

Infectious Diseases with Public Health Impact for Dialysis Services

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Infection

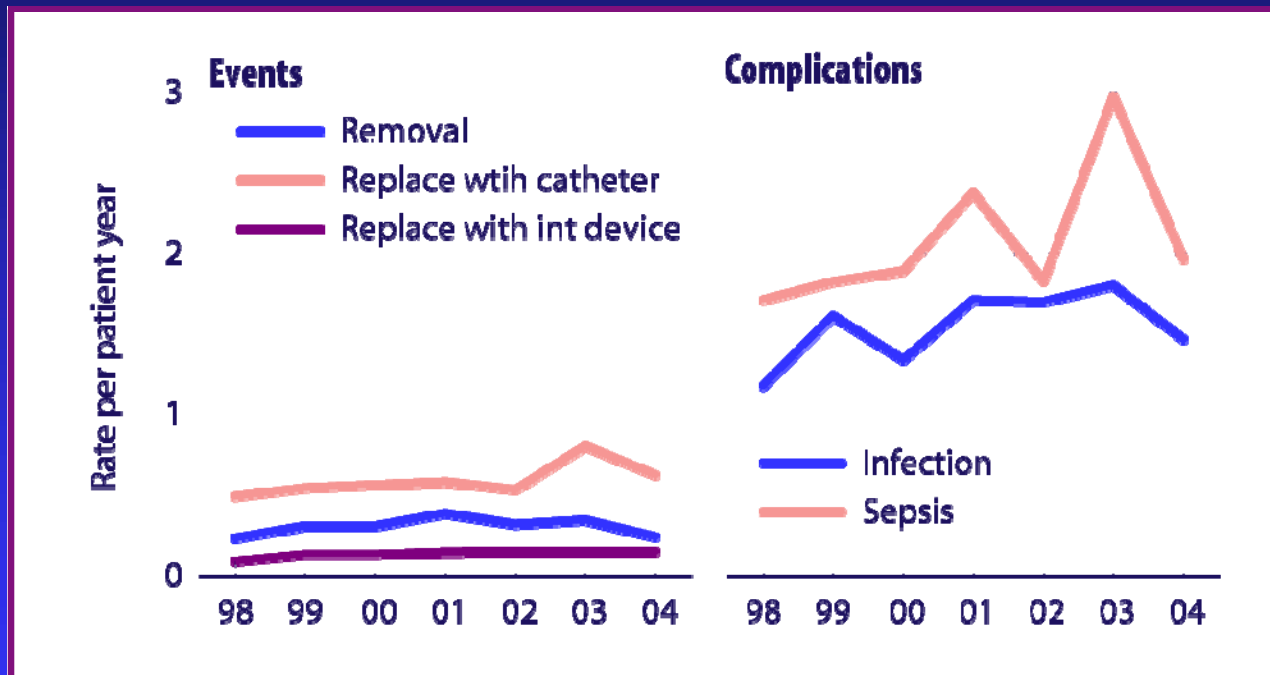
- The leading preventable cause of mortality in the dialysis population
- Reducing the burden of infection should be the number one objective in the care of patients on dialysis
- Discuss

Outline

- Epidemiology
- Consequences
- Prevention (primary)
- Prevention (secondary)
- Treatment
- Summary

Catheter events & complications USRDS

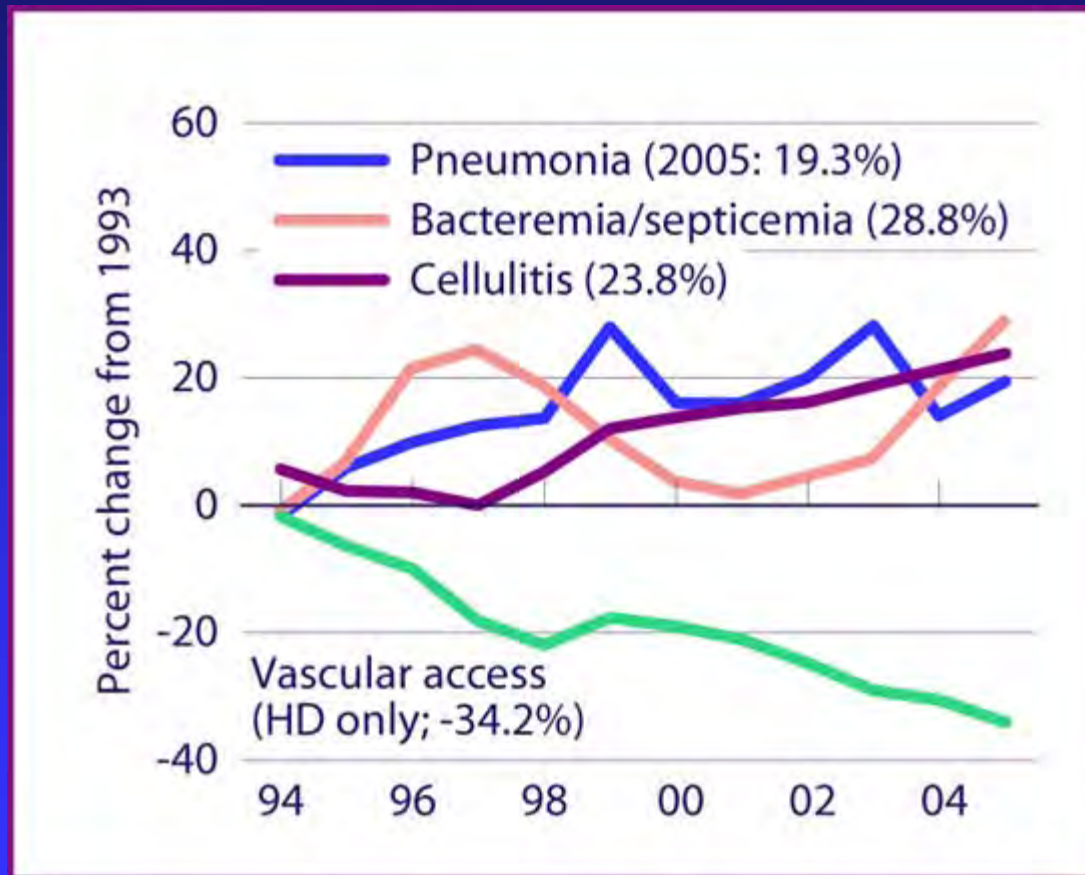
Figure 5.48



Prevalent hemodialysis patients age 20 and older, ESRD CPM data; only includes patients who are also in the USRDS database. Year represents the prevalent year & the year the CPM data were collected. Access is that listed as “current” on the CPM data collection form.

