Indian Health Service
Best Practice for Diabetic Foot Care
A Strategy for Primary Care Clinicians

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Learner Objectives

1. List risk 4 factors for diabetic foot complications
2. Be able to conduct a complete diabetic foot exam
3. List 3 interventions associated with decreased risk for foot complications
4. State 4 educational objectives for patients at high risk for foot complications
5. Describe 4 components of the chronic care model related to improving diabetic foot care

Protecting the Diabetic Foot
A Strategy for Primary Care Clinicians (1)

- *Screening for High Risk Patients*
- Practical Interventions
- Implementation into Practice

Why Is Foot Care Important for People with Diabetes?

- ~40% will develop peripheral neuropathy
- ~20% have an acute foot problem on foot exam
- ~15% will develop an ulceration (cost ~ $13-30K each)
- 5-10% progress to amputation (cost ~ 50K/yr each)
- 43% with ulcer and 47% with amputation die in 5 years
- Most amputations can be prevented with resources currently available in primary care
- Most patients with diabetes get their care from primary care providers

CDC, 2008; Harris, 1993; Kumar, 1994; Borrsen, 1990; Reiber, 1999; Stockl, 2004; Rith-Najarian, 2001;Moulik, 2003

Foot-Related Rick Factors for Ulceration

Risk Factor	Ulcer	LEA
Neuropathy	+	+
Deformity	+	+
Limited Joint Mobility	+	+
Prior Ulcer/LEA	+	+
PVD	+	+
Onychomycosis	+	

Pham, 2000; Lavery, 1998; Rosenbloom, 1996; Walters, 1992; Kumar, 1994; Fernando, 1991; Rith-Najarian, 1992; Mayfield 1996; Alder, 1999, Boyko, 2006

Non-Foot-Related Risk Factors for Ulceration and Amputation

Risk Factor	Ulcer	LEA
Male Sex	+	+
Duration DM	+	
Age	+	
hyperglycemia	+	+
hypertension	+	+
dyslipidemia	+	+
smoking	?	?
Vision < 20/40	+	
Other complications	+	+

Moss, 1996; Alder, 1999; Palumbo, 1995; Moss, 1992; Moss, 1999; Litzelman, 1997; Lee, 1993; Boyko, 1999; Nelson, 1988; Selby, 1995; Lehto, 1996; Eggers, 1999; Boyko 2006

Simple Criteria to Identify High-Risk Feet in People with Diabetes

- Insensate to 10-gram monofilament
  - *or Insensate to 128-Hz tuning fork*
- Foot deformity
- Prior ulcer or amputation
- Absent pulse or abnormal ABI pressure

Diabetes Care, 15:1386-89, 1992; N Eng J Med, 1995;322:269-70.

Diabetes Care, 31:1679-85, 2008; Diabetes Res Clin Pract, 70:8-12, 2005

Feet Can Last a Lifetime, NIH/NIDDK, 2002

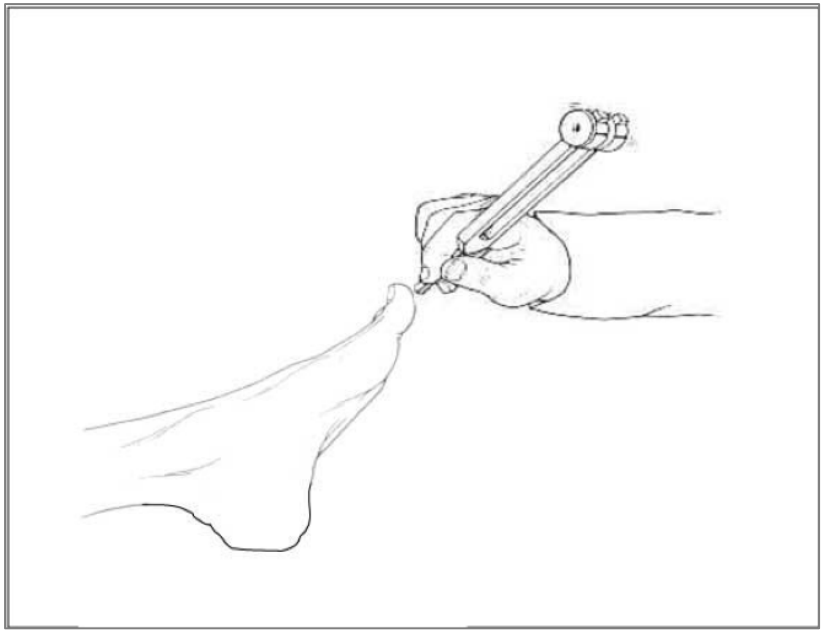
Screening Tests

- Press perpendicular to point of bending, hold
- 1 second and release (Demonstrate on hand)
- Patient closes eyes and acknowledges sensation of pressure with a “yes”
- Test both feet, 4 sites each: Great toe and 1st, 3rd, and 5th metatarsal heads (not heel or dorsum)
- Insensate in one or more area confers risk

Perkins, Diabetes Care 2001;24:250-256 Diabetes Care, 1992;15:1386-89

Vibration Sensation Testing
128 Hz Tuning Fork

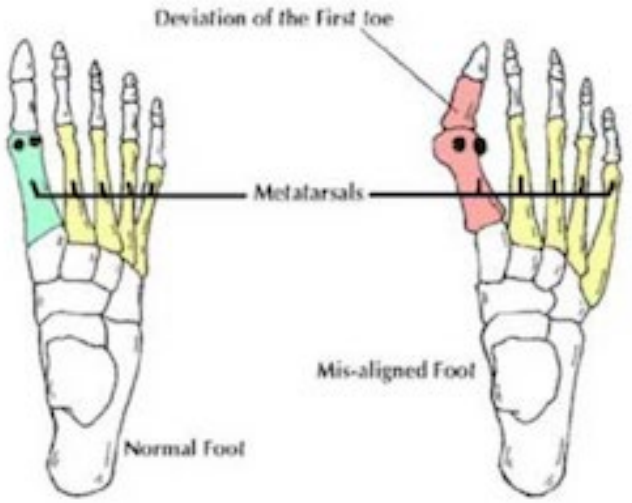
- Tested over the tip of the great toe bilaterally
- An abnormal response can be defined as when the patient loses vibratory sensation and the examiner still perceives it while holding the fork on the tip of the either toe



Singh JAMA 293:217–228, 2005
Abbott, Diabet Med 19:377–384, 2002

Development of Foot Deformities

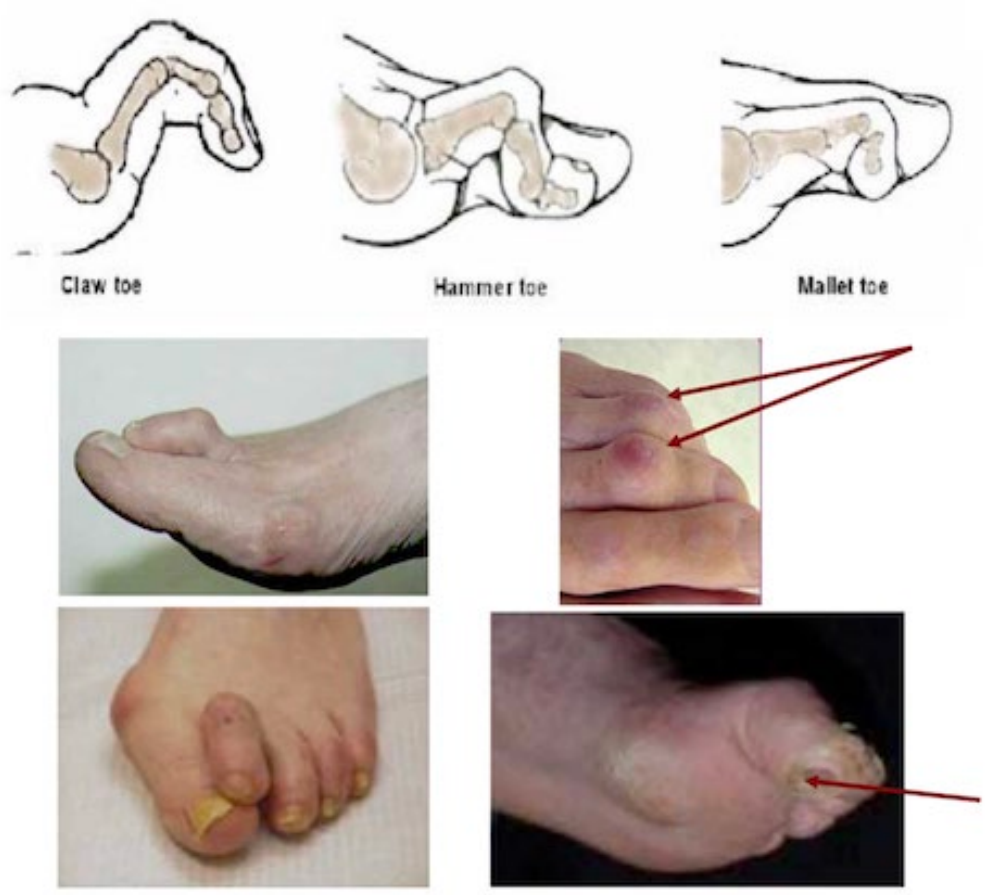
Bunions – hallux valgus



Foot Deformities Associated with Risk for Amputation

Bunions – hallux valgus

Foot Deformities Associated with Risk for Amputation



Foot Deformities Associated with Risk for Amputation

Charcot Foot

Selected Clinical Assessment of Peripheral Arterial Vascular Status and Abnormal Thresholds

