

### Background

- Prophylactic antibiotics at the time of primary arthroplasty reduces infection by 3-4 fold
- Current guidelines state that patients undergoing knee replacement should receive a prophylactic antibiotic one hour prior to the surgical incision and this be discontinued within 24 hours after the surgery
- 60-70% of prosthetic knee infections are caused by *Staphylococci aureus* and epidermidis. Streptococci and/or enterococci account for 12-20%, with gram-negative enteric aerobes or anaerobes causing the remainder
- Current core measures recommend cefazolin as prophylaxis for arthroplasty due to its activity against gram-positive and most clinically important aerobic gram-negative bacilli and non-bacteroid anaerobe

### Objective

- Determine the incidence of surgical site infections (SSI) post-total knee arthroplasty (TKA) in a large medical center
- Describe the microbiologic characteristics of all organisms isolated
- Compare the sensitivities of the organisms to the spectrum of the pre-operative antibiotic
- Analyze patient characteristics for risk factors that may inform pre-operative prophylactic choices
- Determine the incidence of infections due to methicillin resistant *Staphylococcus aureus* (MRSA)

### Method

- Retrospective chart review
- SSI post-TKA identified by Infection Prevention department of Orlando Health
- All knee, blood and urine cultures were examined

### Inclusion Criteria

- Primary knee arthroplasty
- Surgery taking place at Orlando Health or Lucerne Hospital during 2004-2009
- Cases reported within one year of TKA
- Isolates obtained over 1 year after surgery included if obtained intraoperatively

