Centers for Amputation Prevention; Clinical and financial advantages

Richard F. Neville, M.D.
Professor of Surgery
Chief, Division of Vascular Surgery
George Washington University

Disclosures

- WL Gore
- Vascular Flow Technologies
- Cormatrix
- Graftworx

Goals for a Limb Preservation program

- Increase success of limb preservation
- Raise awareness of limb preservation
  - DM
  - ESRD
- Referral source for the community
  - Patient education
  - Physician education
- Streamline care
- Improve financial viability (?)

Proposed benefits of a multidisciplinary limb program

Patient
- Reduced time for vascular assessment
- Reduced time for wound healing
- Reduced time to treat infection
- Reduced time to correct podiatric deformity
- Efficient surveillance

Physician
- Efficiently manage complex patients
- Increase in patient referrals
- Leadership role regionally/nationally
- Enhance identity of institution
- Develop infrastructure for trials


Multidisciplinary limb program Reduction in amputation

- USA (Diabetes Care)
  - Number of amputations decreased 82%
  - 70% of amputations – ankle or toe
- Sweden (Larsson, Diabetes Med)
  - Retrospective analysis, 78% reduction
- UK (Skeffman Diabetes Care)
  - Prospective analysis, 62% reduction
- Italy (Anichini, Diabetes Research)
  - 10/100,000 patients to 6/100,000 patients

Structure of a Limb Preservation program

- Physician team
  - Vascular
  - Podiatry
  - Plastic, ID, Nephrology, Cardiology, Endocrinology, Orthopedics, Physical Medicine, Radiology
- Staff
- Space
- Diagnostic imaging
- Vascular therapy
- Wound care / soft tissue
- EMR
- Education
- Research
- Marketing
- Financial analysis
Staff
- Program Director
- Physicians
  - Vascular, Podiatry, Plastics (Medical Directors)
  - ID, Cardiology, Endocrinology, Nephrology, Orthopedics, Hospitalists, Rehab
- Physician extenders
  - Nurse practitioners
  - Wound nurses / Medical assistants
  - Optimal ratio MD/extender = 1/3
- Support staff
  - Receptionists
  - case manager
  - Billing specialist

Space
- Outpatient space
  - Accessible
  - Exam rooms (6 rooms for 30 patients)
  - Conference rooms
- Non-invasive vascular lab
- Endovascular suite
- Operating room (hybrid)
- Hospital ward
- Hyperbaric oxygen chamber

Vascular lab
*Tests for tissue perfusion*
- Tc02
- Skin perfusion pressure
- SPY Elite camera
- Questions
  - Who needs revascularization?
  - When is enough --- enough?
  - When should we work on the foot?

Arterial imaging
*CTA and MR angiography*

Arteriography still important
- Distal tibial occlusive disease
- Limb Center
  - 533 initial diagnostic
  - 276 primary interventions

Revascularization
*Surgical and Endovascular techniques*
Soft tissue and wound therapy
*As important as revascularization*

- Protocol driven
- Outcome assessment
- Maximize functional length
- Biomechanically sound

Wound debridement

- Debride to viable tissue
- Culture exposed bone edges
- Reconstruct soft tissue
  - Inflammation is gone
  - Granulation tissue appears
  - VAC as temporary dressing until closure
- Wet gangrene
  - Debride pre-revascularization
  - Resect all necrotic tissue
  - Explore tendon sheaths and fascial compartments

Primary amputation
*May be the right choice*

- Lack of tissue
- Non-ambulatory
- Dementia

Amputation principles

- Biomechanics
- Maximize viable tissue
- No pressure points
- Rigid post op dressing
- Early ambulation

Amputation principles
*Below knee amputation*

1) Plan posterior flap design
2) Cut tibia distal from tubercle (10cm)
3) Bevel anterior tibial bone
4) Tenodese Achilles to anterior tibial bone
5) Shape posterior flap

Patient Support and Education

- Community lecture series
- Amputee support group
Financial implications

- Can a Limb Center have an impact and be cost effective?
  - **Direct cost** – salaries/supplies/space
  - **Indirect cost** – electricity/maintenance/loans
  - **Revenue**
    - Center generated fees
      - Technical
      - Professional fees
    - Downstream institutional revenue

Revenue – Outpatient Wound Center

- Surgical debridement and hyperbaric oxygen therapy

Financial implications to healthcare system

**Limb preservation centers**

- Ollendorf
  - 10,000 patients - $750,000 savings
- Ragnarson
  - Markov model (10,000 Swedish patients)
  - Lower costs and reduce amputations
- Ortegon
  - Markov model (10,000 US patients)
  - Cost reduction by treatment protocols

Financial implications

**Hospital Downstream revenue**

Inpatient surgery and associated medical admissions
10-30% of patients will require admission

Limb Preservation Center

- Labor intensive
- Structure and protocols required for success
- Assess data and results
- Aggressive revascularization
  - 20% need some type of revascularization
- Difficult for outpatient wound center to cover costs
- Downstream hospital revenue important

Wound Center → Limb Center