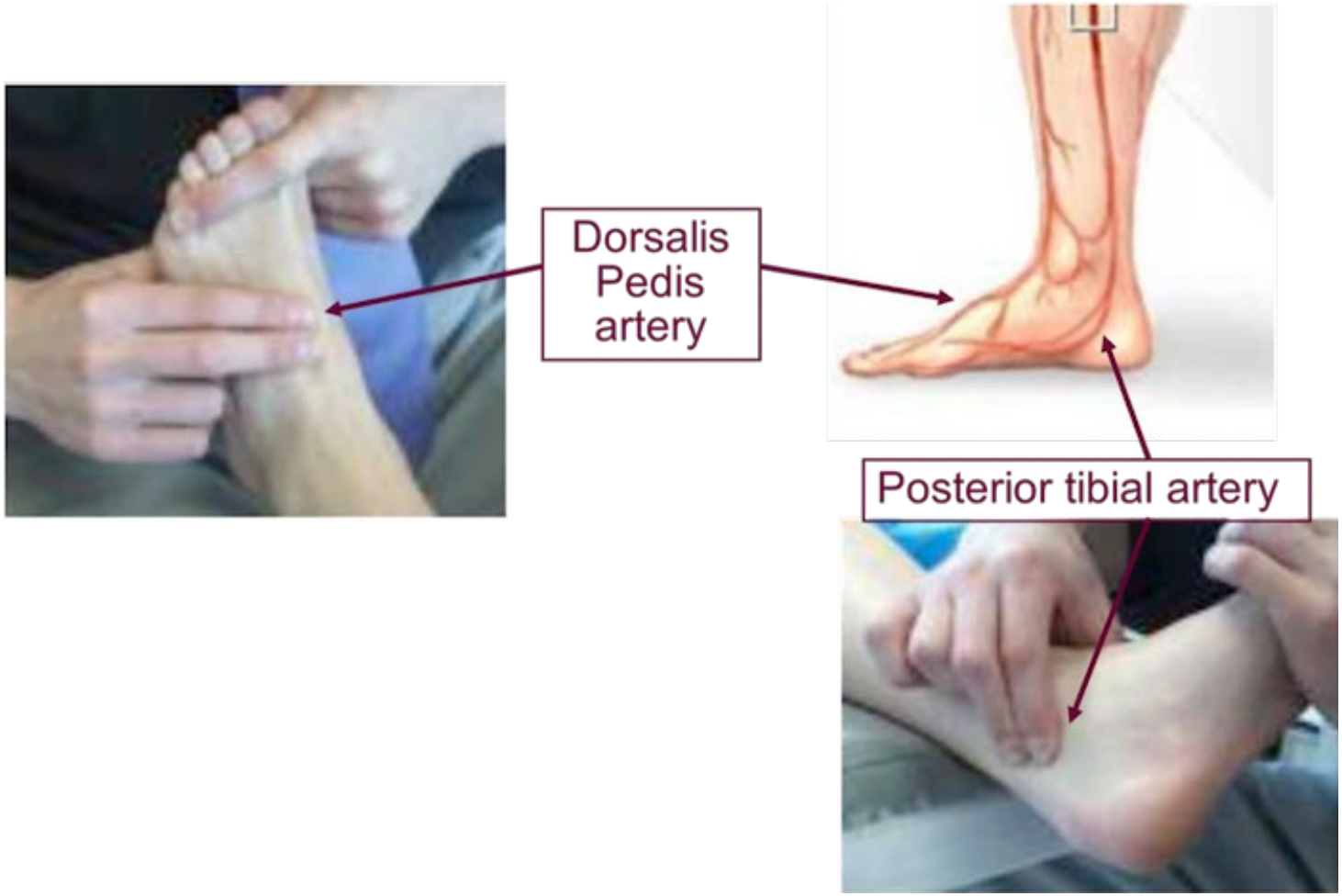
Vascular Test	Abnormal Threshold
Pedal Pulses	Absent
Ankle Brachial Index (ABI)	< 0.8
Toe BI	< 0.6

Pham Diabetes Care 2000;23:606-11

Wang, Circulation 2005;112:3501-3508

Suominen, European J Vasc Surg 2008;35:709

Arterial Anatomy of the Foot



Ankle Brachial Index

1. Measure Doppler brachial pressures in each arm
2. Measure Doppler Pressure in each ankle
3. **Calculate ABI**: ABI = Ankle BP/Brachial BP *Divide the ankle press by the greater of the two brachial pressures*

From Hurley et al, The Diabetic Foot, 1993

Correlation of POAD Symptoms by ABI Category

Severity Category	**ABI Value**
Normal	1.0–1.4
Borderline	0.90–0.99 or > 1.4
Mild	0.70–0.89
Moderate	0.40–0.69
Severe	< 0.40

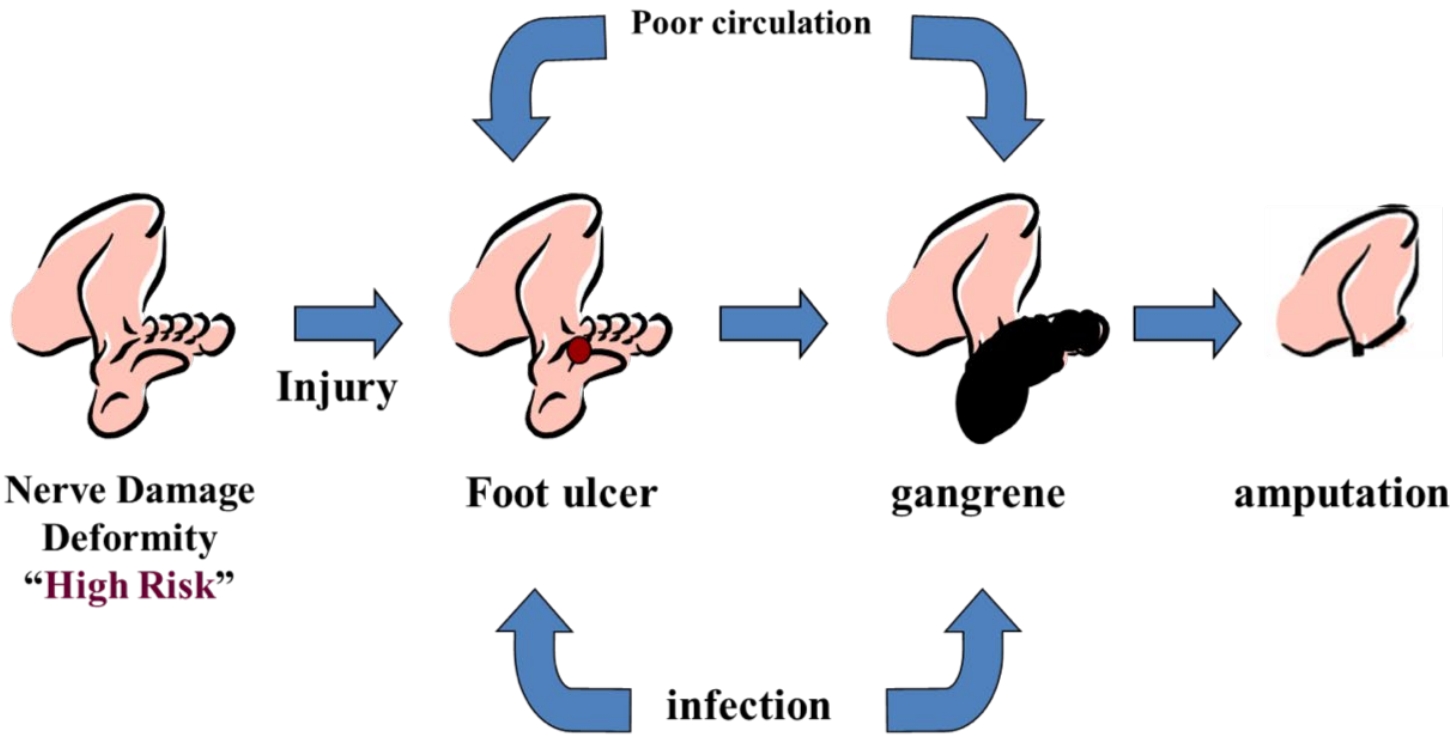
Wang, *Circulation* 2005; 112:3501-3508

Video of Foot Exam

Protecting the Diabetic Foot
A Strategy for Primary Care Clinicians (2)

- Screening for High-Risk Patients
- *Practical Interventions*
- Implementation into Practice

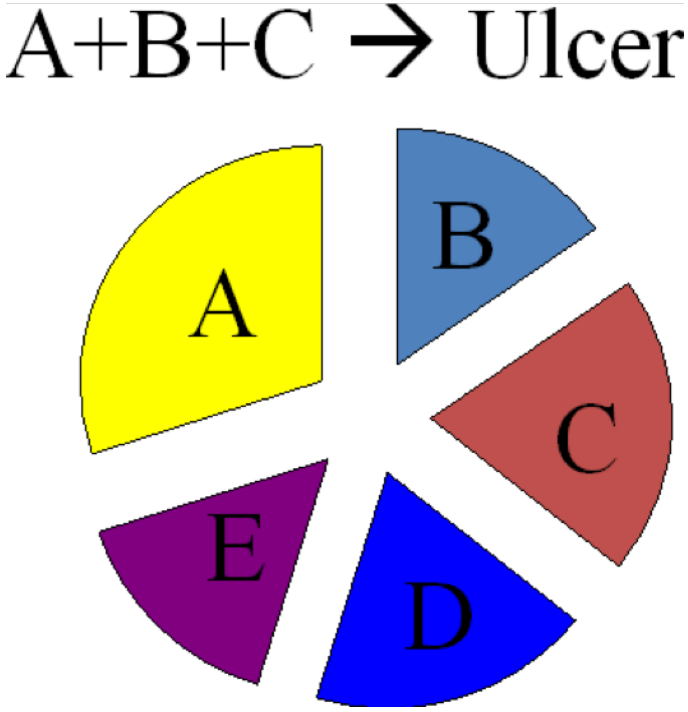
Pathways to Diabetic Limb Amputation: A Basis for Prevention