### Results

Fig 1. Prophylactic antibiotics administered

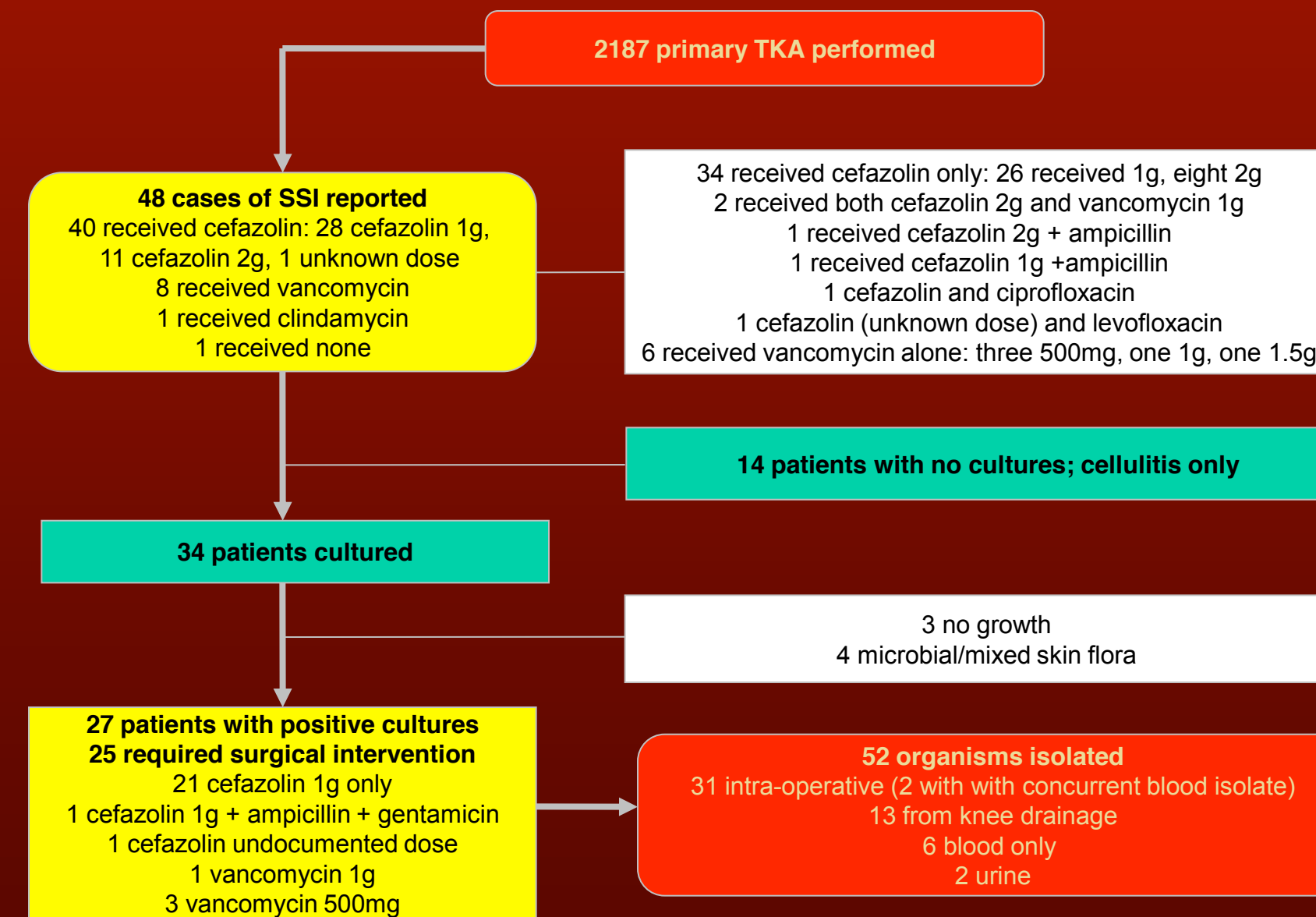


Table 1 – Patient Characteristics

Patients, No	48
Age (y), mean (range)	63 (43-92)
Male, No. (%)	20 (42)
BMI*, mean (range)	32.2 (21-50.8)
Time from index surgery to diagnosis, days (range)	92.7 (2-839)
LOS (Days), mean (range)	5.14 (2-12)
Op time (hrs), mean (range)	1:56 (0:55-3:14)
AB time (hours), mean (range)	0:46 (0:03-4:49)
Surgical wound class No. (%)	
1	47 (98)
3	1 (2)
ASA** class	
2	19 (40)
3	29 (60)
Comorbidities, No. (%)	
Obese	29 (60)
Diabetes	15 (31)
Liver disease	3 (6)
Renal disease	5 (10)
Rheumatoid arthritis	3 (6)
Previous knee surgery***	6 (13)
History of MRSA infection	4 (8)
Smoking	11 (23)

\*BMI – Body mass index, LOS – Length of stay, AB – Antibiotic  
 \*\*ASA – American Society of Anesthesiologist class, 3+ considered a risk for SSI  
 \*\*\*Arthroscopies, meniscectomy, 1 patella surgery

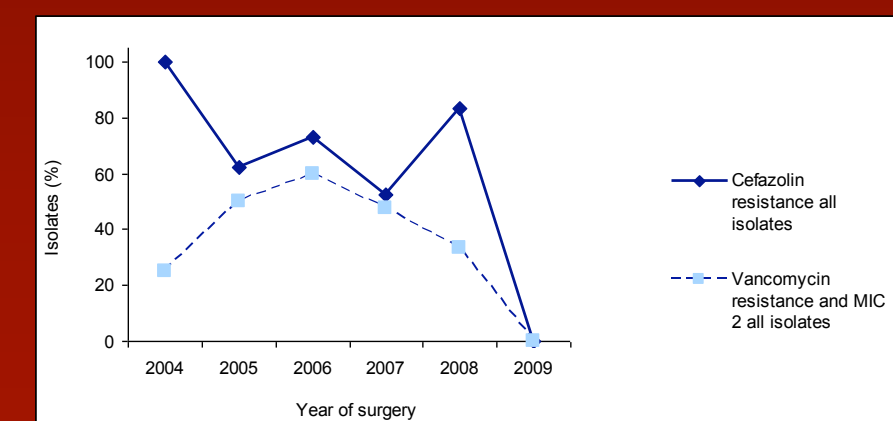


Fig. 2 – Isolate resistance over time



Fig. 3 – Staphylococcal resistance over time

❖ 8 patients with ASA class 2 had positive cultures compared to 12 of class 3 ( $p=0.069$ )

Table 2 – Factors most closely related to positive MRSA

Patients, No	48	MRSA, 9	No MRSA, 39	<i>p</i>
AB time (hours), mean (range)	0:46	1:39:08	1:01:02	$p=0.053$
Dose of cefazolin, No.				
1g	28	7	21	
2g	11	0	11	$p=0.159$
Comorbidities, No.				
Steroid use	1	1	0	$p=0.188$
Smoking	11	4	7	$p=0.18$
ASA Class				
2	19	2	17	
3	29	7	22	$p=0.286$

❖ Incidence of MRSA post cefazolin (9 isolates from 7 patients) versus vancomycin (2 isolates from 2 patients) was not statistically significant

### ❖ Sensitivity to peri-operative antibiotic

- Of the 52 isolates, 6 had no sensitivities recorded
- 16 (35%) were sensitive to prophylactic antibiotic administered
- 30 (65%) were not sensitive to prophylactic antibiotic

