Infection Prevention and Vascular Access

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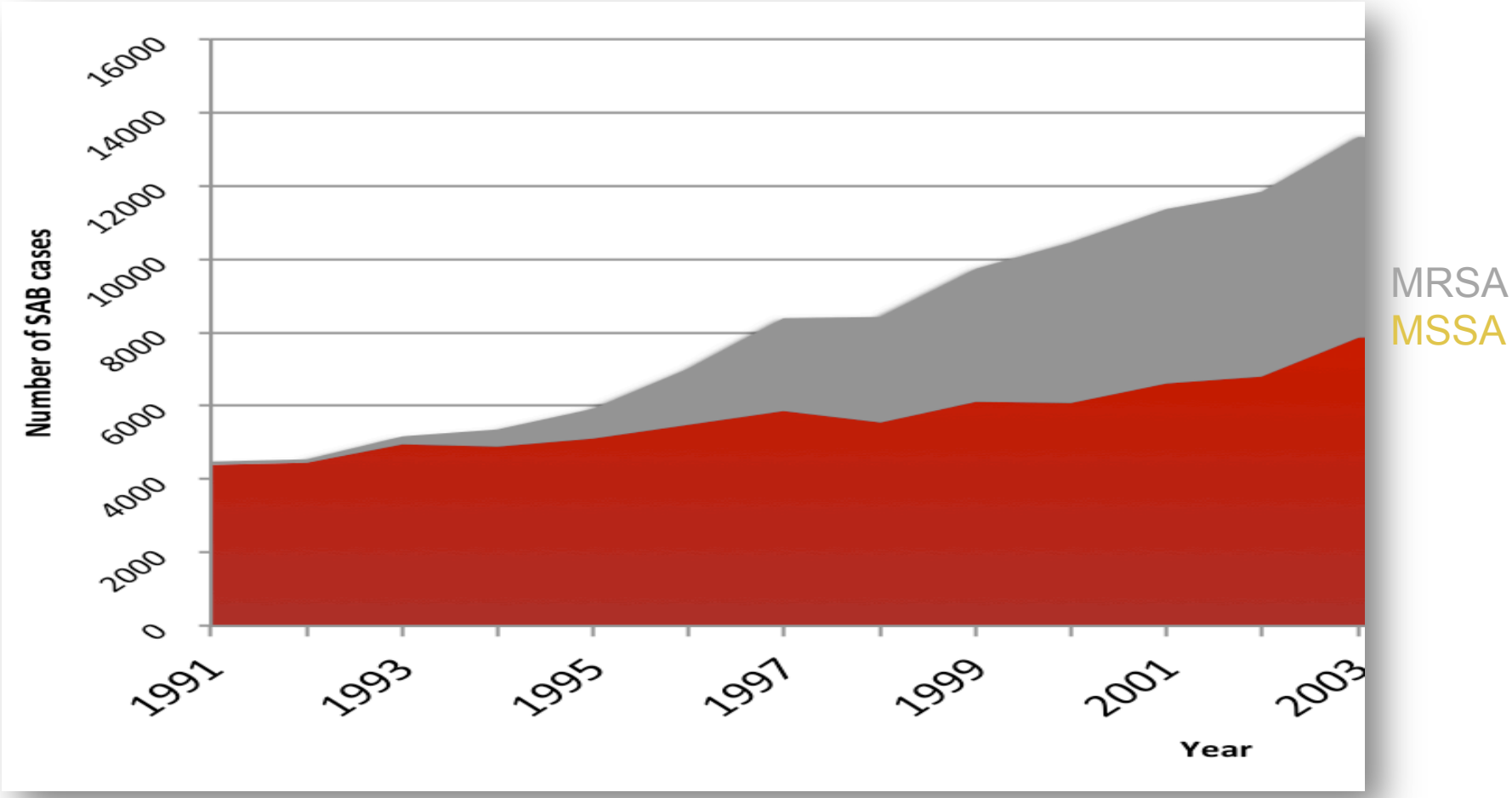
Rise of S. aureus bacteraemia

England 1991-2003



Slide adapted from Susan Hopkins, HPA/PHE

Enough is enough!

