

Norfolk and Norwich University Hospitals



NHS Foundation Trust

# Osteomyelitis Audit: Low Amputation & High Recurrence Rates

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## Elsie Bertram Diabetes Centre Foot Clinic

- The Norfolk and Norwich University Hospital has a catchment population of 600,000
- Population of 32,000 people with diabetes
- EBDC Foot Clinic:
  - 3.8 FTE podiatrists
  - >4,500 contacts / year
  - + 600 new patients / year



# Introduction

- Osteomyelitis is thought to complicate approximately 20% of diabetic foot ulcers managed at specialist clinics in the UK (Shone, et al, 2006) and US (Lavery, et al, 2007)
- Osteomyelitis has historically been considered a surgical condition
- In recent years, multiple authors have reported high success rates with conservative therapy alone
  - Embil, et al (2006)
  - Game & Jeffcoate (2008)

# Introduction: Investigations

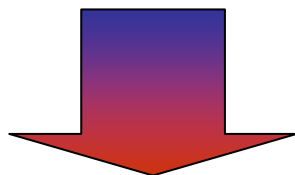
- The probe to bone test is frequently used to determine likelihood of osteomyelitis
  - PPV between 53-57% (Shone et al, 2006, Lavery et al, 2007)
  - NPV of 90%
- MRI is considered to be best imaging option with a sensitivity between 90-100% (Jeffcoate & Lipsky, 2004)
  - not routinely used as first line due to high cost and lack of access
- Bone biopsy is the gold standard for culture
  - not routinely used as invasive and expensive

# Objectives

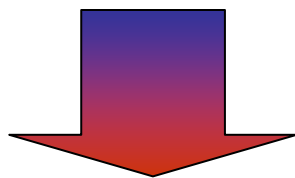
- Aim of audit was to benchmark osteomyelitis outcomes against other centres
- Prospective study undertaken

# Methods

Data collection began 21/11/2007



12 month recruitment period



12 month follow up period

- mean 14.6 months
- range 4 – 22 months

- Patients attending outpatient diabetic foot clinic over 12 month period
- Sample of 46 suspected cases of osteomyelitis
  - visible bone
  - probing to bone
  - ‘sausage toes’
- 23 radiologically confirmed cases (50%)
  - X-ray (22)
  - MRI (1)
- Osteomyelitis remission was defined as:
  - wound healing / no radiological or clinical signs following at least 4 months follow up

