

OUTCOME, COST AND MORTALITY IN WAGNER GRADE 3 DIABETIC FOOT ULCER PATIENTS COMPLETING HYPERBARIC OXYGEN THERAPY

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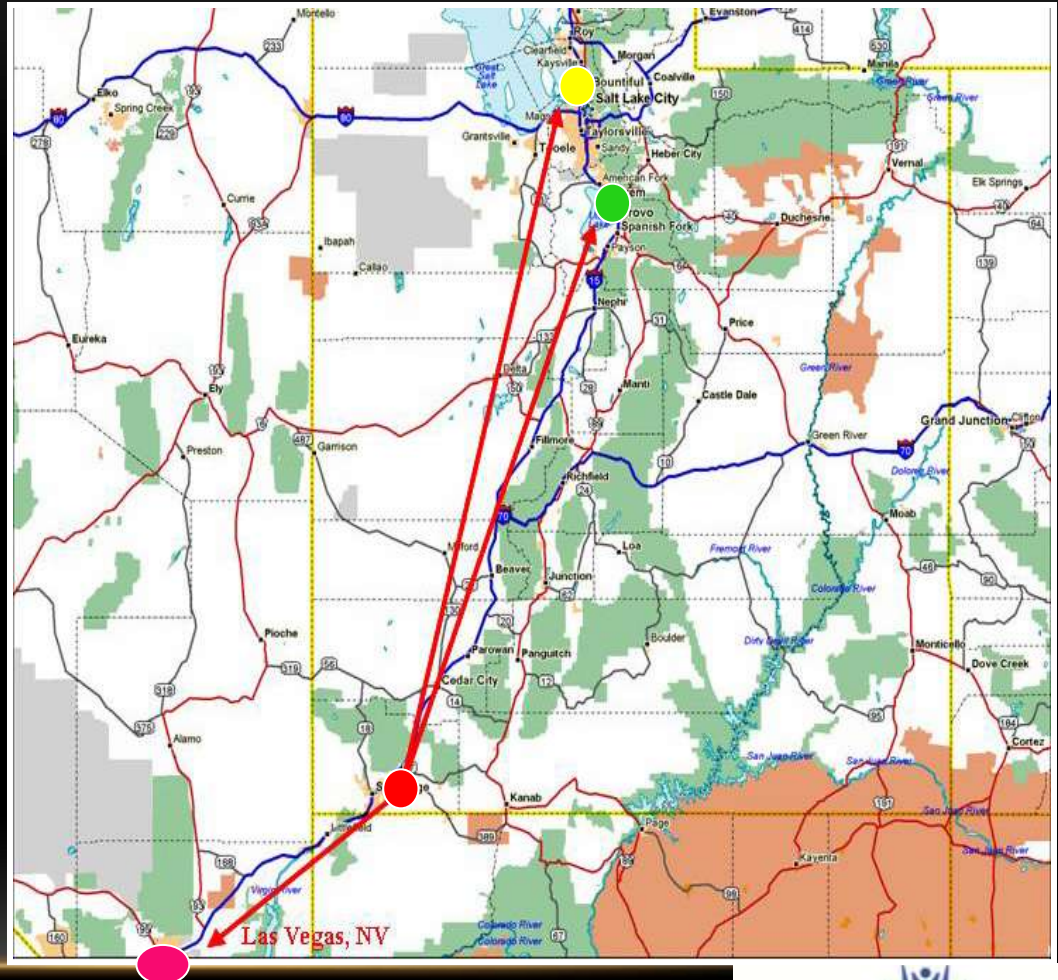


REGIONAL COVERAGE

St. George to
Salt Lake City, UT:
303mi

St. George to
Provo, UT:
259mi

St. George to
Las Vegas, NV:
118mi



INTERMOUNTAIN ELECTRONIC DATA WAREHOUSE (EDW)

- Queried Intermountain EDW for Below Knee and Above Knee Amputations from 2007-2013 in patients with Diabetes Mellitus:
 - cost
 - mortality
 - length of stay
 - discharge disposition
 - procedures
 - clinical outcome

