

Louis Pilati MD FACEP HUM

Medical Director

Wound Healing and Hyperbaric Medicine Center

Located at Sycamore Medical Center

Overview On Wound Care and Hyperbaric Medicine

Wound Healing and Hyperbaric Medicine Center



Educational Background

- Medical School
 - Wright State University School of Medicine
- Specialty
 - Emergency Medicine (Board Certified)
- Subspecialty Training
 - Hyperbaric & Undersea Medicine (Board Certified)
 - Diving Medical Officer US Navy
 - Wound Care Specialist

Our Wound Healing Center

How is it different from other centers?

- Over 15 years of experience Opened in June 1999
- Dedicated Physician 5 days/week and a staff that is wound care certified
- Treatment Options
 - Hyperbaric Chambers (12 Person Chamber)
 - Casting Technicians
 - **ONLY UHMS Certified Facility with Distinction in Ohio**

Why Use a Wound Center

- Studies show when wounds are evaluated weekly and treated aggressively 68% will heal in the first 30 days
- This reduces cost of care and better patient satisfaction
- Wound centers provide education and provide patients with adjunctive modalities to aid in there healing

The background is a dark blue gradient. A thin, light blue curved line starts from the top left and arcs across the middle. A larger, light blue shape, resembling a quarter-circle or a wedge, is positioned in the lower right quadrant, partially overlapping the main text area.

**How to we approach the
Problem Wound?**

Every Wound Should Heal ?

PROBLEM WOUND

- FAIL TO RESPOND AND PROGRESS TO MEDICAL AND SURGICAL MANAGEMENT IN THE EXPECTED TIME FRAME
- GREATER THEN 30 DAYS
- USUALLY IN A COMPROMISED HOST

COMPROMISED HOST

- SYSTEMIC

- ADVANCED AGE
- DIABETES
- INFECTION
- EDEMA
- CIRCULATORY DEFICIT
- MOTION, PRESSURE

- LOCAL

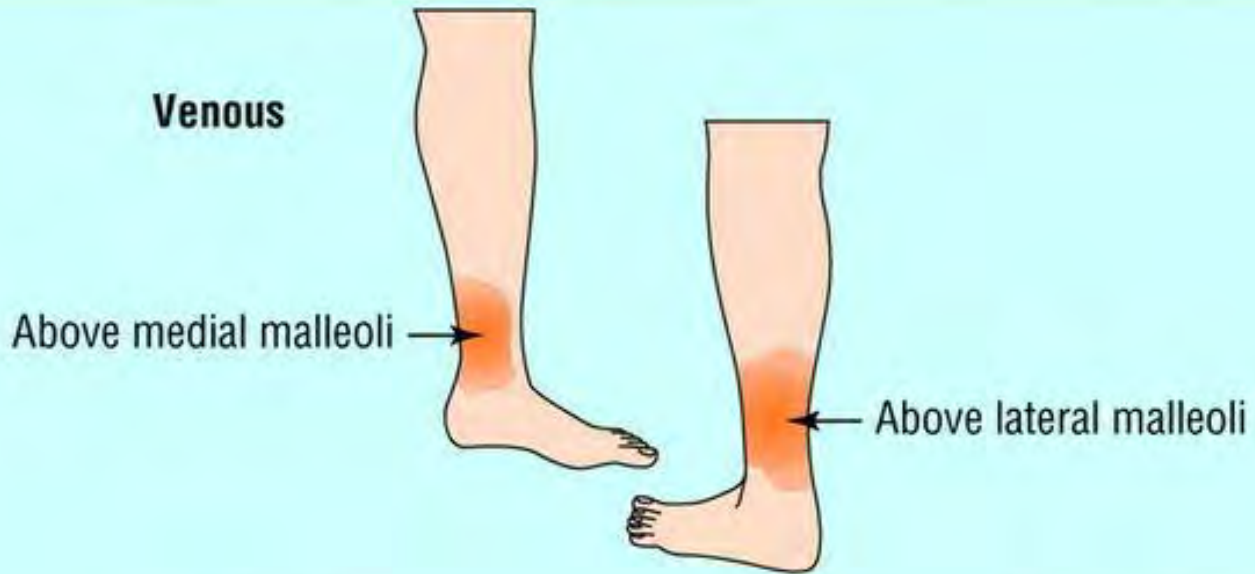
- IMMUNOSUPPRESSION
- FOREIGN BODIES
- NECROTIC TISSUE
- DEAD SPACE
- RADIATION
- NUTRITIONAL DEFICIT

Main causes

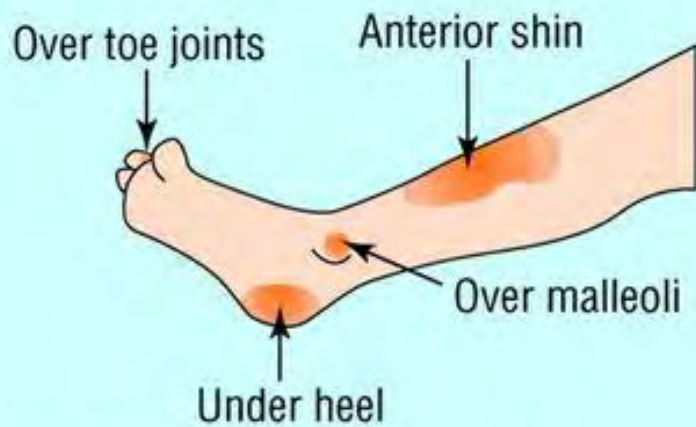
Ask yourself what is the underlying pathophysiology of the wound

- Edema (Venous, Post-op swelling)
- Circulation (Vascular)
- Pressure (Bed Ridden, Diabetic Foot Ulcer)
- Other(Dermatological, Cancers, Foreign Body)