Change in hospital admissions since 1993

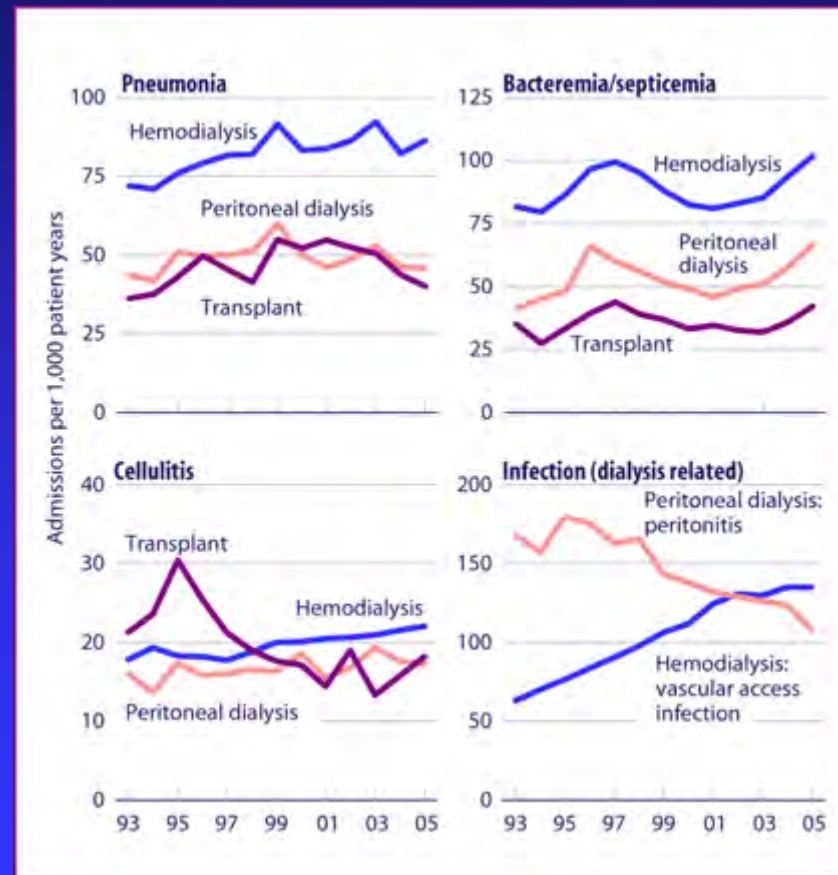
Figure 6.3



Period prevalent dialysis patients. Rates adjusted for age, gender, race, and primary diagnosis. ESRD patients 2005 used as reference cohort.

Adjusted admissions for principal diagnoses, by modality

Figure 6.5

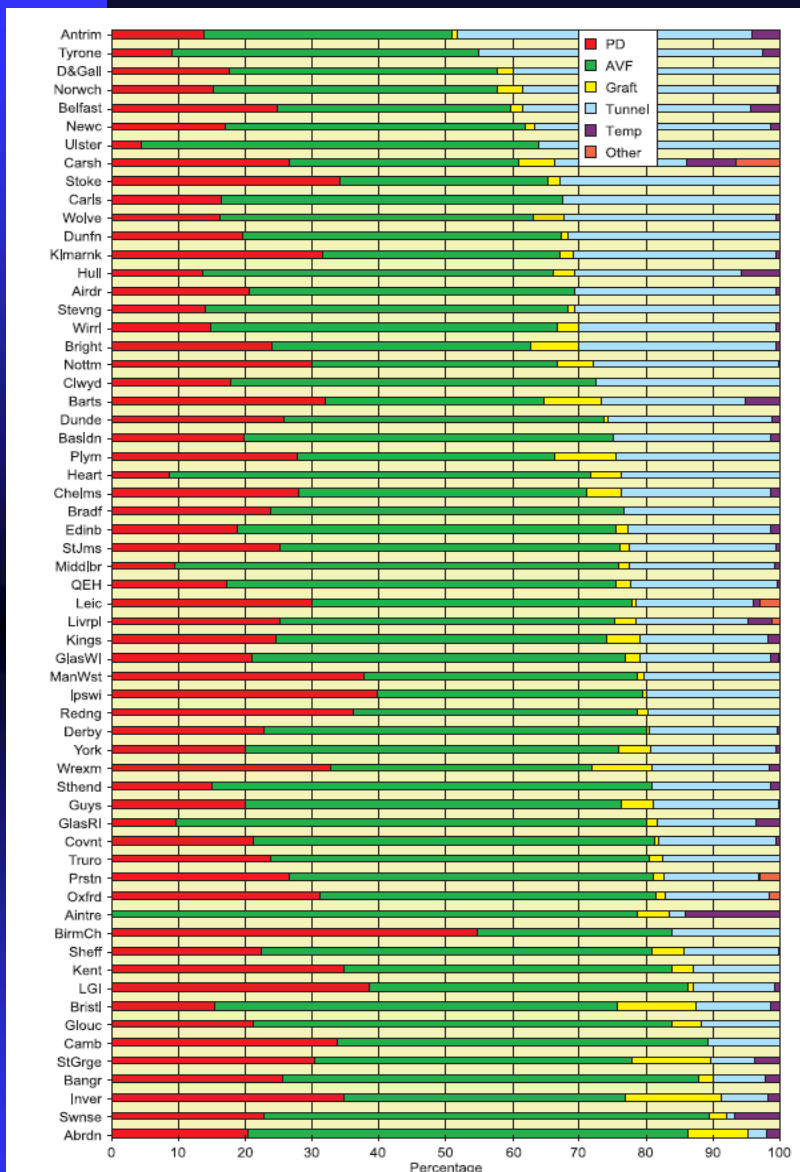


Period prevalent ESRD patients; adjusted for age, gender, race, & primary diagnosis. ESRD patients, 2005, used as reference cohort.

UK RENAL REGISTRY VASCULAR ACCESS SURVEY

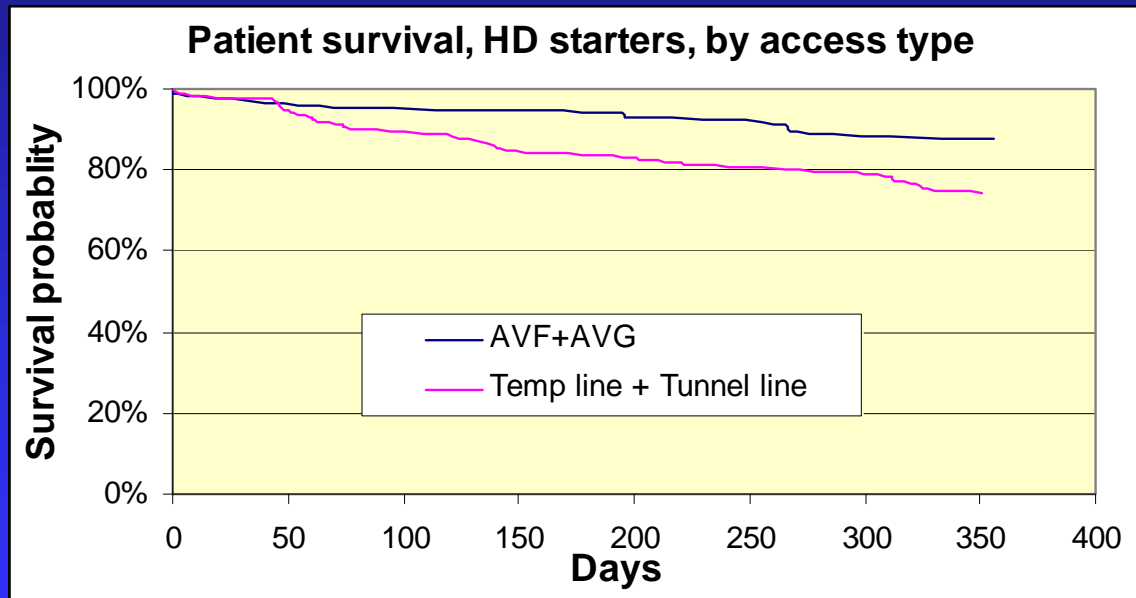
UK RA Vascular Access Survey 2005

- Census of all dialysis patients
 - 62 centres returned
 - 4 unable to assist
 - 6 no return
- Census of chronic HD patients in hospital
- Proportion of above due to vascular access
- 2004 *Staph. aureus* septicaemias in chronic HD patients
- Proportion of those due to MRSA



- Overall 13,343 (77%) of prevalent patients were having dialysis therapy delivered by definitive access.
- Centres varied from 52% to 95%.
- For HD patients only, definitive access was used in 69%, range from 44% to 94%.

