Vascular Access: It's A Risky Business

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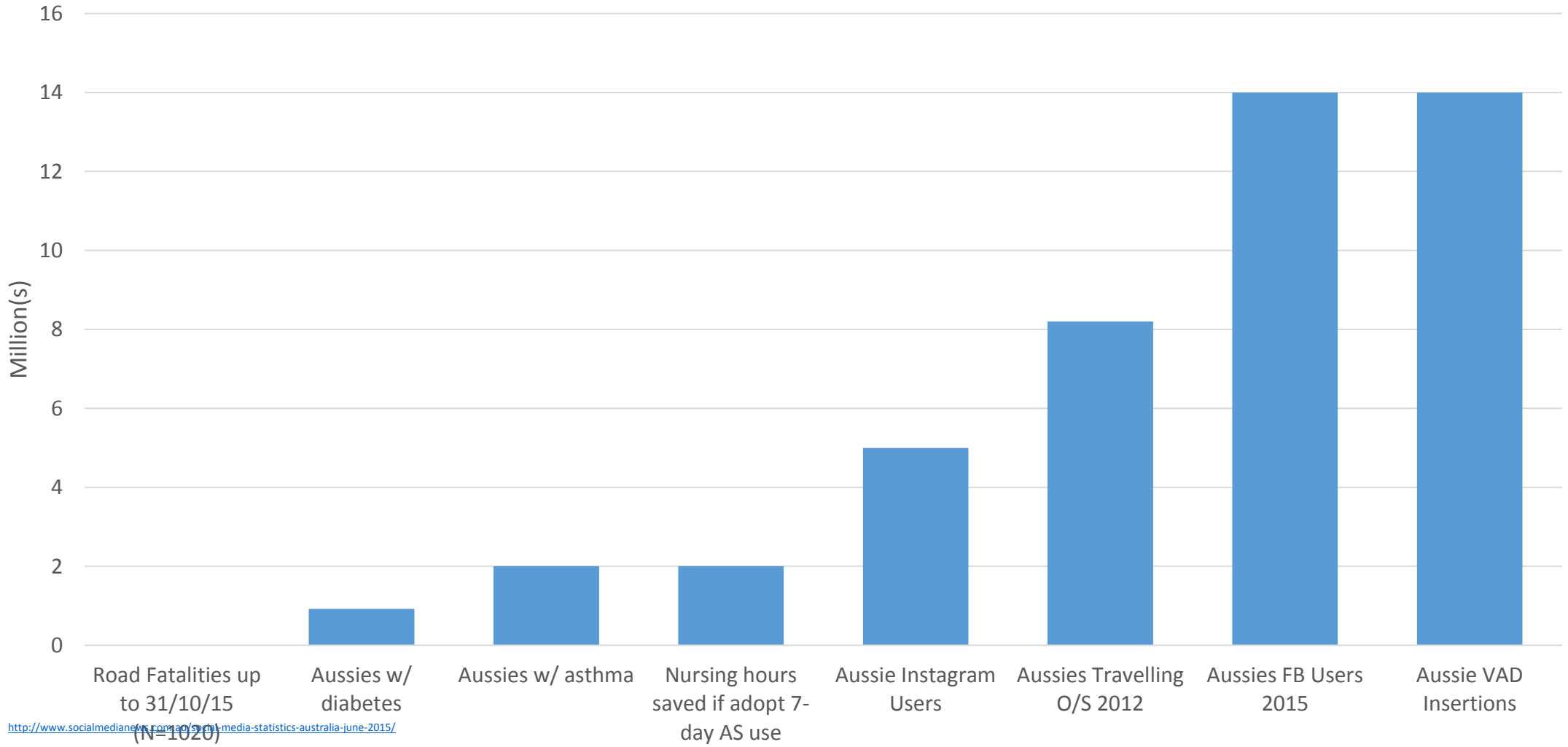
Discussion

- Australian vascular access device use
- How Australia is leading the world in vascular access management
- What we know now about preventing VAD related infection
- The role of humans and technology in VAD related infection prevention
- Using science to keep perspective
- Staying passionate

Vascular Access Use

VAD Use Comparisons



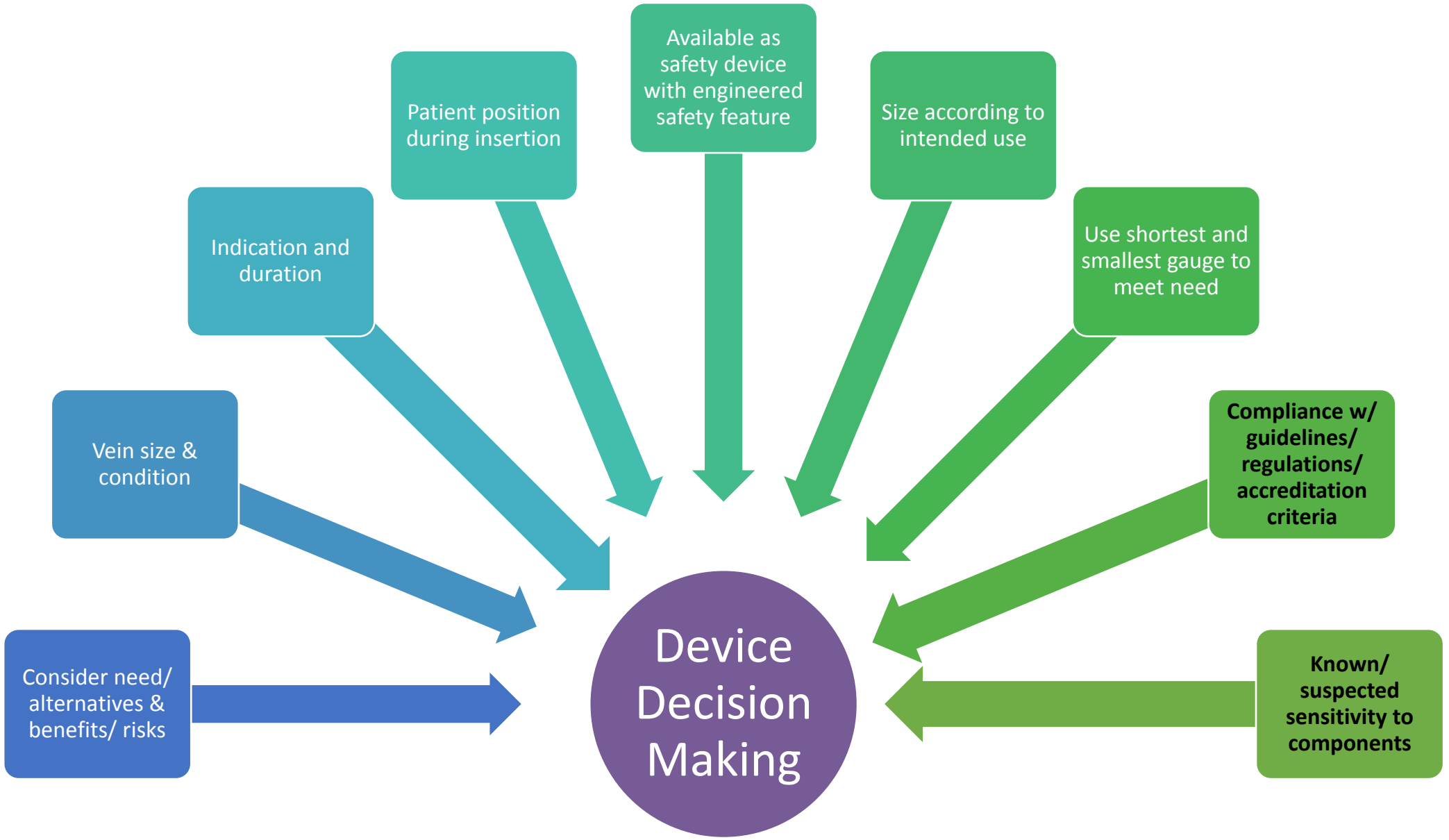
- http://www.socialmedianews.com.au/social-media-statistics-australia-june-2015/
- http://auspost.com.au/how-australians-travel.html
- http://www.aihw.gov.au/how-common-is-diabetes/
- https://bitre.gov.au/statistics/safety/fatal_road_crash_database.aspx

Estimated Device Usage

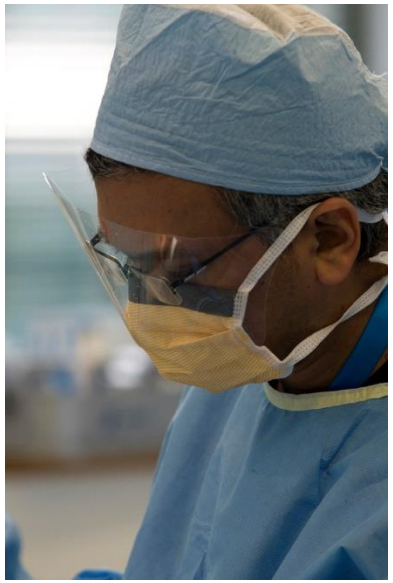
• Peripheral Cannulation	13,500,000
• Central Line Catheter Insertions	187,000
• PICC Line Insertions	110,000
• Midline Catheter Insertions	9,500
• Other Misc Procedures	135,000

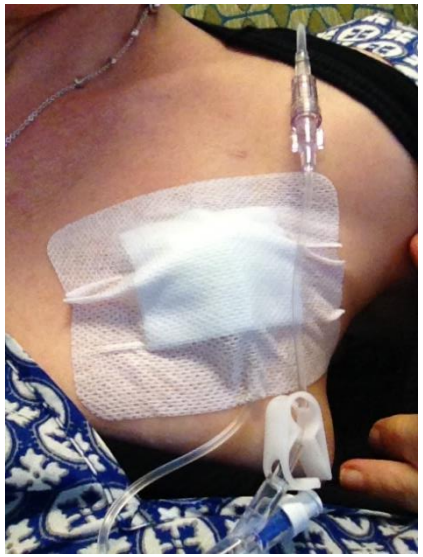
- Rickard CM, Marsh NM, Webster J, et al. Intravascular device administration sets: replacement after standard versus prolonged use in hospitalised patients—a study protocol for a randomised controlled trial (The RSVP Trial). BMJ Open 2015;5:e007257. doi:10.1136/bmjopen-2014-007257
- Blacka, J. 2015. Personal communication.

Device Selection



Device Insertion





Device Insertion: AKA Multiple Opportunities and Places To Screw Up

Device	Who Typically Inserts	Where Inserted (Location by Ward/ Dept)	Most Common Body Part Used
CVC	Anaesthetists, Intensivists, Emergency Room Drs, Some RNs with extended practice roles.	Operating Theatre, Intensive Care, Emergency Room,	Right Internal Jugular vein, Left Internal Jugular vein, R & L subclavian vein, right & left axillary vein, Right or left femoral
PICC	RNs with extended practice roles (usually but not always) with Vascular access teams, Anaesthetists, Intensivists, Interventional Radiologists.	Specialist Procedure Rooms, (usually located in ICU, Recovery, Interventional Radiology, ER),Patient's bed area.	Right / Left Basilic Vein, Right or Left Brachial Vein, Right or Left Cephalic.
Intraosseous	Every health care professional (RN, MO, Paramedic) with their ALS Certificate (advanced life support) is expected to be able to initiate IO access.	Wherever the emergency is Pre Hospital & Hospital	R or L Humeral Head R or L Proximal Tibia R or L Distal Tibia R or L Distal Femur (kids)
Arterial Line	Anaesthetists, Intensivists & Emergency Room Doctors. RNs with extended practice roles (generally in ICU / OR)	Operating Theatres, Intensive Care or Emergency Room.	R & L Radial Artery R & L Femoral Artery R & L Brachial Artery
Peripheral IV	RNs & ENs (who are credentialed IV Cannulaters) Interns, Residents, Registrars, Aneasthetists, Emergency Room Drs.	Wherever the cannula is required	R & L Hand Veins R & L Forearm Veins R & L Ante cubital Veins Leg veins if desperate.

World Leaders in VAD Management

Care Bundles

Research

Effectiveness of a care bundle to reduce central line-associated bloodstream infections

The central line-associated bloodstream infections rate ... decreased from 2.2 in the pre-intervention period to 0.5 in the post-intervention period

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Abstract

Objective: To determine the effectiveness of a care bundle, with a novel line maintenance procedure, in reducing the rate of central line-associated bloodstream infection (CLABSI) in the intensive care unit (ICU).

Design, participants and setting: Before-and-after study using CLABSI data reported to the Victorian Healthcare Associated Infection Surveillance System (VICNISS), in adult patients admitted to a tertiary adult ICU in regional Victoria between 1 July 2006 and 30 June 2014. VICNISS-reported CLABSI cases were reviewed for verification. An intervention was implemented in 2009.

Intervention: The care bundle introduced in 2009 included a previously established line insertion procedure and a novel line maintenance procedure comprising Biopatch, daily 2% chlorhexidine body wash, daily ICU central line review, and liaison nurse follow-up of central lines.

Main outcome measures: CLABSI rate (cases per 1000 central line days).

Results: The average CLABSI rate fell from 2.2/1000 central line days (peak of 5.2/1000 central line days in quarter 4, 2008) during the pre-intervention period to 0.5/1000 central line days (0/1000 central line days from July 2012 to July 2014) during the post-intervention period.

Conclusion: Our study suggests that this care bundle, using a novel maintenance procedure, can effectively reduce the CLABSI rate and maintain it at zero out to 2 years.

Central line-associated bloodstream infections (CLABSIs) are an important source of morbidity, mortality and cost.[1] About 4000 CLABSIs occur in Australian intensive care units (ICUs) each year, with an estimated nationwide cost of $36.26 million and a mortality rate of 4%–20%.[2,3] The importance placed on CLABSI and its prevention has prompted standardised monitoring for quality assurance and innovation of preventive strategies.[1,4,5] Care bundles focused on improving line insertion procedure have proven successful overseas.[1,6] Local implementation of a similar care bundle to that used overseas across New South Wales proved successful, and prompted the Australian and New Zealand Intensive Care Society CLABSI Prevention Project.[7,8] Despite these interventions, CLABSI rates range from 0.9 to 3.6 per 1000 central line days.[6,7,9–20]

The Victorian Healthcare Associated Infection Surveillance System (VICNISS) collects standardised ICU CLABSI rates for the state of Victoria.[21] Since 2006, the University Hospital Geelong (UHG) ICU has reported CLABSI rates to VICNISS.