- 2003 - Health Minister sets ambitious target: 50% reduction by 2008
  - Set from a baseline in 2003-4; really meant 60% reduction was required
  - Many (me included) thought this was impossible
    - Lack of evidence
    - Widespread scepticism
- It is now down 88%..

National Confidential Study 2007
Deaths following MRSA Infection

- In-depth review of randomly selected deaths
  - 80% >70 years of age
  - Significant co-morbidities
  - MRSA often not mentioned on death certificates when an important factor and was mentioned when it was not..
- Deficiencies in documentation of insertion, review and management of invasive devices found
  - Only 50% of Trusts were auditing compliance with policies regarding invasive procedures

‘6 days postoperatively the patient was noted to have pus coming from a cannula site.’ Case Study 6

‘After 8 days the PVC inserted on admission showed signs of infection with a purulent discharge.’ Case study 4

‘For almost half of the cases reviewed, The source of the MRSA infection was an invasive device, particularly PVC and CVC.’

EPIC Guidelines

- The best kept secret in the NHS
  - Only the IPC Teams know about them
- Evidence-based Practice in Infection Control
  - NICE equivalent guideline; sadly not recognised as such
    - If it were, would pass through organisational governance structures - but they don't
- And so no-one asks if we have implemented them and we don't

EPIC 3 Guidance (2014)
Intravascular Devices

- 9 components
  - Training and education
  - General asepsis
  - Selection of catheter type
  - Selection of catheter insertion site
  - Maximal sterile barrier precautions to be employed during catheter insertion
  - Cutaneous antisepsis
  - Catheter and catheter-site care
  - Catheter replacement strategies
  - General principles for catheter management

EPIC 3 - What was new?

- Call for more education
  - Generally the first casualty of staff shortages
- Choice of catheter
  - Do we refer early enough for Midline/PICC?
    - And do we have the staff to insert them?
- Chlorhexidine for everything
  - Cutaneous antisepsis
    - Are all using 2% Chlorhexidine in alcohol?
  - Site care during dressing changes

EPIC 3 - What was new?

- More Chlorhexidine
  - Site dressings
    - Disc or gel dressing
  - Bathing
    - “Consider the use of daily cleansing with chlorhexidine in adult patients with a central venous catheter as a strategy to reduce catheter-related bloodstream infection”
    - Yet to be implemented despite the evidence base
  - Applicable in OPAT?
    - Evidence-free zone

Study on Wipes - 1

ORIGINAL INVESTIGATION

Effectiveness of Chlorhexidine Bathing to Reduce Catheter-Associated Bloodstream Infections in Medical Intensive Care Unit Patients

Susan C. Bleasdale, MD; William E. Trick, MD; Ines M. Gonzalez, MD; Rosie D. Lyles, MD; Mary K. Hayden, MD; Robert A. Weinstein, MD

Evidence of Effectiveness

Table 2. Comparison of Incidence of Infection by Method of Bathing Patients and Infection Category

	Bathing Method					
	Soap and Water		2% CHG			
Infection Category	Events	Rate[a]	Events	Rate[a]	Difference (95% CI)	*P* Value
Primary BSI	22	10.4	9	4.1	6.3 (1.2 to 11)	.01
Contaminant	9	4.3	4	1.8	2.4 (–0.9 to 5.7)	.16
Clinical sepsis	9	4.2	16	7.2	–3.0 (–7.5 to 1.5)	.20
Urinary tract infection	17	8.0	13	5.9	2.1 (–2.8 to 7.1)	.41
Ventilator-associated pneumonia	15	6.8	18	7.8	–1.1 (–6.3 to 4.1)	.69
Secondary BSI	5	2.4	5	2.3	0 (–2.8 to 3.0)	.95
Clostridium difficile diarrhea	20	9.4	21	9.5	0 (–5.9 to 5.7)	.98

Abbreviations: BSI, bloodstream infection; CHG, chlorhexidine gluconate; CI, confidence interval.
[a] Rates are expressed per 1000 patient-days. There were 2119 patient-days in the soap and water arm and 2210 patient-days in the CHG arm.