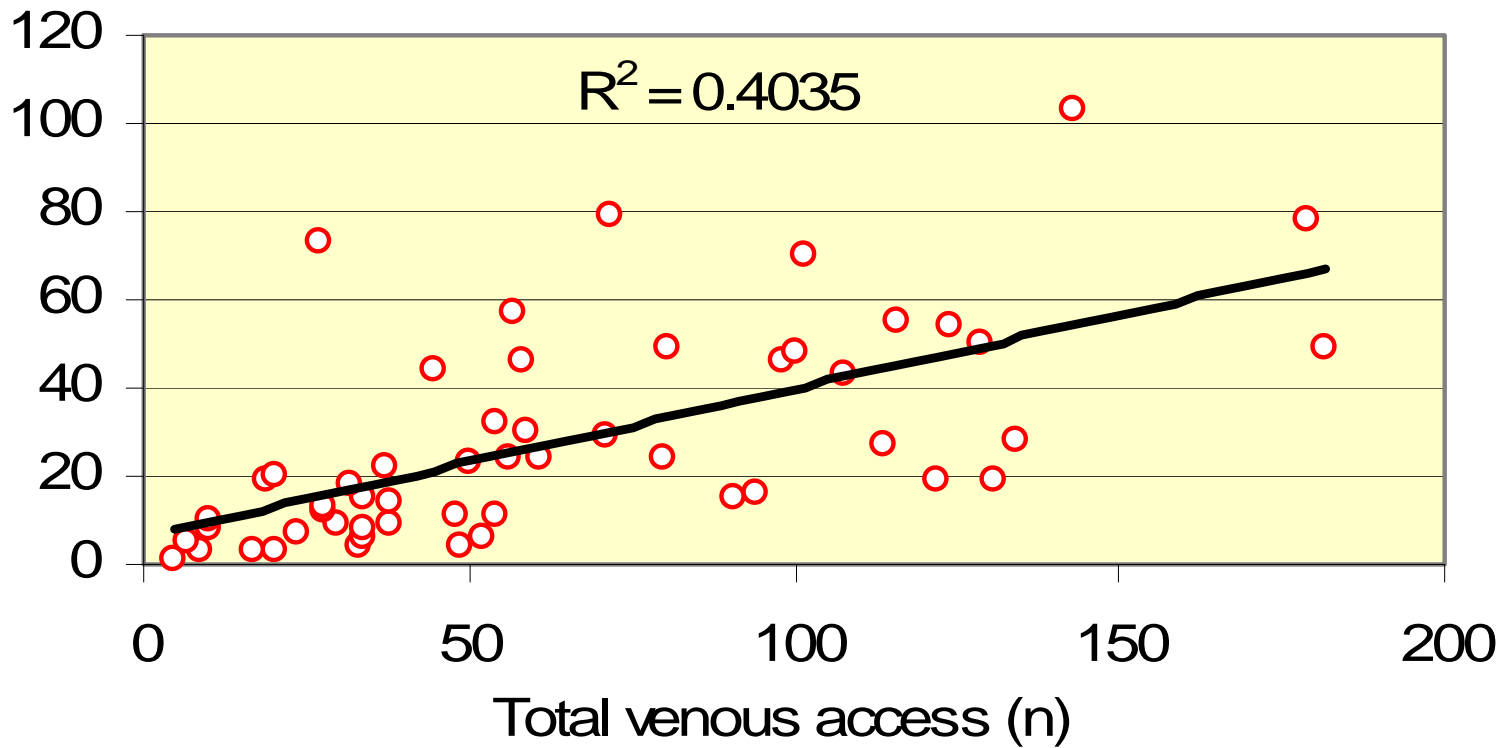
Renal Registry Vascular access survey – incident cohort



Infections

- 54 centres returned data
- 1547 episodes of *Staph. aureus* bacteraemias reported
- 462 episodes of MRSA (29%)
- Equivalent to 5-10% of all MRSA (relative risk 200-400 fold general population)

No of venous access vs Staph aureus episodes

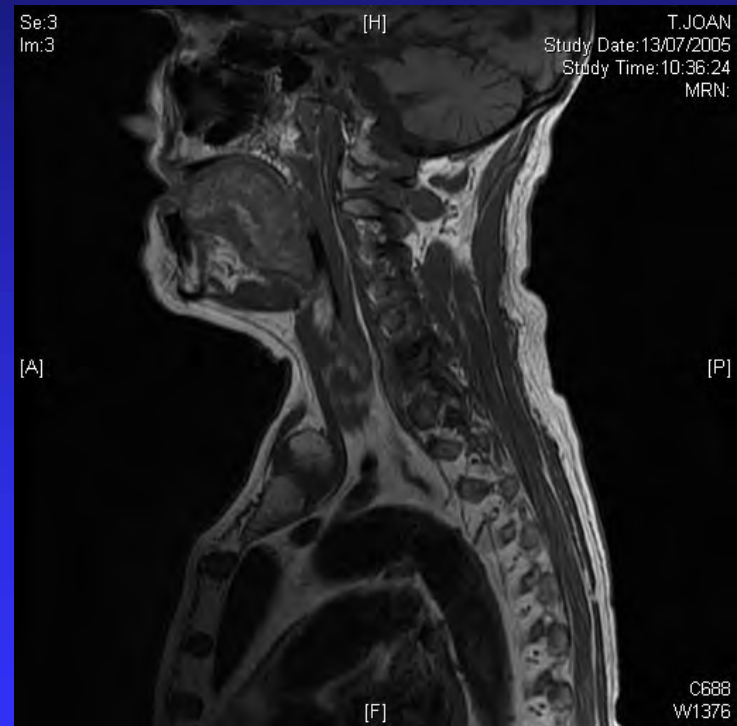
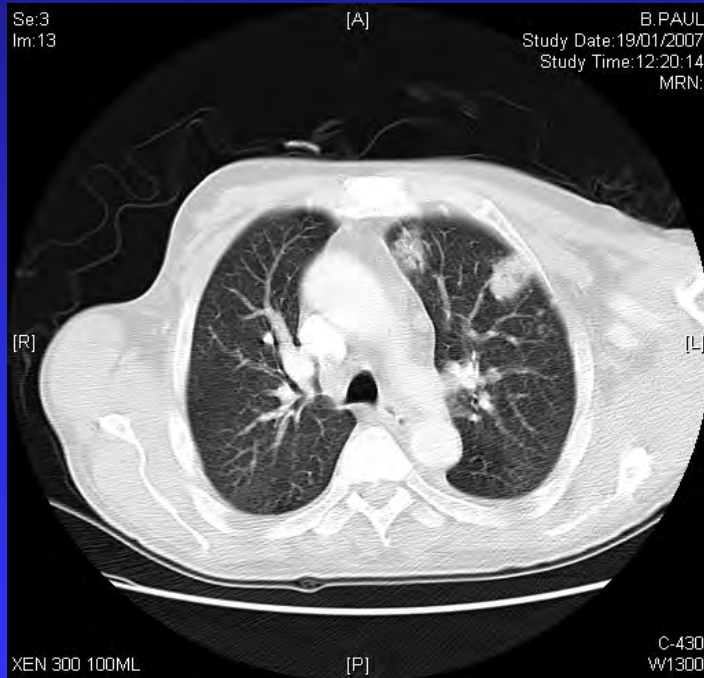