Reiber, Diabetes Care 1999;22:157-62

Pecoraro Diabetes Care 1990;13:513-21

Component Causes Present in Casual Pathways Leading to Foot Ulcers in Persons with Diabetes



Component Cause	Percentage (%)
Neuropathy	78
Minor Trauma	77
Deformity	63
Edema	37
Callus	30
Infection	1
Ischemia	35

Reiber, Diabetes Care, 1999;22:157-62

Strategies to Prevent or Delay Development of Common Component Causes of Foot Ulceration and Amputation

Component Cause	**Intervention Strategy**
Neuropathy	Good glycemic control, Education on Risk for foot injury
Minor Trauma	Clear Walking Space, Nightlights, Protective footwear
Deformity	Accommodative footwear, Education to support footwear
Edema	Footwear accommodative to of edema Reduce edema: pharmacologically, compression stockings
Callus	Regular removal of callus Footwear that minimizes callus development
Infection	Education on reporting problems early
Ischemia	Reduce risk for atherosclerosis (hypertension, and lipid control, smoking cessation) Revascularize for critical ischemia

Reiber, Diabetes Care, 1999;22:157-62

Association of Patient Education and Amputation Prevention

Program	**Reduction in LEA Rate**	
Veterans, Tucson USA	70%	Malone, 1989
Kisa, Sweden	80%	Larrson, 1995
Kings College, London	44%	Edmonds, 1999
Geneva, SZ	85%	Assal, 1993
Madrid, Spain	50%	Calle-Pascual, 2001

Evidence-Based Education and Treatment Objectives for All Patients with Diabetes

- *Low-Risk Feet*
- Control Glucose
- Control Blood Pressure
- Control Lipids
- Smoking Cessation

Dyck, 1999; Moss 1992; Moss 1999; Boyko 1999; Goldberg, 1998; Pyorala, 1997; UKPDS, 1998 Haire-Joshu, 1999

Evidenced-Based Footcare Educational Objectives for Patients with Diabetes

High-Risk Feet

- Daily washing and inspection
- Clear walking area of dangerous objects
- Appropriate footwear (selection, fitting, & use)
- Use slippers indoors – No barefoot
- Proper Nail and Callus Care (no bathroom surgery)
- Avoid extreme temperatures
- Avoid soaking
- Report problems promptly (Infections, ulcers, cuts that do not heal)

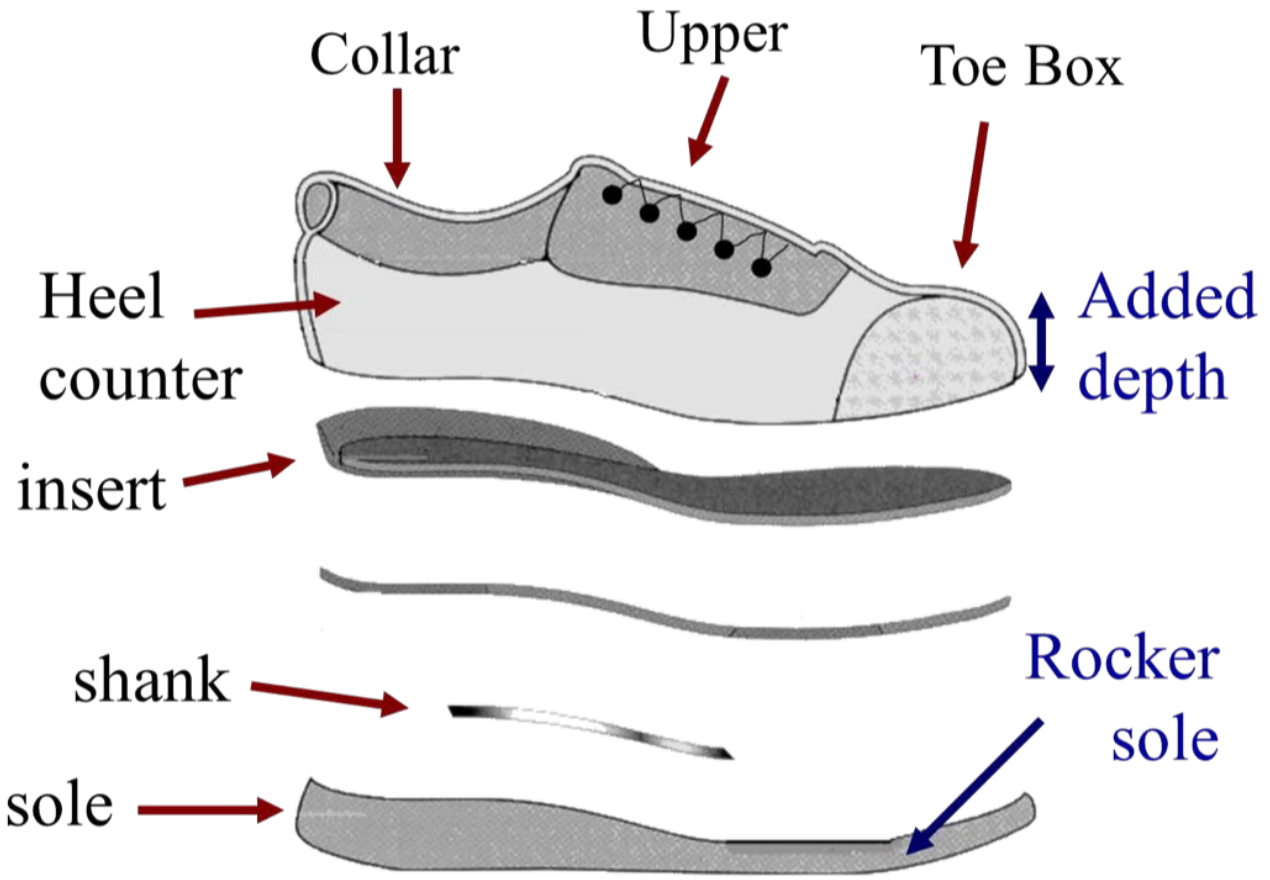
Calle-Pascual, 2001; Reiber, 1999; Ward, 1999;Barth, 1991; Malone, 1989; Edmonds, 1986

Footwear and Prevention of Foot Lesions

- Reduced Peak Planter Pressures > 50%
- Reduced callus formation > 30%
- Ulcer recurrence rates reduced > 50%
- LEA rate reduced > 70%

Viswanathan Diabetes Care 2004;27:474-477
Chanteleau, Diabet Med 1994;11:114-6
Ashry, J Foot Ankle Surg 1997;36:268-71
Edmonds, Q J Med 1986;60:763-71

Footwear Anatomy 101



Footwear Selection

- Normal feet: standard shoes
- Insensate feet: quality walking shoe or added depth shoe
  - Adjustable upper
  - Firm heel counter
  - Padded insert and collar
  - Broad sole with nominal lift

- Insensate feet + Minor deformity: added depth shoe + custom insert
- Major Deformities: custom molded shoes

Tovey, Diabet Med 1984;1:69-71; Dahmen, Diabetes Care. 2001;24:705-9

Custom-Molded Inserts and Extra-Depth Shoes

Fitting Shoes

- Select shoes that match the shape of the foot
- Measure both feet while standing
- Fit while wearing standard socks
- Fit largest foot
- 1 cm length between longest toe and shoe tip

Tovey, Diabet Med 1984;1:69-71

Footwear Precautions

- Break-in:
  - Start half-hour on first day
  - Then increase by half-hour increments per day
  - Inspect for redness after wearing
- Change shoes 1 to 2 times daily
- Check for foreign bodies
- Replace when worn out

Medicare Therapeutic Footwear Benefit

- Three steps:

1. Physician Certification for Therapeutic Footwear (MD, DO)
2. Footwear Prescription (usually a Podiatrist)
3. Fitting and dispensing (usually a Pedorthist)

Statement of Certifying Physician for Therapeutic Footwear

Certifying Physician Information

Prescription Form for Therapeutic Footwear

Prescribing Physician Information

Sugarman, Diabetes Care 1998: 777-81.

Wooldridge, Am J Public Health 1996: 935-8

Routine Podiatry Care for People with Diabetes

Associated with:

- Increased self-foot care knowledge and 30% reduction in callus
  - *Ronnemaa Diabetes Care, 1997;20:1833-1837*
- 54% reduction in ulceration rates in case control study of 91 diabetic patients with a history of foot ulcers
  - *Plank, Diabetes Care 2003;26:1691-1695*
- 75% reduction in LEA rates in Medicare patients with diabetes and high-risk feet who received palliate podiatry foot care services
  - *Sowell, J Am Podiatr Med Assoc 1999;89:312-7*

Principles of Podiatry Care for People with Diabetes

- Lubricate skin
- Trim nails
- Reduce callus

Suico, 1998;; Murray, 1996 Murray, 1996

Lubricate Dry Skin

- Autonomic neuropathy contributes to dry skin
- Instructed Patients to apply a moisturizing lotion daily
- Oil or water-based lotions are a mater of patient preference
- May need care giver to assist

Lubricate Dry Skin (2)

Nail Trimming: Normal Nails

- Use nail nippers, strait or curved.
- Good lighting, comfortable position, safety glasses
- Stabilize the toe with one hand, cut with the other
- Start at one edge and follow the curve.
- File any sharp edges with an emery board

Nail Trimming: Normal Nails (2)

Nail Trimming: Curved Nails

- Use nail nippers, straight
- Good lighting, comfortable position, safety glasses
- Start at one edge and follow the curve
- Avoid cutting into corners
- File any sharp edges with an emery board

Nail Trimming: Thick Mycotic

- Tend to be very brittle
- Can use nail nippers or dremel to trim off sharp edges
- Best to refer to a podiatrist or certified foot care nurse