# Results

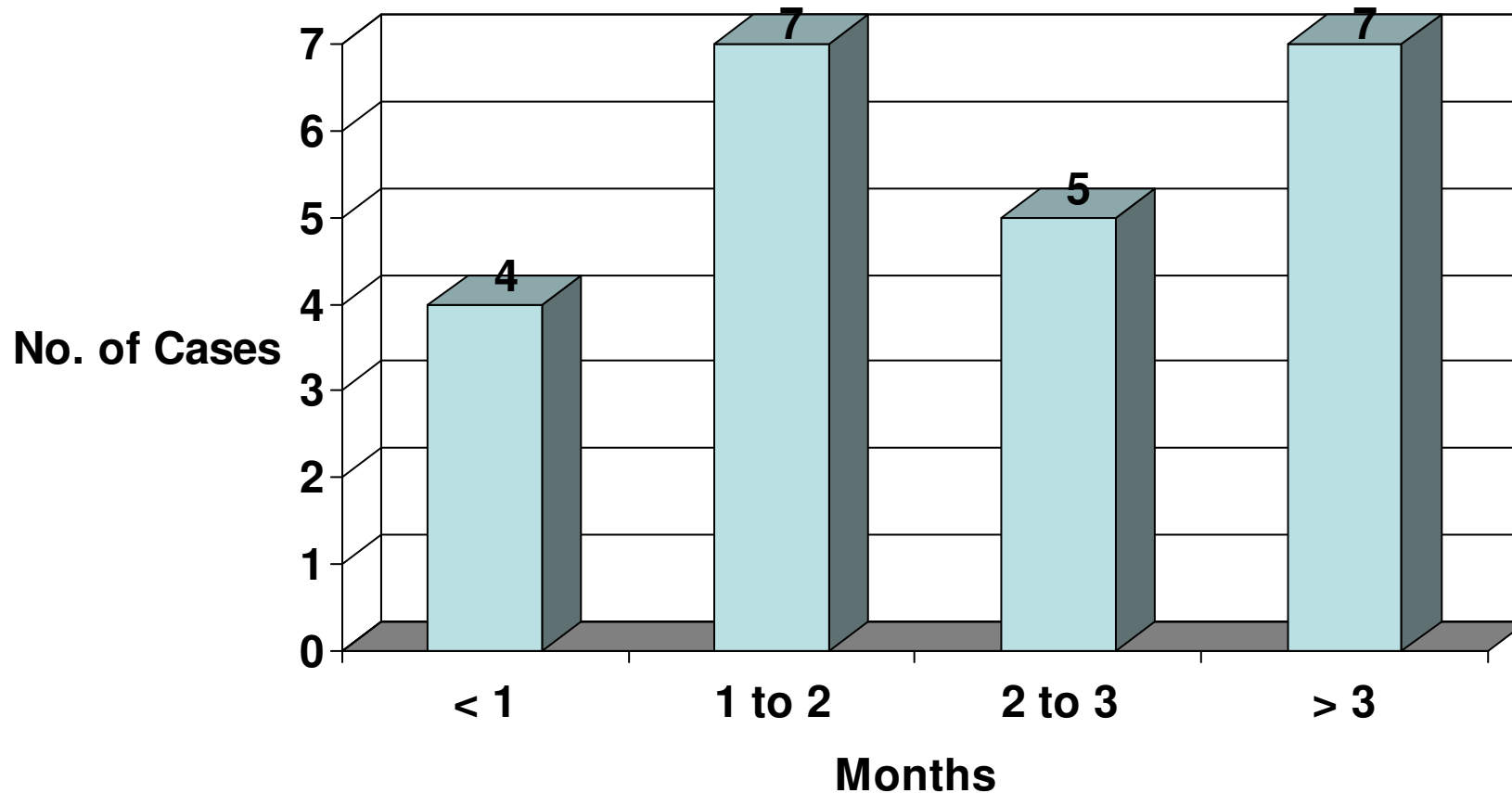
- Over a 12 month period:
- 20 patients with 23 confirmed cases
- 25% (5) had a previous ulcer at site which had gone on to heal
- 55% (11) had previous osteomyelitis,
  - Only 1 of these (5%) was at same site
- 20% (4) had a previous minor amputation