An elevated reported CLABSI rate at UHG in 2007 and 2008 (3.8 and 3.6, respectively, compared with the state average of 2.7 per 1000 central line days)[22] prompted development and introduction of a CLABSI prevention care bundle. Our care bundle used an effective line insertion procedure identified from previous studies,[3,4,7] but also incorporated a novel maintenance procedure. In this article, we report the effectiveness of this care bundle in a tertiary ICU in Victoria.

Methods

We undertook a before-and-after study, retrospectively accessing the pre-intervention data, at an adult, tertiary, 19-bed ICU that admits medical, surgical and cardiac surgical patients.

Ethics approval was obtained from the Barwon Health Research Review Committee. This project was performed as part of the authors' usual roles and no funding or subsidy was received. All of us had full access to the study data.

Intervention

The care bundle was based on the Australian and New Zealand Intensive Care Society CLABSI prevention project,[8] comprehensive literature review and collaboration between UHG ICU, UHG Infection Control Services and other key stakeholders. The final care bundle (Appendix 1) included standard line insertion procedure consistent with that described previously,[6,7] bedside audit by an observer with stopping rules, and a novel line maintenance procedure that included placement of a Biopatch (Johnson and Johnson), sterile line access, daily 2% chlorhexidine body wash, daily central venous catheter (CVC) review with early line removal, and liaison nurse follow-up of all CVCs present at discharge.

Study procedure

All adult patients admitted to UHG ICU between 1 July 2006 and 30 June 2014 were captured in this study. The care bundle was introduced in 2009, dividing patients into a pre-intervention period (1 July 2006 to 31 December 2009) and a post-intervention period (1 January 2010 to 30 June 2014). Case identification of CLABSI was based on the VICNISS dataset and review of blood cultures. All VICNISS-reported CLABSI cases were reviewed by one of us (DE) to confirm that they fulfilled the current VICNISS definition (Appendix 2). This definition is consistent with the internationally accepted O'Grady definition that has been previously applied.[7,23]

All confirmed CLABSIs were included in the analysis, irrespective of whether line insertion occurred in the ICU. Cohort demographic, basic clinical and microbiological data were collected from the hospital electronic database. Patient medical records of all VICNISS-reported CLABSI cases were reviewed to confirm CLABSI definition and collect additional clinical information. Finally, all positive

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Maintenance Bundle +/- Dedicated Trolley

CSIRO PUBLISHING
Healthcare Infection
http://dx.doi.org/10.1071/HI14038

Improving the central venous access devices maintenance process to reduce associated infections in paediatrics: evaluation of a practical, multi-faceted quality-improvement initiati

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Abstract. ***Introduction*:** Central venous access devices (CVADs) provide essential and relia
infection is a common and serious complication with paediatric patients. CVAD bundles hav
effectively reduce central line-associated bloodstream infections (CLABSI), but primarily d
Another emerging strategy to encourage best practice is the use of a dedicated CVAD troll
***Methods*:** A quality-improvement initiative was undertaken to improve CVAD maintena
effectiveness of the chosen interventions at the Royal Children's Hospital, Brisbane. Nursin
within the hospital elected to participate and the wards were allocated to receive either I
maintenance bundle only) or Intervention B (CVAD maintenance bundle and dedicated CVAD
of the interventions was evaluated by: (i) rate of CLABSI per 1000 catheter-days; and (ii) audits
with evidence-based CVAD maintenance strategies.
***Results*:** During the initiative, the hospital-wide CLABSI rate decreased from 9.07 to
catheter-days ($P = 0.01$). The rate of CLABSI in Intervention A wards reduced from 7.6 to
catheter-days ($P < 0.001$) and in Intervention B wards reduced from 8.0 to 0.5 episodes
($P < 0.001$). Hospital-wide audits of clinician compliance increased from 11.9% to 35% ($P = 0.$
A wards and to 83% ($P < 0.001$) in the Intervention B wards.
***Conclusion*:** Implementation of CVAD maintenance bundles and a dedicated CVAD troll
CLABSI and improved audited compliance to evidence-based practices within our tertiary

Received 17 November 2014, accepted 22 December 2014, published online 18 March 2015

Introduction

Central venous access devices (CVADs) are integral to the medical management of many paediatric conditions. Reliable central venous access is essential for the safe and efficient delivery of medications including chemotherapy, antibiotics, haemodialysis, parenteral nutrition and other lifesaving infusions into large calibre vessels to allow adequate dilution of the drug, avoid vessel irritation, and reduce the risk of drug extravasation.[1,2] Despite their necessity, between 20 and 50% of CVADs in tertiary paediatri
treatment, resulting in interrup
insertion and risks associate
sequelae.[3–7]

Central line-associated blood
remains the most significant
morbidity and mortality in patients with CVADs and is associated with increased healthcare costs in hospitalised patients.[8–10] Numerous international clinical practice

Abstract. ***Introduction*:** Central venous access devices (CVADs) provide essential and reliable vascular access, but infection is a common and serious complication with paediatric patients. CVAD bundles have been demonstrated to effectively reduce central line-associated bloodstream infections (CLABSI), but primarily during CVAD insertion. Another emerging strategy to encourage best practice is the use of a dedicated CVAD trolley for maintenance.

***Methods*:** A quality-improvement initiative was undertaken to improve CVAD maintenance and to evaluate the effectiveness of the chosen interventions at the Royal Children's Hospital, Brisbane. Nursing staff from four wards within the hospital elected to participate and the wards were allocated to receive either Intervention A (CVAD maintenance bundle only) or Intervention B (CVAD maintenance bundle and dedicated CVAD trolley). Effectiveness of the interventions was evaluated by: (i) rate of CLABSI per 1000 catheter-days; and (ii) audits of clinician compliance with evidence-based CVAD maintenance strategies.

***Results*:** During the initiative, the hospital-wide CLABSI rate decreased from 9.07 to 1.05 episodes per 1000 catheter-days ($P = 0.01$). The rate of CLABSI in Intervention A wards reduced from 7.6 to 2.2 episodes per 1000 catheter-days ($P < 0.001$) and in Intervention B wards reduced from 8.0 to 0.5 episodes per 1000 catheter-days ($P < 0.001$). Hospital-wide audits of clinician compliance increased from 11.9% to 35% ($P = 0.001$) in the Intervention A wards and to 83% ($P < 0.001$) in the Intervention B wards.

***Conclusion*:** Implementation of CVAD maintenance bundles and a dedicated CVAD trolley successfully reduced CLABSI and improved audited compliance to evidence-based practices within our tertiary paediatric hospital.

CHILDREN'S HEALTH SERVICES

Delivering the best care for our kids.

CVAD (central venous access device) Maintenance Bundle

Hand Hygiene

-Aseptic clinical hand wash (60 seconds) performed before all line access / maintenance procedures
-5 moments* for hand hygiene

ANTT (aseptic non-touch tenchique)

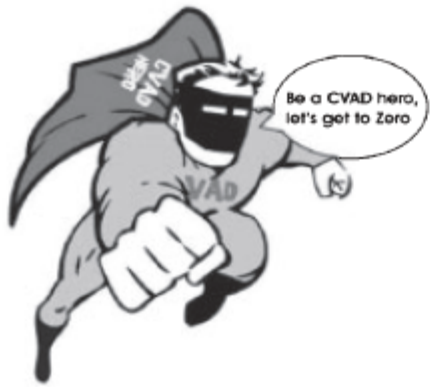
-Appropriate use of surgical or standard ANTT as per nursing standard
-ANTT used for all CVAD line maintenance and access procedures

Scrub the hub

-2% Chlorhexidine Gluconate and 70% Alcohol CVAD hub decontamination will be performed for 30 seconds with
-20-30 seconds dry time before each hub access

Dressing

-Semi-permeable dressing will remain clean, dry and intact
-Dressing care will be documented daily on CVAD Nursing Activity Report



Patency

-Needless Access Device (NAD) will remain clear and free of bloody residue
-NAD changes incorporated in dressing change or if NAD is visibly soiled
-NAD changes documented on CVAD Nursing Activity Report
-CVAD flushes freely and aspirates – patency documented daily on CVAD Nursing Activity Report

For information contact -

The RCH Paediatric Vascular Assessment and Management Service

Pager #59775 or e: abby_davidson@health.qld.gov.au

- Amanda Ullman, Abby Illing, Rachel Edwards, Gerry Fogarty, Tricia Kleidon, Jane Tomlinson (2015): Improving the central venous access devices maintenance process to reduce associated infections in paediatrics: evaluation of a practical, multi-faceted quality-improvement initiative. CSIRO Publishing. http://dx.doi.org/10.1071/HI14038.

Other Great Initiatives

- AVATAR Group
  - Securement
  - Dressing
  - Routine replacement of device(s) and administration sets
- OMG
  - Global overview of use, practices and outcomes

OMGPIVC.org
One Million Global Catheters Prevalence Study

OMG PIVC study | www.omgpivc.org | November 2015—Edition 6

Welcome to the OMG study newsletter!

The OMG PIVC study is officially the largest prevalence study ever undertaken of peripheral IV catheters. With data from 410 hospitals in 50 countries and 15 languages, the results and benchmarking opportunities promise to be fascinating. Thanks to everyone who has contributed to making this study a success.

Study update...

Data entry has finished

410 hospitals in 50 countries have taken part

Data entered in 15 languages

Over 42,000 PIVCs entered

> 70,000 patients screened

Data analysis is underway

Results will be published in 2016

By now, all sites have entered their data (or submitted it for data entry) and most sites have received a spreadsheet of their own findings. You are welcome to use this data for local auditing purposes. Please check this data carefully and let Gillian know if any data are missing or if anything needs to be corrected in our database.

You are also very welcome to reuse the data collection tool for future audits in your hospital so you can track progress.

Many people have asked when the findings will be published. We are as anxious as you to see this, but it will take a bit longer. Now the data has been entered, we are busy cleaning it in preparation for data analysis. Following the data analysis phase, we will publish the full study results in a peer-reviewed journal, hopefully in the first half of 2016. You will definitely be notified when the paper is published.

We are receiving questions about the nature of the final report to each site. The first run of analysis will be fairly descriptive in nature. Your report will provide you with tables of descriptive data from your site in comparison with other sites in your country or region.

We encourage you to create a presentation or write a paper of the findings in your health district or region and describe what steps you plan to take to address any concerns you may have found there. Other sites would be interested to hear of your experience and strategies undertaken for improvement. Please remember, a condition of the study is that results cannot be published before the main paper is published, and any publications must acknowledge the OMG study team, as per the authorship agreement signed by each participating site.

We are providing certificates to every site involved in the study. If you have not yet done so, please provide Gillian with the list of names of people who deserve a certificate of recognition for their participation in the OMG study. So many people have devoted hours of time and effort to this study and we believe they deserve recognition. Many sites have had certificate presentation ceremonies for their staff. This is a great idea because it reminds clinicians how important and useful local research activities can be.

Next year, we will showcase the full OMG study results at the inaugural Australian Vascular Access Society conference in Brisbane, Australia in April and at the World Congress for Vascular Access in Lisbon, Portugal in June.

If you are interested in participating in future IV research projects with the AVATAR group, let us know. To keep up with the AVATAR group, you can subscribe to our AVATAR newsletter (www.avatargroup.org.au) and follow us on Twitter @AVATAR_grp

In conclusion, thanks to everyone for their ongoing support of this ambitious study. It has been quite a journey!

Below: Peninsula Health, Frankston, Vic, Australia

Preventing VAD-related Infection


ZERO ACCIDENTS IS OUR GOAL
FOR THE MINNEAPOLIS CONVENTION CENTER EXPANSION PROJECT
THE PROJECT TEAM HAS WORKED 137 DAYS REPRESENTING
76000 WORK HOURS WITHOUT A LOST TIME ACCIDENT
TEAM MEMBERS
21 6 2000

Central Line Associated Bloodstream Infection Issues

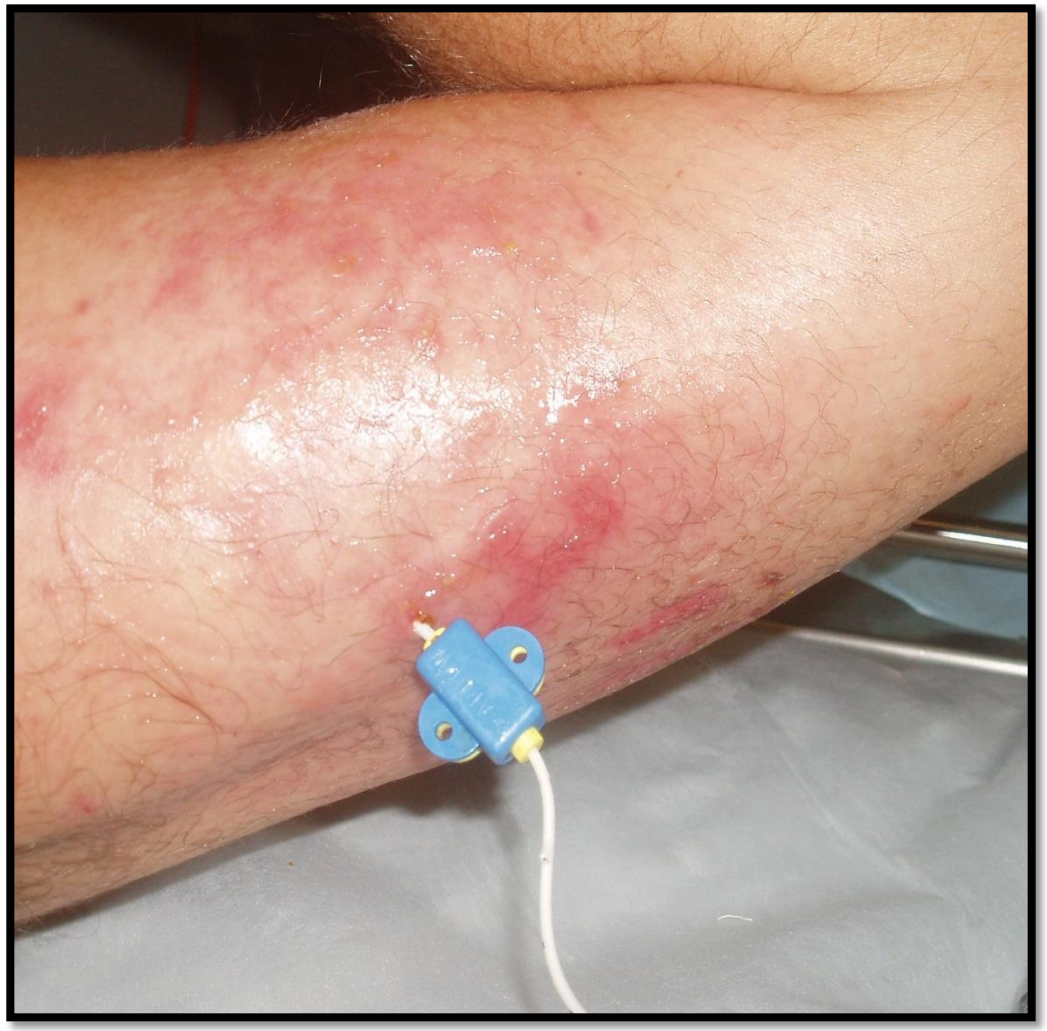
- 17% of Australian ICU patients receive CVCs1
- NSW CLABSI rate around – 1.2/1000 catheter days
- Some organisations have achieved and maintained zero CLABSI
- Clinicians do not comply with evidence-based infection control practice recommendations
  - compliance with the clinician bundle between 61% to 90% & with the patient bundle between 74.1% to 91.8%[2]
  - overall hand hygiene compliance in Australia is only 78.3% (CI 95% 78.2-78.3)[3]
- Some data regarding line management, securement, access and management
- Little data about organisational culture, incentives

