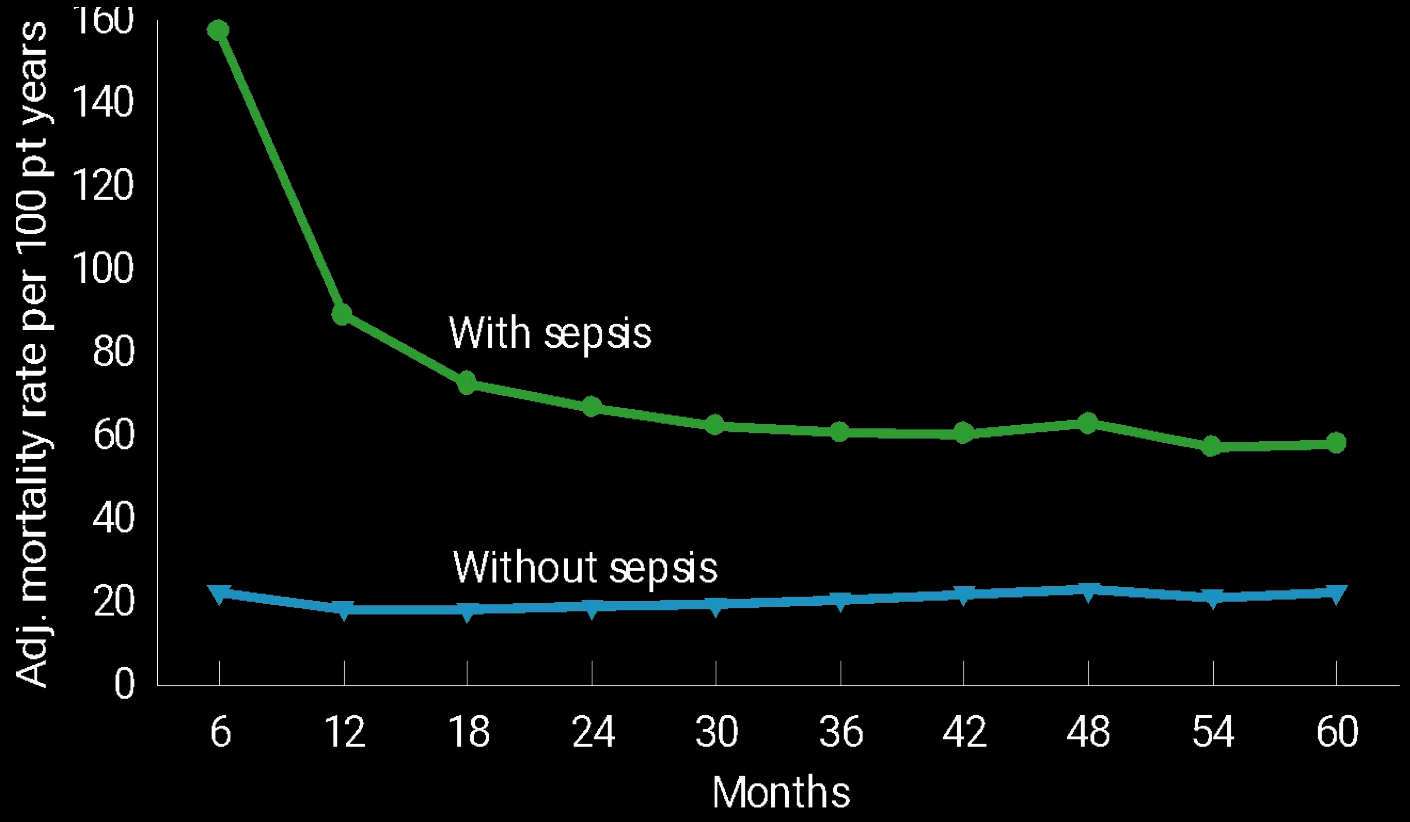
- Semi-permanent dialysis catheters:
  - -dysfunction (clotting, malposition)
  - -infections common
  - -foreign body reaction: inflammation
  - -effective blood flows often low
  - -recirculation high
  - -proximal stenosis
  - -superior vena cava syndrome
  - -may slow native fistula maturation

Acute myocardial infarctions after first sepsis event: adjusted relative risk of AMI event



Incident dialysis patients (90-day rule), 1996–1999 combined; adjusted for modality, age, gender, race, & primary diagnosis. Patients with Medicare as a secondary payor or enrolled in an HMO on day 90, & those with AMI claims overlapping the start date of the followup period, are excluded. Reference group: patients without sepsis.