# Baseline Characteristics

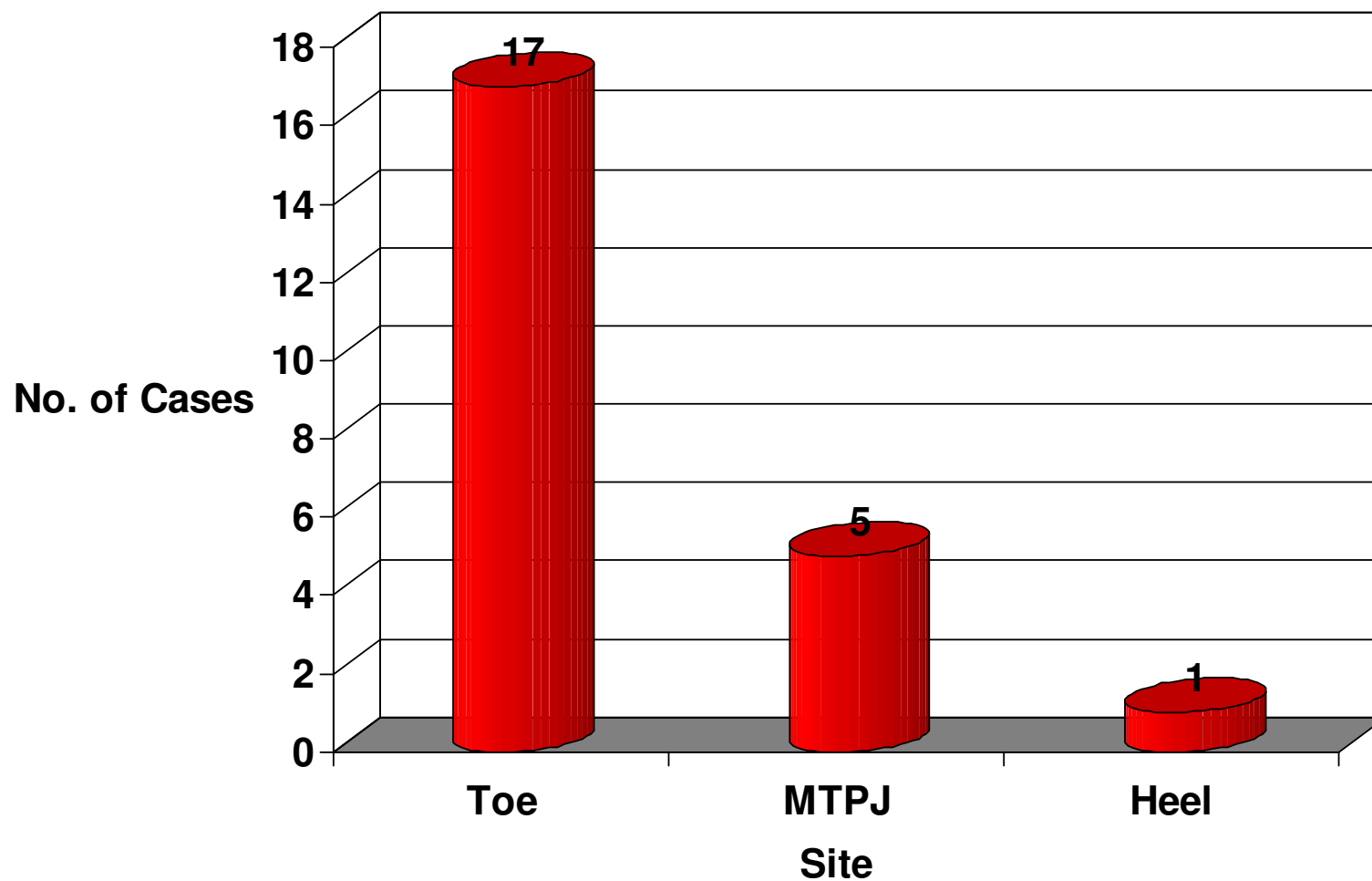
Suspected cases of osteomyelitis	46
Confirmed cases of osteomyelitis	23
Patients included in study	20
Sex (male/female)	14/6
Age (years)	mean = 69 (range 38-94)
Diabetes type (2/1)	17/3
HbA1c - % - (mmol/mol)	mean = 8.0 (range 6.0-11.2) mean = 64 (range 42-99)
Neuropathy	20/20
Neuroischaemia	8/20
eGFR $\leq 29$ (ml/min/1.73m <sup>2</sup> )	3
Dialysis	0