Bleasdale SC, et al Arch Int Med 2007; 19: 2073-2077

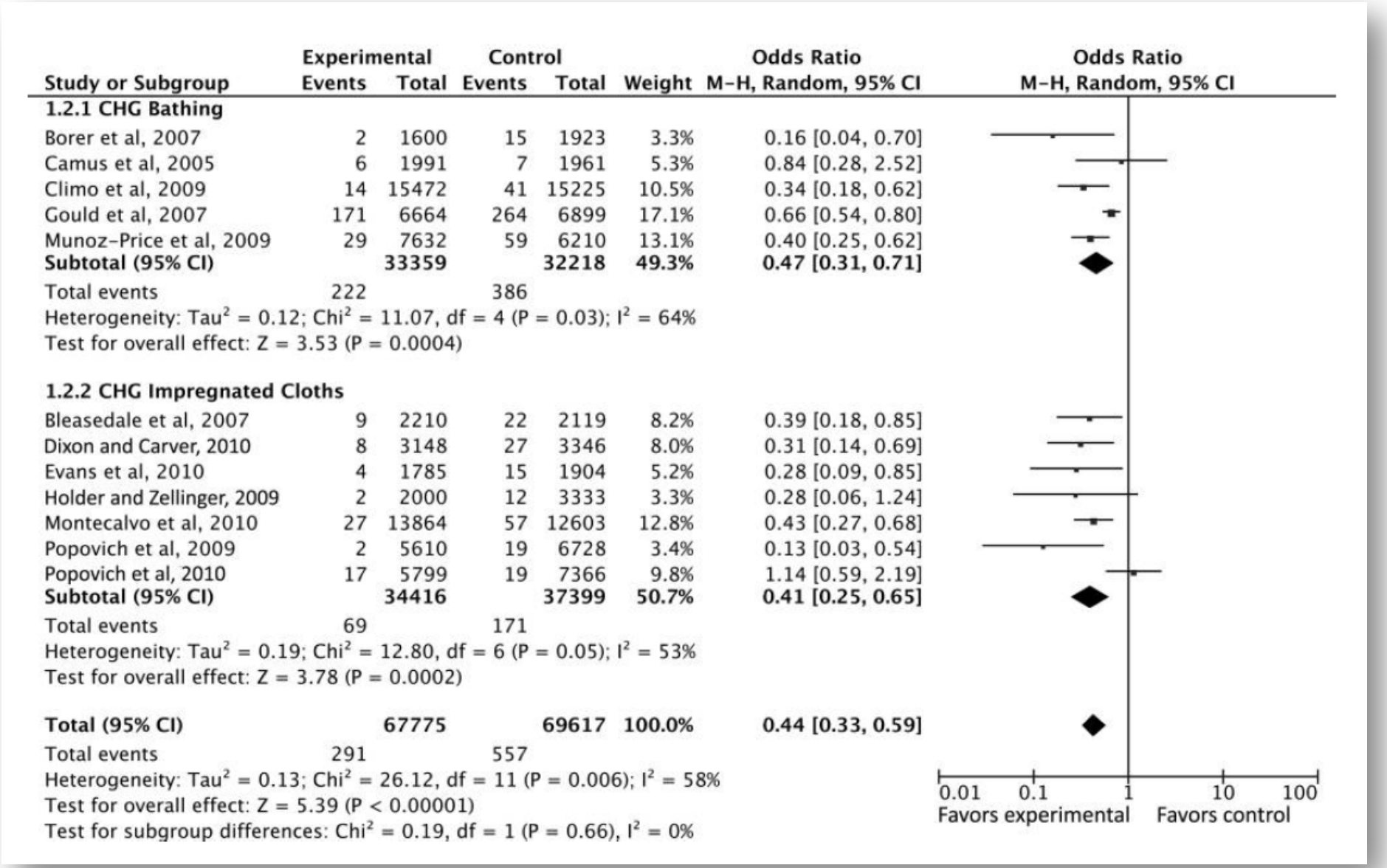
Meta-analysis

INFECTION CONTROL AND HOSPITAL EPIDEMIOLOGY MARCH 2012, VOL. 33, NO. 3

ORIGINAL ARTICLE

The Efficacy of Daily Bathing with Chlorhexidine for Reducing Healthcare-Associated Bloodstream Infections: A Meta-analysis

John C. O'Horo, MD;[1] Germana L. M. Silva, MD;[2] L. Silvia Munoz-Price, MD;[3] Nasia Safdar, MD, PhD[4]



O' Horo JC, et al. Inf Control Hosp Epidemiol 2012; 33:257-267

Line-related infections in OPAT

- Multiple studies say lower than hospitals
  - 0.15/1000 OPAT days: equivalent to patient days but not line days
    - Shrestha NK et al. J Antimicrob Chemother (2016) 71(2) 506-12
  - PICC (0.14/1000 OPAT days; n=1160) > Hickman (0.7; n=93) > Hohn (0; n=108), Port (0; n=68)
  - Line occlusion most common complication (5%)

Use of CVC in Home Care

- Retrospective review of strategic healthcare programs national database
  - Moureau N, et al. J Vasc Interv Radiol. 2002;13(10):1009-16
  - Overall adverse event rate 1.5/1,000 catheter days
    - Complication rates
      - midline catheter, 4.5
      - PICCs, 2.0
      - Non-tunneled central catheters, 1.1
      - tunneled catheters,1.0
      - chest ports, 0.52
  - BSI in <1%, however surveillance er.. less than intensive and dependent on coding
- Likely to be lower risk patients (or so I hope..)