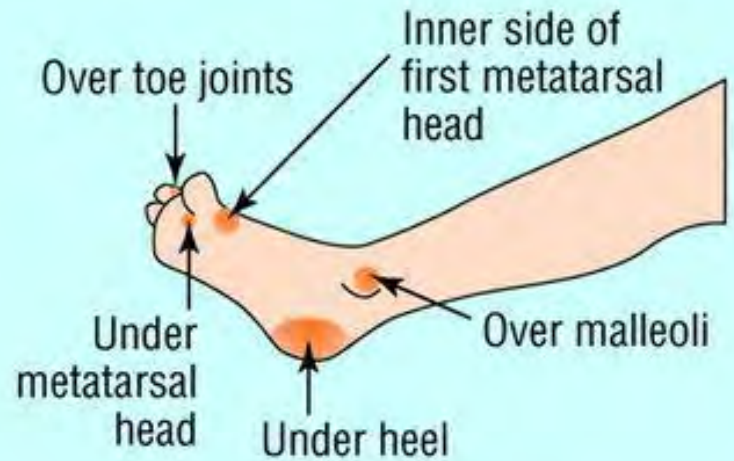
Venous



Arterial



Neuropathic



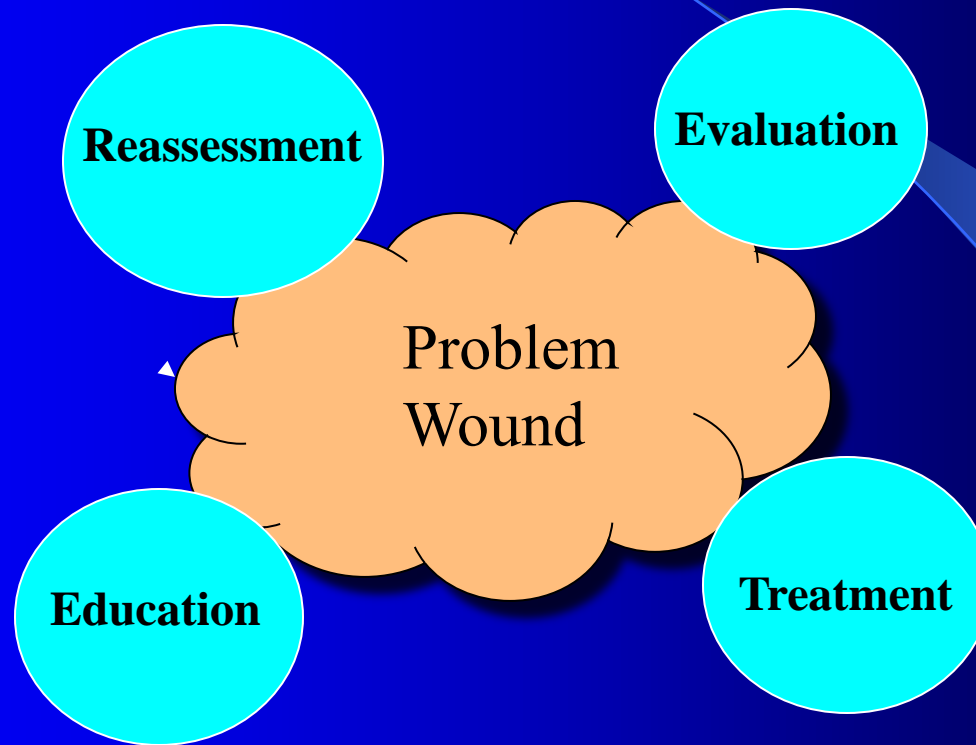
Initial Wound Care Visit

- Review past and current history
- Complete patient history
- Complete Physical exam
- Address complicating factors
 - Vascular
 - Edema
 - Pressure
 - Nutrition
 - Systemic condition
- Consider consults
- Determine etiology and initiate treatment

Treatment Must Address:

- Debridement
- Infection Control
- Pressure Relief
- Edema Reduction
- Revascularization
- Oxygen
- Nutrition/ Hydration
- Medical
 - Glucose control
- Social Needs
 - Trauma
 - Smoking
- Rehabilitation
- Long Term Education

Approach Problem Wound Involves:

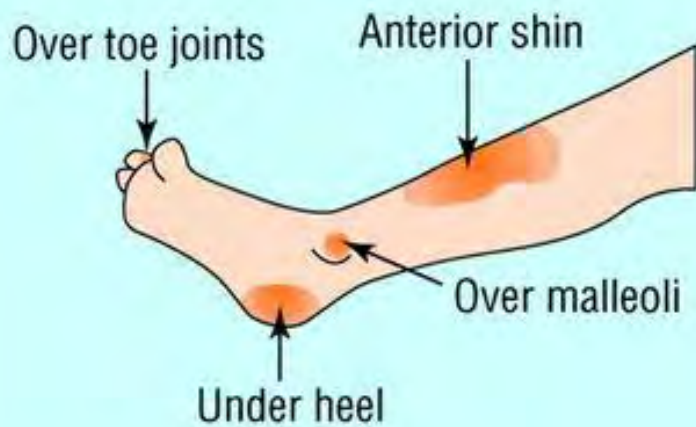


Venous Disease

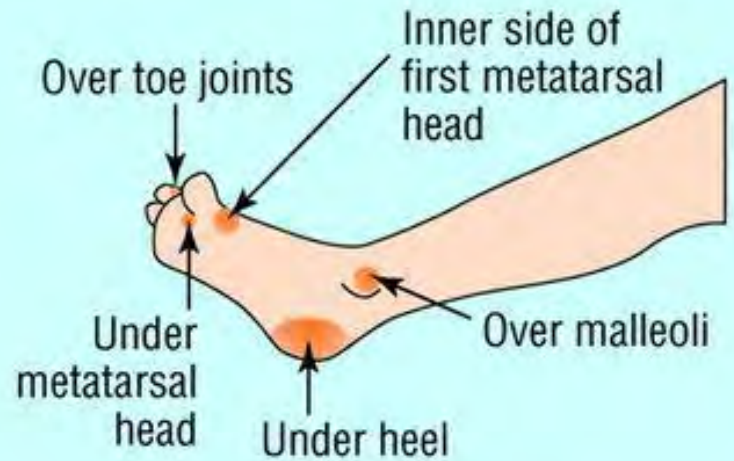
Venous



Arterial



Neuropathic



Cellulitis vs. Venous Stasis

- Not all swollen draining legs are cellulitis
- Most can be managed with compression and +/- antibiotics