### ❖ Epidemiology of infection

Organisms	2004	2005	2006	2007	2008	2009
<b>Gram-positive, No. (%)</b>	<b>2 (67)</b>	<b>5(63)</b>	<b>12 (80)</b>	<b>12 (63)</b>	<b>5 (83)</b>	<b>1 (100)</b>
<i>Staphylococcus</i> spp						
MRSA	0	3	4	1	3	0
MSSA	0	1	2	6	0	0
<i>S epidermidis</i>	0	0	4	2	1	0
Agglutination negative	0	1	1	1	0	0
<i>S hemolyticus</i>	0	0	1	1	0	0
Enterococcus faecalis	1	0	0	1	0	0
Anaerobic gram positive cocci	0	0	0	0	0	1
Streptococcus group B	0	0	0	0	1	0
Clostridium perfringens	1	0	0	0	0	0
<b>Gram-negative No. (%)</b>	<b>0</b>	<b>3 (38)</b>	<b>3 (20)</b>	<b>3(16)</b>	<b>1 (17)</b>	<b>0</b>
<i>Proteus mirabilis</i>	0	1	0	0	0	0
<i>Pseudomonas aeruginosa</i>	0	0	2	3	0	0
<i>Enterobacter cloacae</i>	0	2	1	0	0	0
<i>Escherichia coli</i>	0	0	0	0	1	0
<b>Fungal No. (%)</b>	<b>1 (50)</b>	<b>0</b>	<b>0</b>	<b>4 (21)</b>	<b>0</b>	<b>0</b>
<i>Candida albicans</i>	0	0	0	2	0	0
<i>Candida tropicalis</i>	0	0	0	1	0	0
<i>Penicillium</i> spp.	0	0	0	1	0	0
<i>Aspergillus</i> spp	1	0	0	0	0	0
<b>TOTAL ISOLATES</b>	<b>3</b>	<b>8</b>	<b>15</b>	<b>19</b>	<b>6</b>	<b>1</b>

Organisms	1g Cefazolin	2g Cefazolin
<b>No Cultures</b>	<b>2</b>	<b>7</b>
<b>No growth/Microbial/Skin flora</b>	<b>7</b>	<b>4</b>
<b>Gram-positive, No. (%)</b>	<b>31 (70)</b>	<b>0</b>
<i>Staphylococcus</i> spp		
MRSA	9	0
MSSA	8	0
<i>S epidermidis</i>	5	0
Agglutination negative	3	0
<i>S hemolyticus</i>	2	0
Enterococcus faecalis	2	0
Anaerobic gram positive cocci	1	0
Streptococcus group B	0	0
<i>Clostridium perfringens</i>	1	0
<b>Gram-negative No. (%)</b>	<b>9 (20)</b>	<b>0</b>
<i>Proteus mirabilis</i>	0	0
<i>Pseudomonas aeruginosa</i>	5	0
<i>Enterobacter cloacae</i>	1	0
<i>Escherichia coli</i>	3	0
<b>Fungal No. (%)</b>	<b>4 (9)</b>	<b>0</b>
<i>Candida albicans</i>	2	0
<i>Candida tropicalis</i>	1	0
<i>Penicillium</i> spp.	0	0
<i>Aspergillus</i> spp	1	0
<b>TOTAL ISOLATES</b>	<b>44</b>	<b>0</b>
<b>Patients, No</b>	<b>22</b>	<b>0</b>