Mortality after first septicemia event: adjusted mortality rates



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Hemodialysis access types

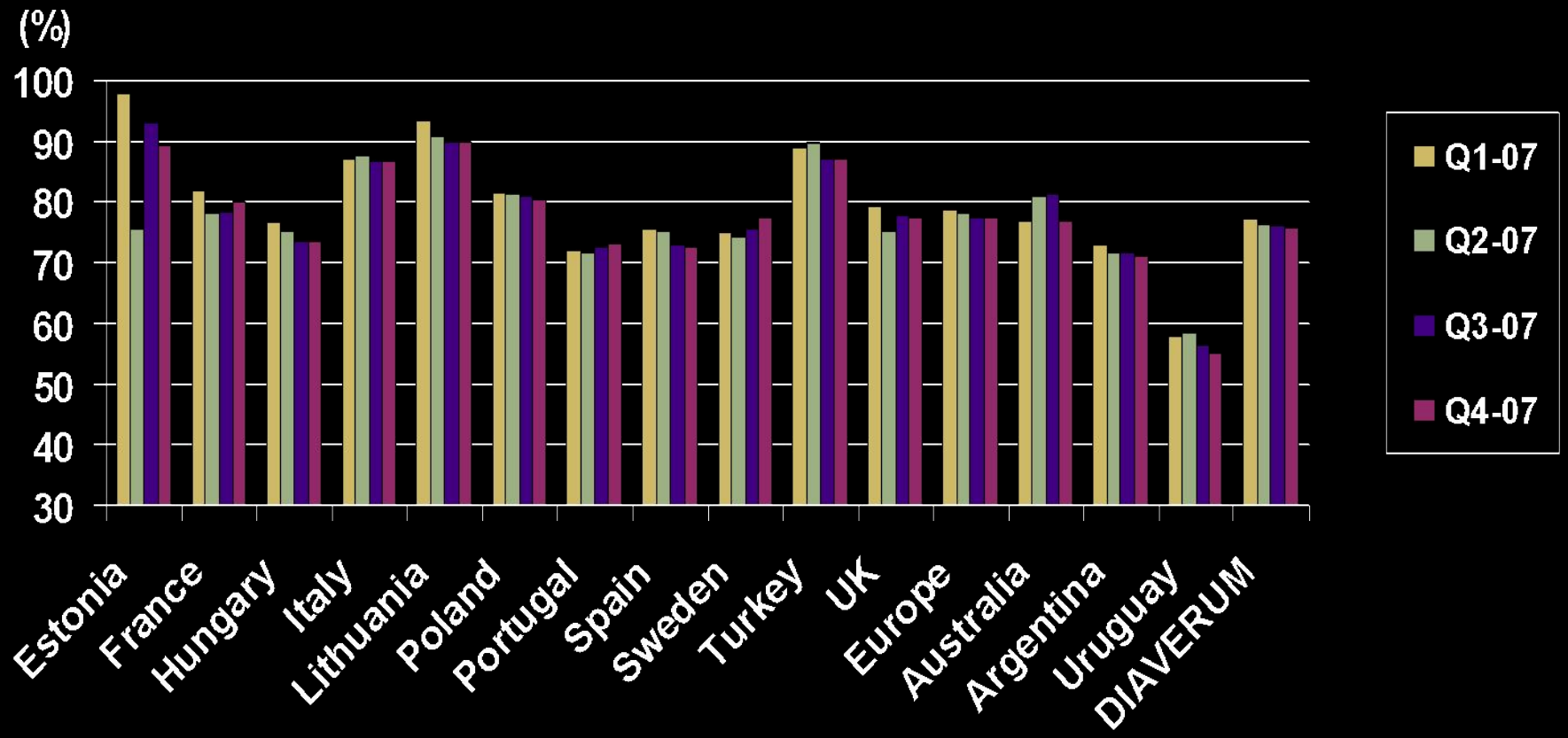
- Native fistula: no foreign body (less inflammation, higher albumin, better mortality), less infections, longer primary (unassisted) patency
- Synthetic graft: more infections, frequent distal stenosis due to myointimal hyperplasia (unpredictable) requiring declotting
- However, native fistula is associated with slow maturation and primary failure, thus increasing the need for a bridge solution: a catheter

A Vicious Cycle….