(937)257-8603
Date: 5/26/05 Case#: 817A
Date: _____ Case#: _____

cm 1 2 3 4 5 6 7 8

Case#: _____ Date: _____

(937)257-8603

Date: 5/26/05 Case#: 817A

cm 1 2 3 4 5 6 7 8



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6-2-05 817A







(937)251-8603

Date: 9/17/04 Case#: 1517



Edema Control

- Elevation of extremities
- Multilayer Compression Wrap
- Profore and Unna boots
- Graded compression stockings
- External sequential compression pumps

Edema Control

- Fibrinogen and peri-capillary cuffing
- Decreases nutrients and oxygen tensions
- Pro-inflammatory proteinaceous mixture
- Matrix metalloproteinases (MMP)
- Controlling edema is a major goal in promoting chronic wounds to heal.

Multilayer Compression Wraps



Lymphedema Pumps



Compression Stockings



Circ-Aids



Pressure Relief

- Decubitus Ulcers
 - Repositioning
 - Foam or air mattresses
- Planter Foot Ulcers
 - Complete bed rest
 - Total contact casting
 - Custom bivalved orthosis
 - DH Walker boot
 - Others

Alternating Air Flow mattress



Roho Cushion



















(937)257-8603

Date: 03-28-05 Case#: 586-C

Date: _____ Case#: _____







Limb Salvage

Nutrition

- Albumin level of < 3.5
- Pre-Albumin levels > 15

Infection and Biobourden

- Stimulates an inflammatory response
- Deprives tissues of nutrients and oxygen

- MRSA
- Beta- Hemolytic Strep
- Staph Aureus
- Pseudomonas
- Later: E. Coli, Proteus and Klebsiella
- Deeper Wounds: Anaerobes
- Most become Polymicrobial over time

- Probe the wound for the presence of bone and tendon
- Looking for foreign material
- Deep tissue cultures
- Sed Rate CBC C-Reactive Protein
- MRI Bone Scan Plain Flim

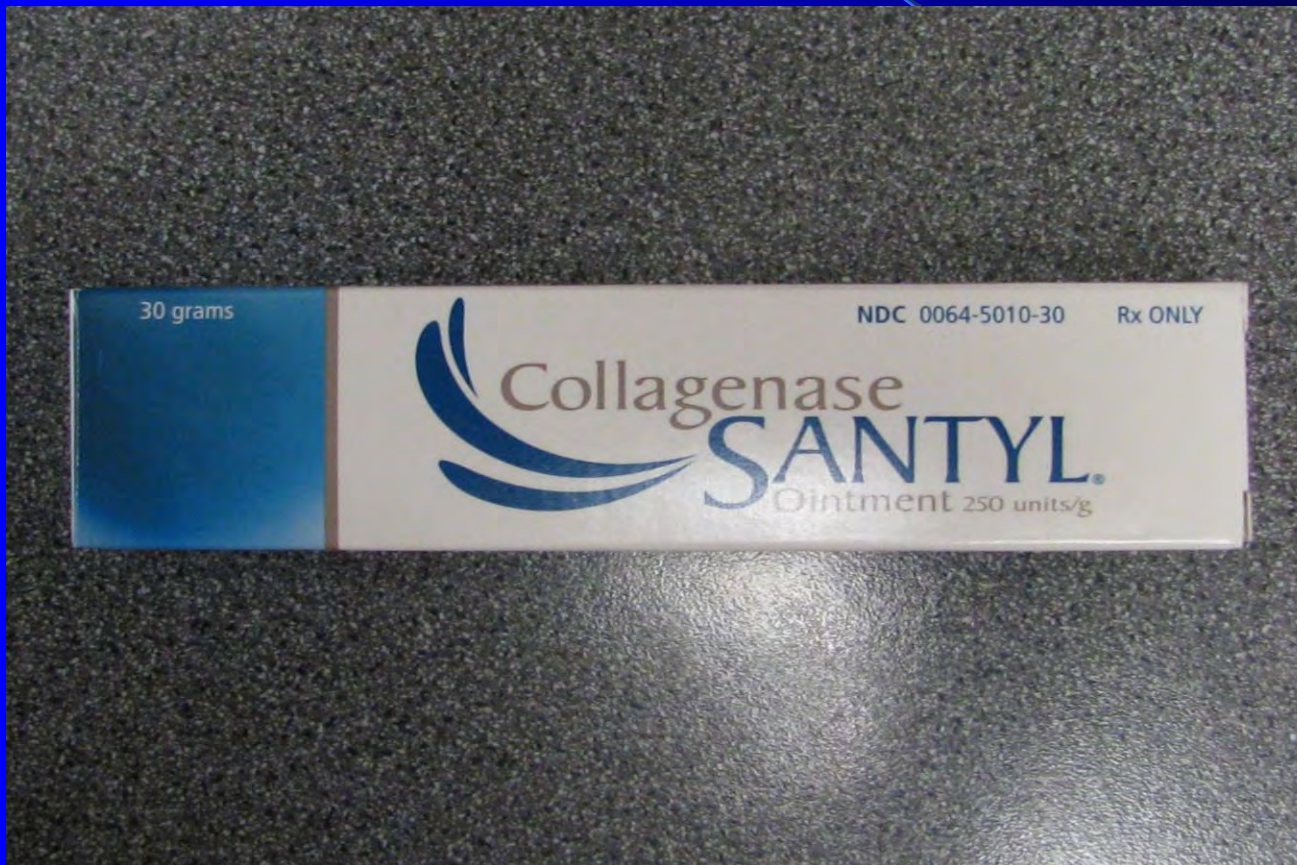
How to Limit Bioburden and Bacteria Counts

- Local wound cleaning
 - Irrigation with 4- 15 psi
- Excision of necrotic tissue and Biofilm

Types Of Debridement

- Surgical/ Sharp Debridement
- Mechanical (wet to dry)
- Enzymatic
- Autolytic
- Biological

Debridement



Hyperbaric Oxygen

What is Hyperbaric Oxygen

- Hyperbaric medicine is the process whereby a patient breaths 100 % oxygen in a chamber at pressure levels greater than sea level.
- This system increases the amount of dissolved oxygen in plasma.