1. Halton, K. A., Cook, D. A., Whitby, M., Paterson, D. L., & Graves, N. (2009). Cost effectiveness of antimicrobial catheters in the intensive care unit: addressing uncertainty in the decision. *Critical care, 13, R35.*
2. McLaws, M. L., & Burrell, A. R. (2012). Zero risk for central line-associated bloodstream infection: are we there yet? *Critical care medicine, 40, 388-393.*
3. *Hand Hygiene Australia, National Data Period Two, 2013* http://www.hha.org.au/LatestNationalData.aspx Accessed 06/10/2013

Source: http://www.clabsi.com.au/ Accessed 24/11/2015

Lack of long-term reliable CLABSI/1,000 line days data

- NSW 3.7 (95%CI 2.5-5.3)
- VIC 2.3 (95%CI 1.5-3.3)
- National 0.6 (95% CI 0.2–2.4)



McLaws ML, Taylor P *J Hosp Infect* **2003**; 53 (4): 260-268.

Russo PL, Bull A, Bennett N, et al.. *Am J Infect Control* **200**6;34: 430-6.

McLaws ML, Burrell A Crit Care Med **2012;** 40:388 –393

Simple Facts

- Estimated overall incidence of infection 2.5%[1]
- Catheter-related bloodstream infections (CR-BSIs) increase health costs and patient morbidity[1]
- Common skin flora – *S. aureus, S. epidermidis* & CNS (gram +ve)
- Fungi as well as gram +ve and gram –ve organisms commonly cause CLABSI - Vancomycin-resistant enterococci, *Ps. aeruginosa* and Candida albicans[2]
- In one study resistant organisms accounted for 64.4% cultures[2]
- ICU CLs may be accessed > 16 times a shift[3]

Halton, K. A., Cook, D. A., Whitby, M., Paterson, D. L., & Graves, N. (2009). Cost effectiveness of antimicrobial catheters in the intensive care unit: addressing uncertainty in the decision. *Critical care, 13, R35.*

Cumbo-Nacheli, G., Paz y Mar, H., Cobb, S., de Sanctis, J., & Guzman, J. (2011). CEntral line-associated bloodstream infections (clabsi) in a large medical intensive care unit. *CHEST Journal, 140, 272A-272A.*

http://www.americannursetoday.com/assets/0/434/436/440/6116/6118/6122/6174/5bf3862f-a647-4391-b3f1-27532fe3f158.pdf Accessed 06/10/2013

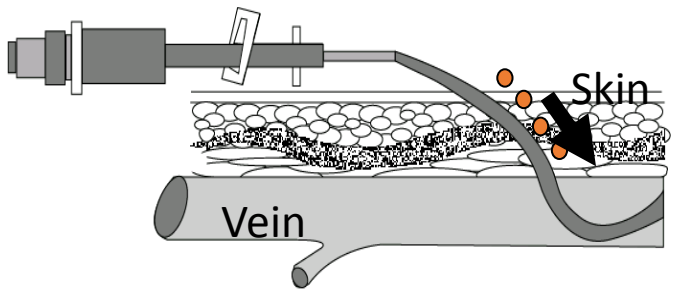
Treatment Costs & Microbial Costs

- ~ 3500 Aussies CLABSI each year
- Excess length of stay 2.4 ICU and 7.5 general ward days
  - ICU bed-day $AUD (2006) 3,021 = $7,250 excess cost per case – **$22,128.750**
  - Ward bed-day $AUD (2006) 843 = $6,322 excess cost per case – **$22,127,000**
- Diagnostic costs – catheter tip & two blood cultures
- Treatment costs
  - 2 weeks of Vancomycin
  - 10 days of Ticarcillin
  - 4 weeks Fluconazole

Halton, K. A., Cook, D. A., Whitby, M., Paterson, D. L., & Graves, N. (2009). Cost effectiveness of antimicrobial catheters in the intensive care unit: addressing uncertainty in the decision. *Critical care, 13, R35.*

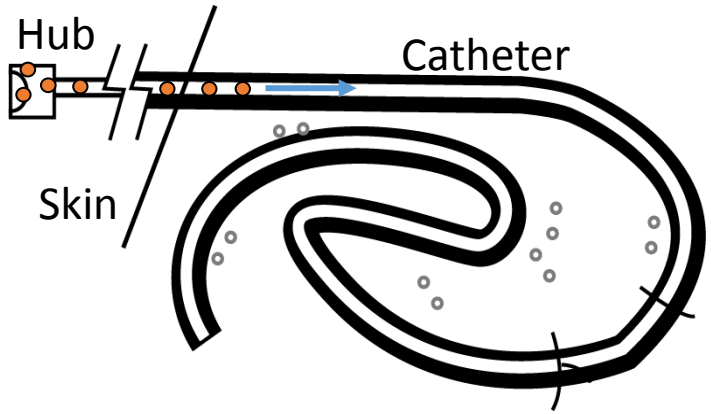
Microbial Source of CRBSI

EXTRALUMINAL COLONIZATION



Extraluminal biofilm is the major source of CRBSI within the first week of catheterization in short-term catheters. Extraluminal biofilm is the major source of tunnel infections (exit site infections) in long-term catheters.

INTRALUMINAL COLONIZATION



Intraluminal biofilm is the major source of CRBSI after 1 week in both short- and long-term catheters.

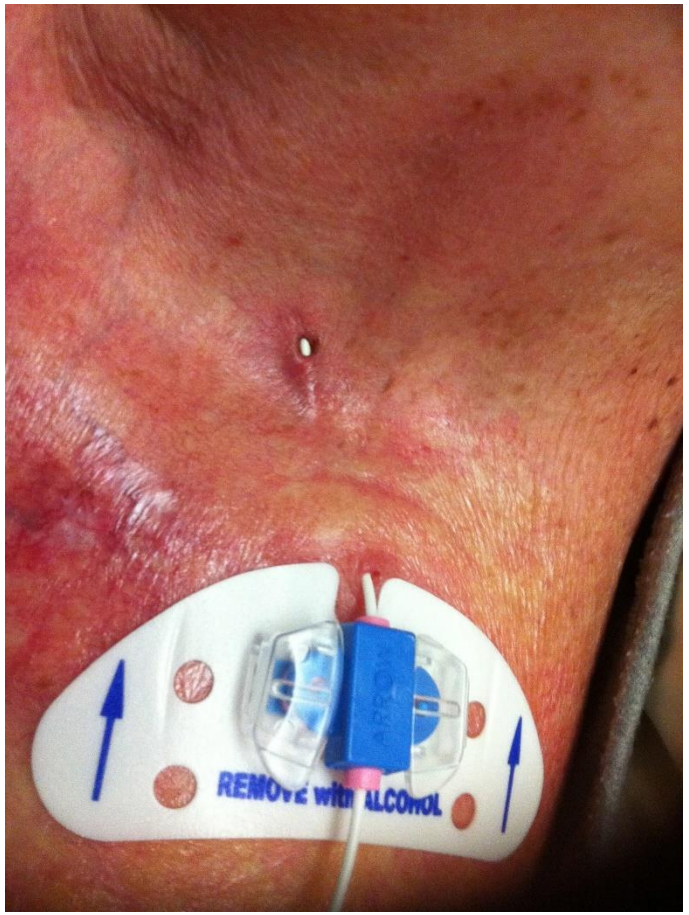
SKIN PREP ASEPTIC TECHNIQUE DRESSING

COATED CATHETERS

Ryder, MA. Catheter-Related Infections: It's All About Biofilm. *Topics in Adv Practice Nursing eJ. 2005;5(3) ©2005 Medscape. Posted 08/18/2005.*
http://www.medscape.com/viewarticle/508109

IVD-related BSI Risk Factors

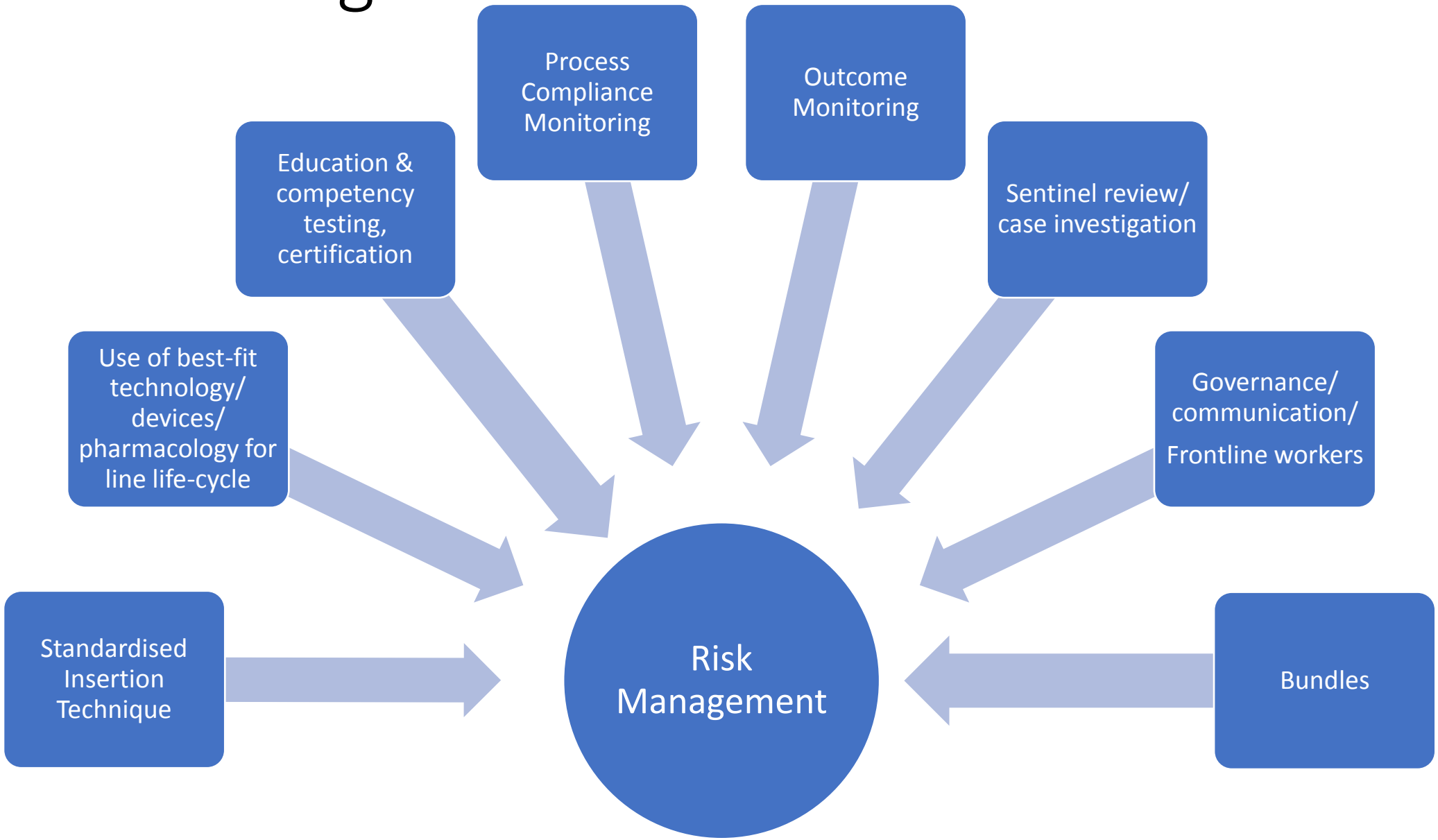
- Underlying disease
- Prolonged hospitalization before device
- Insertion
  - Site (heavily colonized) and type
- Catheter management
  - Duration of insertion
  - Colonization of catheter hub from contaminated HCW hands
- Antibiotic use during catheterization
- Formation of biofilm



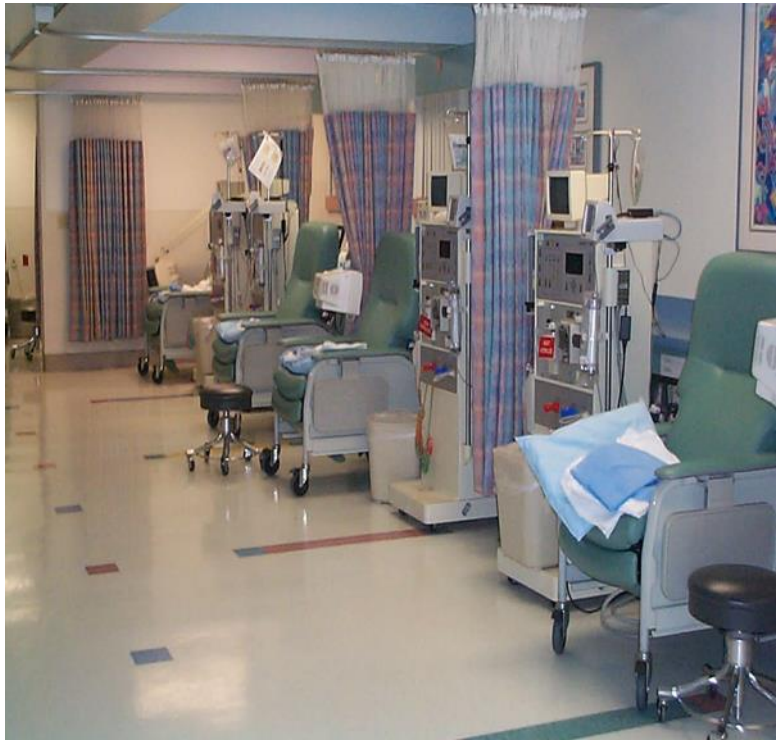
Modifiable Risk Factors

Characteristic	Risk Factor Hierarchy
Insertion circumstances	Emergency > elective
Skill of inserter	General > specialized
Insertion site	Femoral > subclavian
Skin antisepsis	70% alcohol, 10% povidone-iodine > chlorhexidine solutions
Catheter lumens	Multilumen > single lumen
Duration of catheter use	Longer duration of use greater risk
Barrier precautions	Submaximal > maximal

Risk Management



Risk Factors Unique to Setting Where Line Inserted and/or Accessed – Emergency vs Scheduled and Ambulatory vs Inpatient



CLABSIs & Mortality

Relative risk of hospital mortality associated with CR-BSI estimated to be 1.06 or absolute increase in mortality just under 1%

How does that impact the families of the 3500 Australians who develop CLABSI each year?