CONSEQUENCES

Consequences: mortality in HD

- Role of access and outcome
- Single centre 143 SAB -111 hospitalised
 - Catheter 59.5%
 - Graft 36%
 - AVF 4.5%
- *Inrig et al Clin J Am Soc Nephrol 1: 518–524, 2006*

Morbidity and mortality



Consequences: mortality and morbidity in HD

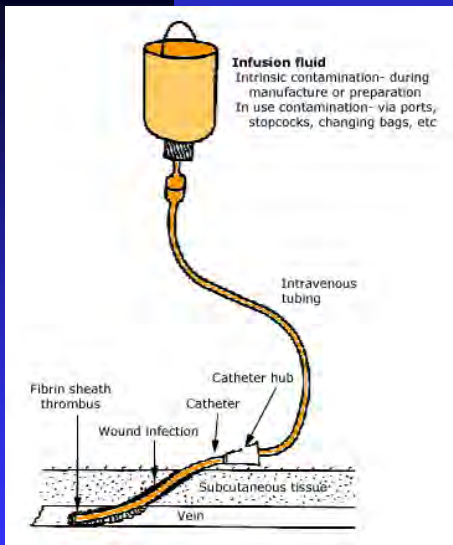
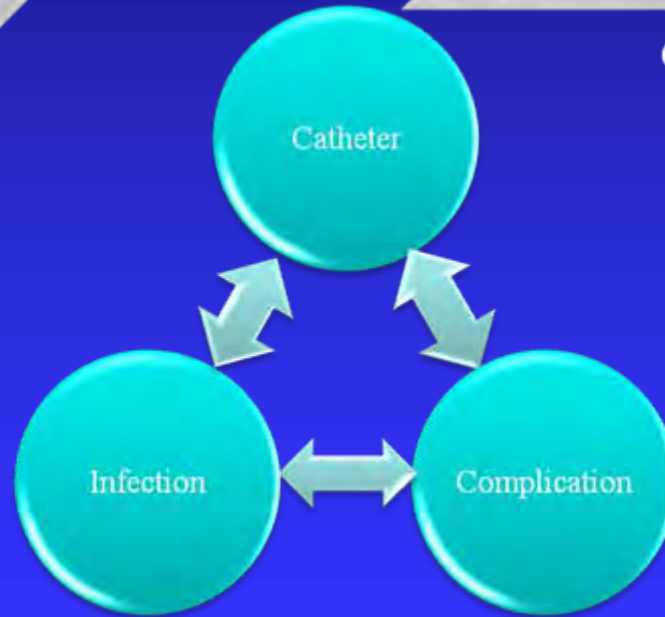
Mortality

- 12 week mortality rate
 - 22.7% Catheter
 - 10.0% AVG
- P=0.098

Morbidity

- Metastatic infection
 - N=34 (TC and AVG)
 - TC n=22 33.3%
 - AVG n=12 30.0%
- Endocarditis n=17
- Septic emboli n=8
- Abscess n=6
- Osteomyelitis n=6
- Mean IP days 10

Infection pathways and access



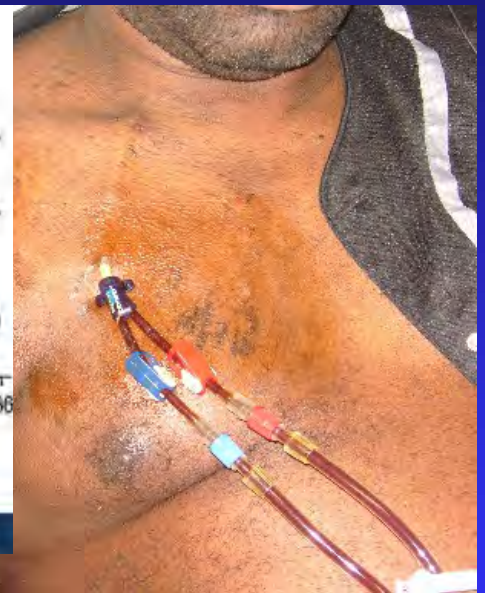
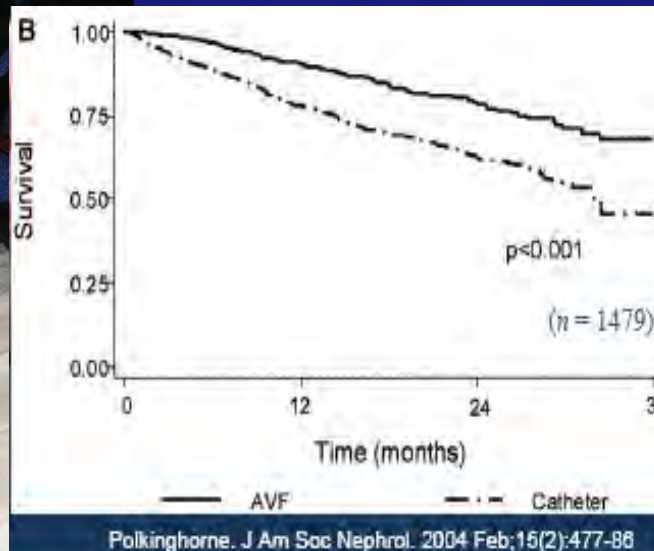
Consequences: Cost

- MSSA and MRSA cost
 - Garau et al ESCMD April 2008
 - MSSA 11,079 Euro
 - MRSA 14859 Euro
- HPA 2002 Surveillance of Hospital Acquired bacteraemia
 - Nephrology only exceeded by ICU and haematology
 - 80% associated with central lines
 - £6029 per episode

Reducing reliance on catheters

‘PRIMARY’ PREVENTION

Renal National Service Framework



Standard 3

“All children, young people and adults with established renal failure are to have timely and appropriate surgery for permanent vascular or peritoneal dialysis access, which is monitored and maintained to achieve its maximum longevity.”