Mono Place







Approved Indications for Hyperbaric Oxygenation

Emergency & Routine

Emergency Indications

- Air or Gas Embolism
- Decompression Sickness
- Carbon Monoxide Poisoning
- Gas Gangrene
- Crush Injuries
- Necrotizing Fasciitis
- Thermal Burns

Appropriate Wound Etiology (Routine)

- Refractory Osteomyelitis
- Necrotizing Soft Tissue Infections
- Gas Gangrene
- Compromised Skin Grafts and Flaps
- Crush Injuries and Compartment Syndrome
- Acute Traumatic Ischemias
- Thermal Burns
- ORN
- Soft Tissue Radionecrosis
- Other Wounds with Demonstrated Tissue Hypoxia

Refractory Nature

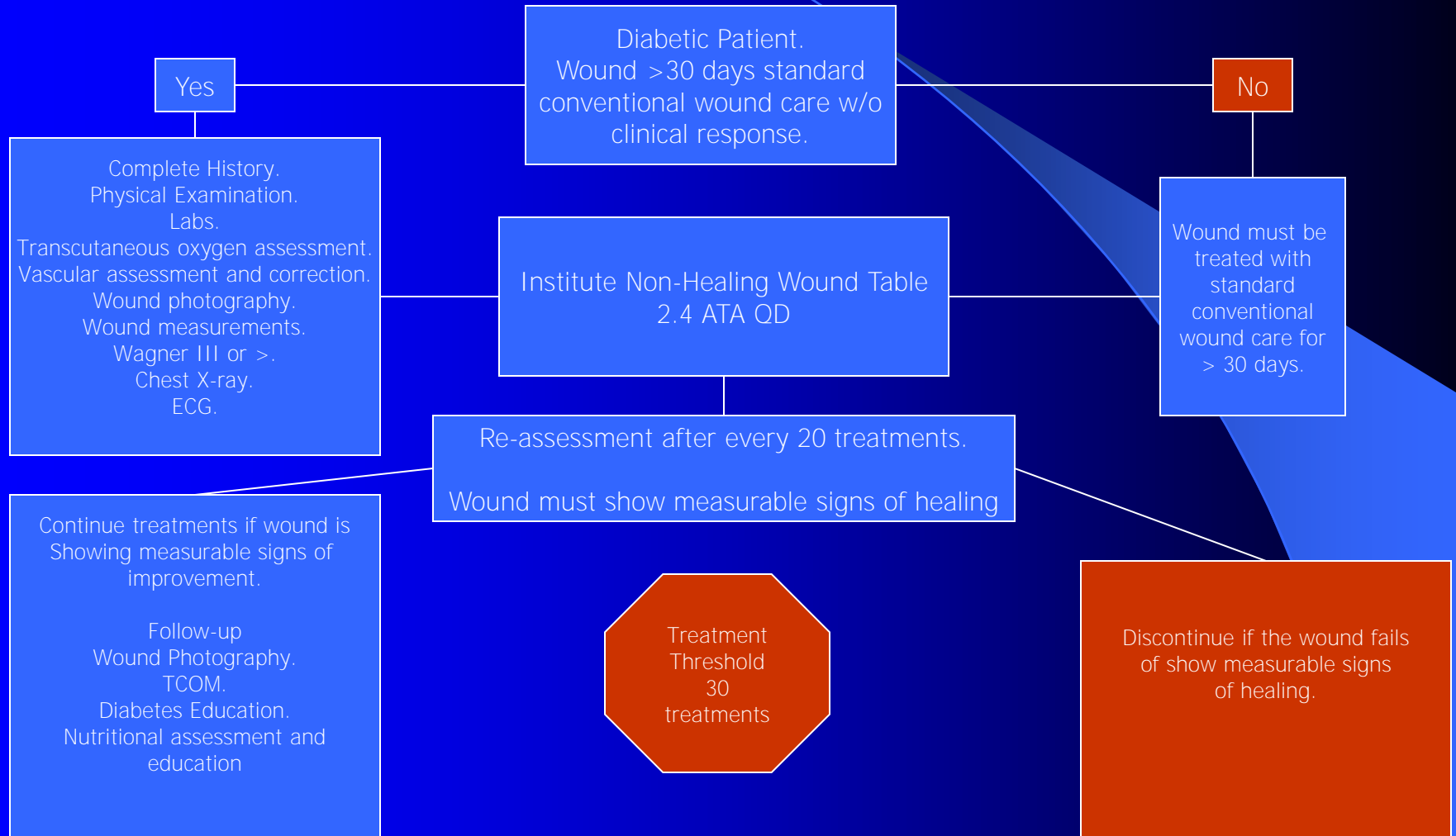
- Refractory to conventional therapy
- Low tissue oxygen tensions
- TCOM correlation