# Results: Ulcer Duration Prior To Diagnosis



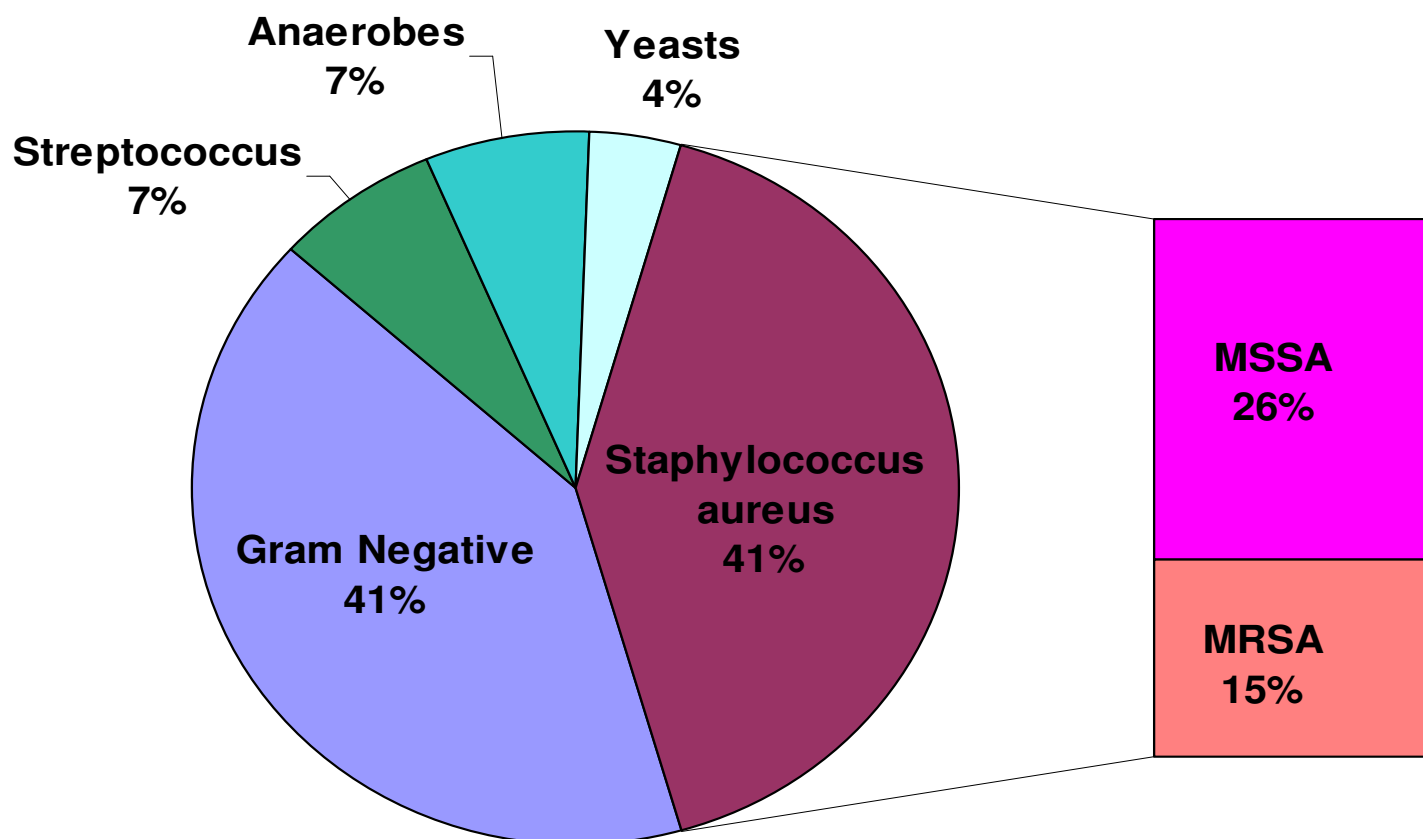
# Results: Site of Osteomyelitis



# Results: Cultures