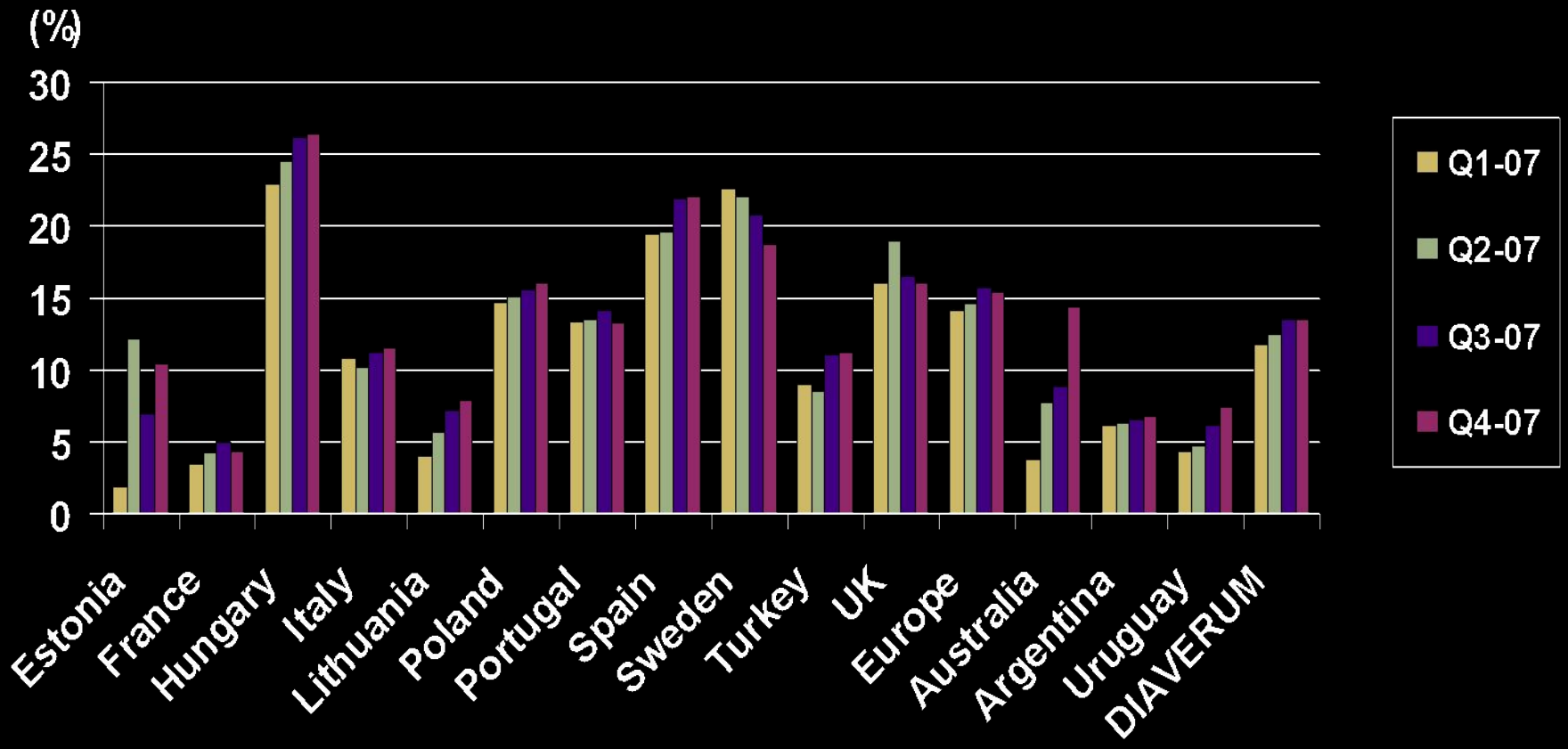
- Poor native fistulae increase catheter use →
- Catheters may slow native fistula maturation ←

Solution???