Three objectives

- An AVF is the optimal type of access to utilise
- Preserving access and extending its lifetime is essential
- Reduce complications

Monitoring vascular access: the pyramid of care and delivery at the point of care

Advanced monitoring

The diagram features a large blue pyramid on the left side. Inside the pyramid, there are three white rounded rectangular boxes stacked vertically. To the right of the pyramid, there are two ovals: a purple one at the top and a teal one at the bottom. The text in the boxes and ovals is as follows:

- Top box: Advanced monitoring
- Middle box: Fistula complications or poor adequacy
- Bottom box: Physical examination
- Top oval: Good needling technique
- Bottom oval: Nurse led examination

Fistula complications
or poor adequacy

Physical examination

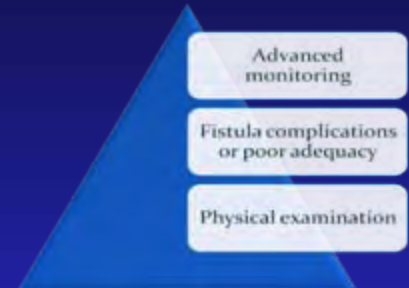
Good needling technique

Nurse led examination

Principle of Vascular Access Maintenance Programme



SURVEY
'Look'



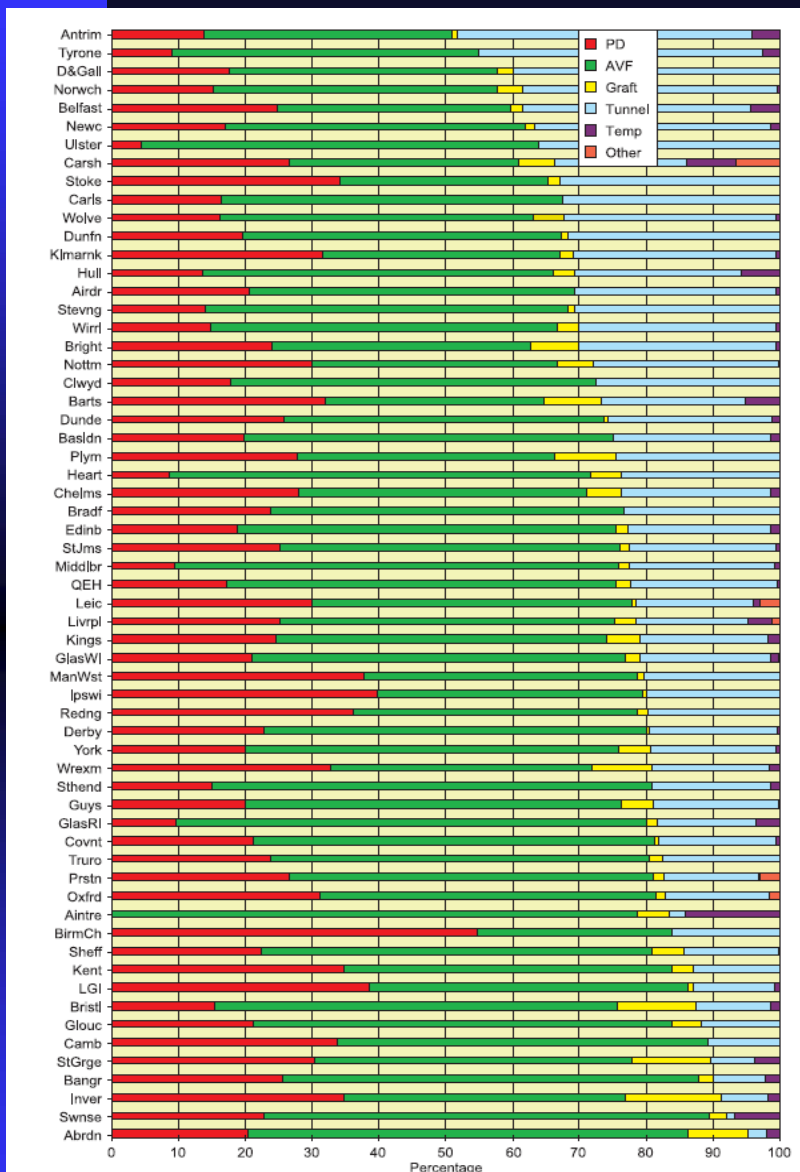
INTERVENE
'Treat'



MONITOR
'Confirm'



DIAGNOSE
'Investigate'



- Overall 13,343 (77%) of prevalent patients were having dialysis therapy delivered by definitive access.
- Centres varied from 52% to 95%.
- For HD patients only, definitive access was used in 69%, range from 44% to 94%.

Vaccination - prevention

- Pneumococcus
- Hepatitis B
- Influenza

If you have to use a line how do you reduce infection

'SECONDARY' PREVENTION

'Secondary' Prevention

- Colonisation
 - Reduce carriage
- Risk
 - Improve modifiable risk factors
- Inoculation
 - Eliminate the chances of inoculation

Suppression therapy for SA carriage

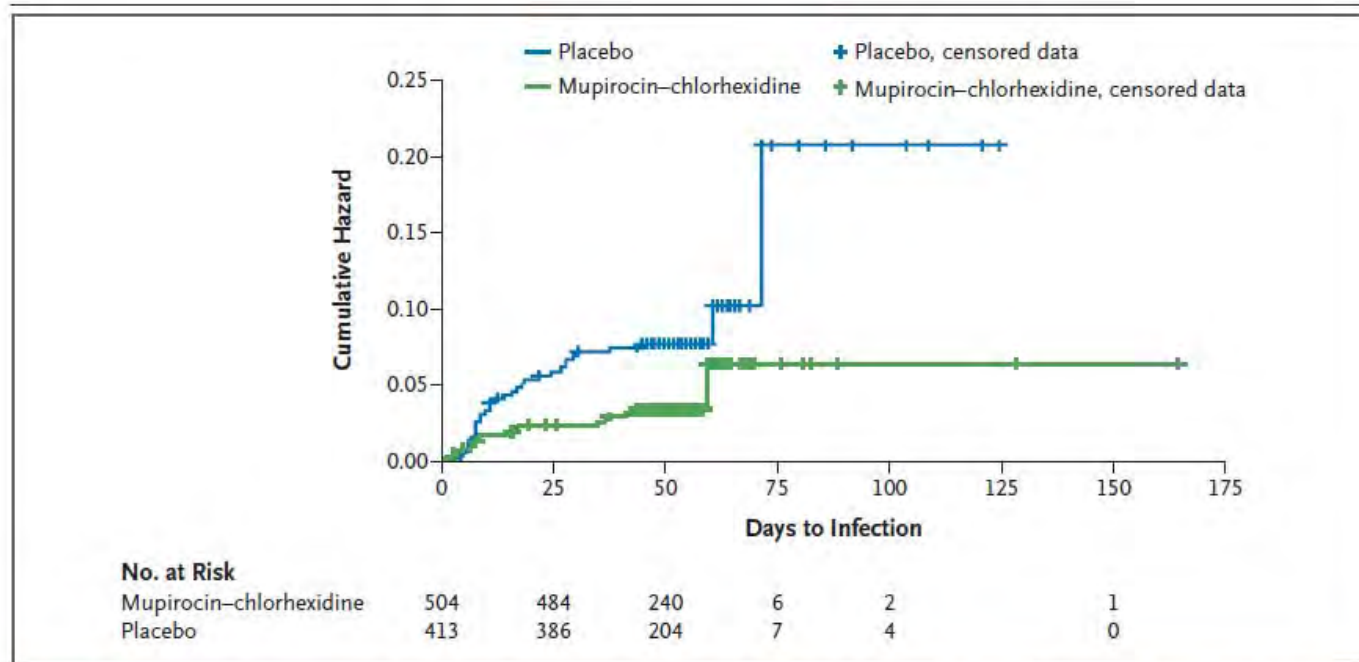


Figure 3. Kaplan–Meier Curves Showing Cumulative Hazard of Hospital-Acquired *Staphylococcus aureus* Infection in the Study Groups.