OPAT Surveillance

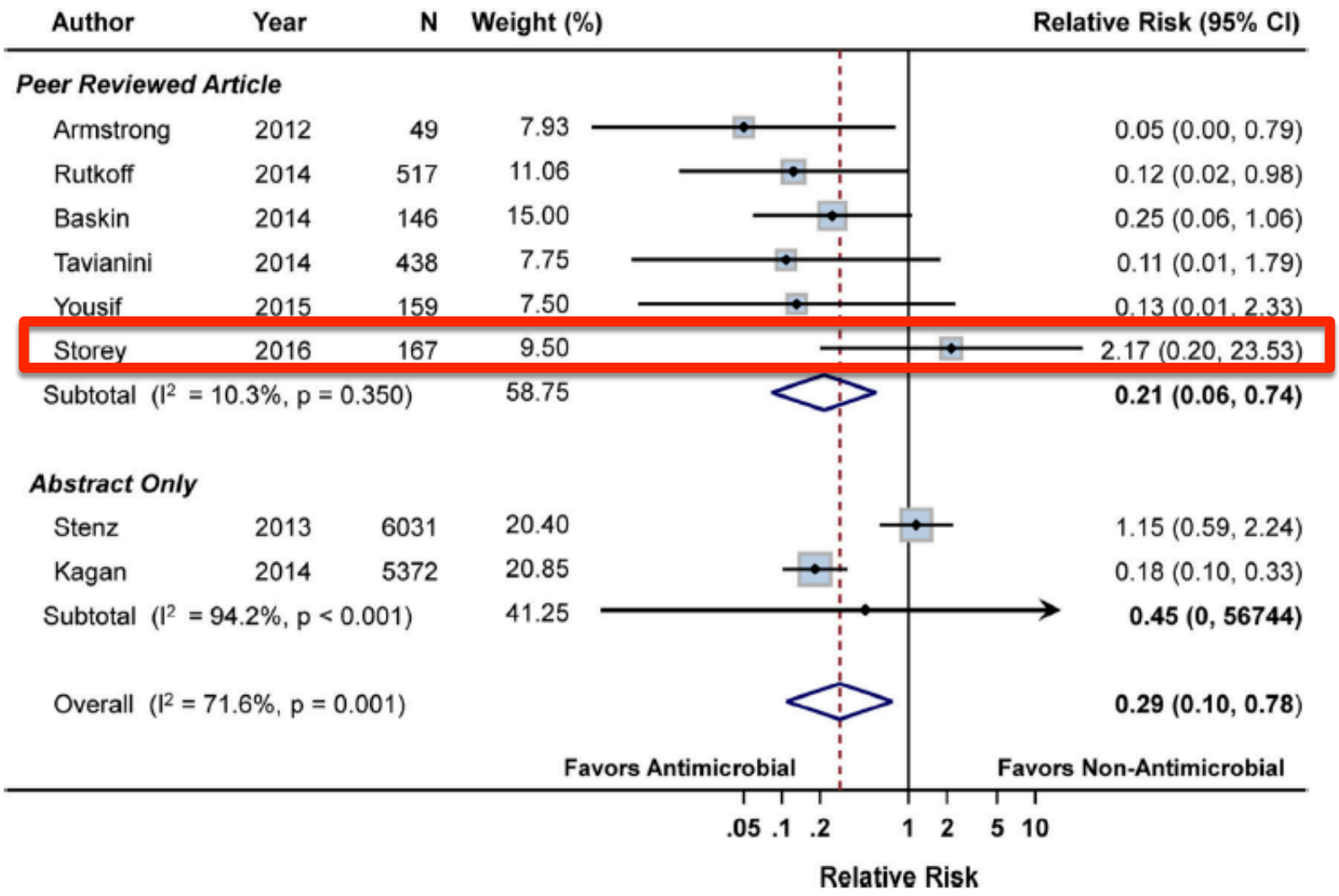
- More questions than answers
- Who should do it?
  - Not clinicians – too diverse a group
  - Pharmacists? IV Specialists?
  - IC Team if they have Epi Software
- How?
  - Shouldn't be too hard
- Data collation and dissemination?
  - To whom?
- Facilitates local risk analysis

Antimicrobial PICCs?

- Systematic review and meta-analysis
  - Kramer, R.D., et al (2016) American Journal of Infection Control [epub ahead of print]
  - 8 studies, 12,879 patients
    - 2 were conference abstracts; not published under peer review, only one was an RCT
  - Results
    - IR Antimicrobial PICCs 0.2% (95% CI 0.0-5%)
    - IR Non-antimicrobial PICCs 5.3% (95% CI 2.6-8.8%)
    - Better effect in patients predicted to be ‘higher risk’
    - No difference between CHG and Rifampicin/Minocycline

Forest Plot

Kramer, R et al AJIC (2016) in press



Self-administration?