Prioratised Needs

Respect For Risks Associated w/ Peripheral IVs and Prevention

Intravascular device use, management, documentation and complications

- 30-80 % of people admitted to hospital receiving a PVC during their stay
- 0.1% or 0.5 per 1,000 catheter days
- 58.7% (n=321) of patients had one or more vascular devices
  - 190 (86.4%) PVCs, 25 (11.4%) PICCs and 5 (2.3%) CVCs.
  - 22.3% inserted by a doctor,
  - 20.5% by the intravenous service,
  - 10% by trained ward nurses and
  - 47% it was not known who inserted the device.

New, Karen A., Webster, Joan, Marsh, Nicole M., Hewer, Barbara, and Hewer, Barbara (2014). Intravascular device use, management, documentation and complications: a point prevalence survey. Aust. Health Review 38, 345–349. http://dx.doi.org/10.1071/AH13111

Evaluation of a Pilot Educational Program on Safe and Effective Insertion and Management of Peripheral Intravenous Catheters

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Abstract

Peripheral intravenous catheter (PIVC) insertion and subsequent care have been highlighted as areas for improvement in the management of intravascular devices; however, only the fundamentals of PIVC care are routinely taught to registered nurses in Australia. In 2013, a vascular access-focused elective postgraduate course, Peripheral Intravenous Access and Care (8035NRS) was commenced for students enrolled in any of the Griffith University master's degree programs. It was developed with the intent to translate research knowledge into practice by providing access to the latest research findings and current best practices in peripheral intravenous access. Topics covered preinsertion, insertion, and postinsertion care and were developed for the online environment, which is known to be conducive to individual student learning styles. Learning activities included viewing short videos delivered by local and international clinical researchers. This course is the first known university-provided, postgraduate academic course on this subject in Australia, and possibly 1 of the few available internationally. The course succeeded in its aim of increasing knowledge and skills about safe, evidence-based PIVC insertion and care to registered nurses. Its development and implementation at the postgraduate level may be regarded as a strategy to provide a greater understanding regarding scope and relevance for nursing practice and for informed decision making on optimum integration at the undergraduate level. This ultimately will increase positive patient outcomes and the patient experience of vascular access.

Keywords: *insertion and management of PIVCs, peripheral intravenous catheters, postgraduate education*

Education & Awareness on Infection Risk and Prevention

Education & Awareness on Infection Risk and Prevention

- Not well addressed in undergraduate courses in Australia – medicine and nursing
- Significant & disproportionate focus to date on hand hygiene
- National focus on aseptic non-touch technique & competency
- Patients, families and carers generally unaware of their role in prevention and advocacy
- Slow and random promotion of standardised practice in ICU-setting with minimal uptake in non-ICU areas eg. renal, interventional radiology, ER and oncology
- Substantial national research – not translated to the bedside

How Humans and Technology Can Prevent VAD-related Infection

Selected Novel Technologies

- Sutureless securement devices
  - ↓ BSI in 2 studies
- Dressings
  - Chlorhexidine-impregnated sponge - ↓60%
- Antimicrobial impregnated catheters
  - 12/16 studies ↓ in CVC-related BSIs ~ 40%
- Iodine-containing catheter hub
  - Unequivocal results
- Mechanical Access Valve (MAV) IV Access Systems
  - Patient vs HCW safety
- Pre-filled syringes

New Technical/ Product Development

New Technical/ Product Development

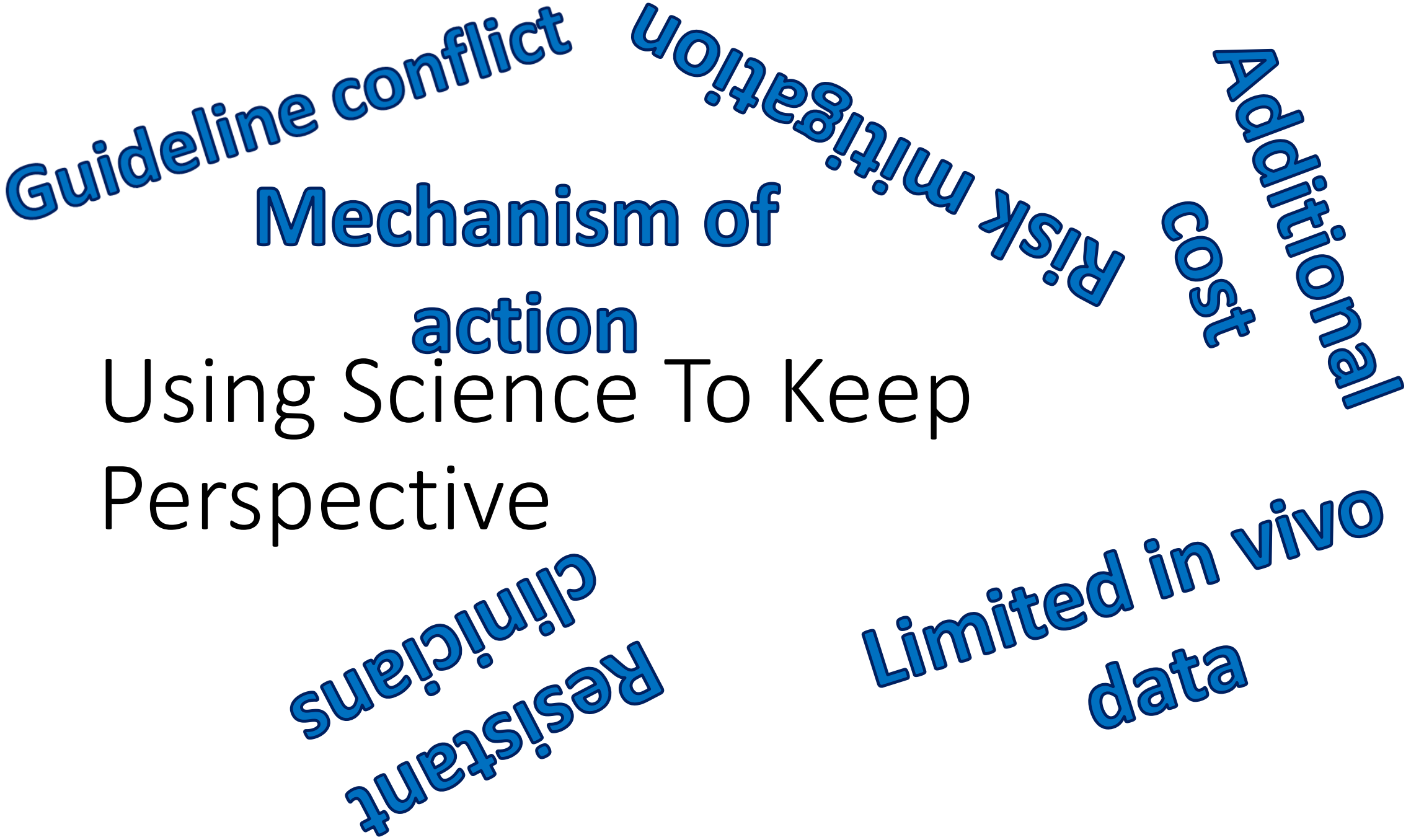
- Better human factors – usage, storage
- More attractive design
- Intuitive & easy to use by ageing workforce (visual cues)
- Use of forcing functions to prevent misuse
- Inbuilt alarms
- Inbuilt compliance monitoring
- Inclusion of “best practice” information with product
- Packaging and presentation to enable seamless insertion, maintenance and access
- Product innovation drives guidelines and standards rather than reverse

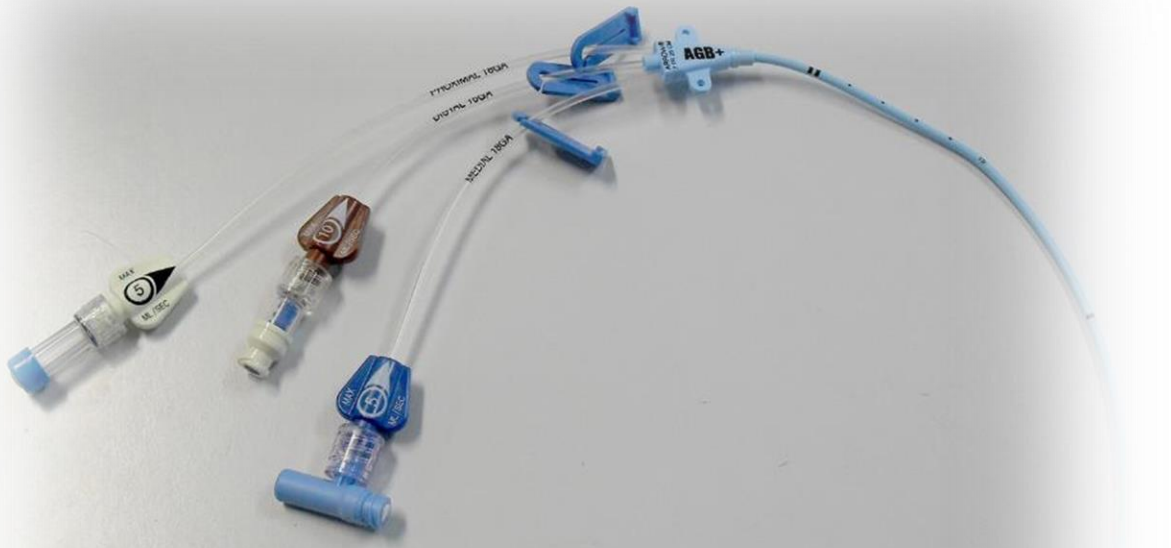
Examples of Technology Driven Infection Prevention Solutions

- Easy-to-use skin preparation
- Ultrasound guided insertion
- Securement devices
- Engineered devices eg. Needleless connectors
- Antiseptic impregnated dressings

How do we address the issue of biofilm?

- Nanotechnologies, improved device composition and design
- ANTISEPTIC AND ANTIMICROBIAL COATED CATHETERS


Guideline conflict
Risk mitigation
Additional cost
Mechanism of action
Using Science To Keep Perspective
Resistant clinicians
Limited in vivo data



Use of Chlorhexidine and CHG-coated Central Venous Catheters

Antimicrobial Catheters

- Arrowg^{+}ard introduced in 1990
- External catheter surface impregnated with combination of silver sulfadiazine (SSD) and chlorhexidine (Chlorhexidine)
- Designed to reduce catheter colonisation
- Demonstrated good in vitro broad spectrum efficacy
- Subsequent publication of additional in vitro and invivo studies as well as economic studies
- Extended dwell times and greater understanding of CLABSI cause lead to 2nd generation

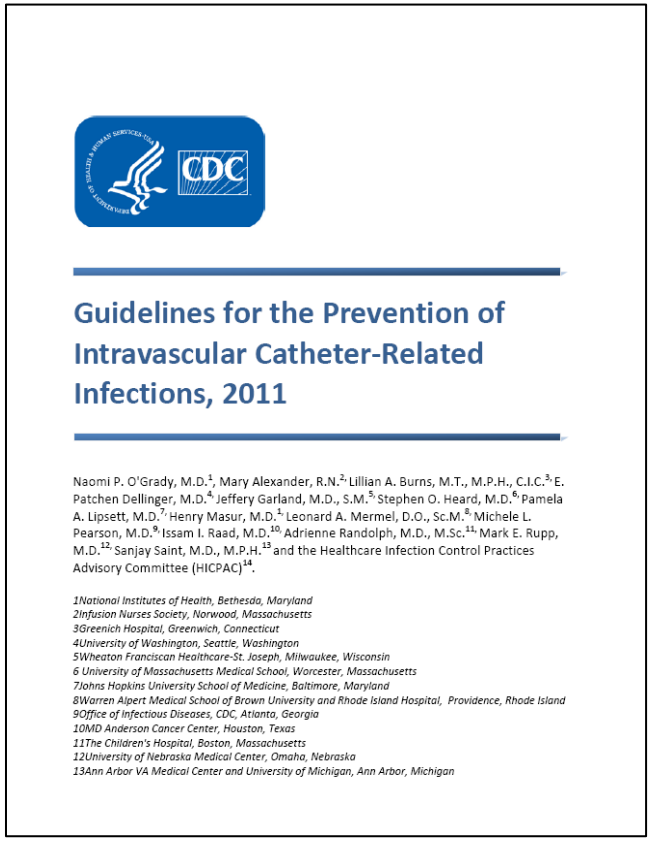
By 2005

- 19 RCTs, 3 meta-analyses & 2 cost-benefit analyses
- CDC recommended use of antimicrobial-impregnated CVCs in selected clinical situations
- 13 of the 17 published studies that examined the effect of antimicrobial-impregnated CVCs on rates of CVC-related BSI found either a statistically significant reduction or a strong trend toward a reduction in rates of BSI
- Evidence that 40% of intravascular device–related BSIs are preventable with the use of antimicrobial-impregnated CVCs
- Support their selective use in situations in which rates of CVC-related BSI remain unacceptably high despite adherence to standard infection-control practices

- Crnich, C. J., & Maki, D. G. (2005). Are antimicrobial-impregnated catheters effective? When does repetition reach the point of exhaustion? *Clinical infectious diseases : an official publication of the Infectious Diseases Society of America, 41, 681-685.*

Current Recommendations

Recommended by CDC



Guidelines for the Prevention of Intravascular Catheter-Related Infections, 2011

Naomi P. O'Grady, M.D.[1], Mary Alexander, R.N.[2], Lillian A. Burns, M.T., M.P.H., C.I.C.[3], E. Patchen Dellinger, M.D.[4], Jeffery Garland, M.D., S.M.[5], Stephen O. Heard, M.D.[6], Pamela A. Lipsett, M.D.[7], Henry Masur, M.D.[1], Leonard A. Mermel, D.O., Sc.M.[8], Michele L. Pearson, M.D.[9], Issam I. Raad, M.D.[10], Adrienne Randolph, M.D., M.Sc.[11], Mark E. Rupp, M.D.[12], Sanjay Saint, M.D., M.P.H.[13] and the Healthcare Infection Control Practices Advisory Committee (HICPAC)[14].