Callus Debridement

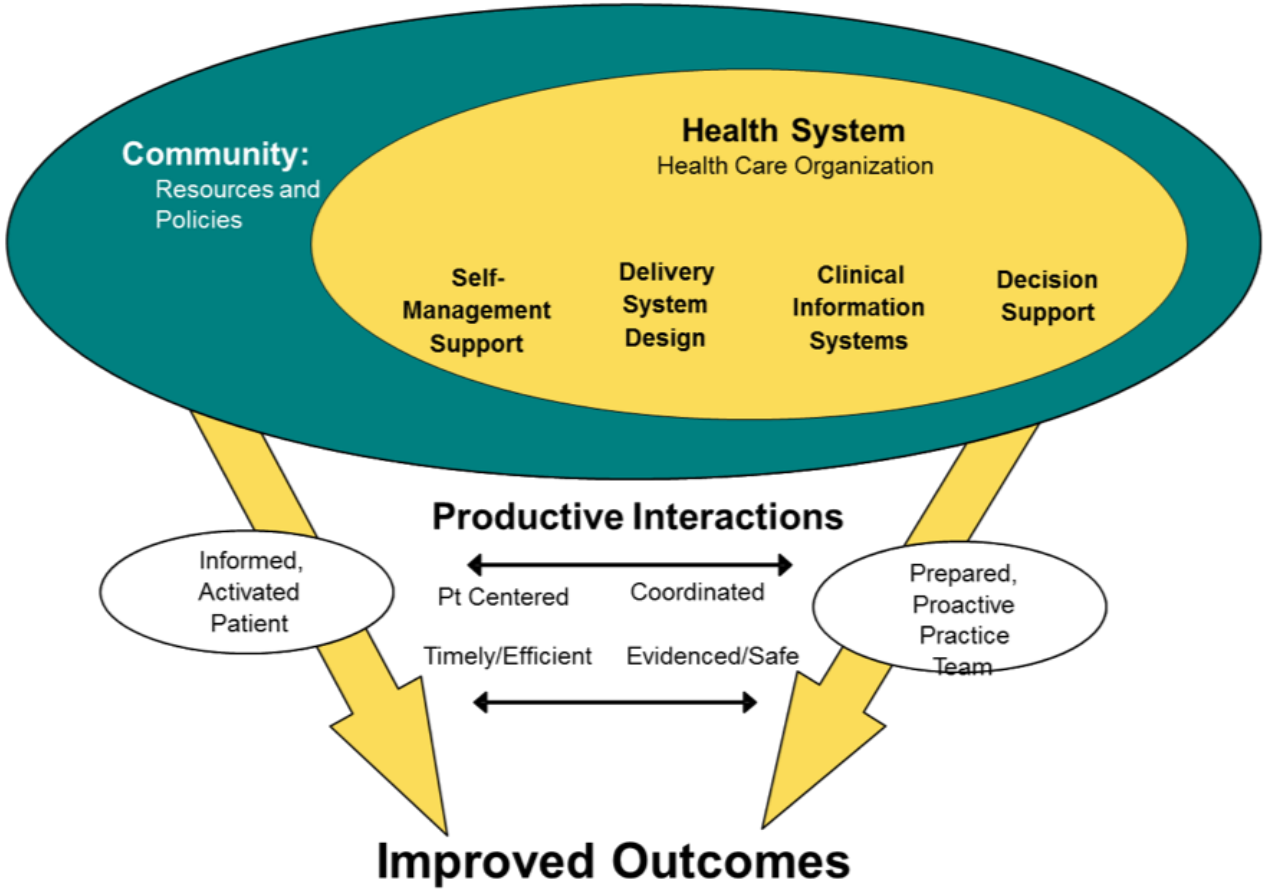
- Good lighting, gloves, alcohol swab, and #15 disposable scalpel
- Wipe with alcohol swab, callus tissue will turn white
- Shave or pear down callus gradually
- Palpate intermittently to feel when you are close to pliable “normal” tissue, then stop.

Callus Debridement (2)

Protecting the Diabetic Foot
A Strategy for Primary Care Clinicians (3)

- Screening for High-Risk Patients
- Practical Interventions
- *Implementation into Practice*

Improving Chronic Disease Care: The Chronic Care Model



Wagner EH. Effective Clinical Practice. 1998;1:2-4

System Redesign: Foot Care Team

Physician/PCP

Nurse Educator

Registrar and Patient Scheduling

PHN

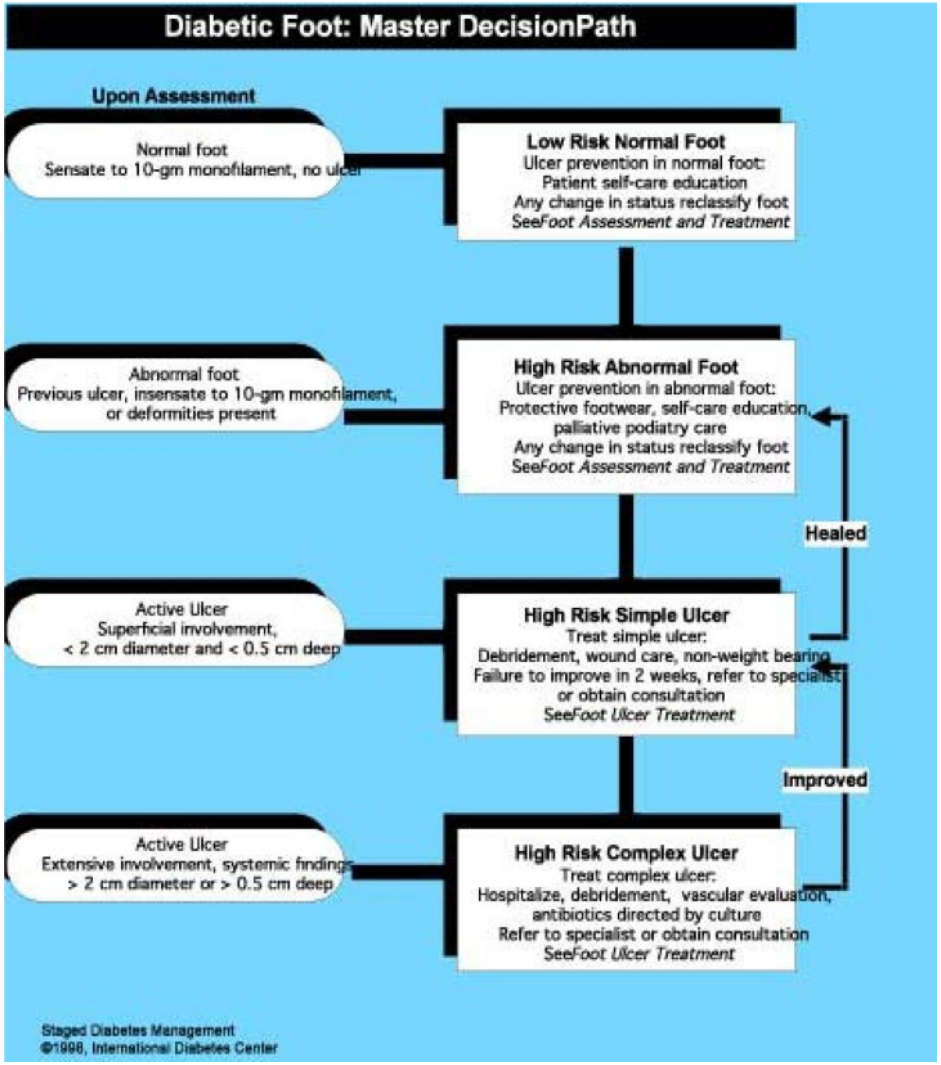
Podiatrist

CHR

Surgeon

Clinic Administration and leadership

Decision Support
Foot Care Guidelines



Rith-Najarian, J Fam Pract 1998;47:128–132

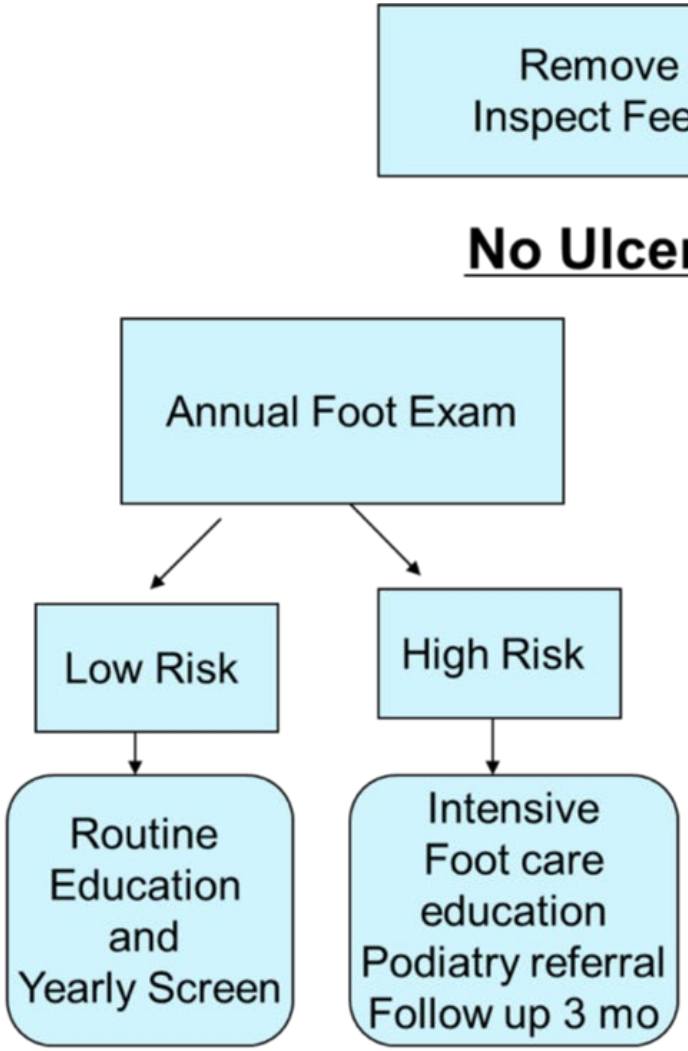
1994–1996 System Redesign Foot Care Team

Moving the Guideline to Practice

Team Coordination

- Input from the team to customize Guidelines
- Delineation of roles
- Documentation
- Training needs
- Measures for monitoring and evaluation

Example of Customization Questions



Annual Foot Exams are performed by:

_____

_____

Documented on Form_____

Form is located _____

Information from exam goes to

_____

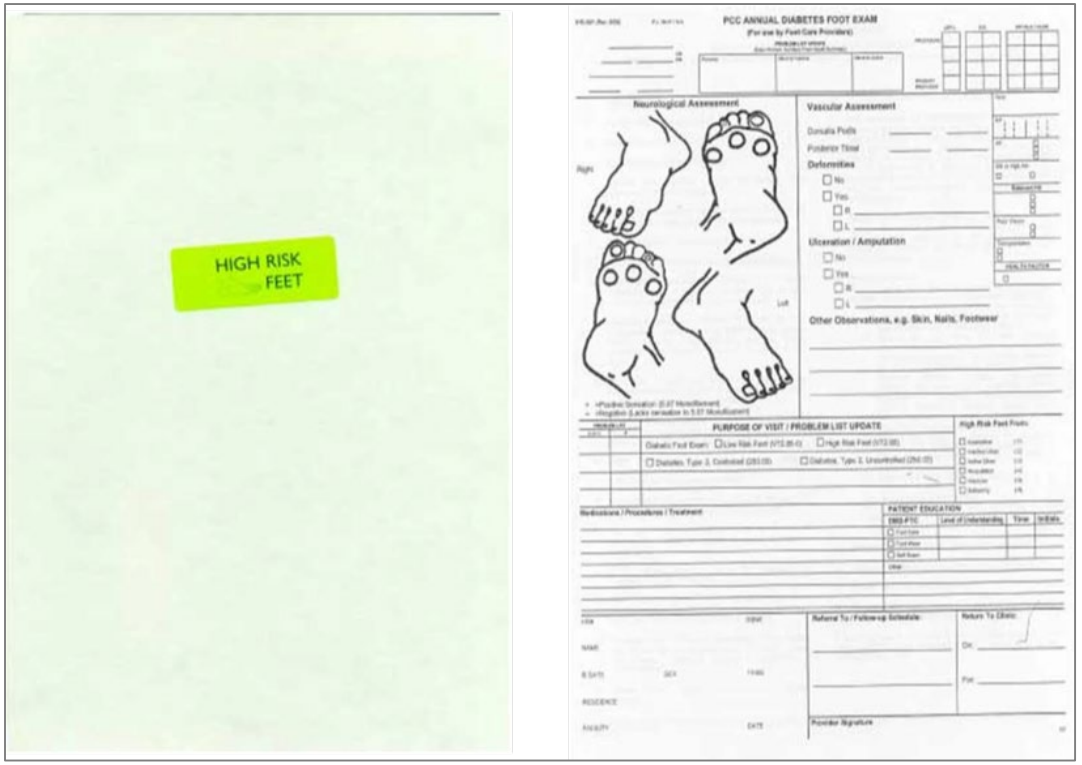
_____

Staff trained to perform exam and refer high risk and acute problems

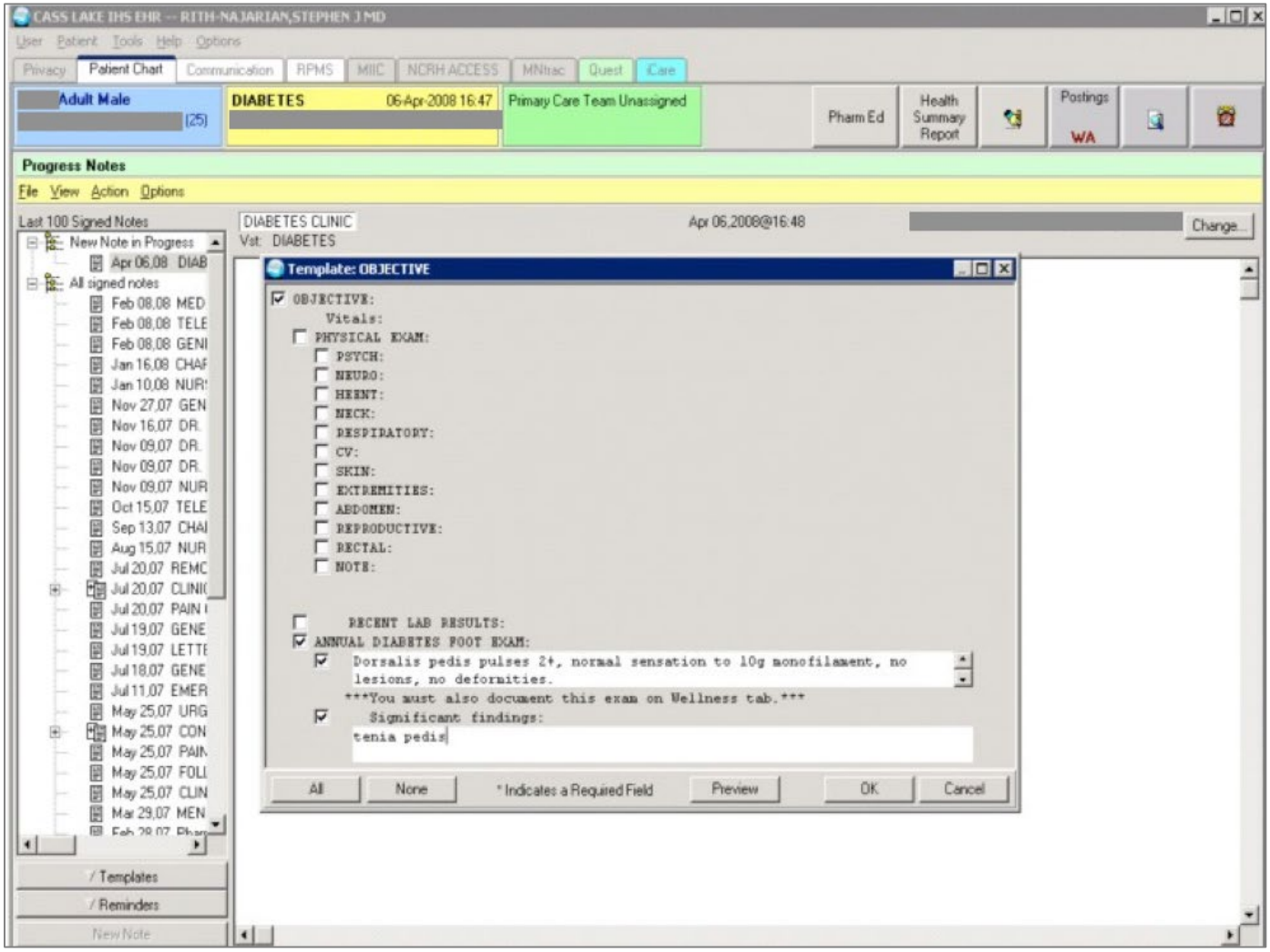
_____

1994–1996 System Redesign Reminders and Documentation Forms

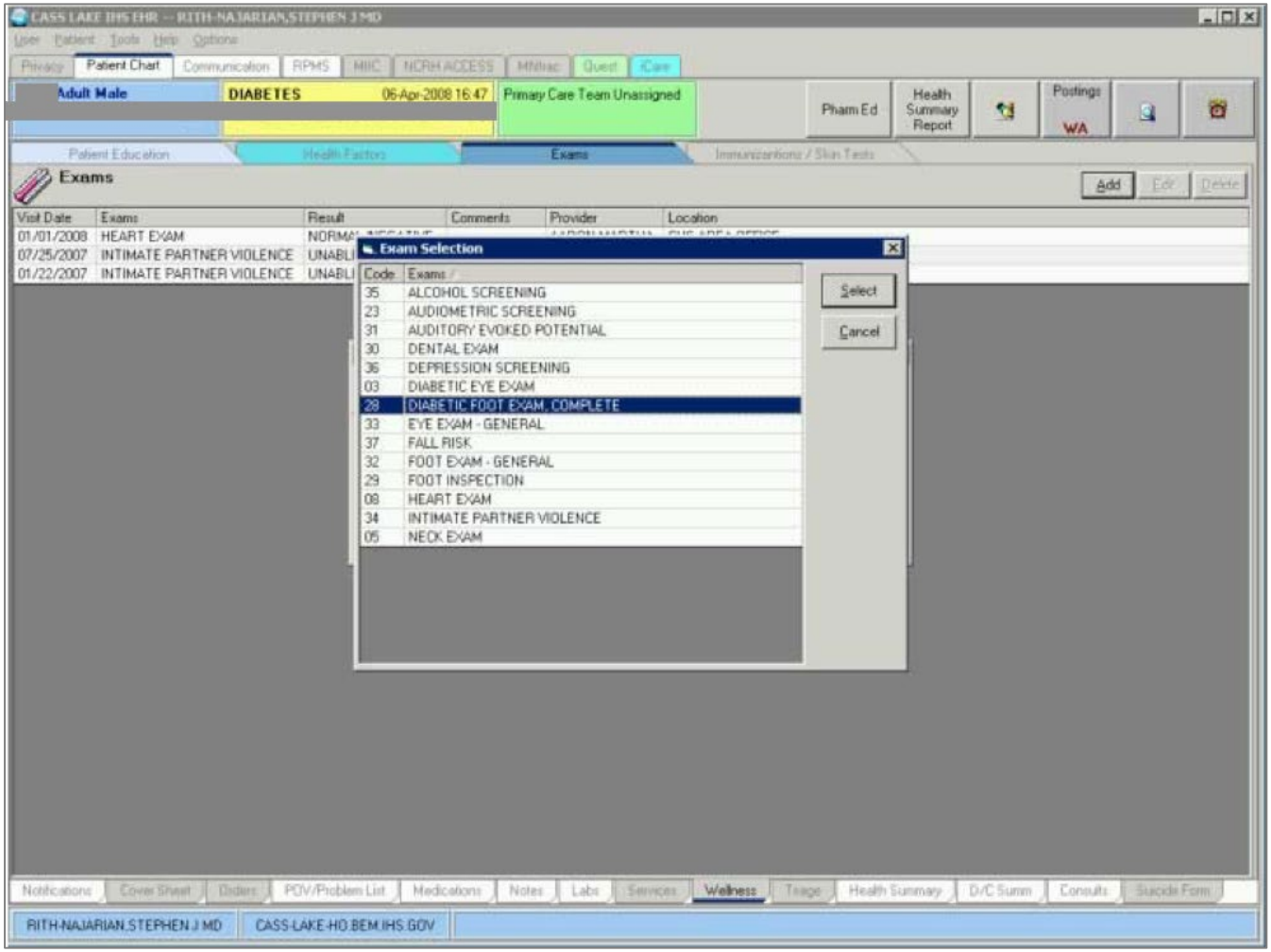
- Exam & Risk Factors
- Assessment
- Treatment plan
- Referrals