Data were censored at the end of the follow-up period or at the time of death.

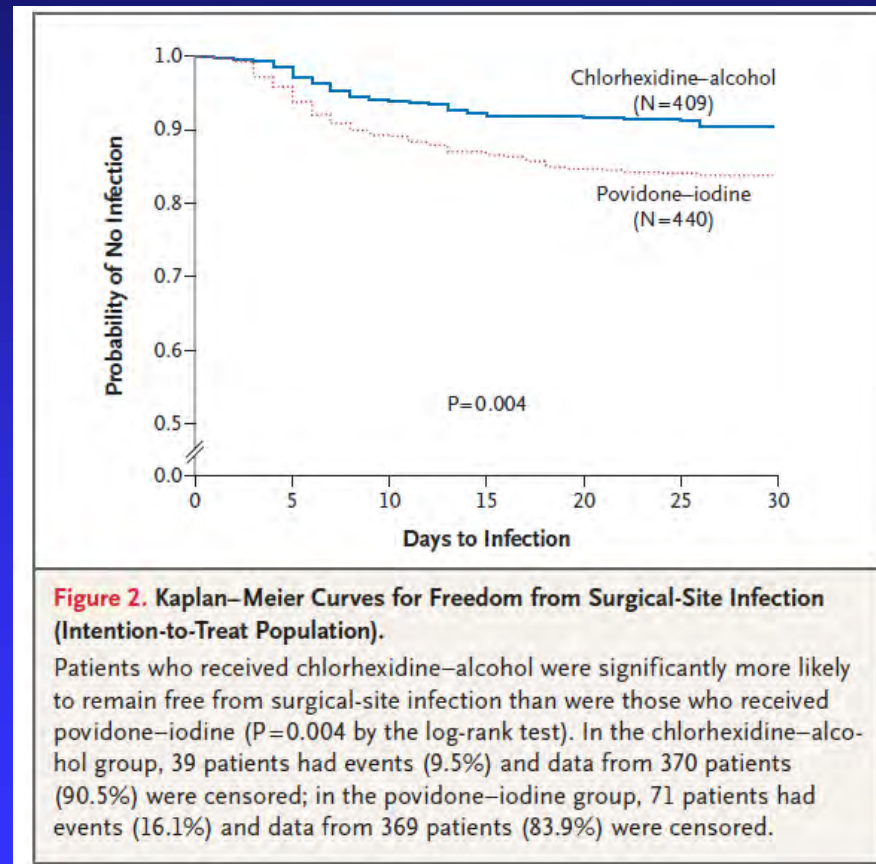
Prevention

- Screening and decolonisation
- Out patient HD population (n=136)
 - 42% nasal MSSA
 - 12% nasal MRSA
 - Carriage treated with mupirocin
 - No MRSA infections at 1 year
 - Eur J Med Res. 2007 Jul 26;12(7):284-8 Lederer et al

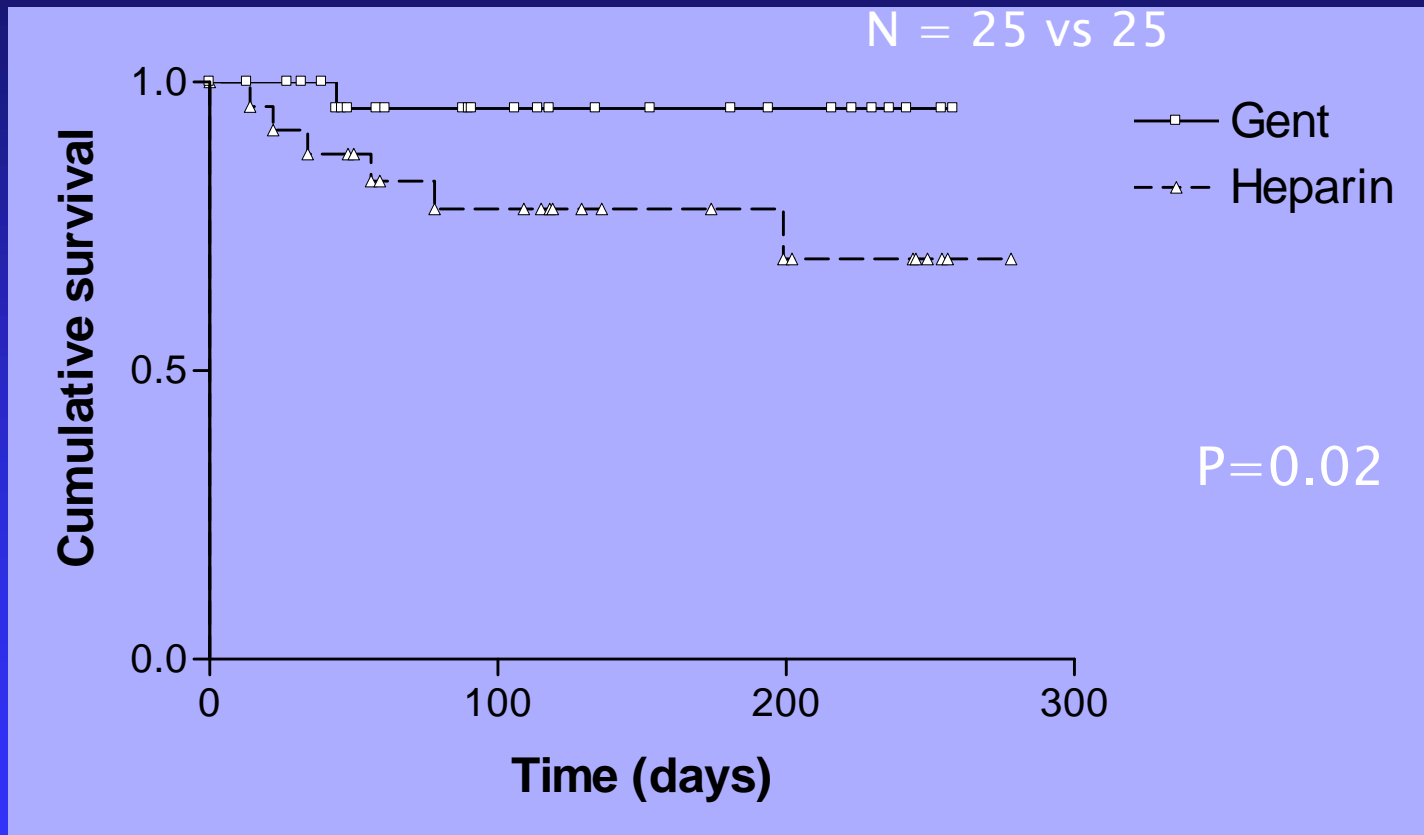
Secondary prevention

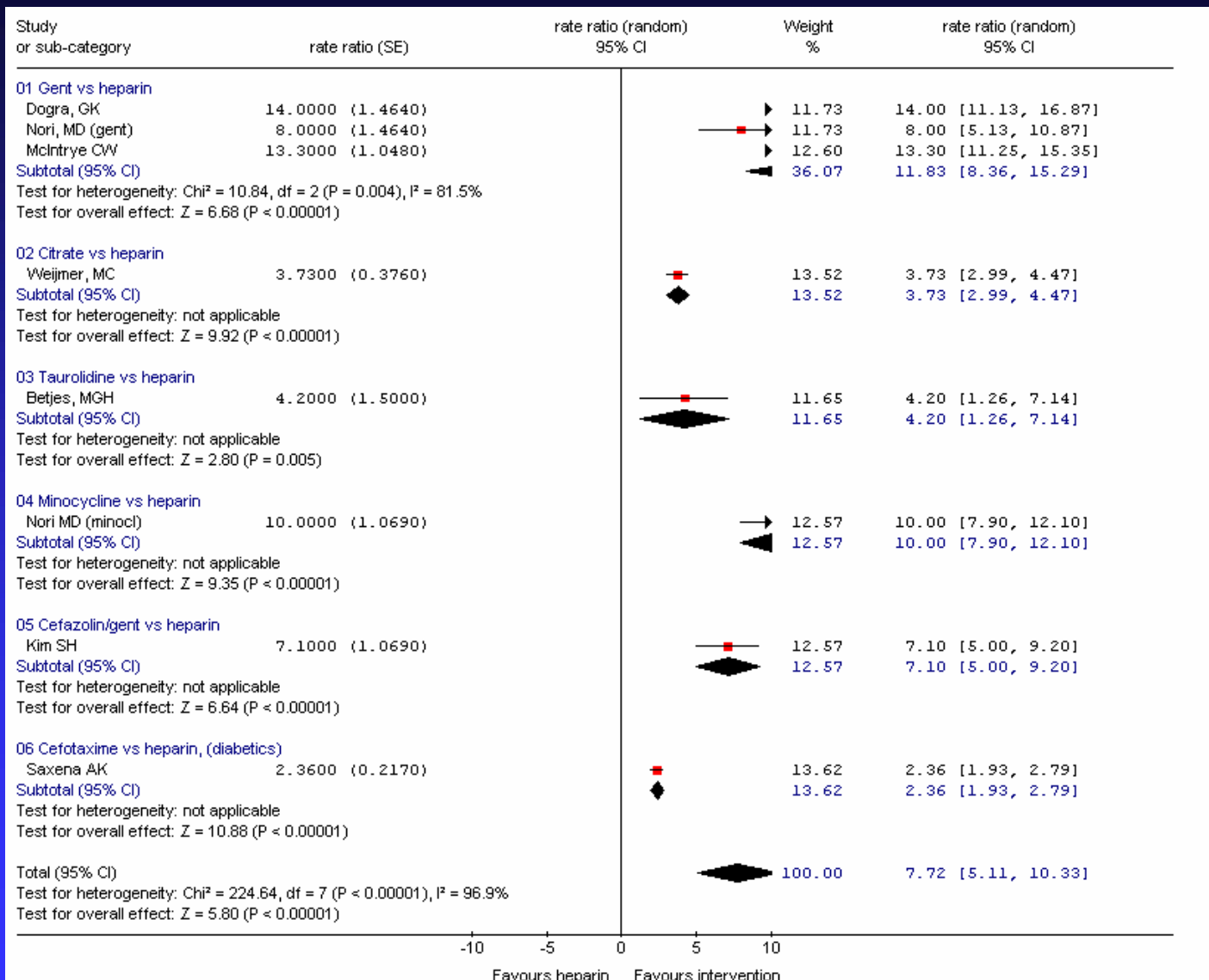
- Exit site options
 - Mupirocin to exit site
 - Meta-analysis Clin Infect Dis. 2003 Dec 15;37(12):1629-38
 - 80% reduction in SAB in HD
 - Resistance?
- Connection technology
- Antibiotic locks

Chlorhexidine–Alcohol versus Povidone–Iodine for Surgical-Site Antisepsis

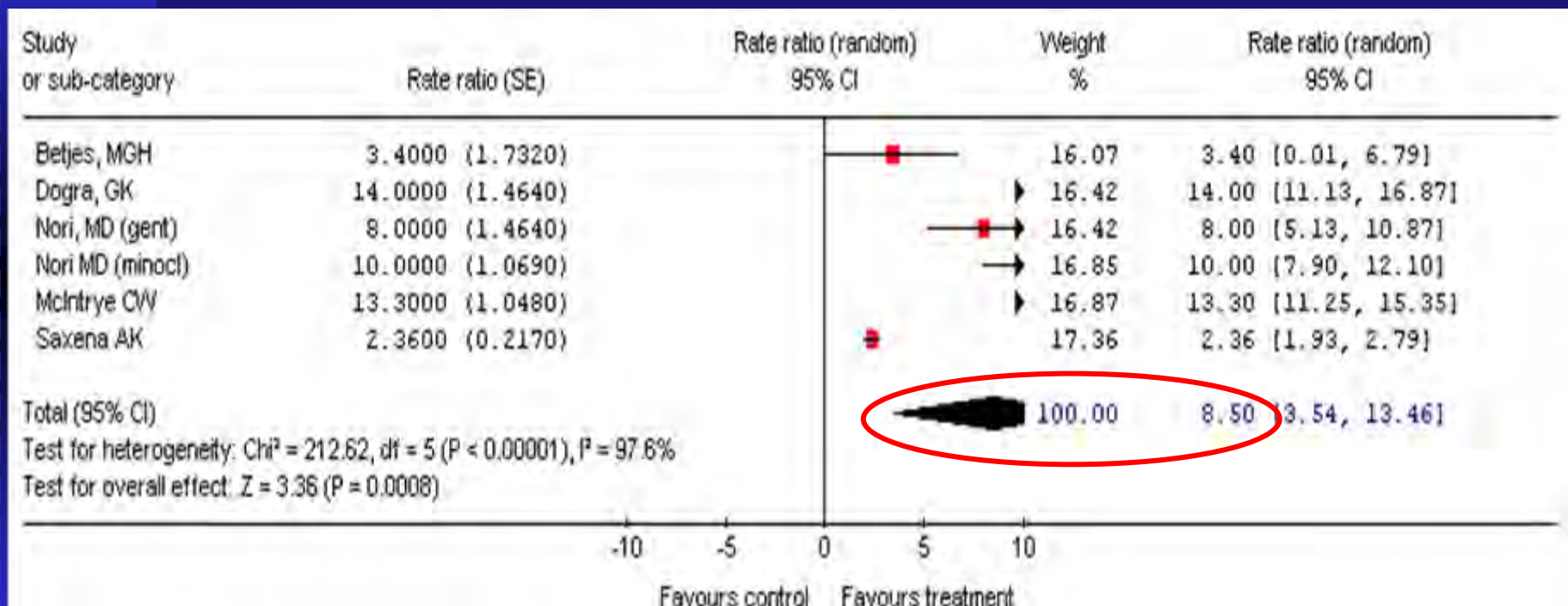


Antibiotic lock solutions





Rates of CRI in tunneled lines only, when comparing ALS and heparin. Includes the five studies that assessed tunneled lines