Native AV-fistula



Catheter


(%)
30
25
20
15
10
5
0
Estonia
France
Hungary
Italy
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Portugal
Spain
Sweden
Turkey
UK
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Australia
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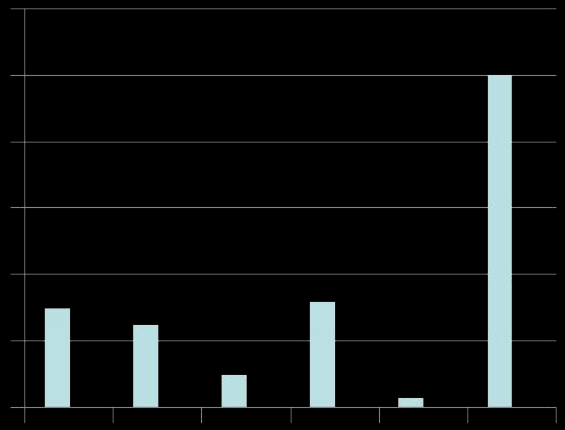
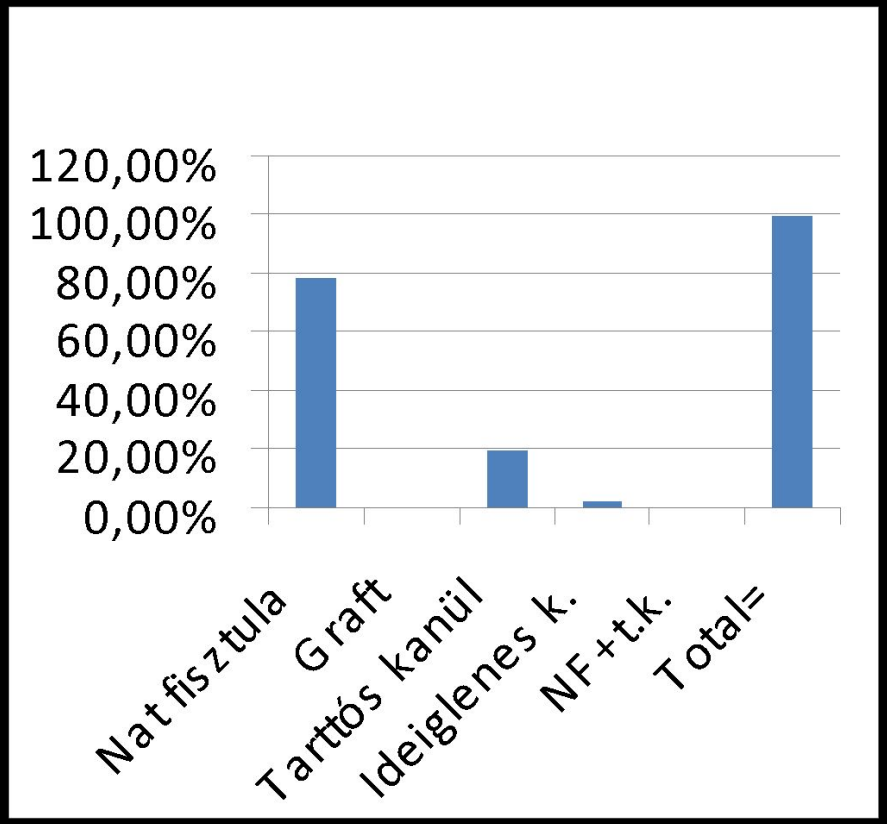
Q4-07

Vascular Access

A TYPICAL AMERICAN UNIT



A TYPICAL EUROPEAN UNIT



No more sitting and waiting!!!

- Decrease catheter time by early sticking!
- K-DOQI: if a fistula is not mature by 4-6 weeks then let it revise, most catheters that are ever going to function will mature in 4 weeks
- European experience: there is no clear benefit in waiting over 1 month
- Technique and communication: surgical and sticking technique, close communication with surgeons, fistulogram or Doppler if needed

What may hinder fistula maturation?