$p < 0.001$

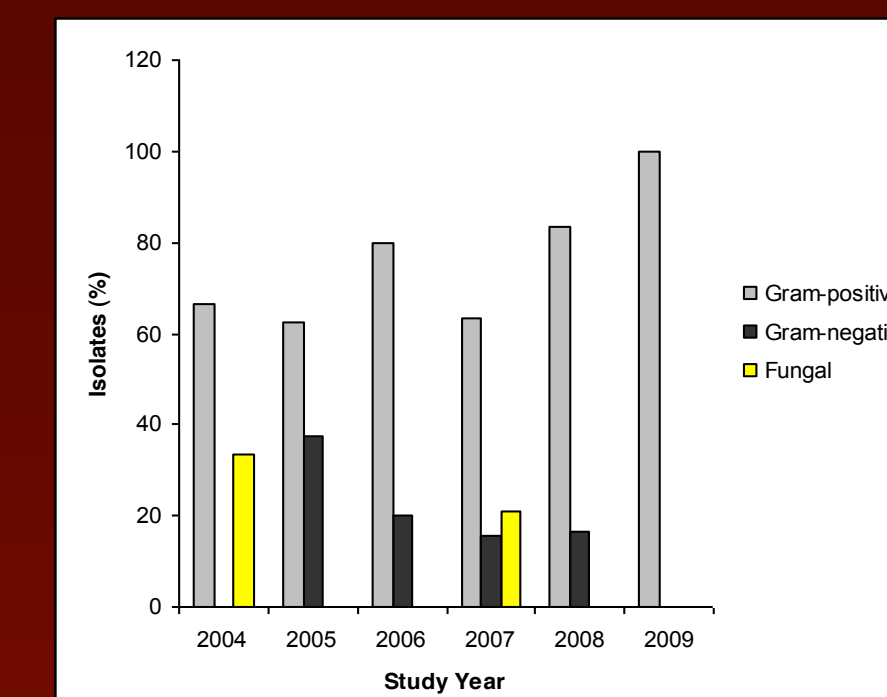


Fig. 4 – Distribution of Isolates after each year of surgery

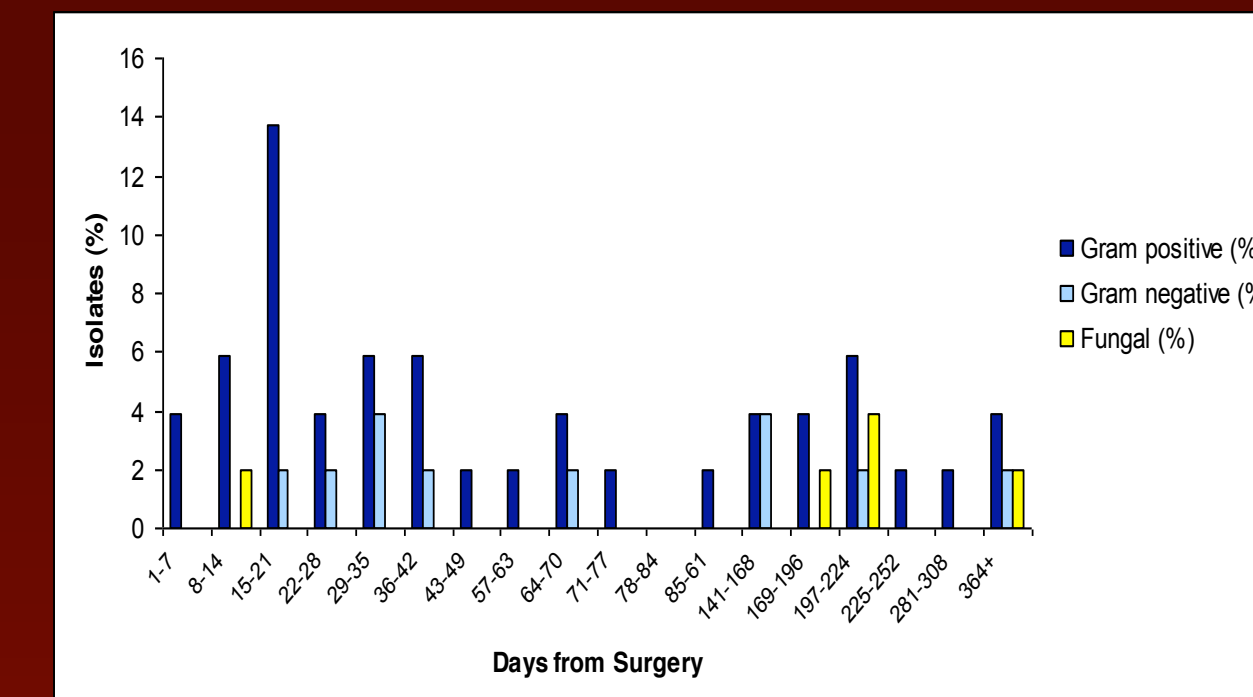


Fig. 5 – Distribution of isolates with time from surgery

### CONCLUSION

- Rate of infection was 2.2%
- Number of patients with positive cultures in the 5 year period was 27 (1.2%)
- Number of patients with positive cultures after 1g cefazolin was significantly greater than after 2g
- There was no statistical significance in characteristics between MRSA and non-MRSA, but possible trends were identified
- Further investigation with a larger sample size (multicenter, primary hip arthroplasties as well as TKA, randomized-matched control) with a particular focus on the use of a higher dose of cefazolin is warranted

### References

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