Local data from Derby

- Focus on bacteraemia
 - NOTE NOT CRB but all episodes
- High usage of venous catheters
- High admission rate
- High complication rate
- High mortality rate

Blood Cultures (HD) 1999-2004

Data	99/00	00/01	01/02	02/03	03/04
Patients having a + blood culture	54	74	77	58	46
No. of positive blood cultures	102	183	179	103	101
Gram positive isolates	70%	82%	67%	55%	69%
Staph epid as % of all isolates	43%	61%	35%	22%	28%
MRSA as % of Staph aureus isolates	24%	13%	12%	11%	30%
Gentamicin resistance in GNBs	16%	11%	18%	4%	10%
Ciprofloxacin resistance in GNBs	30%	19%	14%	6%	10%
HD Patients (December)	127	143	173	189	199

Blood Cultures (HD) 2005-9

Data	2005	2006	2007	2008	2009
Patients having a + blood culture	17	17	12	14	16
No. of positive blood cultures	18	20	12	15	17
Gram positive isolates	61% (10)	45% (9)	42%	53 % (8)	41% (8)
Staph epid as % of all isolates	28% (5)	10% (2)	0%	7% (1)	6% (1) * Gent Res
MRSA as % of Staph aureus isolates	17% (1/6)	43% (4/7)	0	28.5% 2/7	14.3% 1/7
Gentamicin resistance in GNBs	0%	0%	0%	0%	0%
Ciprofloxacin resistance in GNBs	0%	0%	0%	0%	0%
HD Patients (December)	205	210	221	245	255

TC 0.36/1000

Pt days

AVF 0.11/1000

Pt days

2005 6 of 17 had tunnelled access

2006 6 of 17 had tunnelled access

2007 4 of 12 had tunnelled access and 1 had NTC

2008 7 of 15 had tunnelled access

2009 7 of 16 had tunnelled access

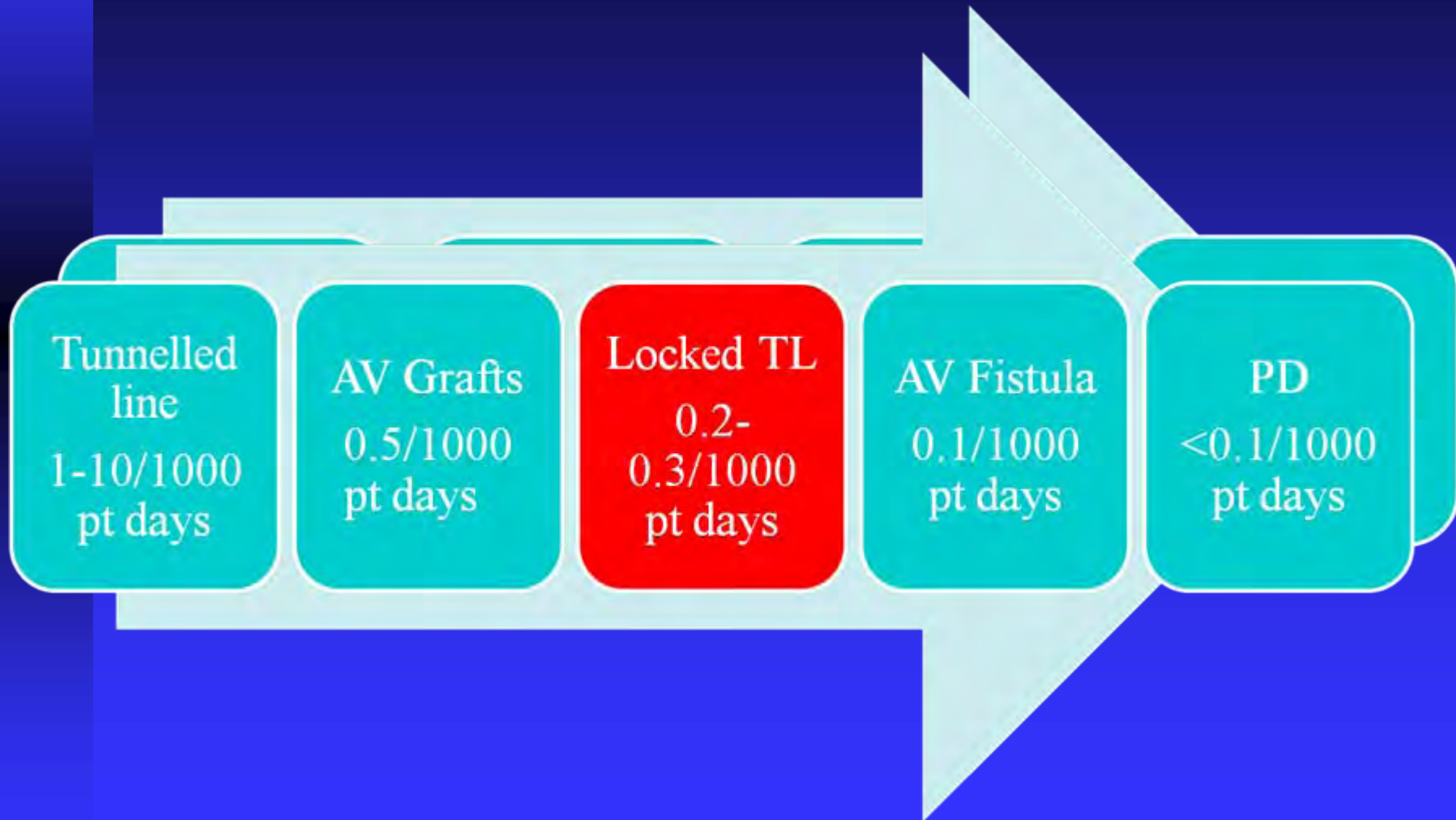
Cost for gentamicin locks

- Gentamicin
 - Additional cost £1.80 per session
- Total cost per annum
 - £260
- Total cost for Derby programme
 - £11000 per annum
 - Saving in bacteraemia costs (100 episodes per annum) ~£600000 per annum

For every person treated

- At least 0.5 Staph. Aureus bacteraemias are prevented
- At least 2.5 bacteraemias are prevented
- The NHS saves at least £15000
- In patient beds are not filled with catheter associated sepsis
- Risk is reduced for patients receiving haemodialysis

Access and bacteraemia rates



Treatment

- Systemic Antibiotic strategy
 - High recurrence/failure rate
 - E.g Clin Infect Dis. 2007 Jan 15;44(2):190-6
- Antibiotic Line locks
 - High failure rate
 - E.g 59% Am J Kidney Dis. 2007 Aug;50(2):289-95.
- Guide wire exchange
 - Less successful in MSSA/MRSA
- Line removal

Summary

- Staphylococcus aureus bacteraemia is a major cause of concern within the HD population
- Improvement in incidence of infections can be made
 - Systems approach
 - Medical management
- Targeting a single organism may improve overall infection rates

Conclusion

- Bacteraemia in the dialysis population is
 - Common
 - Harmful
 - Preventable

Questions?

THANK YOU