1National Institutes of Health, Bethesda, Maryland
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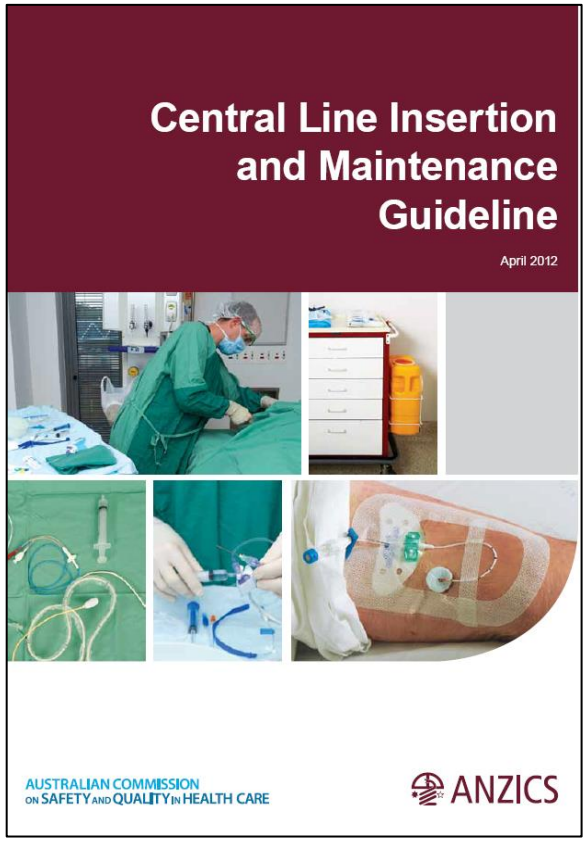
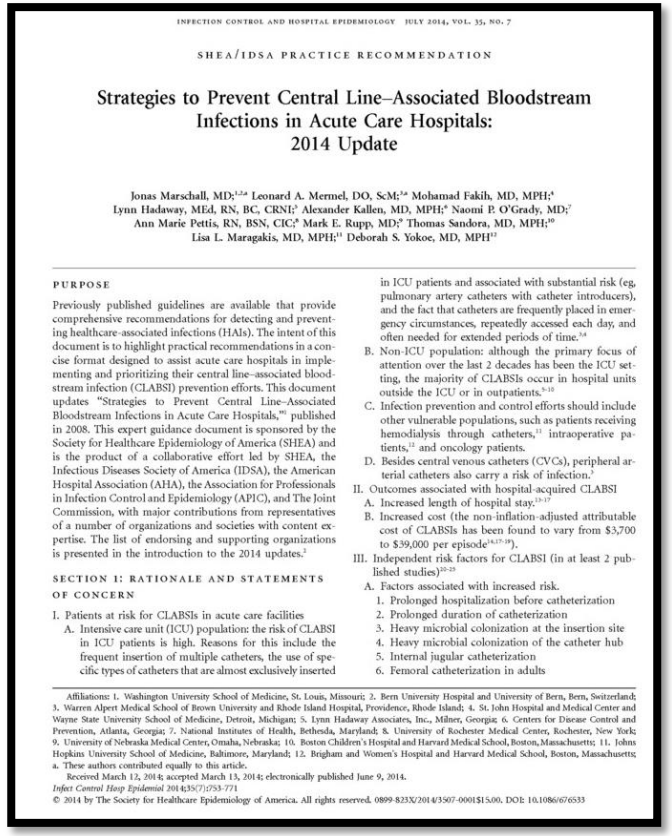
10MD Anderson Cancer Center, Houston, Texas
11The Children's Hospital, Boston, Massachusetts
12University of Nebraska Medical Center, Omaha, Nebraska
13Ann Arbor VA Medical Center and University of Michigan, Ann Arbor, Michigan

Recommended by ANZICs



Recommended by SHEA



INFECTION CONTROL AND HOSPITAL EPIDEMIOLOGY JULY 2014, VOL. 35, NO. 7

SHEA/IDSA PRACTICE RECOMMENDATION

Strategies to Prevent Central Line–Associated Bloodstream Infections in Acute Care Hospitals: 2014 Update

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PURPOSE

Previously published guidelines are available that provide comprehensive recommendations for detecting and preventing healthcare-associated infections (HAIs). The intent of this document is to highlight practical recommendations in a concise format designed to assist acute care hospitals in implementing and prioritizing their central line–associated bloodstream infection (CLABSI) prevention efforts. This document updates "Strategies to Prevent Central Line–Associated Bloodstream Infections in Acute Care Hospitals,"[1] published in 2008. This expert guidance document is sponsored by the Society for Healthcare Epidemiology of America (SHEA) and is the product of a collaborative effort led by SHEA, the Infectious Diseases Society of America (IDSA), the American Hospital Association (AHA), the Association for Professionals in Infection Control and Epidemiology (APIC), and The Joint Commission, with major contributions from representatives of a number of organizations and societies with content expertise. The list of endorsing and supporting organizations is presented in the introduction to the 2014 updates.[2]

SECTION 1: RATIONALE AND STATEMENTS OF CONCERN

I. Patients at risk for CLABSIs in acute care facilities
   A. Intensive care unit (ICU) population: the risk of CLABSI in ICU patients is high. Reasons for this include the frequent insertion of multiple catheters, the use of specific types of catheters that are almost exclusively inserted in ICU patients and associated with substantial risk (eg, pulmonary artery catheters with catheter introducers), and the fact that catheters are frequently placed in emergency circumstances, repeatedly accessed each day, and often needed for extended periods of time.[3,4]
   B. Non-ICU population: although the primary focus of attention over the last 2 decades has been the ICU setting, the majority of CLABSIs occur in hospital units outside the ICU or in outpatients.[5–10]
   C. Infection prevention and control efforts should include other vulnerable populations, such as patients receiving hemodialysis through catheters,[11] intraoperative patients,[12] and oncology patients.
   D. Besides central venous catheters (CVCs), peripheral arterial catheters also carry a risk of infection.[3]
II. Outcomes associated with hospital-acquired CLABSI
   A. Increased length of hospital stay.[13–17]
   B. Increased cost (the non-inflation-adjusted attributable cost of CLABSIs has been found to vary from $3,700 to $39,000 per episode[14,17–19]).
III. Independent risk factors for CLABSI (in at least 2 published studies)[20–25]
   A. Factors associated with increased risk.
      1. Prolonged hospitalization before catheterization
      2. Prolonged duration of catheterization
      3. Heavy microbial colonization at the insertion site
      4. Heavy microbial colonization of the catheter hub
      5. Internal jugular catheterization
      6. Femoral catheterization in adults

Affiliations: 1. Washington University School of Medicine, St. Louis, Missouri; 2. Bern University Hospital and University of Bern, Bern, Switzerland; 3. Warren Alpert Medical School of Brown University and Rhode Island Hospital, Providence, Rhode Island; 4. St. John Hospital and Medical Center and Wayne State University School of Medicine, Detroit, Michigan; 5. Lynn Hadaway Associates, Inc., Milner, Georgia; 6. Centers for Disease Control and Prevention, Atlanta, Georgia; 7. National Institutes of Health, Bethesda, Maryland; 8. University of Rochester Medical Center, Rochester, New York; 9. University of Nebraska Medical Center, Omaha, Nebraska; 10. Boston Children's Hospital and Harvard Medical School, Boston, Massachusetts; 11. Johns Hopkins University School of Medicine, Baltimore, Maryland; 12. Brigham and Women's Hospital and Harvard Medical School, Boston, Massachusetts; a. These authors contributed equally to this article.

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Infect Control Hosp Epidemiol 2014;35(7):753–771
 0899-823X/2014/3507-0001$15.00. DOI: 10.1086/676533

Antibiotic/Antiseptic Catheters

Use an antimicrobial or antiseptic-impregnated CVC in adults whose catheter is expected to remain in place >5 days if, after implementing a comprehensive strategy to reduce rates of CR-BSI, the rate has not sufficiently decreased.

The comprehensive strategy should include the following 3 components:

- educating persons who insert and maintain catheters,
- use of maximal barrier precautions, and
- a 0.5% chlorhexidine preparation for skin antisepsis during central venous catheter insertion.

ANZICS Antimicrobial central lines

Antimicrobial central lines[17,18]

Chlorhexidine and silver sulphadiazine coated lines (not silver-only),[19] and rifampicin and minocycline lines should be considered

- If the CLABSI rate remains high in spite of good compliance with the insertion and maintenance guidelines
- For patients who will have a central line in-situ >7 days[20]
- For patients at particular risk of CLABSI, eg. burns, immunocompromised

Other factors to consider are:[21]

- Both types of catheter have limited antimicrobial action against some organisms.
- If rifampicin and minocycline lines are frequently used, there should be monitoring for the development of resistance.
- Hypersensitivity reactions to chlorhexidine-coated central lines have been reported, albeit rarely.

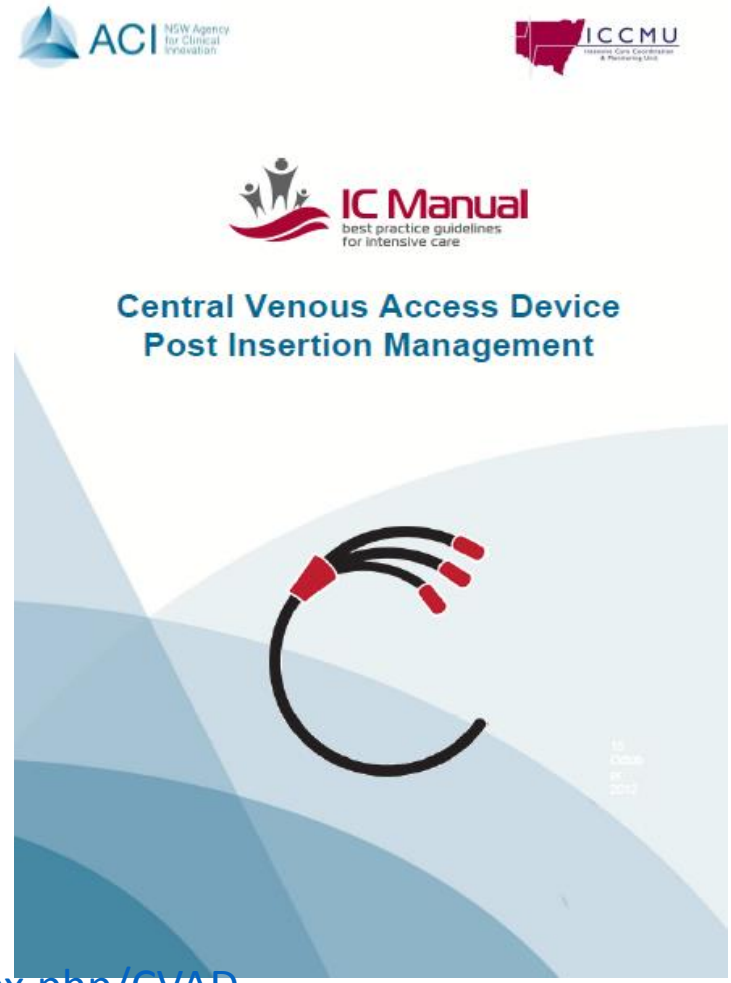
http://www.anzics.com.au/safety-quality/clab Accessed 06/10/2013

2014 Compendium Special Approaches

- Implement after assessment when unacceptably high rates occur despite high compliance with basic prevention practices
- Special Approach Technologies:
  - Antiseptic impregnated CVCs in adult patients (I)
    - Consider duration and CLABSI rates
  - CHG containing dressings (I)
    - Unclear as to benefit if daily HG bathing is already established and vice versa
  - Antiseptic-containing hub/connector cap/port protector (I)
    - Effectiveness of 5 second antiseptic scrub is basic practices
  - Antimicrobial locks (I)
    - Balance development of resistance with subtherapeutic drug concentrations
- Removing special approach technology after return to baseline is a local decision

CVAD Post Insertion Management

- Single use 2% chlorhexidine gluconate in 70% isopropyl alcohol solution is the preferred antiseptic agent for insertion and dressing of CVADs
  - If this is not available, chlorhexidine 0.5% in 70% alcohol or iodine in alcohol should be used
  - Solutions must not be decanted into smaller containers and unused portions must be discarded. Where a patient demonstrates chlorhexidine sensitivity topical povidone iodine 10% in 70% alcohol may be used



http://intensivecare.hsnet.nsw.gov.au/icwiki/index.php/CVAD_-_Recommendation_Statements

Chlorhexidine Sensitivity

Chlorhexidine Antiseptic Properties

- Been used widely as an antimicrobial agent since mid 1970s
- Mouth rinses, cosmetics, contact lens solution, skin creams
- Used clinically urinary antiseptic/ lubricant, implanted mesh
- Increasing use in clinical settings – skin preparation and hand hygiene solution
- Broad spectrum of action, rapid acting & persistent

Safety When Using Chlorhexidine

- Patient reactions are rare & typically minor
- Staff safety is not an issue
- Manufacturers' instructions should be followed including paying attention to label warnings

CHG-Associated Anaphylaxis

- Chlorhexidine introduced in 1954
- Adverse reactions (mostly mild and skin related) reported for last 30 years
- Type 1 hypersensitivity first reported 1984
- Over ten years ~ 50 case reports published
- High rate in Japan
- Most anaphylaxis related to anaesthesia and surgery

Nakonechna, A., Dore, P., Dixon, T., Khan, S., Deacock, S., Holding, S., & Abuzakouk, M. (2012). Immediate hypersensitivity to chlorhexidine is increasingly recognised in the United Kingdom. *Allergologia et immunopathologia*.