- Collateral veins: less flow in the fistula- may get better over time but usually does not; if the surgeon missed a vein it is more visible over time so do a fistulogram and revise-alert the nephrologist if a fistula is slow to mature
- Central stenosis: minimize catheters (number and duration)
- Deep fistula: difficult to see, ask for a diagram or a Doppler
- Sclerotic or tortuous vein: ask for a diagram or a Doppler-if it is not going to work let us get a new one ASAP, no use sitting around!
- Being aware of the problem will facilitate prompt intervention

Fistula maintenance: avoiding hematoma

- Hematoma can act as functional stenosis
- Hematoma can cause pain, patient frustration
- Hematoma can get infected (remember Lifesite???)
- Hematoma can cause hyperkalemia so…..

AVOID HEMATOMA!

Avoiding hematoma, OK but how?

- Size of the needle- a good fistula should easily accommodate 15g sometimes even 14g: diameter of the needle is important in decreasing resistance to flow alias estimated versus measured blood flow rates
- Direction of the needle is key to avoid injury to venous wall, decreasing resistances, maximizing flow (my experience with flow variability) and……decreasing recirculation (this is also dependent on the distance between needles: Brescia-Cimino article…..)

The key to success: needle direction

- Arterious and venous pressures: variability often due to needle direction (Schwab's dynamic pressures: pressures may be higher at any given blood flow and at any needle gauge depending on needle direction)
- Goal: arterial (receiving) needle should point toward blood flow to avoid turbulence at the needle tip due to negative pressure (sucking) effect- turbulence can cause more stenosis, clotting, venous injury
- Goal: venous needle should conform with the direction of the access blood flow
- Needles pointing away from each other means gaining distance, minimizing recirculation
- Higher than usual pressures (arterial or venous) mean higher resistances meaning less effective blood flow

Needle direction: technique

- Physical examination may help but diagram from surgeon or Doppler study will clarify fistula design, direction of flow
- Sticking should always involve visualization of native fistula anatomy
- Every fistula is morphologically different-must learn anatomy of the individual patient
- Experienced stickers must be available and should teach proper technique…by the way….

Who should stick a fistula?

- Sticking a fistula requires experience, skill and attention to detail
- Only highly specialized nephrology nurses or physicians stick fistulae after months of inservice in fistula sticking
- 3 specialized nephrology nurses with 1-2 physicians as a back up for a dialysis center of about 50-60 patients total
- Specialized nephrology nurse per patient ratio **>1:4**
- Recognition that sticking native fistulae is a complex, difficult procedure requiring skill
- This is in Baja, Hungary.....why not here?

Self sticking and buttonholing

- Self sticking or same person sticking can increase chances that needle direction will be similar from treatment to treatment; proper and consistent sticking can optimize outcome ("I am familiar with this fistula")
- This effect may be enhanced by buttonholing: establishing a tunnel of weakened entry site surrounded by scar tissue
- Advantages of buttonholing: established tunnel guides the needle, there is less pain, no need for site rotation so one avoids pseudoaneurysms or aneurysms; in addition, needle distance can be maximized
- Disadvantages of buttonholing: it requires precision and consistency-to establish a tunnel exactly the same spot with the same needle direction needs to be stuck

Summary

- We are doing great in many respects- reducing number of catheters is not one of them
- Reducing the number of catheters means close communication with vascular surgeons: rapid referral to promptly revise poorly maturing fistulae in order to decrease maturation/catheter time
- Proper sticking technique can reduce hematomas, recirculation and can increase effective blood flow
- Needle direction is key- this requires visualization of access flow by physical exam, diagram from surgeon or Doppler study and months of training
- Recognition that maintenance of a native fistula is a complex and highly rewarding practice

Summary 2

- Needle direction is the main cause of variability of venous and arterial pressures at any given blood flow and needle gauge-such need to be checked from treatment to treatment as a quality improvement issue
- Sticking is complex and requires highly skilled personnel
- Self-sticking and buttonholing should be considered in the appropriate context