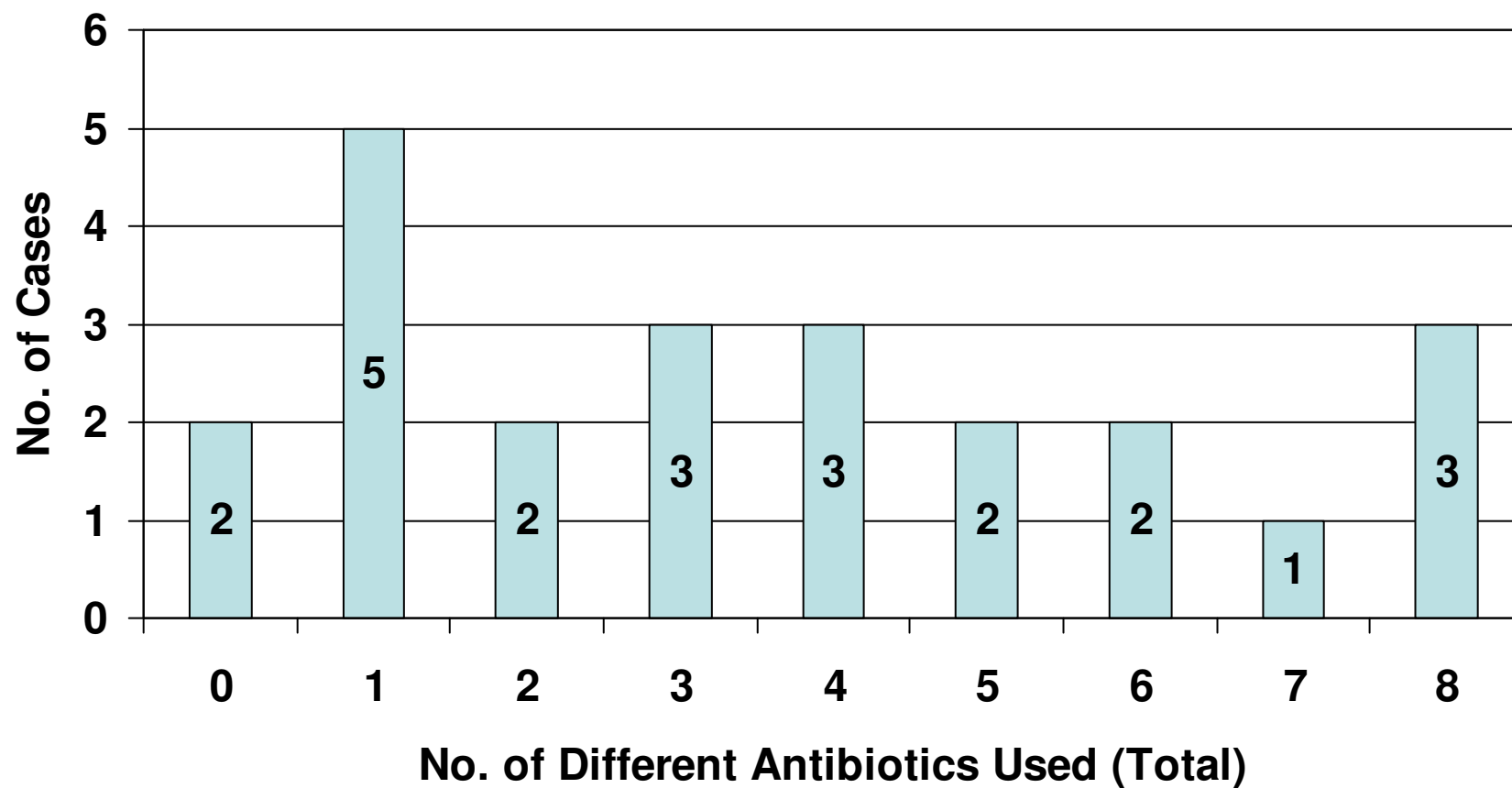
- 70% had positive culture
- All cultures were from either:
  - deep swab, or
  - tissue sample
- No bone biopsies or bone cultures