Four cases of anaphylaxis to chlorhexidine impregnated central venous catheters: a case cluster or the tip of the iceberg?

Editor—We describe four cases of anaphylaxis caused by chlorhexidine in patients undergoing anaesthesia for cardiothoracic procedures in our Trust over a 12 month period. In all of these cases, anaphylaxis was preceded by insertion of a central venous catheter (CVC) impregnated with silver sulphadiazine and chlorhexidine (ARROWgard Blue®). All patients received standard anaphylaxis management including the administration of i.v. epinephrine, steroids, and antihistamines. In each patient, a tryptase increase from baseline was demonstrated in the early post-reaction sample, indicating mast cell degranulation and confirming the clinical impression of anaphylaxis. Allergen-specific IgE testing (ImmunoCAP®) to chlorhexidine was also positive in all cases.

The first patient experienced two separate episodes of chlorhexidine-associated anaphylaxis. He had his initial procedure abandoned after developing anaphylaxis. An ARROWgard Blue® CVC was inserted immediately before his reaction, but the significance was not noted at the time. After investigation under the allergy team, he was found to be positive to chlorhexidine by specific IgE. His surgery was rescheduled and in light of his previous episode, all antiseptic preparations containing chlorhexidine were removed from the theatre. He had a second anaphylactic reaction after insertion of a second ARROWgard Blue® CVC. The external sterile set packaging did not

Chlorhexidine is a chlorophenyl biguanido antiseptic with two identical epitopes. This type of chemical conformation is known to be capable of cross-linking IgE antibodies on the surface of mast cells and basophils, subsequently causing histamine release in sensitized individuals in a manner similar to succinylcholine. Sensitization to chlorhexidine is undoubtedly through exposure, although this does not appear to be more common in health-care professionals who work in an environment where chlorhexidine is ubiquitous.[1]

First reports of anaphylaxis to this substance appeared in medical literature 25 yr ago[2] and subsequent reports have been published sporadically since, mainly involving reactions from topical applications to skin and mucous membranes (ophthalmic wash, urinary catheterization, rectal examination, and intranasal administration).[3–7] The severity of these cases prompted the Food and Drug Administration (FDA) in 1998, to issue an alert to the medical community about the potential for serious hypersensitivity reactions to chlorhexidine-impregnated medical devices.[8]

The incidence of chlorhexidine anaphylaxis is likely to be vastly under-represented; in a world-wide review in 2004, there were only 50 reported cases over a 10 yr period.[9] In response to our recent cases, the Immunology Department in Southampton is currently undertaking a historical review of patients who have had an episode of intraoperative allergy. They have so far discovered 19 patients with positive chlorhexidine 'ImmunoCAP' tests in Wessex out of 86 cases tested in the last 36 months. Of the 86 patients tested, 16 were anaesthetic referrals and of these seven tested positive for chlorhexidine 'ImmunoCAP'.

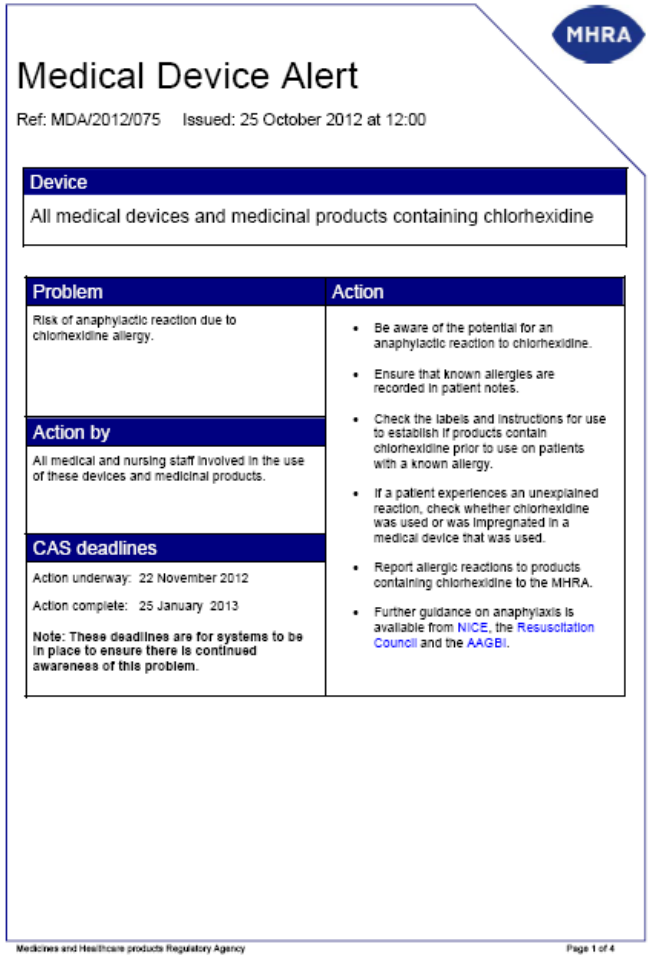
Jee, R., Nel, L., Gnanakumaran, G., Williams, A., & Eren, E. (2009). Four cases of anaphylaxis to chlorhexidine impregnated central venous catheters: a case cluster or the tip of the iceberg? *British journal of anaesthesia, 103, 614-615.*

The Importance of Checking Packaging and Patient History

- "…as it was not widely appreciated that central lines may be pre-coated with Chlorhexidine and (as is routine practice) the line was handed to us already open, none of us thought to check the package insert…"
- CHG-impregnated CVCs are contraindicated for patients with known hypersensitivity

Stephens, R., Mythen, M., Kallis, P., Davies, D. W., Egner, W., & Rickards, A. (2001). Two episodes of life-threatening anaphylaxis in the same patient to a chlorhexidine-sulphadiazine-coated central venous catheter. *British journal of anaesthesia, 87, 306-308.*

UK Medical Device Alert 2012/075



MHRA

Medical Device Alert

Ref: MDA/2012/075 Issued: 25 October 2012 at 12:00

Device

All medical devices and medicinal products containing chlorhexidine

Problem	Action
Risk of anaphylactic reaction due to chlorhexidine allergy.	• Be aware of the potential for an anaphylactic reaction to chlorhexidine. • Ensure that known allergies are recorded in patient notes. • Check the labels and instructions for use to establish if products contain chlorhexidine prior to use on patients with a known allergy. • If a patient experiences an unexplained reaction, check whether chlorhexidine was used or was impregnated in a medical device that was used. • Report allergic reactions to products containing chlorhexidine to the MHRA. • Further guidance on anaphylaxis is available from NICE, the Resuscitation Council and the AAGBI.
Action by All medical and nursing staff involved in the use of these devices and medicinal products.	
CAS deadlines Action underway: 22 November 2012 Action complete: 25 January 2013 **Note: These deadlines are for systems to be in place to ensure there is continued awareness of this problem.**	

Medicines and Healthcare products Regulatory Agency Page 1 of 4

- Be aware of the potential for an anaphylactic reaction to chlorhexidine.
- Ensure that known allergies are recorded in patient notes.
- Check the labels and instructions for use to establish if products contain chlorhexidine prior to use on patients with a known allergy.
- If a patient experiences an unexplained reaction, check whether chlorhexidine was used or was impregnated in a medical device that was used.
- Report allergic reactions to products containing chlorhexidine to the MHRA.

http://www.mhra.gov.uk/home/groups/dts-bs/documents/medicaldevicealert/con197920.pdf Accessed 06/10/2013

Recent National Concerns Regarding Chlorhexidine

Case reports

Lessons from practice

Acute allergic reaction after intravenous saline injection: an unusual presentation of chlorhexidine allergy

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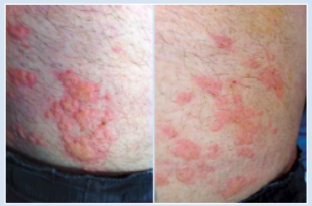
doi: 10.5694/mja13.00144

Clinical record

A 63-year-old man presented to the emergency department after an episode of transient left hemiparesis and hemianaesthesia. His only history of allergy was an episode of mild urticaria after a postsurgical fentanyl infusion a few years previously. An intravenous cannula was inserted in his left cubital fossa. His neurological symptoms had resolved completely by the time he was reviewed by the neurology registrar. A magnetic resonance imaging brain scan was planned. The intravenous cannula was flushed with 10 mL of 0.9% normal saline after the rubber cannula connector was wiped with an alcohol-based swab. Within minutes, the patient experienced rapid development of generalised urticaria and periorbital oedema. He was treated with 25 mg of promethazine and 100 mg of intravenous hydrocortisone, with a good response. He had been fasting for 4 hours before this and was given no other medication.

Three days later, the patient was challenged with the same brand and batch of normal saline through a new intravenous cannula inserted in a different site. The cannula connector was again wiped with the same brand of alcohol-based swab before the challenge. A similar reaction, with immediate generalised urticaria (Figure), was produced, raising the suspicion of allergy to normal saline. Four hours after the challenge, his serum tryptase level was normal.

The patient was referred for allergy testing. Latex allergy was ruled out through negative skin prick testing and serum-specific IgE. He also tested negative on skin prick and intradermal testing to the specific brand of normal saline that had been used, and there were no additives found in the normal saline. He was then challenged with normal saline given through the same brand of intravenous cannula, with a negative result, thus ruling out hypersensitivity to a coating on the cannula. Finally, he underwent a skin prick test to chlorhexidine 0.1%, which yielded a strongly positive reaction (15 mm wheal, 35 mm flare). It was found that the alcohol-based swab used to wipe the cannula connector contained 70% isopropyl alcohol and 2% chlorhexidine. Chlorhexidine allergy was confirmed with a positive chlorhexidine-specific IgE test (1.0kU/L; class 2).



Allergic reaction immediately after normal saline challenge.

Chlorhexidine is widely used as an antiseptic solution in health care settings and in products such as mouthwash, disinfectants and toothpastes. An increase in its use in health care settings in recent years has led to increasing reports of chlorhexidine hypersensitivity reactions. Such reactions may be immediate or delayed,[1,2] and acute reactions reflect type 1 hypersensitivity mediated by chlorhexidine-specific IgE. The incidence of immediate hypersensitivity to chlorhexidine is still unknown,[3] but it has been increasingly reported in relation to exposures including mouthwash,[3] anaesthetic lubricants[4,5] and chlorhexidine-coated venous catheters.[6] As reactions can include contact dermatitis, urticaria and life-threatening anaphylaxis,[7] it is paramount that chlorhexidine allergy be identified. Chlorhexidine allergy should be considered in patients who experience an allergic reaction to an intravenous injection.

In this case, the cause was not immediately evident, as the chlorhexidine was contained in the alcohol-based swab used to wipe the intravenous administration port. The patient's reaction was initially thought to be caused by hypersensitivity to normal saline, which has been reported only twice in the literature.[8,9] Normal saline is isotonic sodium chloride and should not cause an allergic reaction unless there is an additive in the solution. The published reports of normal saline allergy did not include skin prick or intradermal tests, and other potential causes were not adequately excluded. It was only after a series of investigations that our patient was found to be allergic to chlorhexidine. We postulate that a small amount of chlorhexidine from the swab was carried from the surface of the connector through the intravenous cannula while flushing it with normal saline. The patient was likely sensitised to chlorhexidine from exposure during previous hospital admissions. He was issued with a MedicAlert bracelet to prevent future exposure to chlorhexidine in the health care setting and was advised to avoid using mouthwashes and other products containing chlorhexidine.

The amount of chlorhexidine exposure was very small (only 2% in the swab) in this case, which resulted in a significant but not dangerous reaction. Greater exposure to chlorhexidine, such as in surgical preparation or insertion of a coated cannula, could have led to life-threatening anaphylaxis. Skin prick testing with chlorhexidine was positive in this patient but has relatively low sensitivity; intradermal testing with diluted chlorhexidine is more sensitive. Blood

ANZCA
AUSTRALIAN AND NEW ZEALAND COLLEGE OF ANAESTHETISTS

Media release

Sunday August 17, 2014

Allergic reactions to common hospital antiseptic rising, meeting hears

One of the most widely-used hospital antiseptics in Australia and New Zealand is causing an increasing number of allergic reactions in patients in operating theatres and prompting moves for anaesthetists to develop guidelines on the management of patients with a known or suspected allergy to this antiseptic.

Dr Michael Rose, chair of the Australian and New Zealand Anaesthetic Allergy Group (ANZAAG) will tell the group's annual scientific meeting in Sydney on Sunday (August 17) that chlorhexidine is a highly effective antibacterial agent used in many ways across most healthcare environments.

Dr Rose said chlorhexidine, first developed in 1954, is now widely used across operating theatres, other hospital environments and in the community. Despite this, some health care workers were not even aware that chlorhexidine could cause allergy. Allergic reactions range in severity from minor rashes through to life-threatening anaphylaxis.

"It is an excellent antiseptic because it is effective against a wide variety of organisms, and has a lasting effect for days after being applied to the skin," Dr Rose said.

"But as its use increases we are seeing an increasing number of patients diagnosed with allergy to this antiseptic after exposure in the operating theatre. It is included in many disinfectants, hand rubs, lubricating gels and even infused into equipment and drapes and as its presence may not always be obvious, it can be described as a 'hidden' cause of allergy."

He said because health professionals weren't always aware they had exposed a patient to chlorhexidine the diagnosis of an allergy could be missed when complications arise.

"Many of our patients have had more than one reaction before being referred for testing and diagnosis.