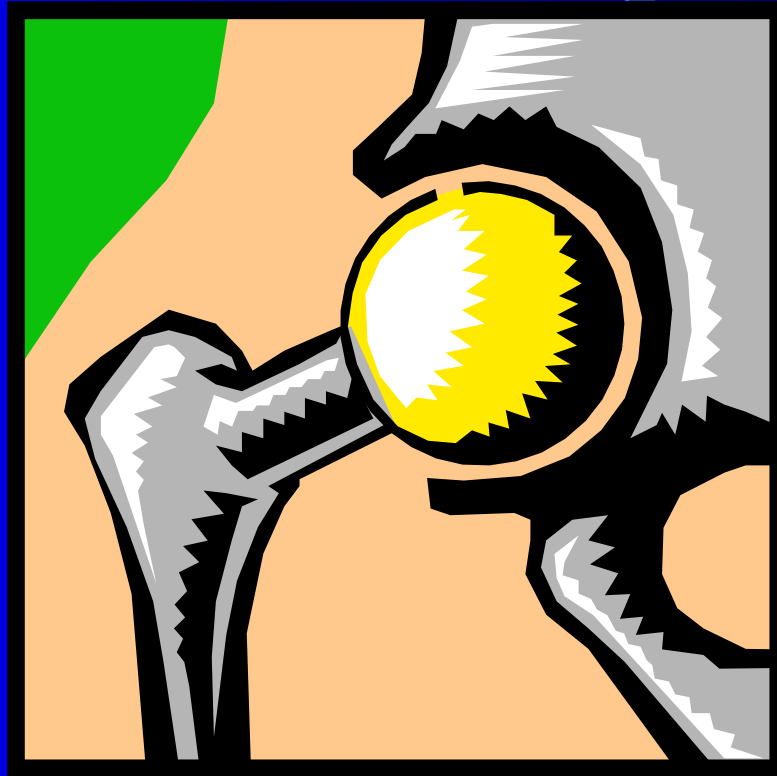


Hyperbaric Treatment Protocol

Diabetic Non-Healing Wounds of the Lower Extremities



OSTEOMYELITIS



Osteomyelitis

- Ischemic & Infectious disease
- Bone & muscle infection with draining sinus
- Trauma or idiopathic
- Poor blood supply causes lowered oxygen tension
- Impedes collagen formation, fibroblast activity & leukocyte response

Osteomyelitis

- Poor blood supply impedes introduction of antibiotics
- Surgery to remove infected bone & tissue
- High dose antibiotics
- If failing despite surgery and antibiotics consider HBO

Osteomyelitis

- HBO reverse tissue anoxia
- Promotes collagen formation
- Stimulates osteoclast' s
- Augments some antibiotics including aminoglycides

Gas Gangrene

- Caused by introduction of *Clostridium Perfringens* via trauma or post-surgery
- Other Clostridial organisms are not gas gangrene, but can be terrible infections
- Acute, rapidly progressive, non-pyogenic, invasive muscle infection
- Profound toxemia, extensive edema, massive tissue death & variable amount of gas production

Gas Gangrene Rx

- Surgery
- Antibiotics
- Hyperbaric oxygen 3 times per day at 60' fsw for :80- :90 minutes X 2 days, then BID for 2 or 3 days

Gas Gangrene

- gas gangrene is a rapidly progressive myonecrosis caused by Clostridial species
- alpha toxin facilitates infection virulence
- surgery removes dead tissue
- antibiotics kill bacteria
- HBO halts alpha toxin production and preserves ischemic tissue
- *****bactericidal action is not sought*****

Radiation Injuries

- Osteoradionecrosis
- Soft tissue radionecrosis
- Radiation enteritis
- Radiation cystitis

Delayed Radiation Injury (Soft & Bony Tissue Necrosis)

- Radiation causes the endothelium of blood vessels to proliferate
- Blood supply decreases or is obliterated
- Radiated area becomes ischemic and fibrotic
- Tissue often survives the hypoxia
- Subsequent injury leads to infection & enlargement of the wound

Treatment Goals

- Reverse, hypo cellular, hypo vascular and hypoxic tissue changes (3Hs)
 - HBOT
- Resect necrotic tissue
- Reconstruct tissues
- Preserve/restore function, esthetics and quality of life

Medical / Social Needs

Medical / Social Needs

- Metabolic Control
 - Hg A1c
- Cessation of Smoking
- Nutritional Support
- Other Medical Conditions
- Pain Relief

Topical Wound Management

Drainage

Drawtex

Silver Dressings

Iodoflex/ Iodosorbe

Wound Vac

Calcium Alginate

Debridement

Santyl

Granulation

Prisma

Wound Gel

Silvadene

Bactroban

Topical Wound Management

- Wound Care “ Preparation of Wound Bed
- Appropriate Dressing
- Do they need off loading or compression
- Advanced Dressing ie Grafix or Skin Graft

Education

Patient
Family
Other Health Care

Wound Healing and Hyperbaric Medicine Center



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Wound Healing and Hyperbaric Medicine Center



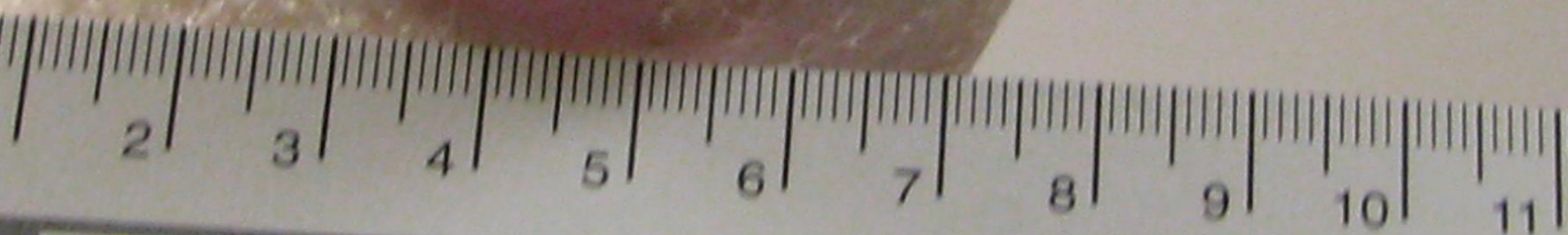
Wound Healing and Hyperbaric Medicine Center





CityHeal
Health Group

Case #	3037
Date	11-3-07
Caught	
Photo	



K-3037

Length:



VENOUS C
SEASONS

3037





Case Study

Wound Healing and Hyperbaric Medicine Center



Nov. 15, 00

K 296

Treatment Goals



- Preserve/restore function, esthetics and quality of life

Case Study







cm 1 2 3 4 5 6 7 8 cm 1 2 3

(937)257-8603

Date: 7/11/01 Case#: K400

Case#:

2001

7



Single Use Only

2972

8-14-07

538-2546 www.hill-rom.com

280-007-2060 Rev. 001 1/99
© 1999 Hill-Rom

Rehab

WOUND SIZE

2972

DATE

9-18-07

LENGTH

WIDTH

DEPTH

Discard After Single Use

WOUND To Order 1-800

CENTIMETER





cm 1 2 3 4 5 6 7 8

(937)257-8603

Date: 8/4/04 Case#: 1537

Case#: _____

Date: _____

cm 1 2 3 4 5





(937)257-8603

8/16/04

Date: _____

Case#: 1537

P debridement

Case#:

Date:

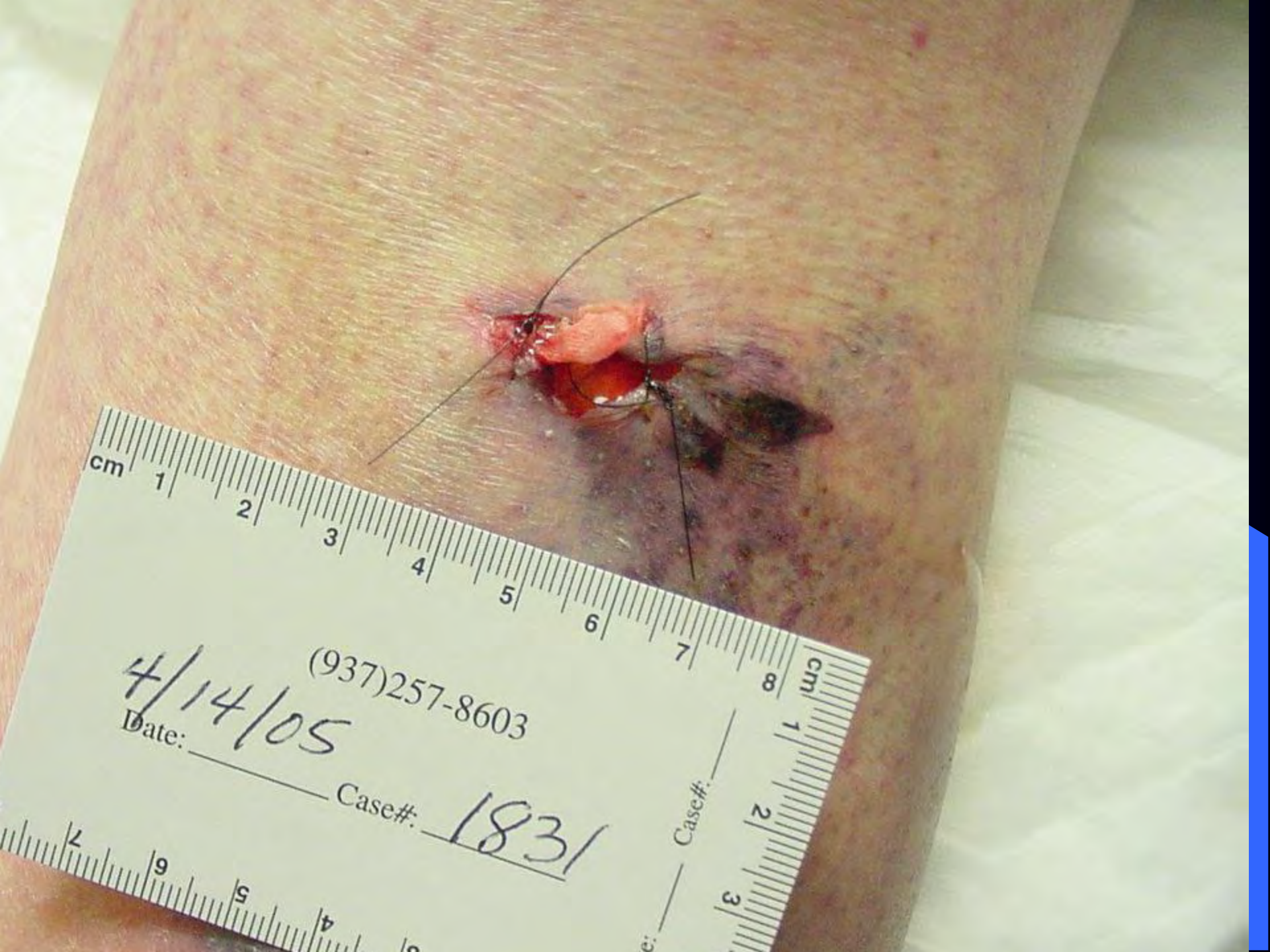




(937)257-8603

Date: 10-7-04 / Case#: K1237

Case#: _____
Date: _____



cm 1 2 3 4 5 6 7 8

(937)257-8603

Date: 4/14/05

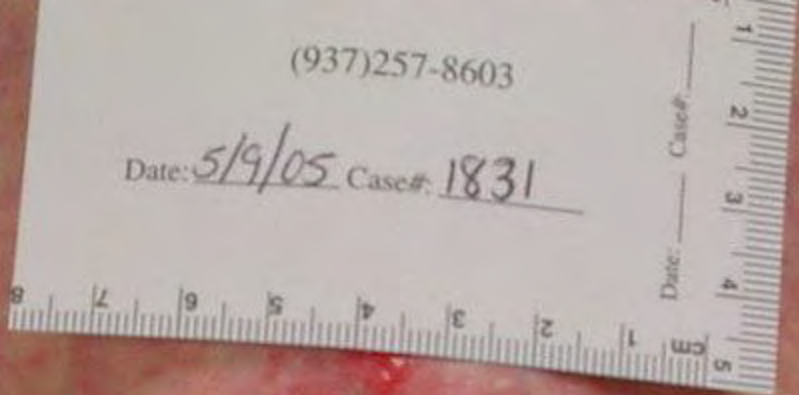
Case#: 1831

cm 1 2 3

7 6 5 4

(937)257-8603

Date: 5/9/05 Case#: 1831

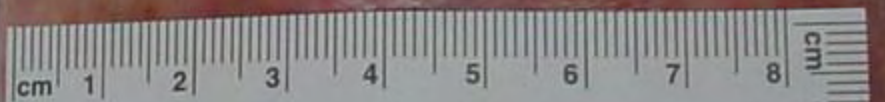




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Date: 5-27-05 Case#: K1831

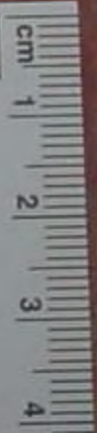
Case#: _____
Date: _____



(937)257-8603

Date: 7/7/05 Case#: 1831

Case#: _____
Date: _____





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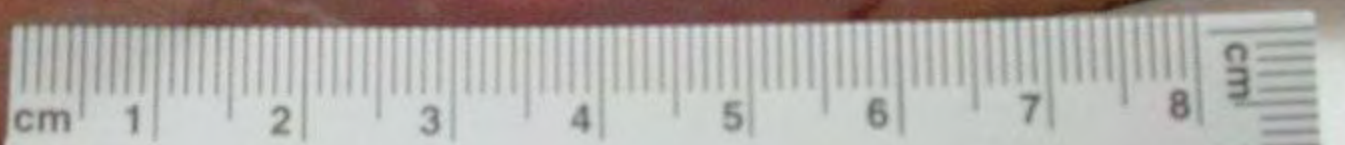
(937)257-8603

Date: 7/11/05 Case#: 1940

Case#: _____

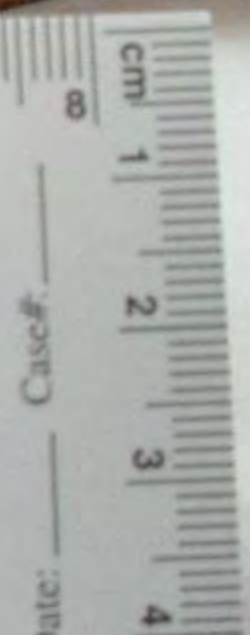
Date: _____

cm 1 2 3 4 5



(937)257-8603

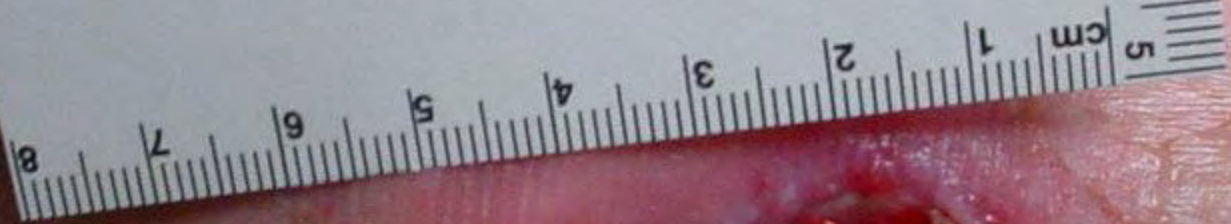
Date: 7/18/05 Case#: A140



(937)257-8603

Date: 06/22/05 Case#: 1940

Case#: _____
Date: _____