# Results: Culture growth

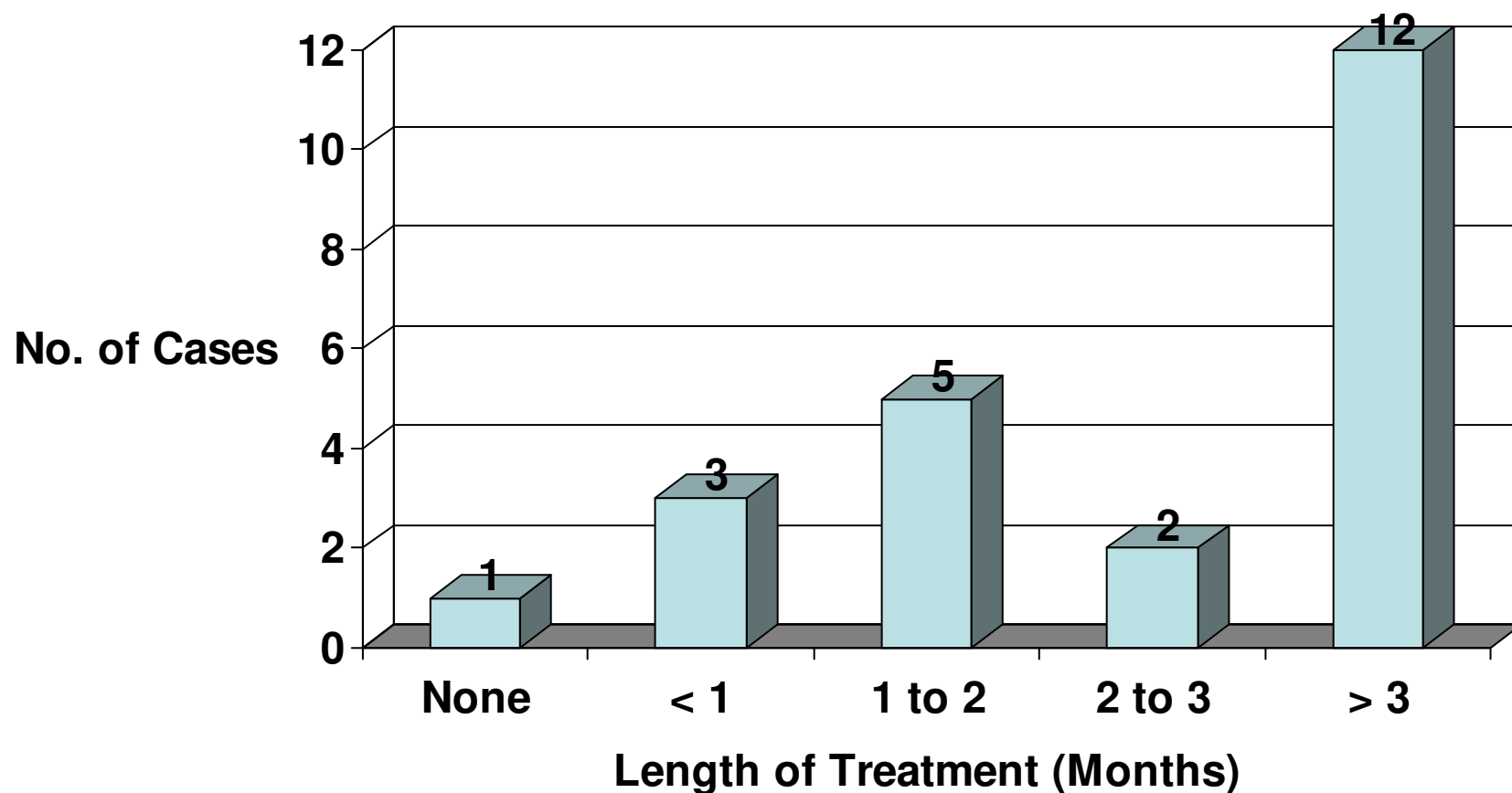


# Results:

## No. of Different Antibiotics Used



# Results: Duration of Antibiotic therapy



# Results: Surgical Management

- 73% of cases (17) received a surgical opinion
- 17% of cases (4) required surgery
  - 3 cases (13%) required a toe amputation
  - 1 case (4%) required a metatarsal head resection
  - **No major amputations**
- Annual amputation rates\*:
  - Norfolk PCT
    - Minor: 1.7/1000 (54.4)
    - Major: 1.1/1000 (35.2)
  - England
    - Minor: 1.5/1000
    - Major: 1.1/1000

\*Hospital Episode Statistics, Yorkshire & Humber Public Health Observatory,  
[http://yhpho.york.ac.uk/diabetesprofiles/pdf/5PQ\\_Diabetes%20Profile.pdf](http://yhpho.york.ac.uk/diabetesprofiles/pdf/5PQ_Diabetes%20Profile.pdf)

# Results: Non-surgical Management

- 9 cases (39%) required hospital admission
  - 1 case required 2 separate admissions
  - mean length of stay was 21 days
  - range 4 - 43 days
- **19 cases (83%) did not require an amputation**
  - In 18 of these 19 cases (95%) the patient went on to heal ulcer
  - 1 patient (5%) died with an open ulcer