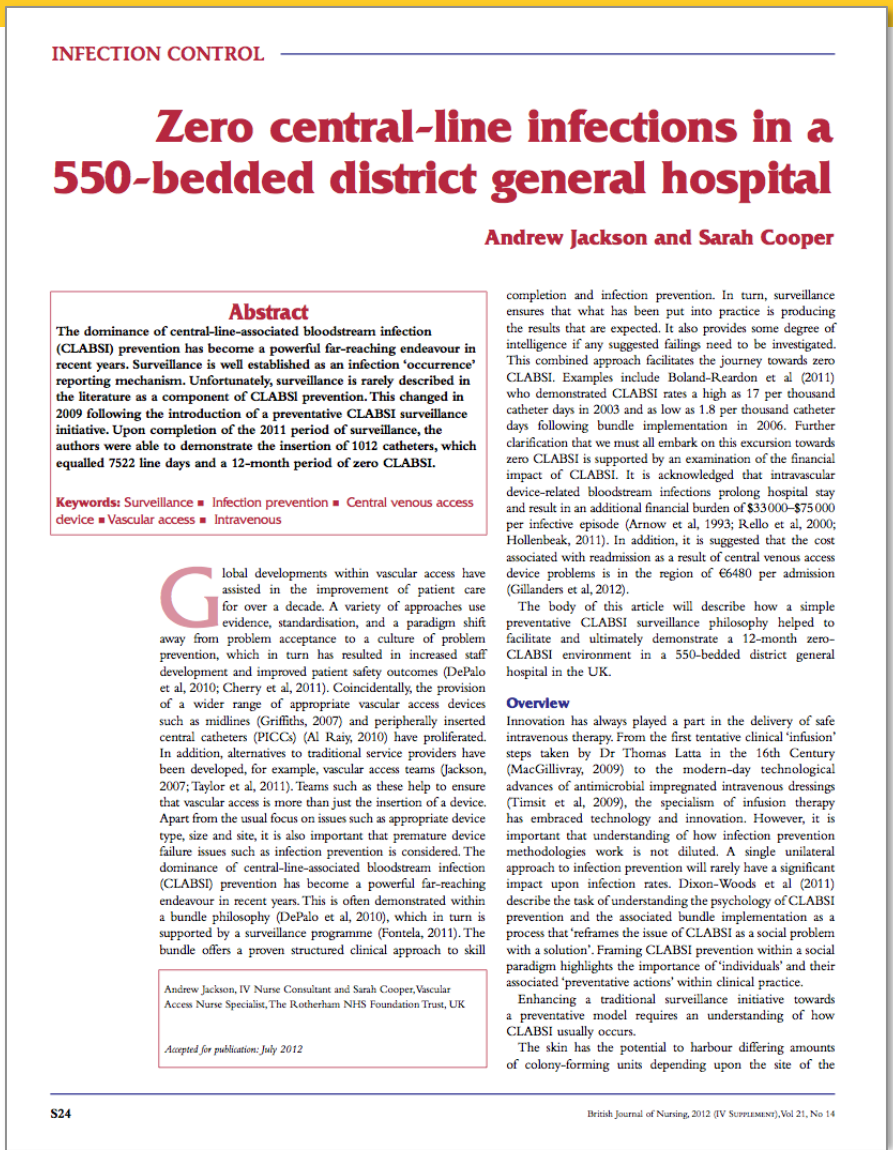
- Analysis 2059 OPAT episodes data over 13yr - retrospective analysis
  - Compared self-administration (S-OPAT; n=513) with Healthcare professionals (H-OPAT; n=1621)
    - eligible for S-OPAT if do not live alone, have intact eyesight and sufficient dexterity to handle an IV access device and are medically and psychologically stable, with normal cognitive function
    - S-OPAT patients younger, more likely to be male, more likely to have a PICC line (long bone, septic arthritis)
  - No excess complications, hospital re-admissions in S-OPAT group
- Self-administration, *in selected patients under supervision of a specialist team*, is safe

EPIC 3 Guidance (2014)
Applicability to OPAT?

- 9 components
  - Training and education
  - General asepsis
  - Selection of catheter type
  - Selection of catheter insertion site
  - Maximal sterile barrier precautions to be employed during catheter insertion
  - Cutaneous antisepsis
    - Studies on CHG use required
  - Catheter and catheter-site care
    - Studies on CHG use required
  - Catheter replacement strategies
  - General principles for catheter management

Sepsis relating to lines

- Is preventable, and we have shown this
- But it needs
  - The right intervention
  - Performed 100% correctly
  - 100% of the time
  - For every patient
- OPAT seems to be safer than InPAT



INFECTION CONTROL

Zero central-line infections in a 550-bedded district general hospital

Andrew Jackson and Sarah Cooper

Abstract

The dominance of central-line-associated bloodstream infection (CLABSI) prevention has become a powerful far-reaching endeavour in recent years. Surveillance is well established as an infection 'occurrence' reporting mechanism. Unfortunately, surveillance is rarely described in the literature as a component of CLABSI prevention. This changed in 2009 following the introduction of a preventative CLABSI surveillance initiative. Upon completion of the 2011 period of surveillance, the authors were able to demonstrate the insertion of 1012 catheters, which equalled 7522 line days and a 12-month period of zero CLABSI.