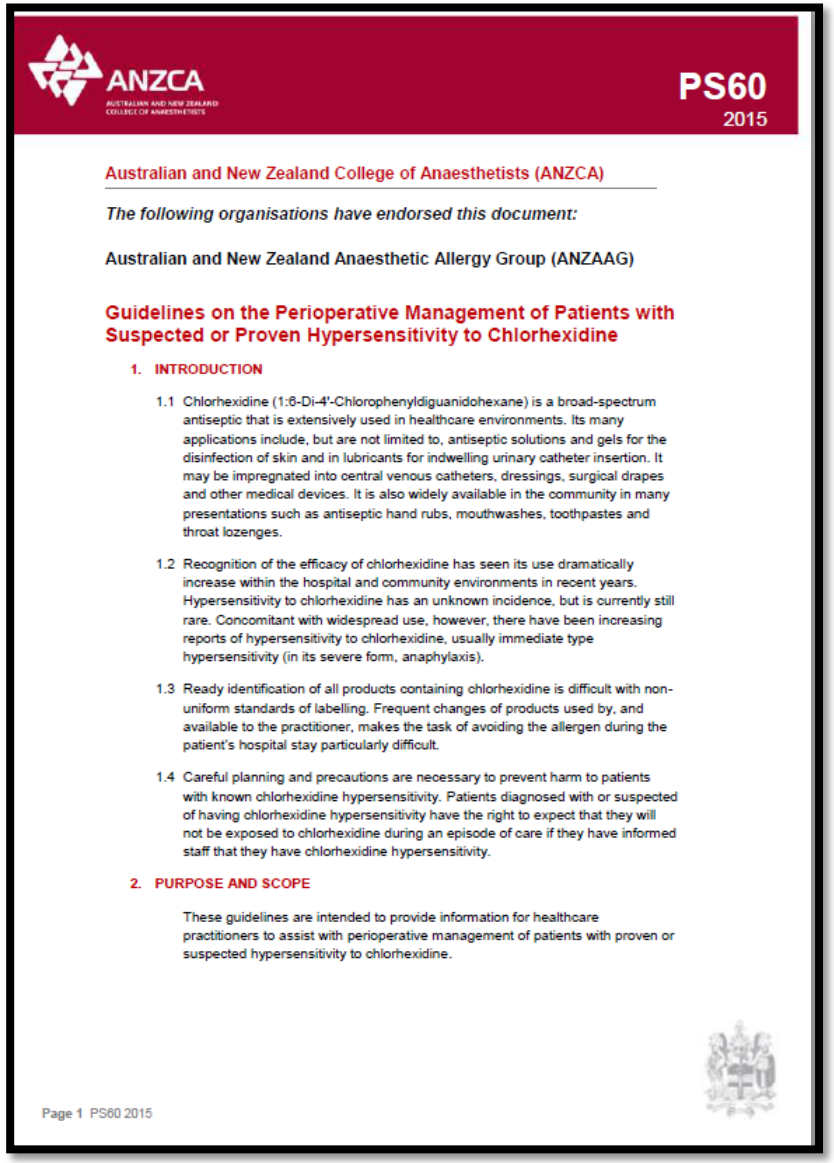
"Where patients are identified with chlorhexidine allergy, it is currently hard for staff to easily identify which products to avoid, because its use is so widespread and it's often not clearly identified on labels."

Dr Rose said clear guidelines regarding management of patients sensitised to chlorhexidine would help raise awareness about the risks of this allergy in the operating theatre environment, promote better labelling of products that contain chlorhexidine and encourage healthcare workers to seek a history of antiseptic allergies from their patients.

The number of patients affected and exact incidences are not known because there is no mandatory reporting of cases in Australia, but in New Zealand reported cases of chlorhexidine allergy have increased significantly.
"The number of reports from 2008-2012 were roughly double that of the entire period from 1965 until 2008 in New Zealand."

http://intensivecarenetwork.com/index.php/icn-activities/icn-podcasts/724-101-rose-on-anaphylaxis?utm_source=The+ICN+Newsletter&utm_campaign=0af2ff69a4-RSS_EMAIL_CAMPAIGN&utm_medium=email&utm_term=0_0f92106109-0af2ff69a4-68246961 Accessed 06/10/2013

ANZCA Guidelines



ANZCA
AUSTRALIAN AND NEW ZEALAND COLLEGE OF ANAESTHETISTS

PS60
2015

Australian and New Zealand College of Anaesthetists (ANZCA)

The following organisations have endorsed this document:

Australian and New Zealand Anaesthetic Allergy Group (ANZAAG)

Guidelines on the Perioperative Management of Patients with Suspected or Proven Hypersensitivity to Chlorhexidine

1. INTRODUCTION

1.1 Chlorhexidine (1:6-Di-4'-Chlorophenyldiguanidohexane) is a broad-spectrum antiseptic that is extensively used in healthcare environments. Its many applications include, but are not limited to, antiseptic solutions and gels for the disinfection of skin and in lubricants for indwelling urinary catheter insertion. It may be impregnated into central venous catheters, dressings, surgical drapes and other medical devices. It is also widely available in the community in many presentations such as antiseptic hand rubs, mouthwashes, toothpastes and throat lozenges.

1.2 Recognition of the efficacy of chlorhexidine has seen its use dramatically increase within the hospital and community environments in recent years. Hypersensitivity to chlorhexidine has an unknown incidence, but is currently still rare. Concomitant with widespread use, however, there have been increasing reports of hypersensitivity to chlorhexidine, usually immediate type hypersensitivity (in its severe form, anaphylaxis).

1.3 Ready identification of all products containing chlorhexidine is difficult with non-uniform standards of labelling. Frequent changes of products used by, and available to the practitioner, makes the task of avoiding the allergen during the patient's hospital stay particularly difficult.

1.4 Careful planning and precautions are necessary to prevent harm to patients with known chlorhexidine hypersensitivity. Patients diagnosed with or suspected of having chlorhexidine hypersensitivity have the right to expect that they will not be exposed to chlorhexidine during an episode of care if they have informed staff that they have chlorhexidine hypersensitivity.

2. PURPOSE AND SCOPE

These guidelines are intended to provide information for healthcare practitioners to assist with perioperative management of patients with proven or suspected hypersensitivity to chlorhexidine.

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Common Features of Reports

- Reaction to Chlorhexidine occurs during multi-body site exposure to Chlorhexidine – urinary catheter insertion/ skin preparation & insertion of impregnated CVC
- In multi-case series reports of Chlorhexidine hypersensitivity most reactions occur after urinary tract mucousal contact with Chlorhexidine vs insertion of impregnated CVC[1]
- Specific reports of reaction to Chlorhexidine impregnated CVCs are rare and most often Chlorhexidine sensitivity known prior to insertion[2]

Nakonechna, A., Dore, P., Dixon, T., Khan, S., Deacock, S., Holding, S., & Abuzakouk, M. (2012). Immediate hypersensitivity to chlorhexidine is increasingly recognised in the United Kingdom. *Allergologia et immunopathologia.*

Oda, T., Hamasaki, J., Kanda, N., & Mikami, K. (1997). Anaphylactic shock induced by an antiseptic-coated central venous [correction of nervous] catheter. *Anesthesiology, 87, 1242-1244.*

Garvey, L. H., Roed-Petersen, J., & Husum, B. (2001). Anaphylactic reactions in anaesthetised patients - four cases of chlorhexidine allergy. *Acta anaesthesiologica Scandinavica, 45, 1290-1294.*

Anaphylaxis to CHG-coated CVCs: Current Thinking

BACKGROUND: Anaphylactic reactions to chlorhexidine are rare but are being reported increasingly in association with a variety of products.

METHODS: We report three cases of anaphylaxis to chlorhexidine in patients presenting for cardiac surgery.

RESULTS: In each case, anaphylaxis was precipitated by the insertion of a central venous catheter impregnated with chlorhexidine acetate. Subsequent investigations confirmed chlorhexidine as the causal agent.

CONCLUSION: Extensive use of chlorhexidine to reduce hospital-acquired infections has the potential to sensitise a small proportion of patients, leading to life-threatening anaphylaxis on subsequent exposure.

Guleri, A., Kumar, A., Morgan, R. J., Hartley, M., & Roberts, D. H. (2012). Anaphylaxis to chlorhexidine-coated central venous catheters: a case series and review of the literature. *Surgical infections, 13, 171-174.*

Other Important Considerations

- What type of Chlorhexidine?
  - Chlorhexidine digluconate (CHG) – dissolves in water and delivers molecule effectively (scrub solutions, dressings, oral solutions)
  - Chlorhexidine diacetate (CHA) or chlorhexidine base (CHX) – no easily soluble, used for slow release of chlorhexidine from product surface (catheter surface)
- How is Chlorhexidine bonded to surface?
- How long is it protective?
- How is it released?
- Has it passed *Biological evaluation of medical devices ISO 10993-1-2009?*
- Chlorhexidine has non-specific action so true resistance unlikely – no chlorhexidine-resistant bacterial or fungal strains reported despite >60 years use

Modified with permission from K Giare-Patel. Chlorhexidine – the agent, the legacy, the novelty and the safety. AVA 2015.

Staying Passionate

Current Beliefs & Focus

- CLABSI prevention is possible
- Requires rigorous policy and guidelines
- Specific education and training
- Continuous implementation of quality improvement initiatives
- Good governance
- Clinician compliance

AIM for Zero

- Permanent culture change to zero tolerance for all HAIs including CLABSIs
- Includes maintenance bundle in addition to insertion bundle
- Bundles applied house wide not just in ICU
- Involves all organisations and all clinical settings
- Education, Competency and Privileging of Staff including Physicians
- Strong clinical and executive leadership

Modified with permission from Ed Septimus, Personal Communication, 23 Nov 2015.

Zero risk for central line-associated bloodstream infection: Are we there yet?*

Mary-Louise McLaws, MPH, PhD; Anthony R. Burrell, MB, BS

Objective: Identify the longest period a central line remains free from central line-associated bloodstream infection during an 18-month insertion-bundle project.

Design: Prospective cohort.

Setting: New South Wales adult intensive care units at university teaching hospitals between July 2007 and December 2008.

Patients: Intensive care unit adult patients whose central line was inserted in the intensive care unit.

Intervention: Compliance with the insertion bundle for central lines during the first 12-month roll-out period and the last 6 months.

Main Outcomes: The cumulative line days that remained close to infection-free before the lowest probability of central line-associated bloodstream infection, 1 in 100 chances, was identified using conditional probability modeling. An adjusted central line-associated bloodstream infection rate was calculated for these cumulated line days and thereafter where the probability for infection increased with additional dwell time.

Results: The lowest probability identified for central line-associated bloodstream infection was 1 in 100 chances regardless of the phase of the project or central line type. During the first 12 months of the project, the close to infection-free period finished by the end of day 7 giving an adjusted central line-associated bloodstream infection rate of 1.8 3.3)/1000 line days. By the last 6 to infection-free period was exten the end of day 9, giving an ad bloodstream infection rate of 0.9 1.5)/1,000 line days. For dialysis types, the close to infection-fre additional line days, from day 2 wit interval 0.9–12.5)/1,000 line days (95% confidence interval 0.2–2.4)/

Conclusion: The success of the by improved analysis that identif was extended to the first 9 days fo to day 7 for dialysis, peripherally unspecified central line types. Giv sive care unit patients have their zero risk for central line-associate be achievable in the majority of pa with the clinician and patient ins 2012; 40:388–393)

Key Words: bloodstream infectio patient safety; risk free

Central line-associated bloodstream infections (CLABSIs) are among the top four sites for healthcare-associated infections and the most costly (1). High CLABSI rates are not uncommon in Australia: 3.7 (95% confidence interval [CI] 2.5–5.3)/1,000 line days from pooled data from seven teaching intensive care units (ICUs) for the period 1998–2000 (2), and 6.4 (95% CI 5.6–7.2)/1,000 line days from pooled data from 13 teaching hospitals during 2002–2004 (3). The most recent mean rates in adult teaching ICUs in the United States that contribute to the National Healthcare Safety Network Report system range from 1.2 to 5.6/1,000 line days, and median rates range from 1.2 to 3.8/1,000 line days (4). Surveillance systems were in place in these ICUs (1–4) but surveillance alone does not necessarily result in sustained, low CLABSI rates. As such, CLABSI has gained international attention, with stakeholders agreeing that with judicious clinical practice the risk for CLABSI should be zero (5). Multiple prevention strategies have been successful in reducing CLABSI (6), ranging from improved technology of the device (7–10), which are expensive but appropriate for extended exposure to central venous lines (CVLs) (6), to inexpensive aseptic insertion (11–13), early removal of lines (14 (16). Strat insertion b rates comi achieving 17, 18). Sin tion of inse public teac cant reduct rate, from but did no during the Guidelin tance of a short catheter dwell time based on two studies (20, 21), although neither illustrated a direct link between judicious removal of lines and reduced CLABSI. Yet the advice is logical – the shorter the dwell time the lower the risk for CLABSI. Previously, surveillance data (2) were analyzed for risk of CLABSI by dwell time and found the longest dwell time associated with the closest zero risk for CLABSI was the first 5 line days, when the prob-

*See also p. 657.

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Supported, in part, by the New South Wales Health Department.

The authors have not disclosed any potential conflicts of interest.

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DOI: 10.1097/CCM.0b013e318232e4f3

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Results: The lowest probability identified for central line-associated bloodstream infection was 1 in 100 chances regardless of the phase of the project or central line type. During the first 12 months of the project, the close to infection-free period finished by the end of day 7 giving an adjusted central line-associated bloodstream infection rate of 1.8 (95% confidence interval 0.9–3.3)/1000 line days. By the last 6 months of the project the close to infection-free period was extended by 2 additional line days to the end of day 9, giving an adjusted central line-associated bloodstream infection rate of 0.9 (95% confidence interval 0.5–1.5)/1,000 line days. For dialysis and unspecified central line types, the close to infection-free period was extended by 5 additional line days, from day 2 with a rate of 4.3 (95% confidence interval 0.9–12.5)/1,000 line days to day 7, giving a rate of 0.6 (95% confidence interval 0.2–2.4)/1,000 line days.