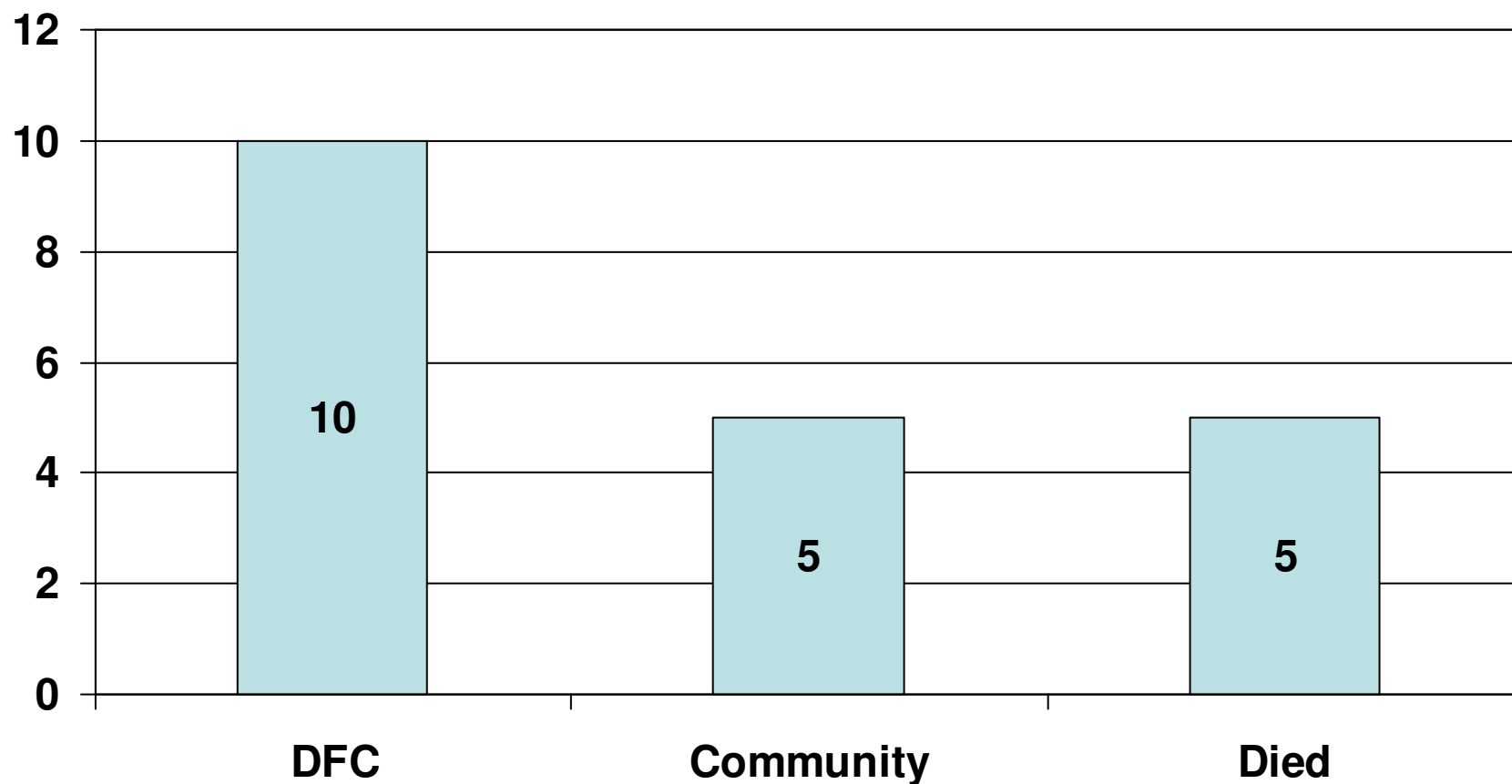


# Results: Outcome Data

## Ongoing Ulceration / Osteomyelitis:

- 7 patients (35%) had further osteomyelitis post-remission
  - 1 at same site
  - 6 at a different site
- 12 patients (60%) had further ulceration post-healing

# Results: Where Are They Now?



# Discussion: Risk Factors

## Clinical signs (probing to bone & 'sausage toes'):

- predicted osteomyelitis in 50% of patients in this audit
- consistent with PPV estimates for probe to bone test of 53% (Shone et al, 2006) and 57% (Lavery et al, 2007) from larger studies

## Previous osteomyelitis:

- 55% (11) of patients in study had previous osteomyelitis,
  - only 1 of these 11 at same site
- 35% (7) of these patients developed further osteomyelitis within follow up period
  - only 1 of these 7 at same site

# Discussion: Risk Factors

- Neuropathy, all patients were neuropathic with 40% of patients being neuroischaemic
- Advanced age, mean age was 69 years
- Males, 70% in this audit
- Distal ulcers, 96% of cases involved either toes or MTPJ's
- Chronic ulcers, 82% of ulcers had been present for > 1 month

# Discussion: Where To From Here?

- Antibiotic policy has been rationalised
  - Dhatariya, et al (2009) Development of a Rationalized Antibiotic Protocol for Inpatient and Outpatient Use in a Tertiary Diabetic Foot Clinic
  - Abstract available:  
[http://dfsg.org/fileadmin/user\\_upload/EWMA/DFSG/abstracts/2009/P46.pdf](http://dfsg.org/fileadmin/user_upload/EWMA/DFSG/abstracts/2009/P46.pdf)
- Need for ongoing monitoring of patients following successful treatment of osteomyelitis due to high rate of recurrence
- Only able to assess rate of arrest after a year (Berendt, et al, 2008)

# Conclusion

- Osteomyelitis can be successfully treated conservatively
  - Extended antibiotic course (>3 months)
  - Low amputation rates
  - 83% managed conservatively, consistent with previous authors (Game & Jeffcoate, 2008)
- High recurrence rates
  - During follow up period
  - 60% had recurrent ulceration
  - 35% had recurrent osteomyelitis

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- Patients involved in audit