Keywords: Surveillance ■ Infection prevention ■ Central venous access device ■ Vascular access ■ Intravenous

Global developments within vascular access have assisted in the improvement of patient care for over a decade. A variety of approaches use evidence, standardisation, and a paradigm shift away from problem acceptance to a culture of problem prevention, which in turn has resulted in increased staff development and improved patient safety outcomes (DePalo et al, 2010; Cherry et al, 2011). Coincidentally, the provision of a wider range of appropriate vascular access devices such as midlines (Griffiths, 2007) and peripherally inserted central catheters (PICCs) (Al Raiy, 2010) have proliferated. In addition, alternatives to traditional service providers have been developed, for example, vascular access teams (Jackson, 2007; Taylor et al, 2011). Teams such as these help to ensure that vascular access is more than just the insertion of a device. Apart from the usual focus on issues such as appropriate device type, size and site, it is also important that premature device failure issues such as infection prevention is considered. The dominance of central-line-associated bloodstream infection (CLABSI) prevention has become a powerful far-reaching endeavour in recent years. This is often demonstrated within a bundle philosophy (DePalo et al, 2010), which in turn is supported by a surveillance programme (Fontela, 2011). The bundle offers a proven structured clinical approach to skill completion and infection prevention. In turn, surveillance ensures that what has been put into practice is producing the results that are expected. It also provides some degree of intelligence if any suggested failings need to be investigated. This combined approach facilitates the journey towards zero CLABSI. Examples include Boland-Reardon et al (2011) who demonstrated CLABSI rates a high as 17 per thousand catheter days in 2003 and as low as 1.8 per thousand catheter days following bundle implementation in 2006. Further clarification that we must all embark on this excursion towards zero CLABSI is supported by an examination of the financial impact of CLABSI. It is acknowledged that intravascular device-related bloodstream infections prolong hospital stay and result in an additional financial burden of $33 000–$75 000 per infective episode (Arnow et al, 1993; Rello et al, 2000; Hollenbeak, 2011). In addition, it is suggested that the cost associated with readmission as a result of central venous access device problems is in the region of €6480 per admission (Gillanders et al, 2012).

The body of this article will describe how a simple preventative CLABSI surveillance philosophy helped to facilitate and ultimately demonstrate a 12-month zero-CLABSI environment in a 550-bedded district general hospital in the UK.

Overview

Innovation has always played a part in the delivery of safe intravenous therapy. From the first tentative clinical 'infusion' steps taken by Dr Thomas Latta in the 16th Century (MacGillivray, 2009) to the modern-day technological advances of antimicrobial impregnated intravenous dressings (Timsit et al, 2009), the specialism of infusion therapy has embraced technology and innovation. However, it is important that understanding of how infection prevention methodologies work is not diluted. A single unilateral approach to infection prevention will rarely have a significant impact upon infection rates. Dixon-Woods et al (2011) describe the task of understanding the psychology of CLABSI prevention and the associated bundle implementation as a process that 'reframes the issue of CLABSI as a social problem with a solution'. Framing CLABSI prevention within a social paradigm highlights the importance of 'individuals' and their associated 'preventative actions' within clinical practice.

Enhancing a traditional surveillance initiative towards a preventative model requires an understanding of how CLABSI usually occurs.

The skin has the potential to harbour differing amounts of colony-forming units depending upon the site of the

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