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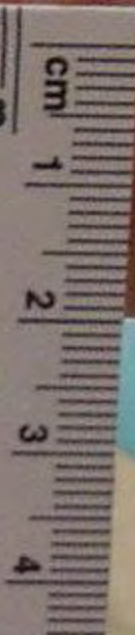
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Case#:

1940

Date: _____ Case#: _____





11-18-05

Date: _____

Case#: 2011

(937)257-8603

Case#:

Date:







(937)257-8603

Date: 2/2/06 Case#: 2011

Case#: _____
Date: _____



cm 1 2 3 4 5 6 7 8

Case# _____

Date: _____

(937)257-8603

10/03/05 K# 2025

Case# _____

cm 1 2 3 4

(937)257-8603

10-27-05

Date: _____ Case#: 2025

Date: _____ Case#: _____





(937)257-8603

10-27-05 Date: _____ Case#: 2025

Case#

Date

CM

Periodic Reassessment

- Look for consistent progress
- Regularly reevaluate the wound
- Failure to progress needs prompt reevaluation

Wound Physician Consult Program

- Bringing the excellence of the Outpatient Wound programs to the Inpatient Arena
- Advanced Wound Care
- Continuum of Care
 - Inpatient consults
 - Follow up in KHN Outpatient Wound Centers
 - Follow up in LTC facilities
- Decreased readmission rate for exacerbation of wound pathology

Who Needs a Referral?

- Patients with:
 - Pressure ulcers – Stage II, III, or IV
 - Lower extremity ulcers
 - Lymphedema
 - Diabetic foot ulcers
 - Non-healing surgical wounds
 - Any wound that will follow the patient upon discharge

Placing a Wound Physician Consult

Facility List Search - Monnin, Donald L

WOUND [Search]

Browse (F4) | Preference List (F5) | Facility List (F6)