BK/AK AMPUTEES 2007 – 2013

BK/AK Admissions	BK-Diabetic	AK-Diabetic
No. Admissions	40	31
LOS & Range	8.23 (3-22)	9.52 (3-33)
Average Charge	\$42,318	\$54,268
Range of Charges	\$7413-\$137,241	\$9041-\$148,940
Average Cost	\$21,282	\$28,044
Median Cost	\$18,117	\$25,216
Death by 5/1/2014*	47%	48%
Discharged to home	20%	27%

*UNDERESTIMATES 5 YR MORTALITY ON >50% OF PATIENTS:

BACKGROUND – HYPERBARIC MEDICINE DEPARTMENT DATABASE

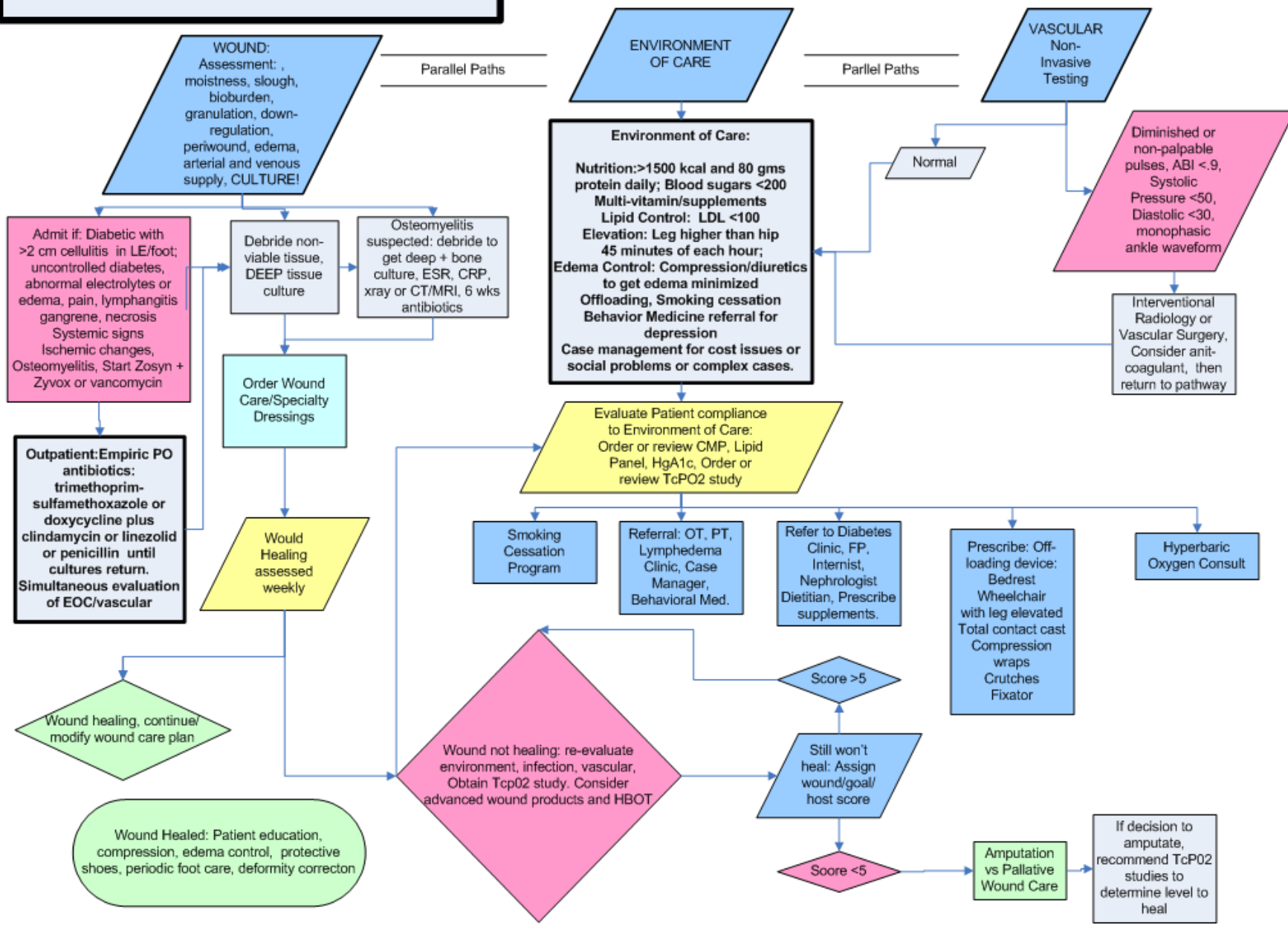
- Intermountain Dixie Medical Center (DRMC) database of all patients treated since opening in 2005.
 - Having 1 or more hyperbaric treatments
 - Sorted by diagnosis, year, number of treatments and outcome.
 - A discharge summary kept for each patient
 - Links to that patient's medical record in the EDW.