Conclusion: The success of the insertion bundle was identified by improved analysis that identified that the safest dwell time was extended to the first 9 days for centrally inserted lines and up to day 7 for dialysis, peripherally inserted central catheters, and unspecified central line types. Given that three quarters of intensive care unit patients have their central line removed by day 7, zero risk for central line-associated bloodstream infection should be achievable in the majority of patients where clinicians comply with the clinician and patient insertion bundles. (Crit Care Med 2012; 40:388–393)

Key Words: bloodstream infection rate; central line dwell time; patient safety; risk free

Gold Coast Hospital Staphylococcus aureus bacteraemia (SAB) | MyHospitals - Windows Internet Explorer

http://www.myhospitals.gov.au/hospital/gold-coast-hospital/safety-and-quality/sab

Favorites | http--www.cdc.gov-nhsn... | Website Design for Busine...

Gold Coast Hospital Sta... | http://www.rapid-diagnos...

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Staphylococcus aureus bacteraemia (SAB)

Staphylococcus aureus bacteraemia is a serious bloodstream infection (sometimes called SAB or 'golden staph') that may be associated with hospital care.

The aim is to have as few cases of SAB as possible. One of the most effective ways to minimise the risk of SAB and other healthcare associated infections is good hand hygiene.

The national benchmark for states and territories (public hospitals) is no more than 2 cases per 10,000 days of patient care. For hospitals where there are fewer than 5,000 days of patient care, a comparison cannot be made with the national benchmark. For some private hospitals, rates but not counts of cases are shown. For more information about state and territory SAB rates see: Hospital performance: staphylococcus aureus bacteraemia (SAB) in Australian public hospitals.

The cases shown are for SAB associated with care provided by this hospital for the period 1 July 2010 to 30 June 2011.

16 cases of SAB occurred during 271,183 days of patient care.
There were 0.59 cases per 10,000 days of patient care.

National benchmark

No cases

See more current hospital information published by Queensland

Perspectives

Designing incentives for good-quality hospital care

Is now the time to send a signal that poor-quality care should not be rewarded in activity-based funding?

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doi: 10.5694/mja11.11464

Public hospitals in Australia are in for a shake-up over the next few years, with boards being reintroduced in many states and activity-based funding (ABF) being rolled out nationally.[1] ABF will replace global or historic budgets for hospitals in most states. National casemix classifications will be agreed, and the work of hospitals described and priced using these classifications. Australian refined diagnosis-related groups (AR-DRGs) will be used for inpatients, and other classifications will describe outpatient, emergency department, mental health and subacute activity.

The national introduction of ABF will immediately improve transparency of federal funding support for hospital activity. The rhetoric associated with ABF also emphasises efficiency of hospital care. Much of this will depend on how states, who will manage the system, pass on incentives to local hospital networks. However, the National Health Reform Agreement goes further and declares that the Independent Hospital Pricing Authority (IHPA) will have regard to, among other things, clinical safety and quality (clause B12a) in setting a "national efficient price" for hospital activity.[2] It is probably a stretch to add "quality improvement" as a third objective (in addition to funding transparency and clinical safety), but certainly the National Health Reform Agreement signals a potential role for the IHPA in this area.

"one could determine that the treatment of all hospital-

Non-pay for non-performance

Routine hospital datasets used for ABF distinguish between patients' comorbidities present on admission and hospital-acquired complications. In the US Medicare system, a limited list of hospital-acquired conditions has been excluded from being used in assigning cases to its casemix classification and thus affecting activity-based payment. The current non-pay for non-performance regime shifts only a small amount of funding around, but has been extensively debated, perhaps because of its potential to affect hospital reputation.

There are several options within the area of non-pay for non-performance, relating to which complications should not attract payment for their management, and what financial impact should be imposed.

In its most narrow implementation, non-payment can be targeted at those complications that are clearly preventable and should never occur, with wrong-site surgery being the

issues in Australia, but would only shift a trivial proportion of payments.[11] In addition, as the US list can be challenged, a better path might be to use the work of the Australian Commission on Safety and Quality in Health Care to create our own shortlist of conditions linked to quality of care. The list should only include conditions where responsibility for the adverse event can be clearly attributed to the hospital and its staff, perhaps by failure to implement the Commission's standards, such as those relating to patient identification. Initially, the impact could

Duckett SJ. Designing incentives for good-quality hospital care. *Med J Aust.* Jun 18 2012;**196**(11):678-679.

Payment for Performance - Victoria

High-performing health services

Victorian health service performance monitoring framework 2014–15

fety and quality performance thresholds and points

	KPI	Description	Threshold	Points
nd	VHES*	Patient experience score based on compliance with use of VHES	Compliance	5
			Noncompliance	0
	SAB rate	Rate of SAB infections per 10,000 occupied bed days	Less than or equal to 2.0	5
			2.1 to 2.5	3
			2.6 to 3.5	1
			Greater than or equal to 3.6	0
	Mental health seclusion	Mental health seclusion rate per 1,000 occupied bed days	Less than or equal to 15	5
			16 to 20	3
			21 to 25	1
			Greater than or equal to 26	0
nd	Safety culture	Composite safety culture score based on eight safety culture items in the People Matter survey (percentage agreement)	Equal to or greater than 80%	5
			75% to less than 80%	3
			Less than 75% or response rate for People Matter survey of less than 10%	0
	Hand hygiene**	Hand hygiene compliance – quarter 2	Equal to or greater than 75%	5
			73% to less than 75%	3
			72% to less than 73%	1
			Less than 72%	0
		Hand hygiene compliance – quarter 3	Equal to or greater than 77%	5
			75% to less than 77%	3
			74% to less than 75%	1
			Less than 74%	0
		Hand hygiene compliance – quarter 4	Equal to or greater than 80%	5
			78% to less than 80%	3
			75% to less than 78%	1
			Less than 75%	0
	HCW immunisation	Rate of healthcare worker immunisation – influenza	Equal to or greater than 75%	5
			65% to less than 75%	3
			Less than 65%	0

based on compliance for the first three quarters of 2014–15 with the target to be established in quarter four.
rter 1 will be based on 2013–14 results.

Payment for Non-Performance - Queensland

- "…penalties still do exist for any HCA BSI. (inpatient and non inpatient) I believe it is $12000 per episode. I have heard anecdotally that occasionally some of the larger facilities have received a double whammy if there was more than one organism (which they have been arguing against).

- More recently with the healthcare purchasing agreements being reviewed, I believe they were looking at establishing a baseline and penalties would apply over that. What that 'baseline' is I have no idea. I suspect for smaller facilities like Redland it will be zero.

- Has it actually helped at our facility ? – the million dollar question – for our facility it is used as a big stick but honestly when I investigate I often find there is no recommendations except improving documentation"

QLD-based ACIPC member response to question regarding non-payment.

AVAS.org.au - Embryonic

ACIPC.org.au – Infection Prevention & Control

Engagement & Facilitating Change – None 100% Effective

- Webinars -> increasing
- Online discussion forums (NB foster “group think” & inaccurate information distillation)
- Use of Key Opinion Leaders
- Online publications and interactive websites
- Conference attendance – exposure to “new” science and devices
- Public/ private partnerships – joint evaluations
- Expert forums
- Use of facilitated focus groups is untapped
- Limited networking outside of Australia other than by KOLs and academics
- Hospital-based multi-disciplinary QI projects eg.

How Tim Spencer Remains Passionate

As an experienced operator of 15 years, being an expert clinician in vascular access has given me the ongoing desire to push the boundaries within my scope of practice and also assist and develop other professionals in their pursuit of a vascular access career. Moving from a blind sticking, landmark technique to utilising state-of-the-art ultrasound practices, not only in pre-assessment for vessel health, but for direct visualisation and intra-procedural monitoring and assessment, this allows me to make a concise clinical decision on which device is the best for the patient, for the therapy and for the duration of treatment. Achieving this experience can be challenging when clinicians are undertaking new and diverse roles, but it is the leaders in vascular access who will continue to challenge the boundaries of clinical practice in modern healthcare and stimulate those who aim to follow in their footsteps.

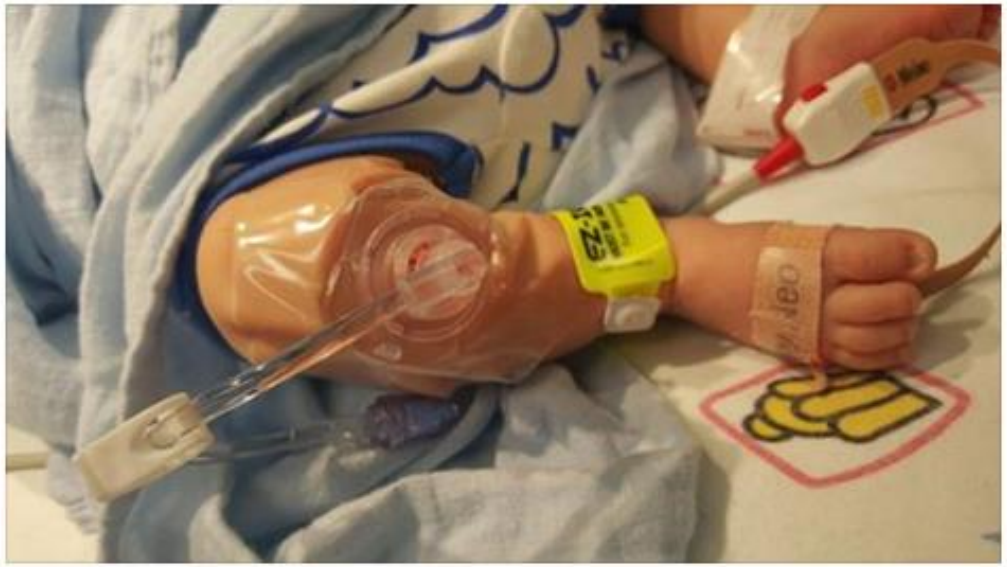
How Evan Alexandrou Remains Passionate

I maintain my passion to reduce catheter acquired infection because we still have much to learn and teach with regard to best catheter, best vessel, best anatomical placement and best practice with managing that device. We need to remember that complications from vascular access devices are preventable adverse events that can be reduced and even eliminated with the right education and attitude.

How Cath Murphy remains Passionate

Infection Control Plus Pty Ltd
Published by Cath Murphy [?] · 27 mins ·

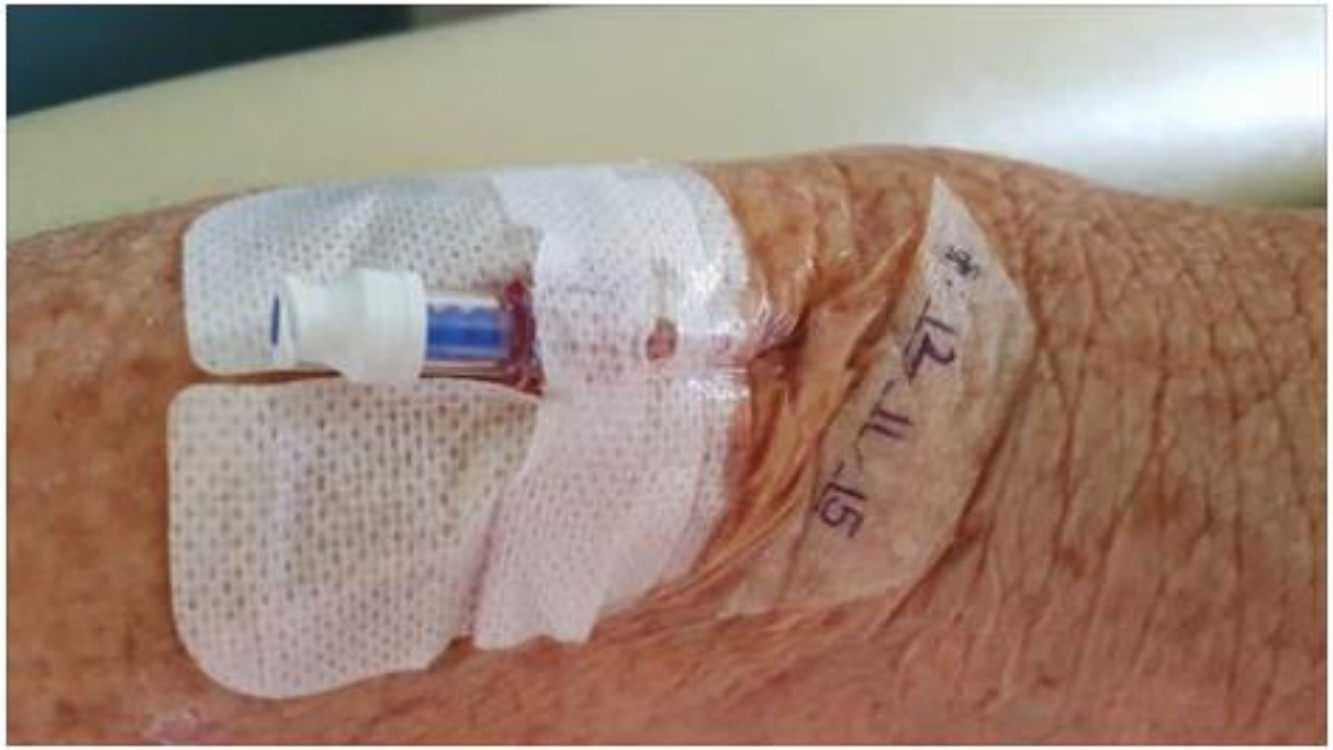
This little guy is 35 days old and a precious family friend. He has had 4 courses of antibiotics and multiple IVs already in his little life. Last week four doctors attempted at least 12 times to cannulate him. Not one Dr or assisting nurse performed hand hygiene. Like me they, commented on his cuteness and his vulnerability. What will it take for healthcare workers to do the right thing always? Looking forward to telling his story in more detail tonight in Brisbane.



Infection Control Plus Pty Ltd

Published by Cath Murphy [?] · November 14 at 9:00am · Edited [?] ·

Amazing how the sight of someone you love with a peripheral IV and a urinary catheter can fill you with fear. Thank you to all the nurses at MAU, Robina Hospital who performed hand hygiene, removed devices as soon as possible and respected asepsis. This family member is very grateful.



1,243 people reached

Boost Post

Summation

- Millions of $AUD and hours of manpower invested in understanding and improving practice and reducing healthcare associated infections (HAIs) especially vascular access related infections.
- Raised clinician, media and public awareness yet minimal impact in terms of reduction
- ? Exhausted input from clinicians, government, academics and infection prevention community
- Remaining solutions are technology-based and involve welcoming medical industry to the infection prevention table as equal partners
- Clinicians and procurement staff must assess new offerings and review protocols only after thorough and thoughtful review of science and current information.