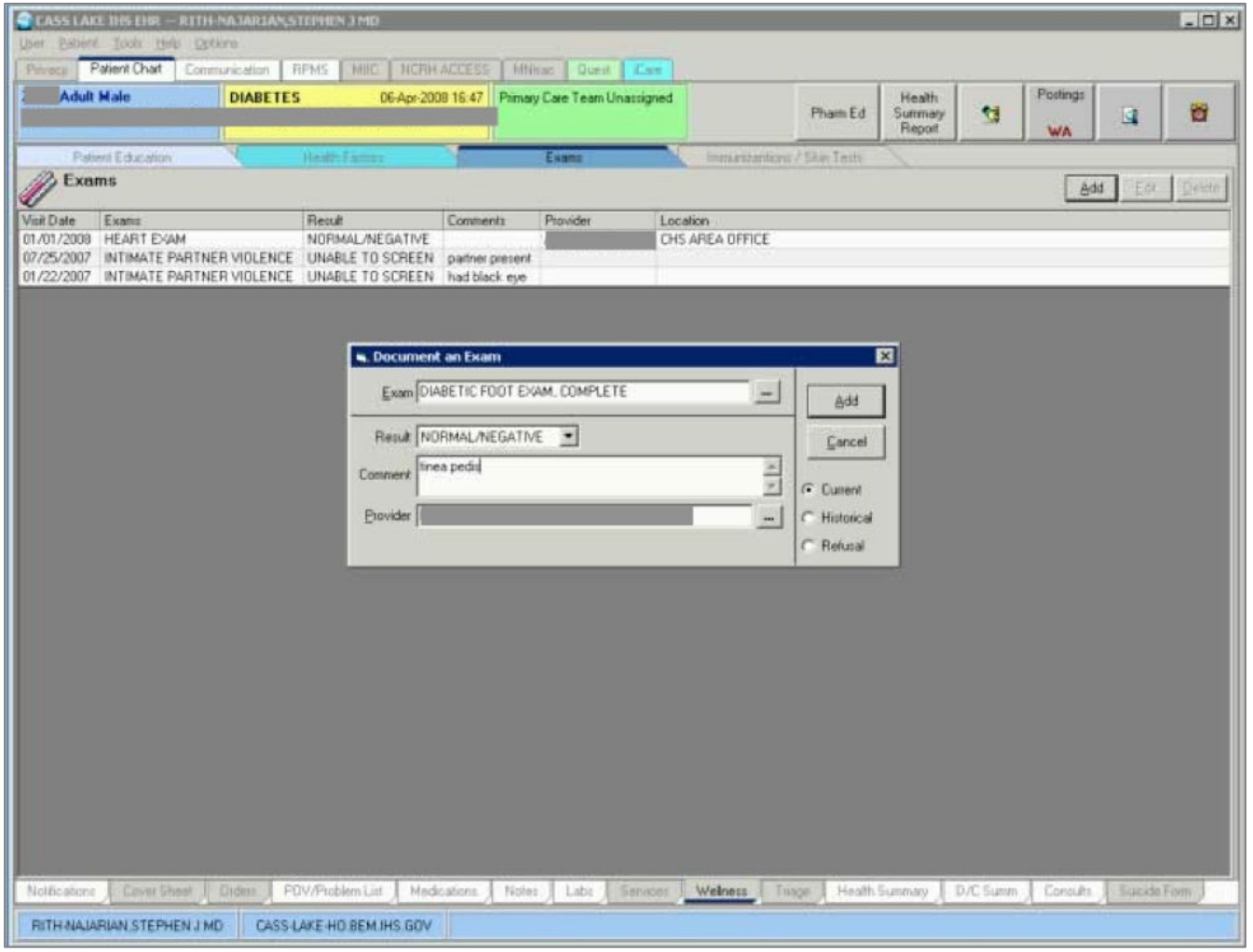
Patient Chart Tab



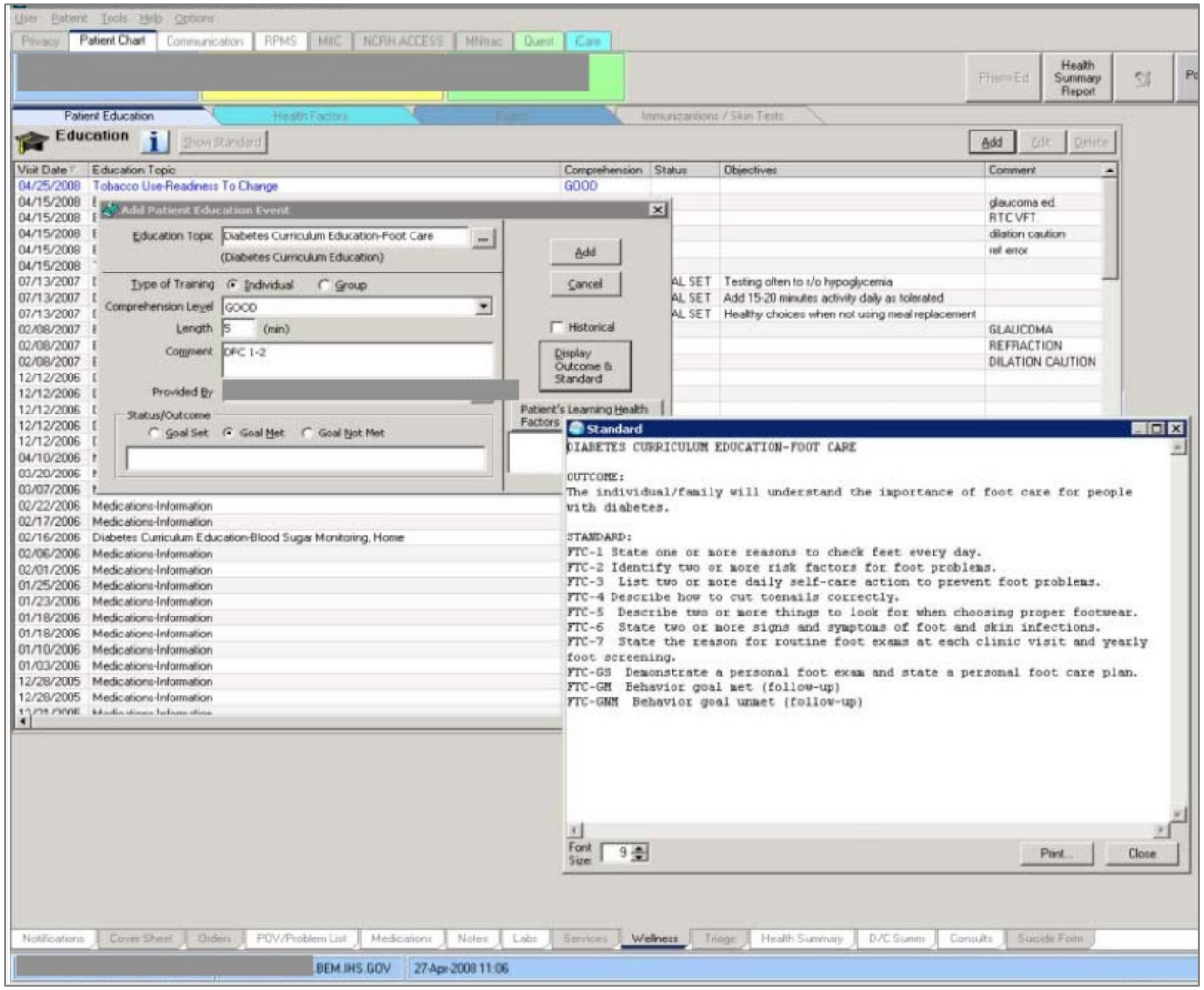
Exam Selection Dialog



Document an Exam



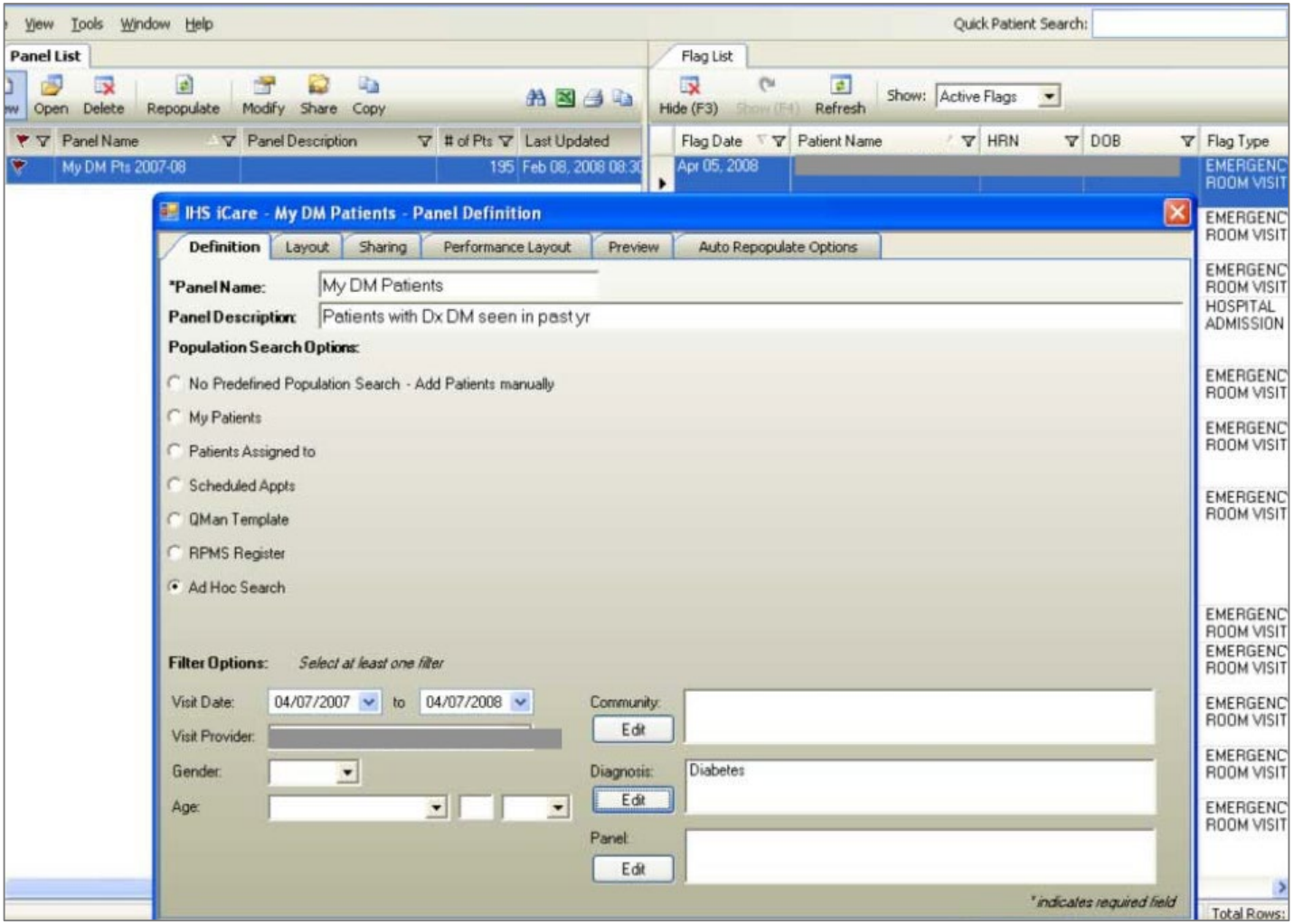
Add Patient Education
Diabetes Curriculum Education – Foot Care



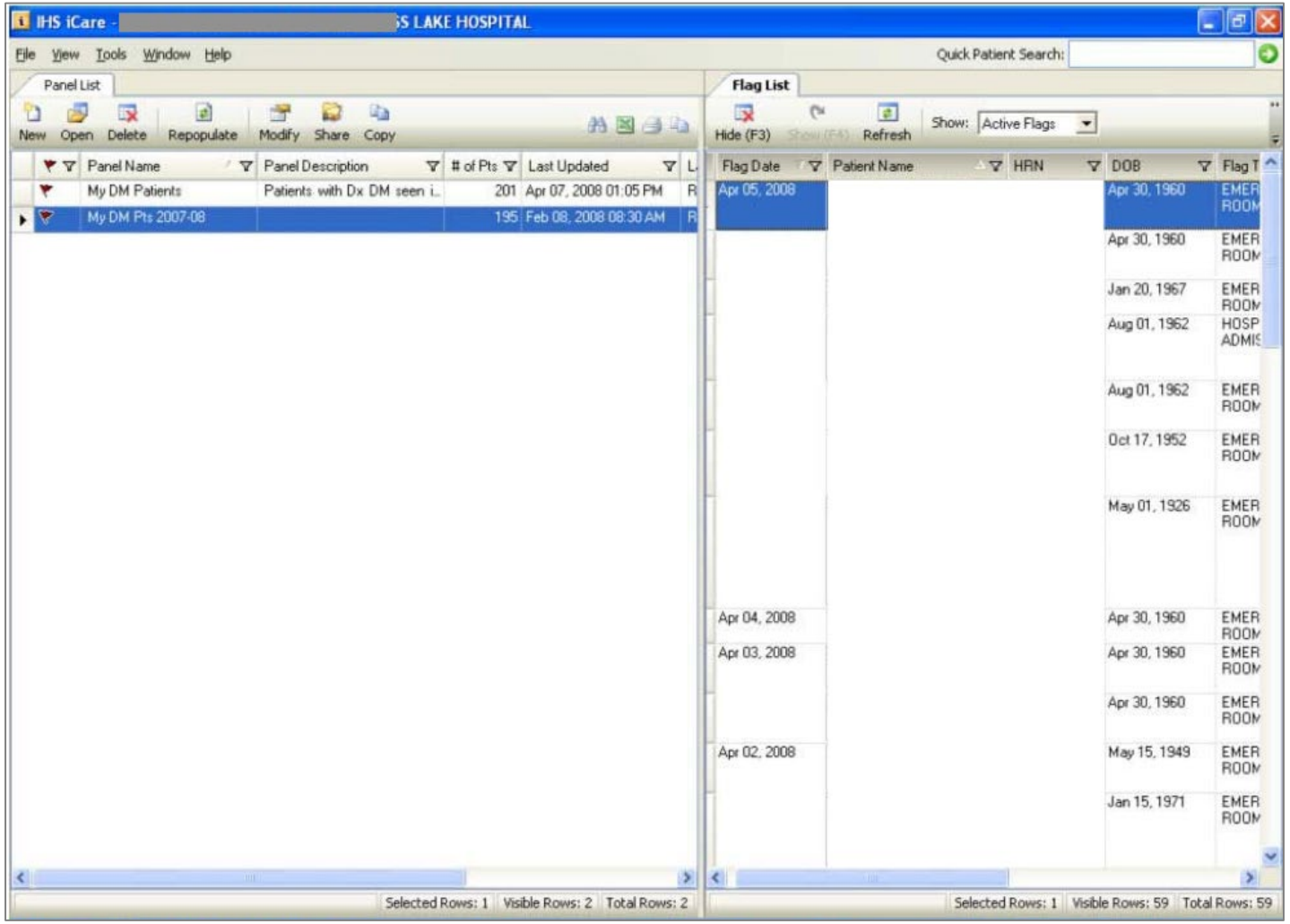
System Redesign: Foot Care Case Manager

Information Technology
Electronic Diabetes Registry

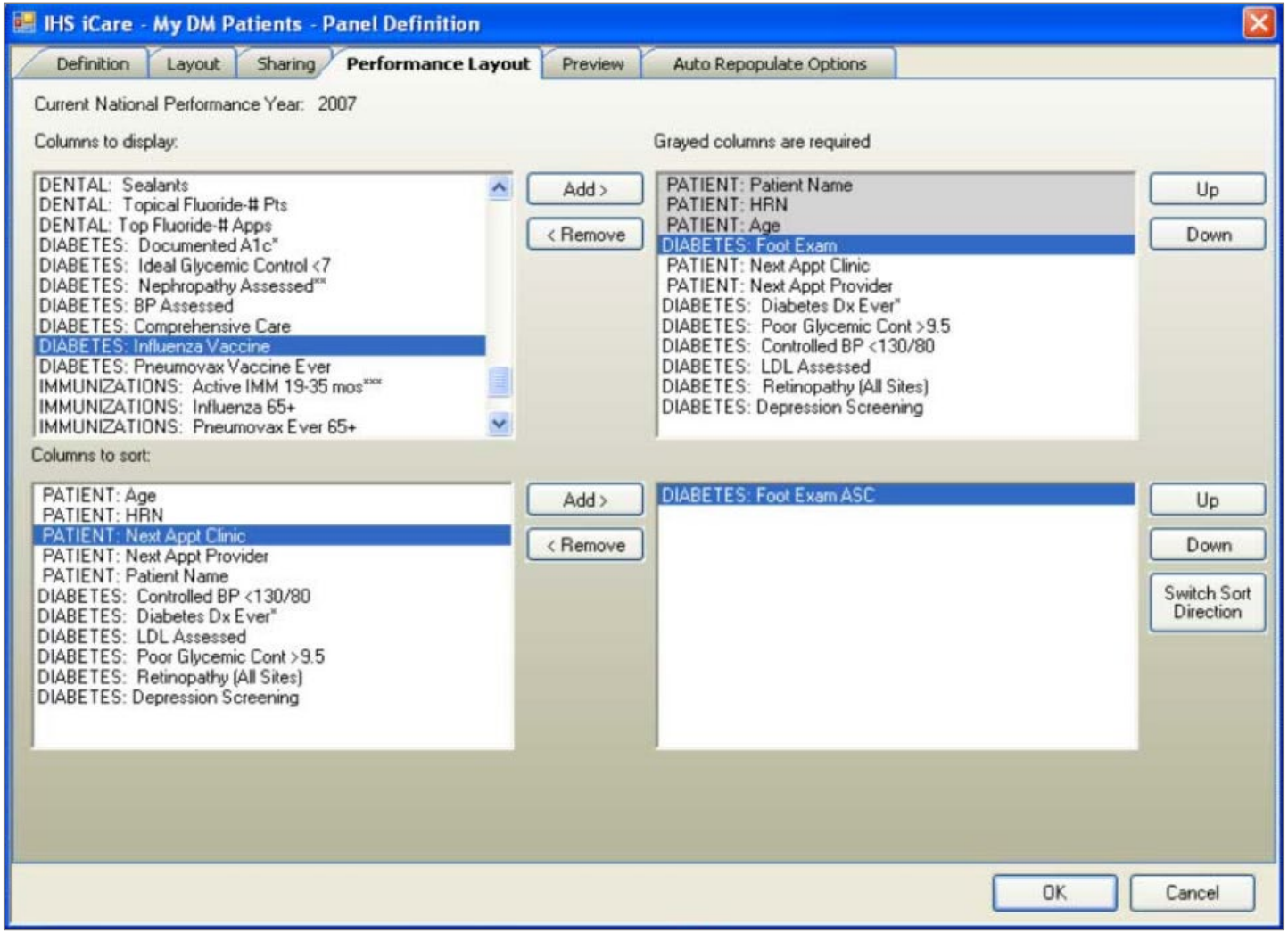
My DM Patients – Panel Definition



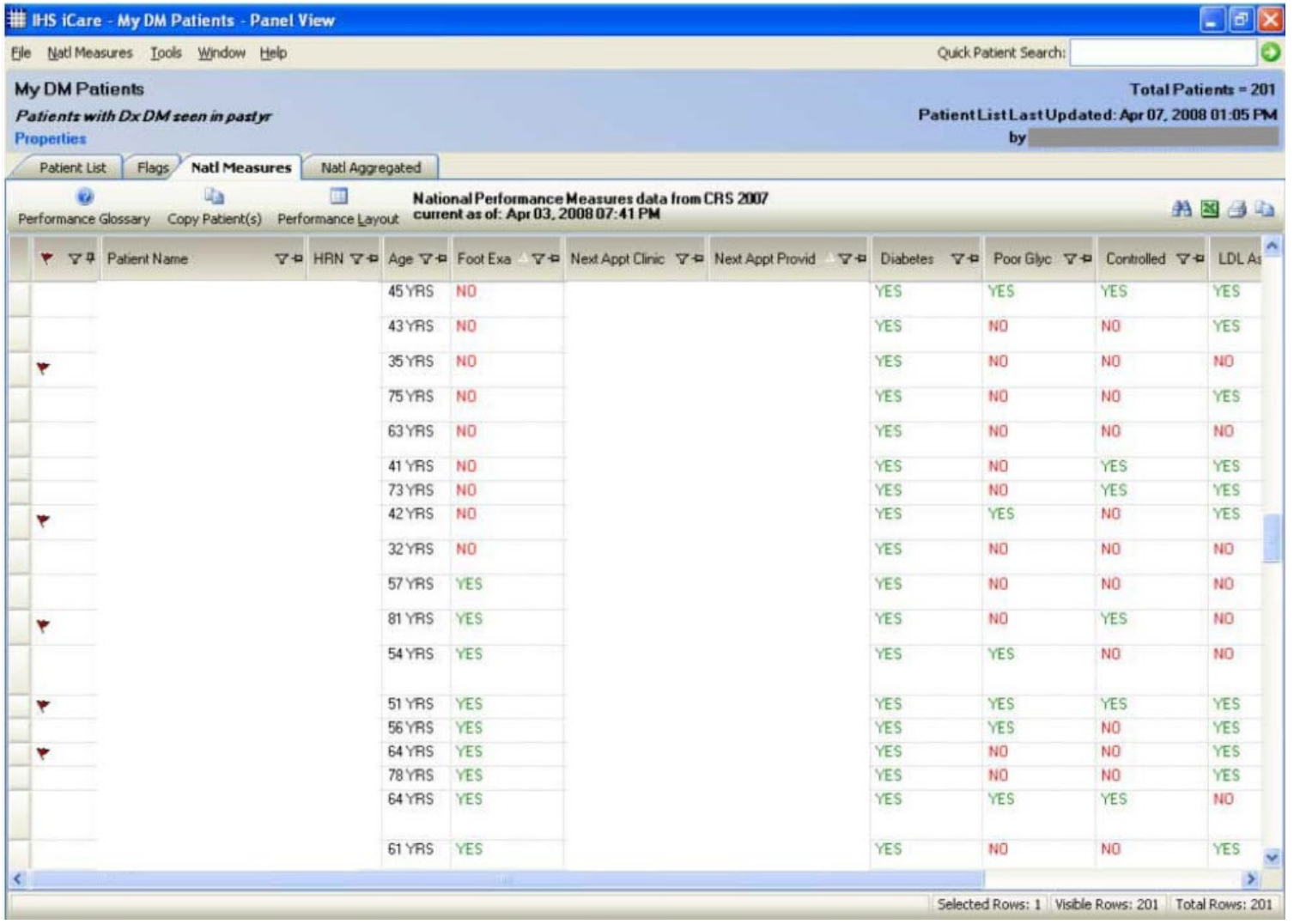
Panel List and Flag List



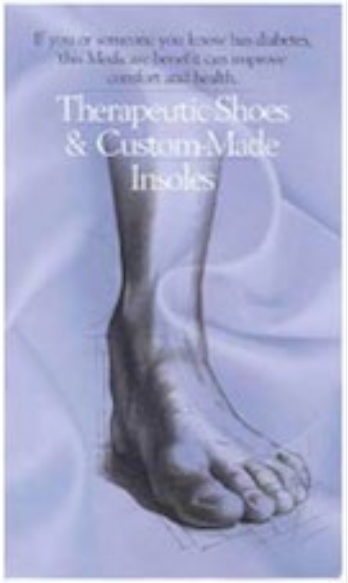
Performance Layout Tab



National Measures Tab

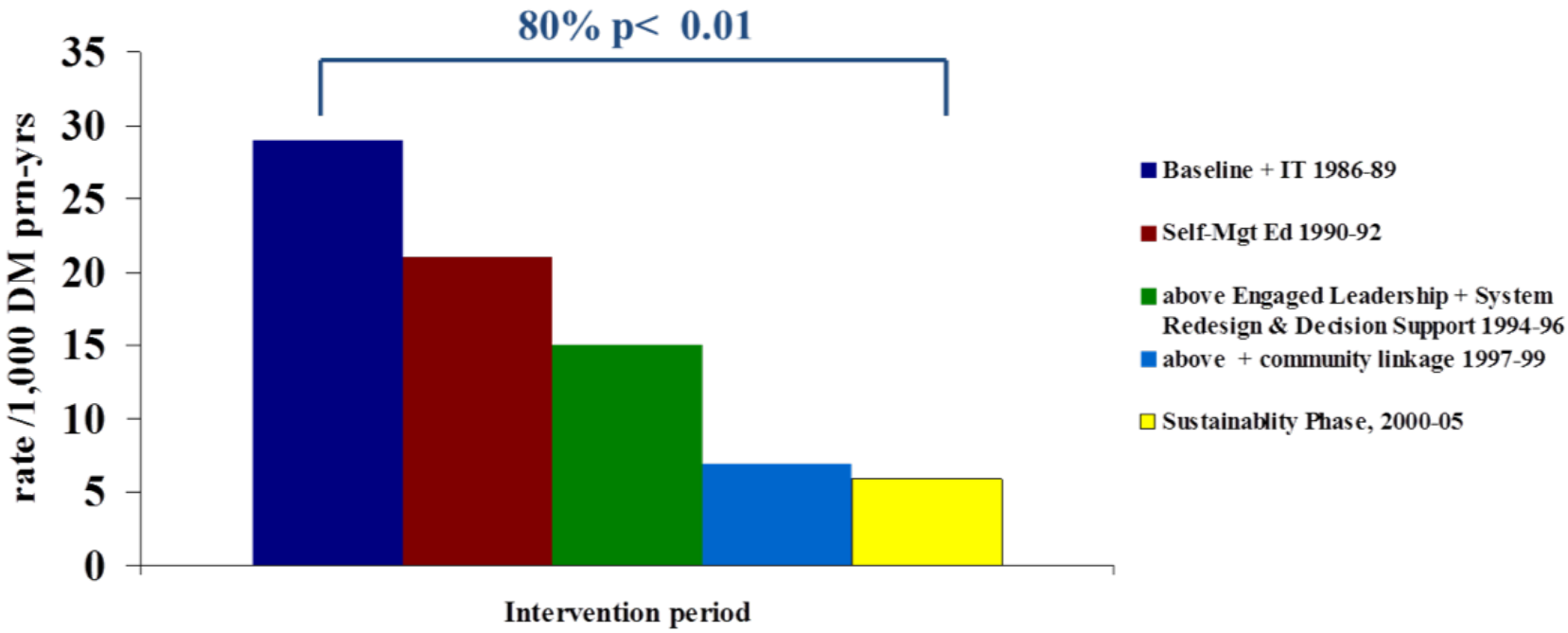


Community Linkages
Referrals for Therapeutic Footwear



Community Linkage
Wound Care Outreach Clinic

Average Annual Incidence Lower Extremity Amputations (LEA) among Diabetic Patients according to Chronic Care Model Intervention Period in an Indian Health Service Primary Care Setting



1986-1996: J Fam Pract 1998;47:128-132

1997-1999: Diabetes Care 2000;23:1445-46

2000-2005: Bemidji Area IHS Diabetes Program; CCM Interventions: Lancet 2005;366:1676-7