LIMB SALVAGE PROTOCOL FOR WAGNER GRADE 3+ DIABETIC FOOT ULCERS (DFU)

- IRB approved protocol that included a limb salvage pathway
 - guideline to treating Wagner Grade 3+ DFU patients
 - comparing outcomes to amputation data
- Patients with the diagnosis of Wagner Grade 3+ DFU evaluated using this limb salvage pathway
- Pathway included: “VOIDS” principles (vascular, offload, infection control, diabetes management, surgical debridement/amputation)

Lower Extremity Ulcer or Problem Wound

These are guidelines and not policy. Application for patients at every facility may require individualization or will not be possible. They are provided for guidance only.



POPULATION

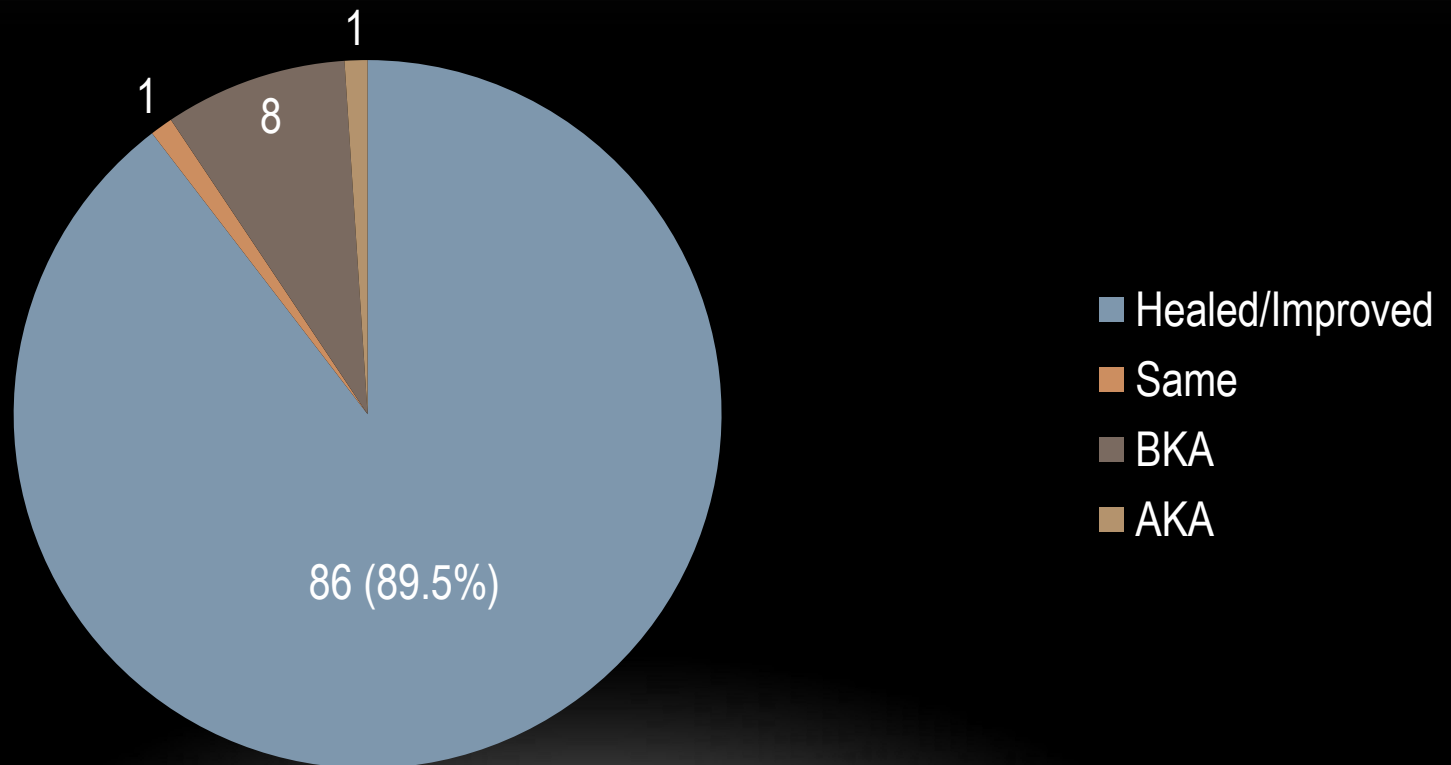
- Our department database:
 - 111 patients from August 2005 – June 2013
 - At least 1 HBO treatment
 - Diagnosis of Wagner Grade 3+ DFU
- Ninety-six patients with Wagner Grade 3+ diabetic foot ulcer completed 104 series of hyperbaric oxygen therapy (HBOT)
 - “Completed” = 20 or greater HBOT
 - Avg number of treatments/series = 27

“INCOMPLETE” HBOT: <20 HBOT

- Fifteen patients who received at least 1 HBOT and less than 20
- Reasons for stopping HBOT:
 - 8 had Urosepsis/MI or chose hospice
 - 3 chose amputation/complex flap rotation as a “shorter treatment”.
 - 1 was claustrophobic
 - 1 left Utah
 - 1 opted for a wound study
 - 1 had transportation problems
- 8 of these patients are confirmed dead (53%)

RESULTS

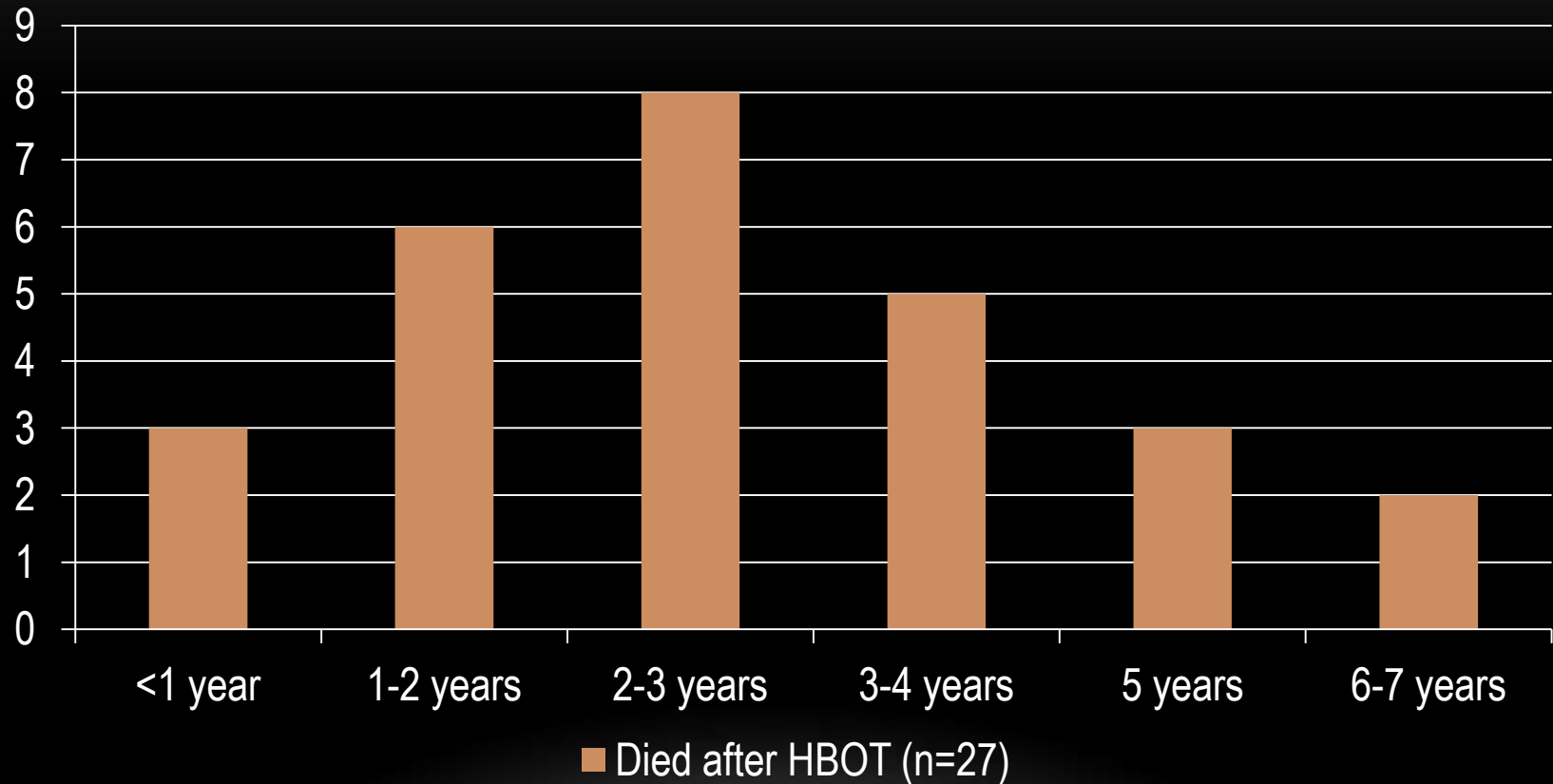
No. Patients = 96



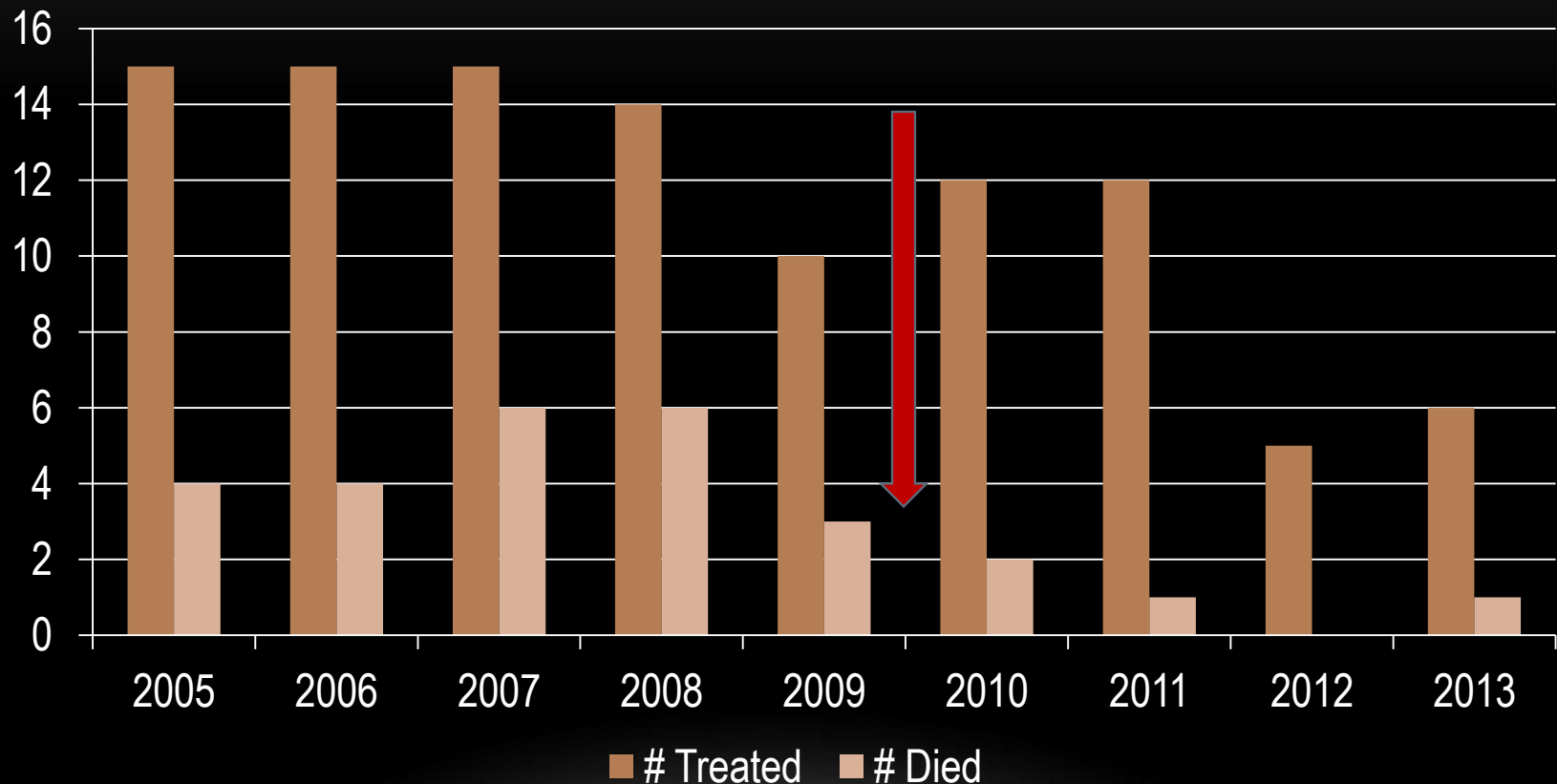
MORTALITY – PATIENTS “COMPLETED” HBOT

- Causes of Death were: (n=27)
 - Heart failure (7)
 - Myocardial Infarction (9)
 - Renal failure (4)
 - Sepsis (4)
 - Cancer (2)
 - Heatstroke (1)

MORTALITY AFTER COMPLETING HBOT



MORTALITY VS. YEAR HBOT COMPLETED



MORTALITY VS AGE COMPARED TO SW DIABETICS OR ALL CAUSES MORTALITY

- <60yrs old: 32 treated, 4 died (12.5%)
- 60-69: 27 treated, 6 died (22%)
- 70-79: 24 treated, 8 died (34%)
- >79: 13 treated, 9 died (69%)

Age	Mortality SW Utah Diabetics- 1999	Mortality All Causes USA 2010
35-44	.01%	.170%
45-54	.008	.407
55-64	.066	.851
65-74	.102	1.87
75-84	.299	4.79
85+	.352	13.9

COSTS OF HBOT VS AMPUTATION

- **Does Not** Include Costs of Wound Care, Revascularization, Surgical Debridements, Rehab, SNF, Loss of Work Time, Prosthesis
- 96 patients an average of 27 hyperbaric treatments = cost of \$13,000/pt
 - One patient “failed” HBOT, had an AKA, average hospital costs = \$28,000
 - Eight patients “failed” HBOT, had an BKA, average hospital costs = \$21,000
- Average cost per patient for 96 patients (including “failed”) was \$15,041.66

WOUND CARE/OTHER COSTS

- Level 3 Wound Clinic Visit: Approximate cost: \$125.
- BK Prosthesis Approximate cost for the first year: \$22,000
- CT Angio: \$800.
- Angio with revascularization: \$2000.

CONCLUSION

- Wagner Grade 3+ DFU as well as BK/AK amputations are associated with high 5 year mortality rate.
- Our limb salvage approach had an 89% success rate for avoiding BK/AK amputations in patients with Wagner Grade 3+ DFU who completed >20 HBOT.
- 29% of these patients died by May 1, 2014
 - Probably underestimates 5-year mortality rate.
- The average cost of HBOT for these patients was less than the cost of a single hospitalization resulting in either BK or AK amputation.

COMMENTS - AMPUTATION

- The wide range of charges/costs for emergent amputation hospitalizations may have included revascularization or initial debridement and thus be higher than the cost of a non-emergent amputation where revascularization or debridement may have been done as an outpatient or during a previous hospitalization.
- Costs for amputation are hospital only
 - does not include physician, rehab, SNF, or prosthesis costs, or further hospitalizations for amputation complications.

COMMENTS – COMPLETED HBOT

- Patients who quit HBOT before completion had a higher mortality rate and can “skew” statistics for overall Wagner Grade 3+ DFU.
- Any cost data needs to include 5-year mortality in determining whether a limb salvage approach with HBOT is more or less costly than amputation.
- We need better prospective cost data to define the most “cost effective” way to treat Grade 3+ DFU in this day of decreasing health care dollars.