Medications
 Procedures
 Order Panels
 Split

Name	Type	Dose	Route	Frequency	Pref List	Code
CT-DRAIN POST OP WOUND (+S&I) 10180	Imaging				KHN IMAGING MASTER IP FACILIT	IMG8493
Change Dressing	Nursing				KHN NURSING ORDERS FACILITY	NUR400
DC Hospital VAC Dressing at Discharge	Nursing				KHN NURSING ORDERS FACILITY	NUR1404
DRS MESALT 3/4 X39IN (DRS WOUND MESALT .75 X39IN (10/BX))	General Supp				KH SUPPLIES	SUP5872
DRS PRIM WOUND VIGILON 6X8 ST	General Supp				KH SUPPLIES	SUP5112
DRS PROMOGRAN WOUND 4IN (10EA/BX)	General Supp				KH SUPPLIES	SUP5863
DRS WOUND AQUACEL 4X4	General Supp				KH SUPPLIES	SUP5484
DRS WOUND AQUACEL AG 3.5X12	General Supp				KH SUPPLIES	SUP8677
DRS WOUND AQUACEL AG 4X5 (10/BX)	General Supp				KH SUPPLIES	SUP5939
DRS WOUND AQUACEL-AG ROPE .75IN X 18IN	General Supp				KH SUPPLIES	SUP5913
DRS WOUND MESALT 4X4 (30/BX)	General Supp				KH SUPPLIES	SUP7023
DRS WOUND NU-GEL ST 3.75X3.75 (5/BX)	General Supp				KH SUPPLIES	SUP5943
DRS WOUND WALGINATE 4X4 MELGISOORB (10EA/PAK)	General Supp				KH SUPPLIES	SUP9326
Debride Wound	Nursing				KHN NURSING ORDERS FACILITY	NUR292
IP Consult to Wound Care	Consult				KH FACILITY PREF LIST	CON223
Measurement Wounds	Nursing				KHN NURSING ORDERS FACILITY	NUR2146
Monitor Wound Drainage	Nursing				KHN NURSING ORDERS FACILITY	NUR559
OST POUCH WOUND DRAIN 4X8 (3/BX)	General Supp				KH SUPPLIES	SUP5223
POUCH WOUND 4.3X3 Ø EAKIN W/DRAIN (10/BX)	General Supp				KH SUPPLIES	SUP10580
POUCH WOUND DRAIN 3X3 (10/BX)	General Supp				KH SUPPLIES	SUP5222
RESERV SUCT WOUND 100CC (20/CS)	General Supp				KH SUPPLIES	SUP5959
RESERV SUCT WOUND 400CC (10/BX)	General Supp				KH SUPPLIES	SUP6144
Routine Wound Care (specify)					KHN NURSING ORDERS FACILITY	NUR424
Shower with wound covered					KHN NURSING ORDERS FACILITY	NUR104
Shower with wound open					KHN NURSING ORDERS FACILITY	NUR105
Skin Care					KHN NURSING ORDERS FACILITY	NUR875
US-DRAIN POST OP WOUND (+S&I)					KHN IMAGING MASTER IP FACILIT	IMG8446
VAC WOUND THERAPY KIT (1EA)					KH SUPPLIES	SUP5892
VAC WOUND THERAPY KIT (1EA)					KH SUPPLIES	SUP5892
VAC WOUND THERAPY KIT OLD SYS					KH SUPPLIES	SUP5501
WOUND GEL DERMAL CURASOL 30Z (12/CS)					KH SUPPLIES	SUP5989
WOUND GEL DERMAL NORMAGEL .500Z (10/BX)					KH SUPPLIES	SUP10913
WOUND MEAS 4.5X6 (250/BX)					KH SUPPLIES	SUP5369
WOUND POWDER SILVER 5GM (5EA/BX, 4BX/CS)					KH SUPPLIES	SUP10915
WOUND SHURCLENS 3.40Z (8EA/BX, 3BX/CS)					KH SUPPLIES	SUP6063
WOUND STERILE SALINE SOL 210ML					KH SUPPLIES	SUP7358
Wound (Skin) Care					KHN NURSING ORDERS FACILITY	NUR418
Wound Care Follow-Up	Nursing				KHN NURSING ORDERS FACILITY	NUR421
Wound Closure	Nursing				KHN NURSING ORDERS FACILITY	NUR425
Wound Culture (Aerobic)	Microbiology				BEAKER LAB FACILITY LIST	LAB233
Wound Dressing	Nursing				KHN NURSING ORDERS FACILITY	NUR426
Wound Ostomy Eval And Treat	WON				KH FACILITY PREF LIST	WOU1
oral wound care (GELCLAIR) gel	Medication				KH FACILITY MED PREF LIST	123032

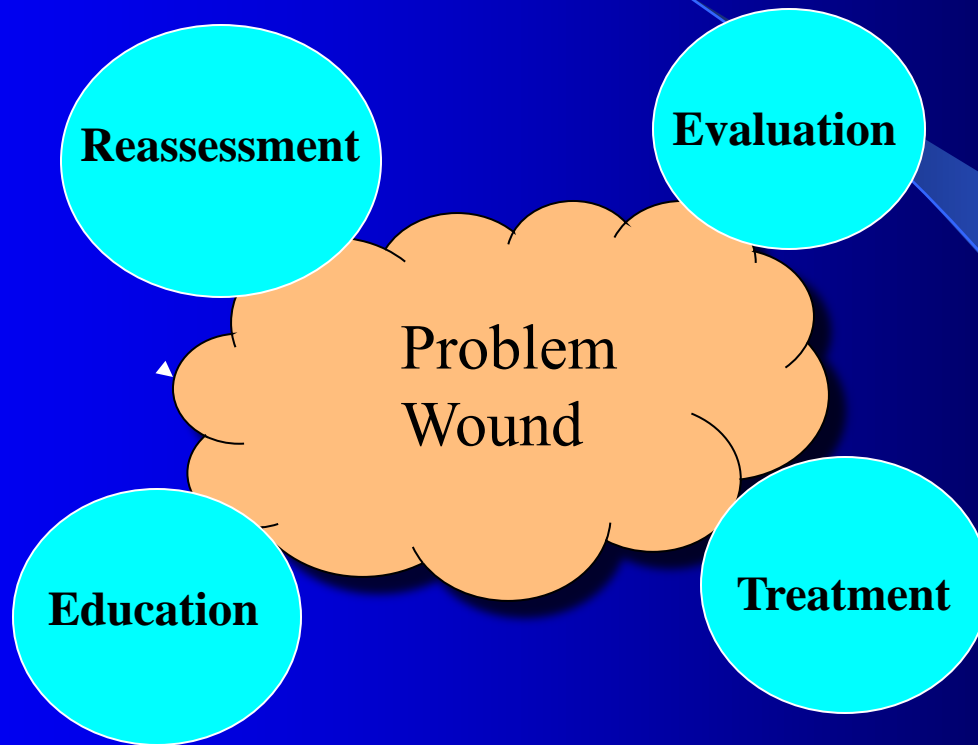
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Select & Stay | Accept | Cancel

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IP Consult to Wound Care

Summary:



Questions: