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UAE 2019

2nd UAE International Conference on Antimicrobial Resistance (ICAMR)

21st & 22nd March, 2019

Dubai, United Arab Emirates

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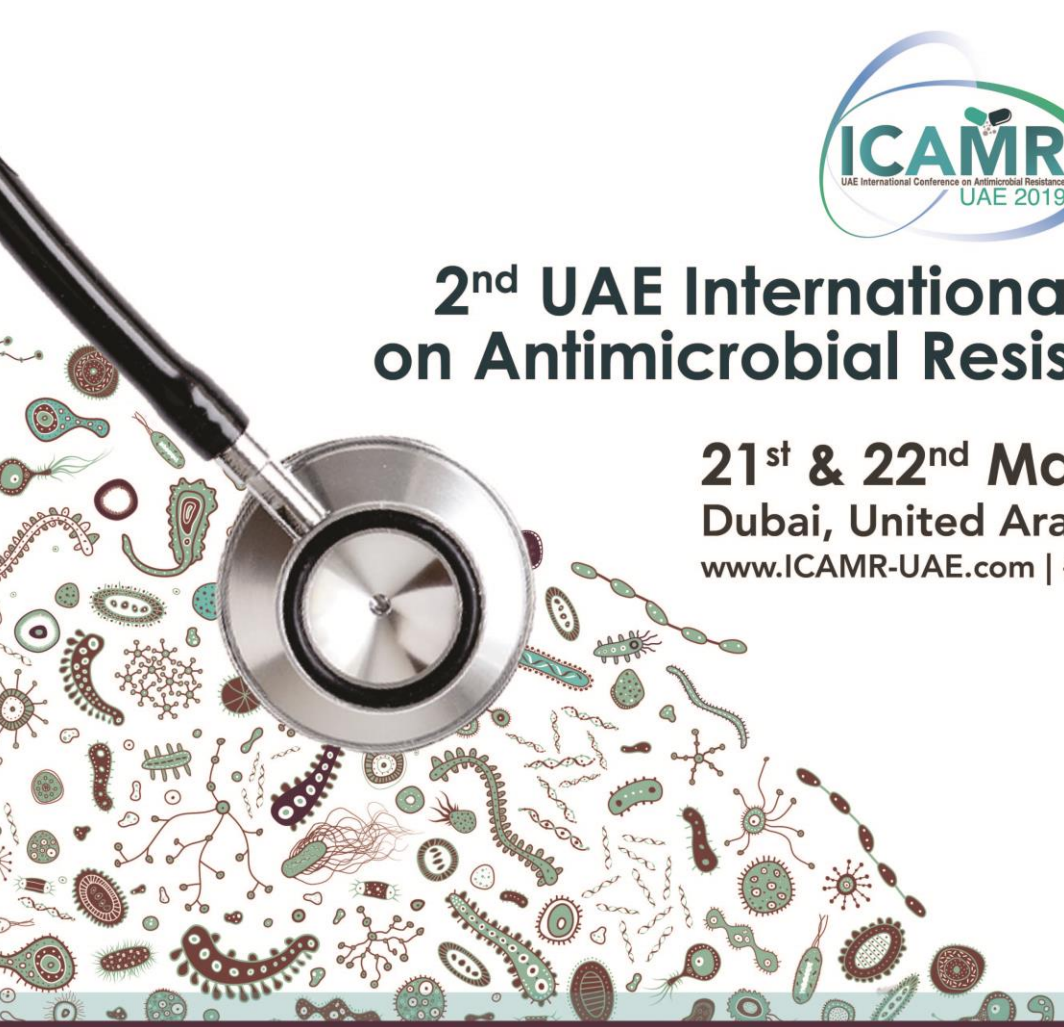

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How Do Bundles Improve HAI

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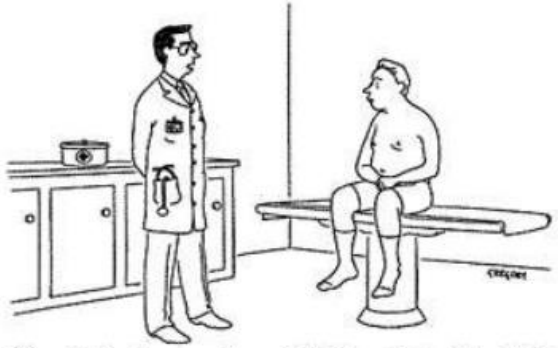
Healthcare Associated Infection

- Poor clinical outcome
- Longer hospital stay
- More resources and effort spent
  - Money
  - Manpower
  - Materials
  - Methods
  - Management

you can get an infection in the hospital while you're being treated for something else



"Your infection may be antibiotic-resistant, but let's see how it responds to intensive litigation."

Care Bundles

- Care “bundles” are **simple** sets of **evidence-based practices** that, when implemented **collectively**, improve the reliability of their delivery and improve patient outcomes.[1]
- A number of specific bundles can be implemented at healthcare facilities to prevent HAI infection, reduce unnecessary antibiotic prescribing, and limit the development of antibiotic resistance.

1. Haraden C. Institute for Healthcare Improvement Website: What is a bundle? http://www.ihi.org/knowledge/Pages/ImprovementStories/WhatIsaBundle.aspx.

Why Care Bundles

- **Reliable** and **consistent** care systems.[1]
- Simple 3-5 elements that are clear and concise.[1]
- Promote multi-disciplinary collaboration, consensus and endorsement.[1,2]
- Help to deliver the best possible care for patients undergoing treatments with inherited risks.[2]

1. Resar R, Griffin FA, Haraden C, Nolan TW. Using Care Bundles to Improve Health Care Quality. IHI Innovation Series White Paper: Institute for Healthcare Improvement; 2012
2. Resar R, Pronovost P, Haraden C, et al. Using A Bundle Approach to Improve Ventilator Care Processes and Reduce Ventilator-Associated Pneumonia. Jt Comm J Qual Patient Saf. 2005; 31(5):243–8.

So, A Bundle

- Based on randomized controlled trials, level 1 evidence
- Focuses on **how to deliver the best care-** not what the care should be

What's the difference between a bundle and a checklist?

- A checklist can be very helpful and an important vehicle for ensuring safe and reliable care.
- The elements in a checklist are often a mixture of nice-to-do tasks or processes (useful and important but not evidence-based changes) and have-to-do processes (proven by randomized control trials).
- A checklist may also have many, many elements.

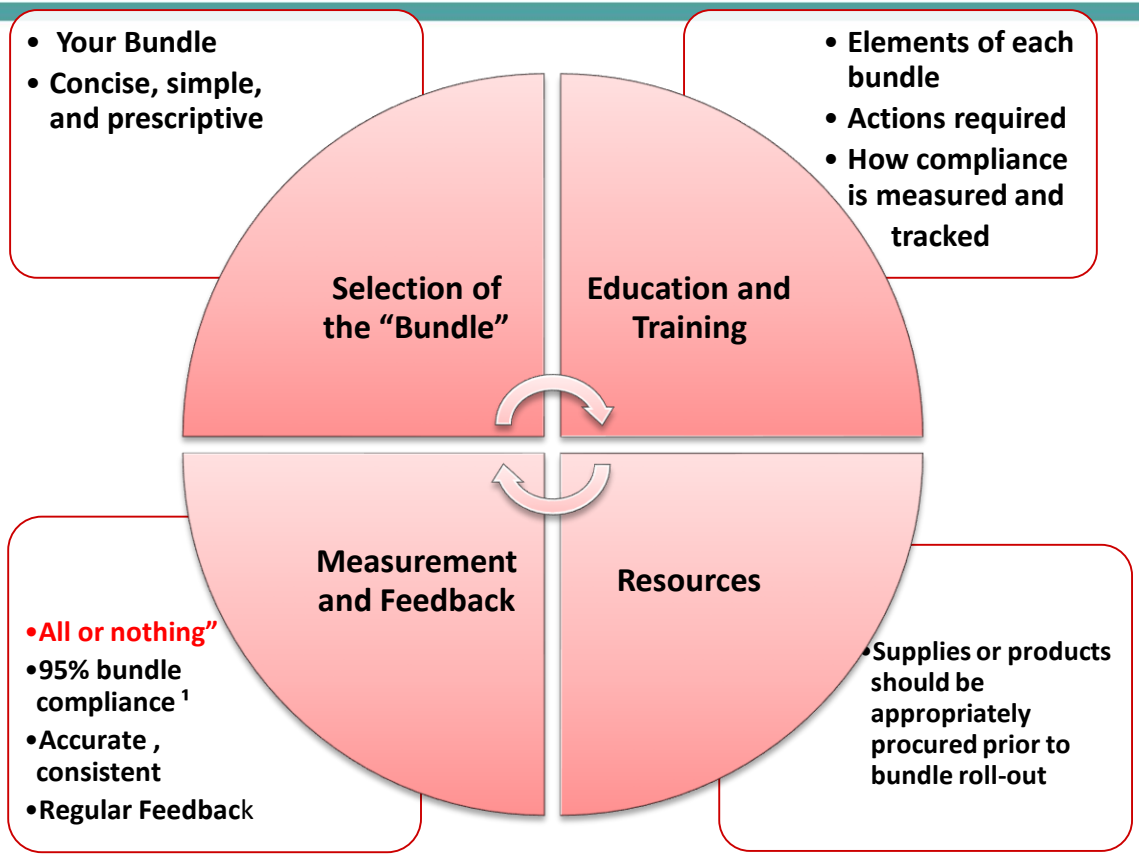
What's the difference between a bundle and a checklist?

- There's also a level of accountability tied to a bundle that you don't always have with a checklist.
- An identified person or team owns it. A checklist might be owned by everybody on a floor or a team, but in reality, when it's owned by everyone – nobody owns it.
- Things don't always get done.
  - So maybe the pharmacist does one thing in a checklist, a nurse another, the doctor something else, but in reality it's no one's job at the end of the day.
- A bundle is a person or a team's responsibility – period.
  - It's their job at a certain point and time – during rounds every single day, possibly.
  - It's very clear who has to do what and when, within a specific time frame.
  - The accountability and focus give a bundle a lot of its power.

Who Can Use Care Bundles

- Anyone in any clinical setting with the agreement of the clinical team leaders
- Infection Control Team should offer support with regard to implementation and advice on data collection, analysis and feedback

Implementation and Performance Measures



Resar R, Griffin FA, Haraden C, Nolan TW. Using Care Bundles to Improve Health Care Quality. IHI Innovation Series White Paper: Institute for Healthcare Improvement; 2012

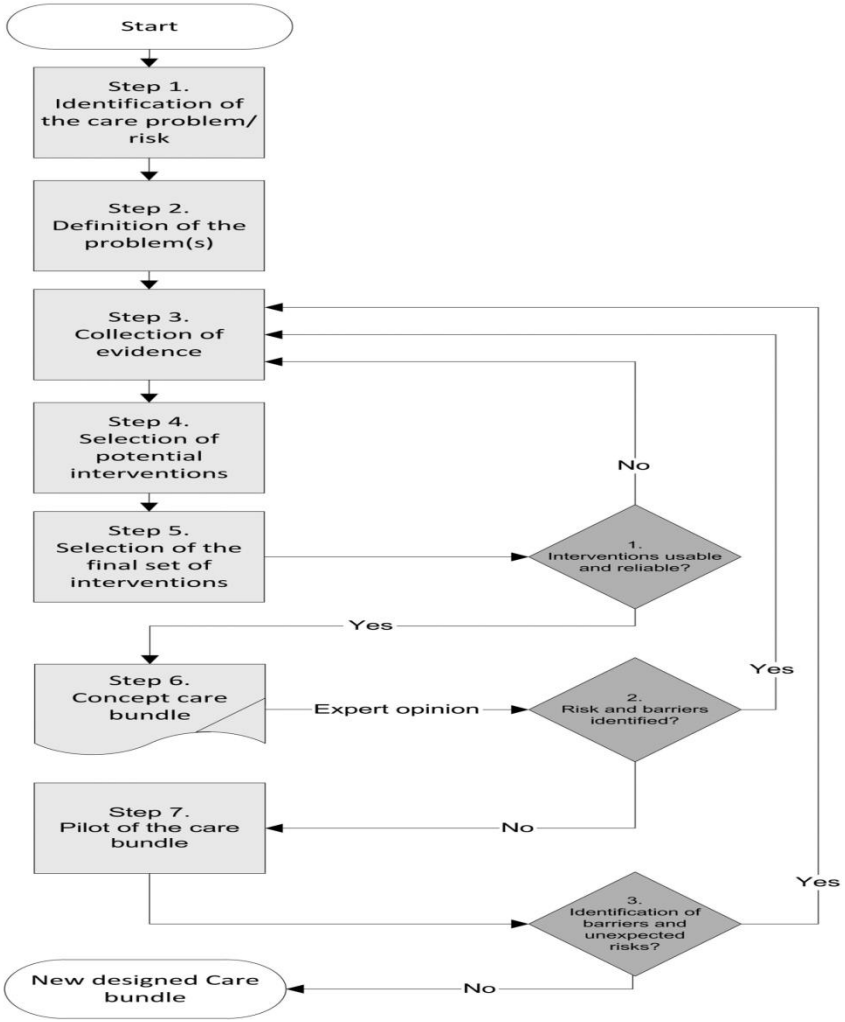
All or None” Approach

In successful bundle implementation each element of the bundle must be implemented collectively with complete consistency to achieve the most favorable outcomes.[1]

- Appropriately followed
- Entrenched in patient care culture
- “Positive habit forming behavior”
- Recorded and evaluated to assess compliance [2]
- Teamwork [3]

1. Resar R, Griffin FA, Haraden C, Nolan TW. Using Care Bundles to Improve Health Care Quality. IHI Innovation Series White Paper: Institute for Healthcare Improvement; 2012
2. Richards GA, Brink AJ, Messina AP, et al. Stepwise Introduction of the 'Best Care Always' Central-Line-Associated Bloodstream Infection Prevention Bundle in a Network of South African hospitals. J Hosp Infect. 2017; 97(1):86–92. doi: 10.1016/j.jhin.2017.05.013.
3. Jain M, Miller L, Belt D, et al. Decline In ICU Adverse Events, Nosocomial Infections and Cost Through a Quality Improvement Initiative Focusing on Teamwork and Culture Change. Qual Saf Health Care. 2006; 15(4):235–9.

Process steps for designing care bundles



Flowchart for designing new care bundles

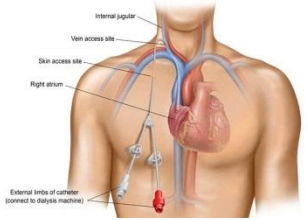
International Journal for Quality in Health Care, Volume 29, Issue 2, 02 February 2017, Pages 163–175.

Types of Care Bundles

- CVC Care Bundle
- PVC Care Bundle
- Surgical Site Infection Bundle
- Urinary Catheter Care Bundle
- Clostridium difficile Care Bundle
- Ventilator Assisted Pneumonia Care Bundle
- Environmental cleaning Care Bundle
- Infection control Care Bundle
- ……
- …….

Bundles for the prevention of central line-associated bloodstream infections (CLABSI)

- CLABSIs are responsible for excess mortality and morbidity, prolonged hospital stays and increased costs[1]
- CLABSI incidence is higher in low income countries[1]
- Implementation of central line insertion and maintenance bundles reduces the incidence of CLABSI in ICUs and non- ICU settings[2,3]



1.Ista E, van der Hoven B, Kornelisse RF, et al. Effectiveness of Insertion and Maintenance Bundles to Prevent Central-Line-Associated Bloodstream Infections in Critically Ill Patients of All Ages: a Systematic Review and Meta-Analysis. Lancet Infect Dis. 2016; 16(6):724–34. doi: 10.1016/S1473-3099(15)00409-0.
2.Dumyati G, Concannon C, van Wijngaarden E, et al. Sustained Reduction of Central Line-Associated Bloodstream Infections Outside the Intensive Care Unit with a Multimodal Intervention Focusing on Central Line Maintenance. Am J Infect Control. 2014; 42(7):723–30. doi: 10.1016/j.ajic.2014.03.353.
3.Klintworth G, Stafford J, O'Connor M, et al. Beyond the Intensive Care Unit Bundle: Implementation of a Successful Hospital-Wide Initiative to Reduce Central Line-Associated Bloodstream Infections. Am J Infect Control. 2014; 42(6):685–7. doi: 10.1016/j.ajic.2014.02.026.

Insertion Bundle

- Hand Hygiene
- Maximal sterile barrier precautions (surgical mask, sterile gloves, cap, sterile gown)
- Full body sterile drape
- Skin cleaning with alcohol-based chlorhexidine (rather than iodine)
- Avoidance of the femoral vein for central venous access in adult patients; use of subclavian rather than jugular veins

Maintenance Bundle

Hand Hygiene

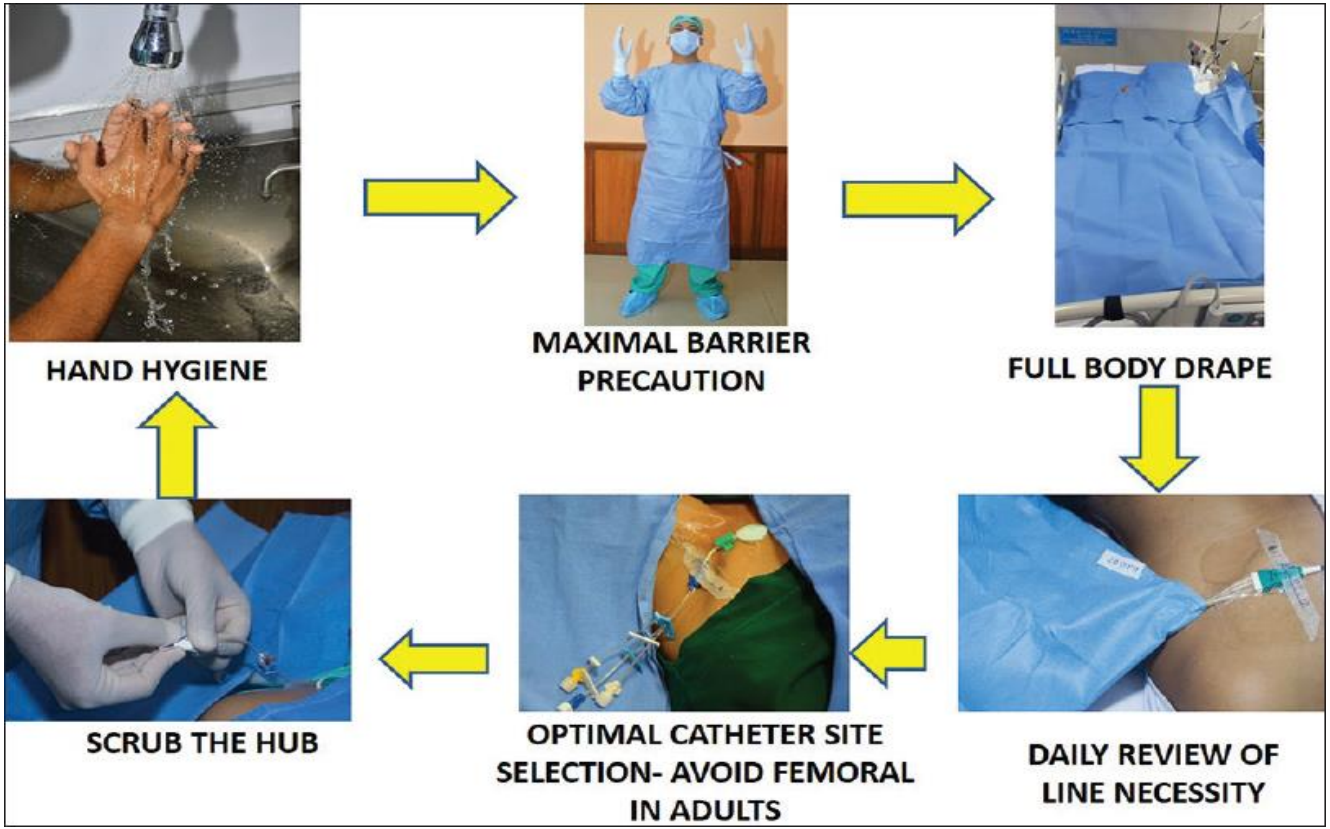
Daily review of line

Disinfect catheter hubs, ports, connectors, etc., before using the catheter

Ensure dressing is intact

Change dressings and disinfect site with alcohol-based chlorhexidine every 5-7 days (change earlier if soiled)

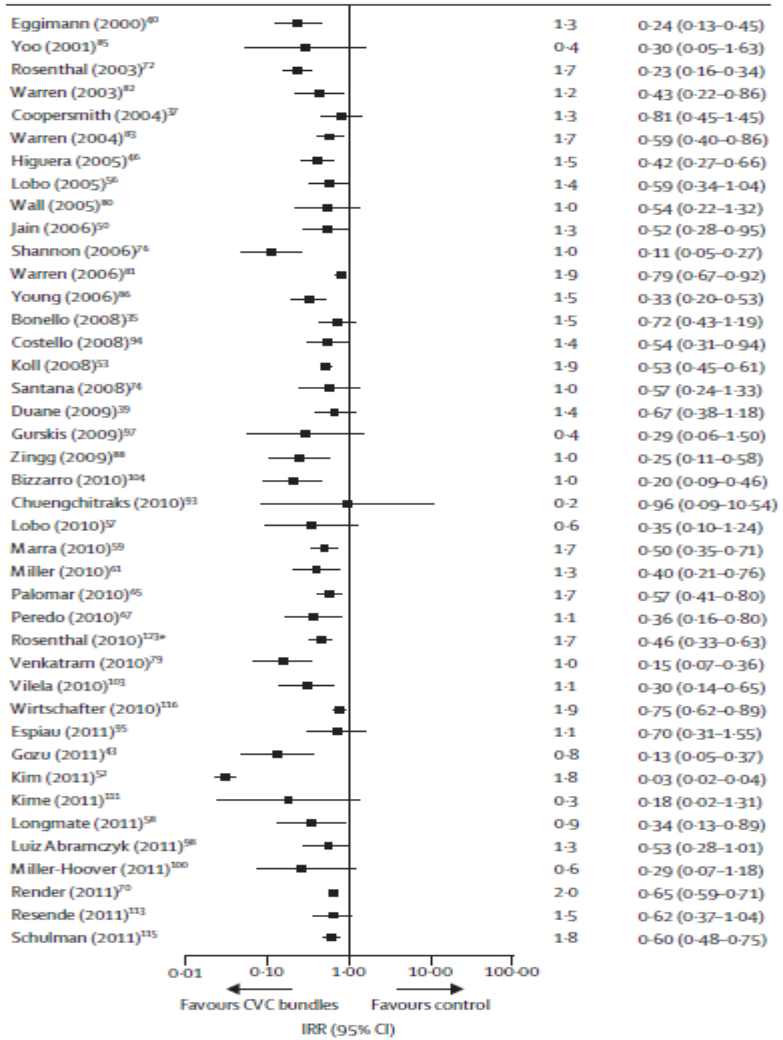
- A multi-modal approach including hand hygiene, clinician and nurse education, and performance of surveillance and feedback of CLABSI rates

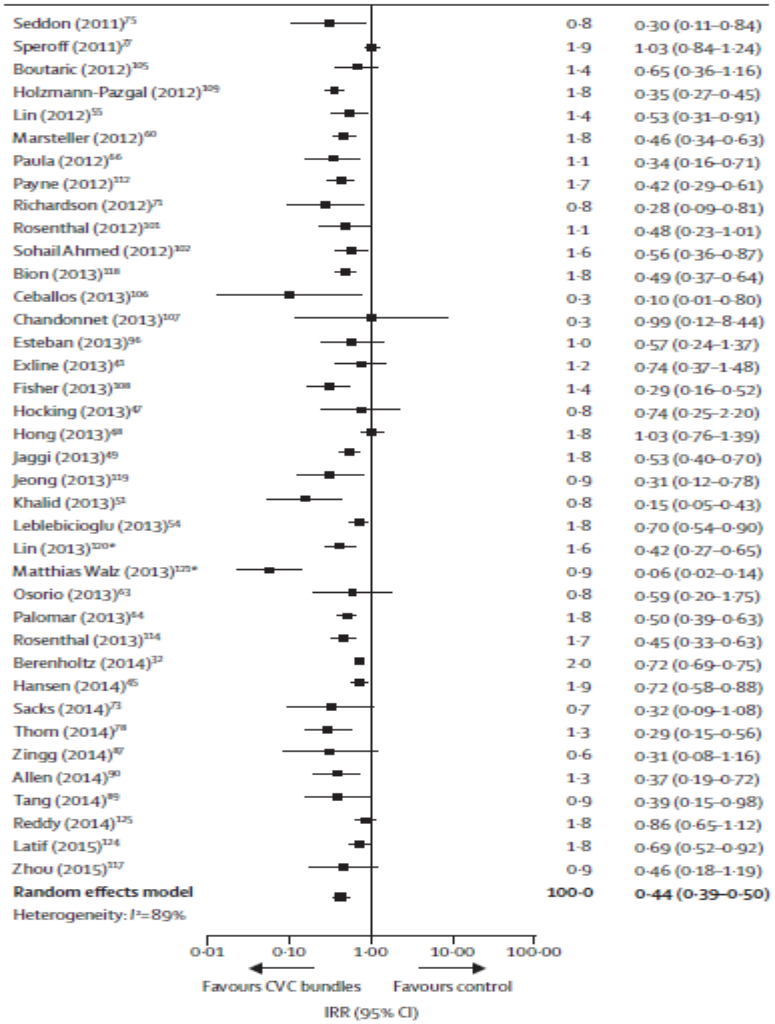

HAND HYGIENE
MAXIMAL BARRIER PRECAUTION
FULL BODY DRAPE
DAILY REVIEW OF LINE NECESSITY
OPTIMAL CATHETER SITE SELECTION- AVOID FEMORAL IN ADULTS
SCRUB THE HUB

Effectiveness of insertion and maintenance bundles to prevent central-line-associated bloodstream infections in critically ill patients of all ages: a systematic review and meta-analysis

Erwin Ista, Ben van der Hoven, René F Kornelisse, Cynthia van der Starre, Margreet C Vos, Eric Boersma, Onno K Helder

Lancet Infect Dis 2016;16:724-34


Weight
IRR (95% CI)
Eggimann (2000)[90] 1·3 0·24 (0·13–0·45)
Yoo (2001)[95] 0·4 0·30 (0·05–1·63)
Rosenthal (2003)[72] 1·7 0·23 (0·16–0·34)
Warren (2003)[82] 1·2 0·43 (0·22–0·86)
Coopersmith (2004)[37] 1·3 0·81 (0·45–1·45)
Warren (2004)[83] 1·7 0·59 (0·40–0·86)
Higuera (2005)[46] 1·5 0·42 (0·27–0·66)
Lobo (2005)[96] 1·4 0·59 (0·34–1·04)
Wall (2005)[80] 1·0 0·54 (0·22–1·32)
Jain (2006)[50] 1·3 0·52 (0·28–0·95)
Shannon (2006)[76] 1·0 0·11 (0·05–0·27)
Warren (2006)[81] 1·9 0·79 (0·67–0·92)
Young (2006)[86] 1·5 0·33 (0·20–0·53)
Bonello (2008)[35] 1·5 0·72 (0·43–1·19)
Costello (2008)[94] 1·4 0·54 (0·31–0·94)
Koll (2008)[53] 1·9 0·53 (0·45–0·61)
Santana (2008)[74] 1·0 0·57 (0·24–1·33)
Duane (2009)[39] 1·4 0·67 (0·38–1·18)
Gurskis (2009)[97] 0·4 0·29 (0·06–1·50)
Zingg (2009)[88] 1·0 0·25 (0·11–0·58)
Bizzarro (2010)[104] 1·0 0·20 (0·09–0·46)
Chuengchitraks (2010)[93] 0·2 0·96 (0·09–10·54)
Lobo (2010)[97] 0·6 0·35 (0·10–1·24)
Marra (2010)[59] 1·7 0·50 (0·35–0·71)
Miller (2010)[61] 1·3 0·40 (0·21–0·76)
Palomar (2010)[65] 1·7 0·57 (0·41–0·80)
Peredo (2010)[67] 1·1 0·36 (0·16–0·80)
Rosenthal (2010)[123]* 1·7 0·46 (0·33–0·63)
Venkatram (2010)[79] 1·0 0·15 (0·07–0·36)
Vilela (2010)[103] 1·1 0·30 (0·14–0·65)
Wirtschafter (2010)[116] 1·9 0·75 (0·62–0·89)
Espiau (2011)[95] 1·1 0·70 (0·31–1·55)
Gozu (2011)[43] 0·8 0·13 (0·05–0·37)
Kim (2011)[52] 1·8 0·03 (0·02–0·04)
Kime (2011)[111] 0·3 0·18 (0·02–1·31)
Longmate (2011)[58] 0·9 0·34 (0·13–0·89)
Luiz Abramczyk (2011)[98] 1·3 0·53 (0·28–1·01)
Miller-Hoover (2011)[100] 0·6 0·29 (0·07–1·18)
Render (2011)[70] 2·0 0·65 (0·59–0·71)
Resende (2011)[113] 1·5 0·62 (0·37–1·04)
Schulman (2011)[115] 1·8 0·60 (0·48–0·75)
0·01
0·10
1·00
10·00
100·00
Favours CVC bundles
Favours control
IRR (95% CI)


(Figure 1 continued)
Weight
IRR (95% CI)
Seddon (2011)[75] 0·8 0·30 (0·11–0·84)
Speroff (2011)[37] 1·9 1·03 (0·84–1·24)
Boutaric (2012)[105] 1·4 0·65 (0·36–1·16)
Holzmann-Pazgal (2012)[109] 1·8 0·35 (0·27–0·45)
Lin (2012)[55] 1·4 0·53 (0·31–0·91)
Marsteller (2012)[60] 1·8 0·46 (0·34–0·63)
Paula (2012)[66] 1·1 0·34 (0·16–0·71)
Payne (2012)[112] 1·7 0·42 (0·29–0·61)
Richardson (2012)[71] 0·8 0·28 (0·09–0·81)
Rosenthal (2012)[101] 1·1 0·48 (0·23–1·01)
Sohail Ahmed (2012)[102] 1·6 0·56 (0·36–0·87)
Bion (2013)[118] 1·8 0·49 (0·37–0·64)
Ceballos (2013)[106] 0·3 0·10 (0·01–0·80)
Chandonnet (2013)[107] 0·3 0·99 (0·12–8·44)
Esteban (2013)[96] 1·0 0·57 (0·24–1·37)
Exline (2013)[45] 1·2 0·74 (0·37–1·48)
Fisher (2013)[108] 1·4 0·29 (0·16–0·52)
Hocking (2013)[47] 0·8 0·74 (0·25–2·20)
Hong (2013)[48] 1·8 1·03 (0·76–1·39)
Jaggi (2013)[49] 1·8 0·53 (0·40–0·70)
Jeong (2013)[119] 0·9 0·31 (0·12–0·78)
Khalid (2013)[51] 0·8 0·15 (0·05–0·43)
Leblebicioglu (2013)[54] 1·8 0·70 (0·54–0·90)
Lin (2013)[120]* 1·6 0·42 (0·27–0·65)
Matthias Walz (2013)[125]* 0·9 0·06 (0·02–0·14)
Osorio (2013)[63] 0·8 0·59 (0·20–1·75)
Palomar (2013)[64] 1·8 0·50 (0·39–0·63)
Rosenthal (2013)[114] 1·7 0·45 (0·33–0·63)
Berenholtz (2014)[32] 2·0 0·72 (0·69–0·75)
Hansen (2014)[45] 1·9 0·72 (0·58–0·88)
Sacks (2014)[73] 0·7 0·32 (0·09–1·08)
Thorn (2014)[78] 1·3 0·29 (0·15–0·56)
Zingg (2014)[87] 0·6 0·31 (0·08–1·16)
Allen (2014)[90] 1·3 0·37 (0·19–0·72)
Tang (2014)[85] 0·9 0·39 (0·15–0·98)
Reddy (2014)[125] 1·8 0·86 (0·65–1·12)
Latif (2015)[124] 1·8 0·69 (0·52–0·92)
Zhou (2015)[117] 0·9 0·46 (0·18–1·19)
Random effects model 100·0 0·44 (0·39–0·50)
Heterogeneity: I^2=89%
0·01
0·10
1·00
10·00
100·00
Favours CVC bundles
Favours control
IRR (95% CI)

Health Protection Scotland

Preventing CRBSIs and other complications from CVCs

NHS National Services Scotland

RISK FACTORS

- Central Vascular Catheters (CVCs) can cause catheter related blood stream infections (CRBSIs) by enabling microorganisms to gain direct access to the blood stream.
- Microorganisms can originate from; the patient's skin at the insertion site, hub contamination; the hands of healthcare workers (HCWs).
- Additionally, poor drug preparation can result in infusate contamination and can lead to CRBSI.
- Patients requiring CVCs may be vulnerable e.g. patients in ICUs; those undergoing cancer therapy; or long term treatment such as renal dialysis.
- The duration of CVC use, poor insertion and maintenance actions also increases the risk of infection.

EQUIPMENT

- Use only single-use sterile equipment, with intact non-stained, non-wet packaging that is within its expiry date, as well as single use vials.
- Ensure there is a selection of CVCs, sterile gloves, masks, gowns and headwear, skin antiseptic containing 2% chlorhexidine* gluconate in 70% isopropyl alcohol, sterile transparent semi-permeable dressings, 70% isopropyl alcohol and sterile body drapes available.
- Keep the equipment in a clean dry area where it will not be subject to possible splash contamination.
- Be alert to the efficacy of the dressing used e.g. any patient allergies, efficiency of the adhesive to provide a good seal.

ENVIRONMENT

- Surfaces used for any CVC procedures e.g. during dressing changes, must be visibly clean.
- The areas where intravenous drugs are compounded (prepared) must be free from clutter and possible splash contamination and risk assessed as suitable.

Preventing CRBSIs and other complications from CVCs

METHODS (Insertion)

- Only use a CVC if it is clinical necessary to do so.
- Consider using an insertion checklist to ensure the procedure is performed correctly.
- Aim to keep the number of needle passes to less than three.
- Select a CVC most appropriate for patient's management.
- Ensure that surgical scrub is performed immediately before donning maximal sterile barrier precautions (i.e. gloves and gown).
- Ensure that maximal sterile barrier precautions are used; including headwear, mask, sterile gown and sterile gloves for healthcare workers.
- Ensure that maximal sterile barrier precautions are used by applying a sterile body drape.
- Ensure aseptic technique is maintained throughout insertion of CVCs.
- Ensure 2% chlorhexidine* in 70% isopropyl alcohol is used for skin preparation of the insertion site and allowed to dry, before CVC insertion.
- Ensure the subclavian site is used if possible, or internal jugular vein (femoral site should be avoided whenever possible).
- Ensure that a sterile, transparent, semi-permeable dressing is used to cover the catheter site.

METHODS (Maintenance)

- Ensure that the need for the CVC in situ is reviewed and recorded today (on a daily basis).
- Ensure the CVC dressing is intact.
- Ensure that the CVC dressing has been changed in the last seven days.
- Ensure that 2% chlorhexidine* gluconate in 70% isopropyl alcohol is used for cleaning the insertion site during dressing changes.
- Ensure that hand hygiene is performed immediately before accessing the line/site (WHO Moment 2).
- Ensure that an antiseptic containing 70% isopropyl alcohol is used to clean the access hub prior to accessing – rub the access hub for at least 15 seconds ('scrub the hub').
- Use aseptic technique for all CVC administration manipulations / procedures.
- Consider the use of a chlorhexidine* impregnated sponge dressing, e.g. based on current infection rates
- Designate one port for TPN (if required).
- Have a planned scheduled change of the administration set minimum 72 hrs, max 96 hours or 24 hours if lipid or blood transfusions are used.
- Monitor the patient's temperature and pulse for signs of a CRBSI; report any abnormal findings in the patient or at the line site.

HEALTHCARE WORKERS (HCWs)

- Participate in programmes designed to optimise care, including training.
- HCWs must be competent in the prevention of CRBSIs and committed to minimising them by:
  - Removing CVCs as soon as possible.
  - Performing all CVC procedures aseptically.
  - Documenting all CVC procedures.
  - Listening to and observing patient for signs of infection.
  - Acting on locally available data.
- There should be visible, documented signs that the clinical team is committed to patient safety. This can be by the collection and display of data in the clinical area on compliance with procedures and outcome rates (from participation in CRBSI surveillance) to inform positive discussions on how to optimise the care provided.

* http://www.mhra.gov.uk/Publications/Safetywarnings/MedicalDeviceAlerts/CON197918

September 2014

Bundle for the prevention of catheter-associated urinary tract infections (CAUTI)

- CAUTI is : A urinary tract infection (significant bacteriuria plus symptoms and/or signs attributable to the urinary tract with no other identifiable source) in a patient with current urinary tract catheterization or who has been catheterized in the past 48 hours
- Most common HAI worldwide resulting in increased costs, hospital stays, and substantial morbidity [1]
- **Avoidable** with the implementation of bundles of care[2]
- General strategies to prevent CAUTI include : appropriate use, aseptic insertion and maintenance, early removal, and hand hygiene[3]

1.Hooton TM, Bradley SF, Cardenas DD, et al. Diagnosis, Prevention, and Treatment of Catheter-Associated Urinary Tract Infection in Adults: 2009 International Clinical Practice Guidelines from the Infectious Diseases Society of America. Clin Infect Dis. 2010; 50(5): 625-63.

2. Umscheid CA, Mitchell MD, Doshi JA, et al. Estimating the Proportion of Healthcare-Associated Infections that are Reasonably Preventable and the Related Mortality and Costs. Infect Control Hosp Epidemiol. 2011; 32(2):101–14. doi: 10.1086/657912.

3.Lo E, Nicolle LE, Coffin SE, et al. Strategies to Prevent Catheter- Associated Urinary Tract Infections in Acute Care Hospitals: 2014 Update. Infect Control Hosp Epidemiol. 2014; 35 Suppl 2:S32–47

CAUTI Bundles

Multimodal approach of hand hygiene, healthcare worker education, and feedback of catheter use and CAUTI rates

Saint S, Greene MT, Krein SL, et al. A Program to Prevent Catheter- Associated Urinary Tract Infection in Acute Care. N Engl J Med. 2016;374(22):2111–9.

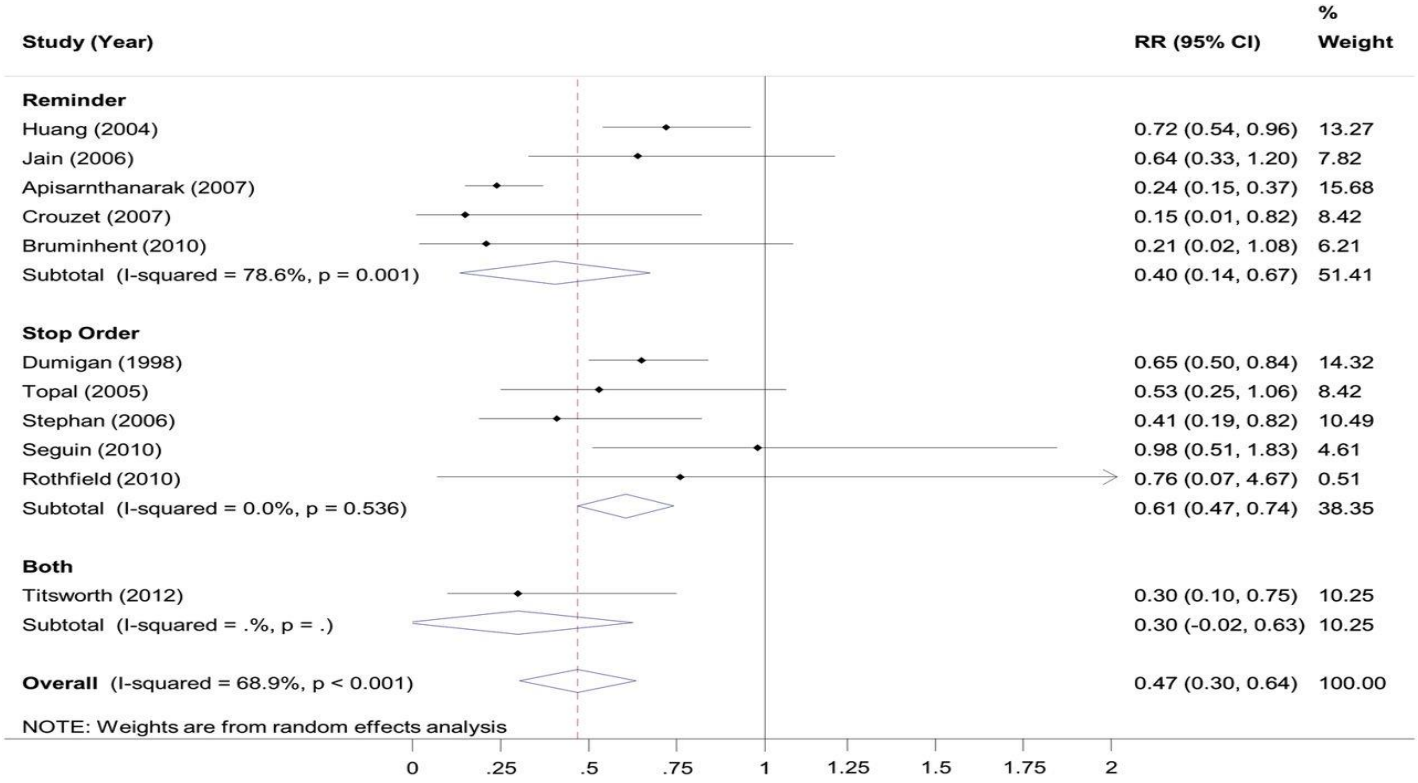
1. Aseptic insertion
2. Proper maintenance and dependant drainage
3. Condom or intermittent catheterization in appropriate patients
4. Catheter required (Daily Assessment)

PROPER MAINTENANCE

ASEPTIC INSERTION

DEPENDENT DRAINAGE

Meta-analysis of rate ratios for catheter-associated urinary tract infection episodes per 1000 catheter days, for intervention versus control groups, stratified by type of intervention to prompt catheter removal.



Meddings J et al. BMJ Qual Saf 2014;23:277-289

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BMJ Quality & Safety

Bundle for the prevention of ventilator associated pneumonia (VAP)

- VAP- New pneumonia occurring > 48 hours after endotracheal intubation
- In 20% of patients receiving mechanical ventilation[1]
- Associated with increased antibiotic use, length of hospitalization and healthcare costs[1]
- Mortality 20% to 50%, and attributable mortality is estimated at 13%[2]
- Over half the cases of VAP may be preventable with evidence-based strategies, with an impact on mortality[3]

1.Safdar N, Dezfulian C, Collard HR, Saint S. Clinical and Economic Consequences of Ventilator-Associated Pneumonia: a Systematic Review. Crit Care Med. 2005; 33(10):2184–93.

2. Melsen WG, Rovers MM, Groenwold RH, et al. Attributable Mortality of Ventilator-Associated Pneumonia: a Meta-Analysis of Individual Patient Data from Randomised Prevention Studies. Lancet Infect Dis. 2013; 13(8):665–71. doi: 10.1016/S1473-3099(13)70081-1.

3.Umscheid CA, Mitchell MD, Doshi JA, et al. Estimating the Proportion of Healthcare-Associated Infections that are Reasonably Preventable and the Related Mortality and Costs. Infect Control Hosp Epidemiol. 2011; 32(2):101–14. doi: 10.1086/657912.

VAP Care Bundles

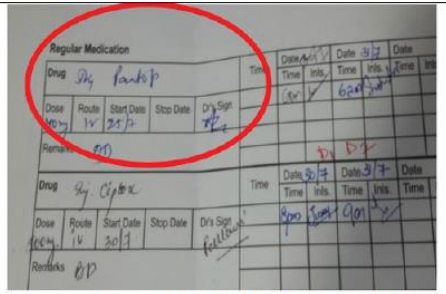
- Elevate the head of the bed to between 30 and 45 degrees
- Daily “sedation interruption” and daily assessment of readiness to extubate
- Prophylaxis for peptic ulcer disease
- Prophylaxis for deep venous thrombosis

- Daily oral care with chlorhexidine
- Utilization of endotracheal tubes with subglottic secretion drainage (only for patients ventilated for longer than 24 hours)
- Initiation of safe enteral nutrition within 24-48 hours of ICU admission

Hand hygiene and Gloves

Adequate disinfection and maintenance of equipment and devices

ELEVATION OF HEAD-END OF BED



PEPTIC ULCER PROPHYLAXIS

DAILY SEDATION VACATION AND
ASSESSMENT OF READINESS TO EXTUBATE

DVT PUMP

DVT PROPHYLAXIS

VAP Bundle

Table 4. Associations Between Processes of Care and Patient Outcomes

Process of Care	Outcome, HR (95% CI)							
	Time to Extubation Alive	*P* Value	Ventilator Mortality	*P* Value	Time to Hospital Discharge Alive[a]	*P* Value	Hospital Mortality[a]	*P* Value
Head-of-bed elevation	1.38 (1.14-1.68)	.001	0.86 (0.59-1.25)	.42	1.01 (0.96-1.05)	.80	0.98 (0.93-1.03)	.36
Sedative infusion interruptions	1.81 (1.54-2.12)	<.001	0.51 (0.38-0.68)	<.001	1.09 (1.05-1.14)	<.001	0.92 (0.88-0.96)	<.001
Spontaneous breathing trials	2.48 (2.23-2.76)	<.001	0.28 (0.20-0.38)	<.001	1.00 (0.98-1.02)	.92	0.99 (0.96-1.02)	.46
Prophylaxis								
Thromboembolism	2.57 (1.80-3.66)	<.001	1.39 (0.82-2.37)	.23	1.02 (0.97-1.07)	.41	0.97 (0.92-1.02)	.26
Stress ulcer	1.12 (0.95-1.32)	.17	0.91 (0.64-1.31)	.62	1.00 (0.98-1.03)	.89	1.00 (0.96-1.04)	.90
Oral care with chlorhexidine	0.92 (0.80-1.04)	.18	1.63 (1.15-2.31)	.006	0.99 (0.98-1.01)	.26	1.01 (0.98-1.05)	.44

Abbreviation: HR, hazard ratio.

[a] Analyses are restricted to patients who survived mechanical ventilation.

Klompas M, Li L, Kleinman K, Szumita PM, Massaro AF. Associations Between Ventilator Bundle Components and Outcomes. *JAMA Intern Med.* 2016;176(9):1277–1283.

Monitor and measure effectivity of bundle

- Calculate the VAP Rate
  - Numerator: No. of VAP cases
  - Denominator: Total ventilator days
  - Multiply by 1,000 to convert to a rate
- Calculate the compliance with Ventilator Bundle
  - Numerator: No. of vented patients receiving ALL components of bundle
    - Note: This is an "all or nothing" measure: a patient who had 1, 2 or 3 (not all) of the elements would count as a "no".
  - Denominator: Total No. of patients on ventilators for the day of the prevalence sample

Maintenance Bundle for Ventilator Care

Day	Adherence to hand hygiene	Assessment of Readiness to Extubate (Done or not)	PUD prophylaxis Needed or not	DVT prophylaxis Given or not	Daily oral care with Chlorhexidine			Suspected VAP	Signature	
					6 am	12 noon	6 pm		Doctor	Nurse
1										
2										
3										

Maintenance Bundle for Central line Care

Day	Daily Catheter Care by Aseptic technique			Any local signs of infection	Whether Dressing changed or not	CVC still required or not	Signature	
	Alcohol hub decontamination during handling	Hand hygiene before handling	Chlorhexidine gluconate 2%for insertion site dressing changes				Doctor	Nurse
1								
2								
3								

Maintenance Bundle for Urinary Catheter Care

Day	Daily Catheter Care by Aseptic technique (Vaginal care/ Meatal care) + Perineal care			Closed Drainage system (Yes/No)	Drainage bag above floor & below bladder lever (Yes/No)	Catheter Needed (Yes/No)	Signature
	6 am	12 noon	6 pm				
1							
2							
3							

Move to New Areas

- Develop a sedation protocol
- Develop a weaning protocol
- Create a pre-extubation worksheet to assess the risk of failed extubation
- Spread the use of ventilator bundle to other ICU's in your hospital

Bundle for the prevention of surgical site infection (SSI)

- SSIs: infections of the incision or organ or space that occur after surgery
- SSIs complicate ~1.9% of surgical procedures in US[1] and 10% in African countries with a 9.7% case fatality rate[2]
- Half of SSIs are preventable[3]

1.Berrios-Torres SI, Umscheid CA, Bratzler DW, et al. Centers for Disease Control and Prevention Guideline for the Prevention of Surgical Site Infection, 2017. JAMA Surg. 2017; 152(8):784–91. doi: 10.1001/jamasurg.2017.0904

2.Biccard BM, Madiba TE, Kluyts HL, et al. Perioperative Patient Outcomes in the African Surgical Outcomes Study: a 7-Day Prospective Observational Cohort Study. Lancet. 2018; pii: S0140- 6736(18)30001-1

3.Mangram AJ, Horan TC, Pearson ML, et al. Guideline for Prevention of Surgical Site Infection, 1999. Centers for Disease Control and Prevention (CDC) Hospital Infection Control Practices Advisory Committee. Am J Infect Control. 1999; 27(2):97–132; quiz 133–4

SSI Care Bundle

- Administration of parenteral antibiotic prophylaxis

- should be administered within 60 minutes prior to incision, including for Cesarean section25

- Re dosing is recommended for prolonged procedures , major blood loss or excessive burns 22

- Patients should be washed with soap or an antiseptic agent within a night prior to surgery
- Avoid hair removal: use electric clippers if necessary
- Use alcohol-based disinfectant for skin preparation in the operating room
- Maintain intraoperative glycemic control with target blood glucose levels < 200 mg/dL
- Maintain perioperative normothermia
- Administer increased fraction of inspired oxygen during surgery and after extubation in the immediate postoperative period in patients with normal pulmonary function

Hand hygiene, sterilization of surgical equipment, use of appropriate surgical attire, and staff education and feedback

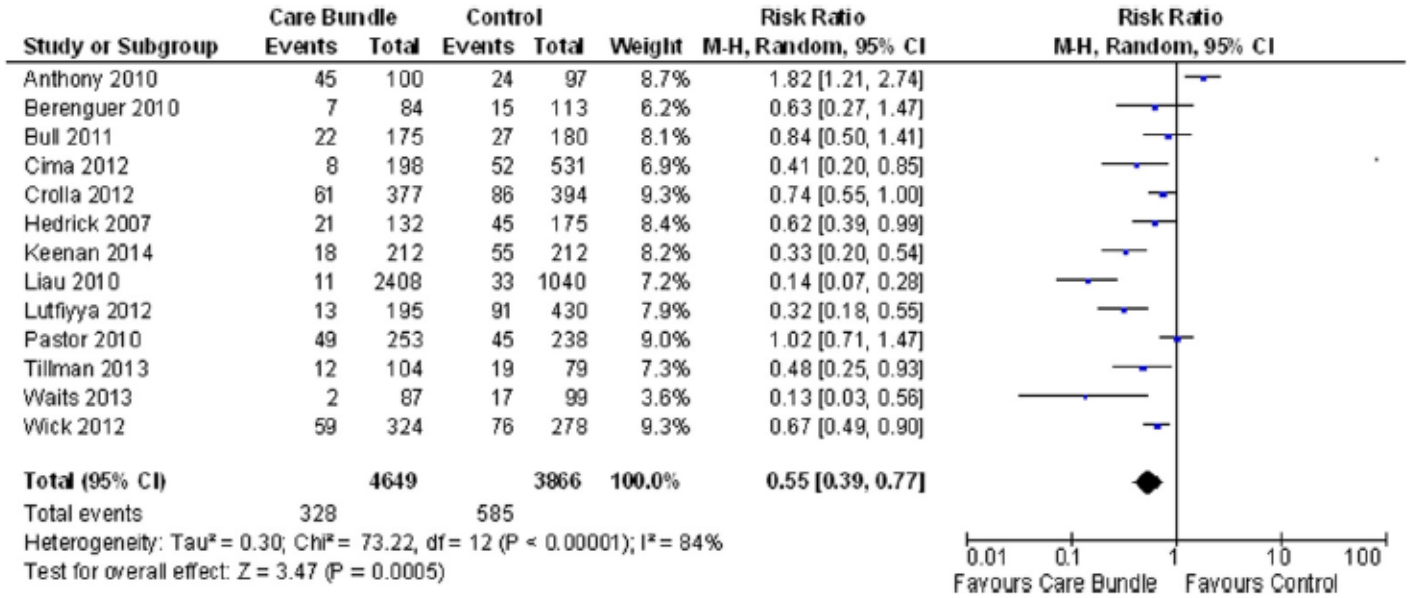


Fig 2. Forest plot. Surgical care bundles to reduce the risk of surgical site infections.

Tanner J et al. Do surgical care bundles reduce the risk of surgical site infections in patients undergoing colorectal surgery? A systematic review and cohort meta-analysis of 8,515 patients. Surgery 2015; 158(1)

Health Protection Scotland

Preventing cross transmission when an individual has known or suspected CDI

NHS National Services Scotland

Patient with *Clostridium difficile* infection (CDI)

If a patient* has a known or suspected CDI

Ensure that:

- patients with CDI are isolated in a single room with en suite facilities or an allocated commode, until they are at least 48 hours symptom free and bowel movements have returned to patient's normal
- unnecessary antimicrobial treatment are stopped where this is indicated by local antimicrobial policy and that the antibiotic regimens of the patient with CDI is reviewed on a daily basis
- personal protective equipment (PPE) (i.e. gloves and aprons) is donned prior to, and subsequently removed, following each period of care activity for a patient with CDI
- the patient with CDI's immediate environment is cleaned at least daily using neutral detergent followed by a disinfectant containing 1000 parts per million (ppm) available chlorine(av cl) (or a combined detergent/disinfectant (1000ppm av cl))
- hand washing is performed after body fluid exposure during patient care and after touching a patient's surroundings following a period of care activity (WHO Moments 3 and 5)
- ensure that patients have access to handwashing facilities and promote hand washing after patient uses toileting facilities and before eating
- care equipment e.g. blood pressure cuffs, thermometers and stethoscopes is dedicated to a single patient with CDI whenever possible

https://www.hps.scot.nhs.uk

Health Protection Scotland

Preventing CDI Cross-Transmission in Healthcare settings

NHS National Services Scotland

RISK FACTORS

- *Clostridium difficile* infection (CDI) is the most common cause of intestinal infections associated with antimicrobial treatments which have been given to treat other infection and is recognised as an important cause of HAI. Presentation ranges in severity from mild diarrhoea to pseudomembranous colitis and toxic megacolon and CDI can result in death.
- The risk of CDI is greater when patients with diarrhoea also have: current or recent use of antimicrobial agents, increased age, prolonged hospital stay, serious underlying diseases, surgical procedures (in particular bowel procedures), immunocompromising conditions or through use of proton pump inhibitors (PPIs).
- CDI produces spores that are difficult to eradicate from the environment. Cross transmission occurs through the faecal-oral route, via direct and indirect contact.

EQUIPMENT

- Ensure that care equipment e.g. blood pressure cuffs, thermometers and stethoscopes is dedicated to a single patient with CDI whenever possible.
- Equipment must be visibly clean, fit-for-purpose and capable of being effectively cleaned/decontaminated between uses.
- Ensure there is a selection of consumables including disposable gloves, disposable aprons, detergent and disinfectant (containing 1000 parts per million available chlorine) available, as well as adequate commodes.

ENVIRONMENT

- Surfaces should be clear from extraneous items to reduce the risk of contamination and aid cleaning.
- the patient with CDI's immediate environment is cleaned at least daily using neutral detergent followed by a disinfectant containing 1000 parts per million (ppm) available chlorine(av cl) (or a combined detergent/disinfectant (1000ppm av cl)). (Alcohol is ineffective against *Clostridium difficile*).

Preventing CDI Cross-Transmission in Healthcare settings

METHODS

- Ensure that patients with CDI are isolated in a single room with en suite facilities or an allocated commode, until they are at least 48 hours symptom free and bowel movements have returned to patient's normal.
- Ensure that PPE (i.e. gloves and aprons) is donned prior to, and subsequently removed, following each period of care activity for a patient with CDI. PPE must be put on before entering the room/ environment.
- Unnecessary antimicrobial treatment are stopped where this is indicated by local antimicrobial policy and that the antibiotic regimens of the patient with CDI is reviewed on a daily basis.
- Ensure that hand washing is performed after body fluid exposure during patient care and after touching patient's surroundings following a period of care activity (WHO Moment 3 and 5).
- Ensure that patients have access to handwashing facilities and promote hand washing after patient uses toileting facilities and before eating.

METHODS

- Ensure that a CDI care plan or similar is used to direct care.
- Ensure that a stool chart and a fluid balance chart are used. Report any abnormal findings.
- Monitor asymptomatic patients for possible relapse.
- Early diagnosis is essential with all wards/units; determine a baseline incidence of CDI and set a trigger that will ensure rapid targeted action.
- Clinical staff should review use of proton pump inhibitors (PPI).

HEALTHCARE WORKERS (HCWs)

- Should be aware of the availability of single rooms with en suite facilities for patients with CDI. When there is insufficient single rooms available, patients should be nursed in a cohort.
- Must be aware of CDI: symptoms, major risk factors, the trigger for their area, the actions required to prevent cross-transmission and outbreaks and the possibility of recurrence.
- Must follow the National Infection Prevention and Control Manual and local policies.
- Must obtain stool specimens from all patients 15 years and over with diarrhoea requesting testing for CD toxin as soon as possible or when suspected in younger patients.
- Must explain to the patient what CDI is, and seek the patient's and visitors co-operation in complying with infection control precautions.
- Infection Control Teams should undertake surveillance and feedback results locally to all relevant staff including managers.

Environmental cleaning Care Bundle

The REACH Study

- Multicenter, randomized trial 11 acute care hospitals in Australia
- Intervention periods varied from 20 weeks to 50 weeks
- A multimodal intervention, focusing on optimizing product use, technique, staff training, auditing with feedback, and communication, for routine cleaning
- The primary outcomes were incidences of health-care-associated *Staphylococcus aureus* bacteraemia, *Clostridium difficile* infection, and vancomycin-resistant enterococci infection
- The secondary outcome was the thoroughness of cleaning of frequent touch points, assessed by a fluorescent marking gel

Mitchell B. et al. An environmental cleaning bundle and health-care-associated infections in hospitals (REACH): a multicentre, randomised trial. The Lancet Infectious Diseases(2019)

Table 1 Environmental cleaning bundle

Bundle component	Key activities
Training	- Tailored training activities with environmental services staff at the commencement of the intervention phase, as part of induction for new cleaning staff, and as required throughout the intervention phase - Content to reflect the trial site context and cleaning roles and responsibilities
Technique	Attention to cleaning technique, including: - A defined and consistent cleaning sequence - A focus on cleaning high risk frequent touch points - The use of sufficient pressure and movement - Adherence to manufacturers' instructions for product use
Product	- Disinfectant minimally used for all discharge cleans and for daily cleans of high risk/precautions rooms - Point of care wipes used for medical equipment
Audit	- Audit activities across the trial site using ultraviolet (UV) marker technology (all trial sites) and adenosine tri-phosphate (ATP) luminosity (3 trial sites) - Regular audit feedback to cleaning staff - Summarised audit results provided to clinical governance committees
Communication	- Promotion of a team approach - Daily contact between cleaners and ward leaders or managers - Cleaners represented on relevant clinical governance committees

Mitchell B. et. Lancet Infectious Diseases(2019)

Environmental cleaning Care Bundle

The REACH Study

- Vancomycin-resistant enterococci infections reduced from 0·35 to 0·22 per 10 000 occupied bed-days (relative risk 0·63, 95% CI 0·41–0·97, p=0·0340)
- *S aureus* bacteremia (0·97 to 0·80 per 10 000 occupied bed-days; 0·82, 0·60–1·12, p=0·2180)
- *C difficile* infections (2·34 to 2·52 per 10 000 occupied bed-days; 1·07, 0·88–1·30, p=0·4655) did not change significantly
- The intervention increased the percentage of frequent touch points cleaned in bathrooms from 55% to 76% (odds ratio 2·07, 1·83–2·34, p<0·0001) and bedrooms from 64% to 86% (1·87, 1·68–2·09, p<0·0001)

Mitchell B. et. Lancet Infectious Diseases(2019)

The Most Effective Bundle Implementation

- Robust leadership
- Stringent protocols
- Participation of all members of the available healthcare team
- Reliable measurement of compliance
- Feedback of results
- The enablement of nursing staff to stop practice if the required protocols are not appropriately followed by other team members

Richards GA, Brink AJ, Messina AP, et al. Stepwise Introduction of the 'Best Care Always' Central-Line-Associated Bloodstream Infection Prevention Bundle in a Network of South African hospitals. J Hosp Infect. 2017; 97(1):86–92. doi: 10.1016/j.jhin.2017.05.013.

Ista E, van der Hoven B, Kornelisse RF, et al. Effectiveness of Insertion and Maintenance Bundles to Prevent Central-Line-Associated Bloodstream Infections in Critically Ill Patients of All Ages: a Systematic Review and Meta-Analysis. Lancet Infect Dis. 2016; 16(6):724–34. doi: 10.1016/S1473-3099(15)00409-0.

Lavallée *et al. Implementation Science* (2017) 12:142
DOI 10.1186/s13012-017-0670-0

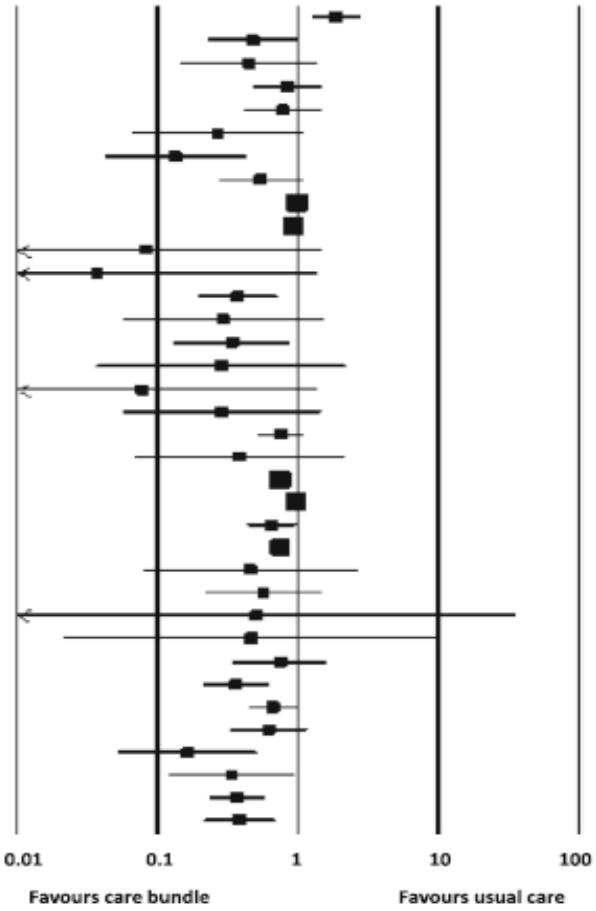
Implementation Science

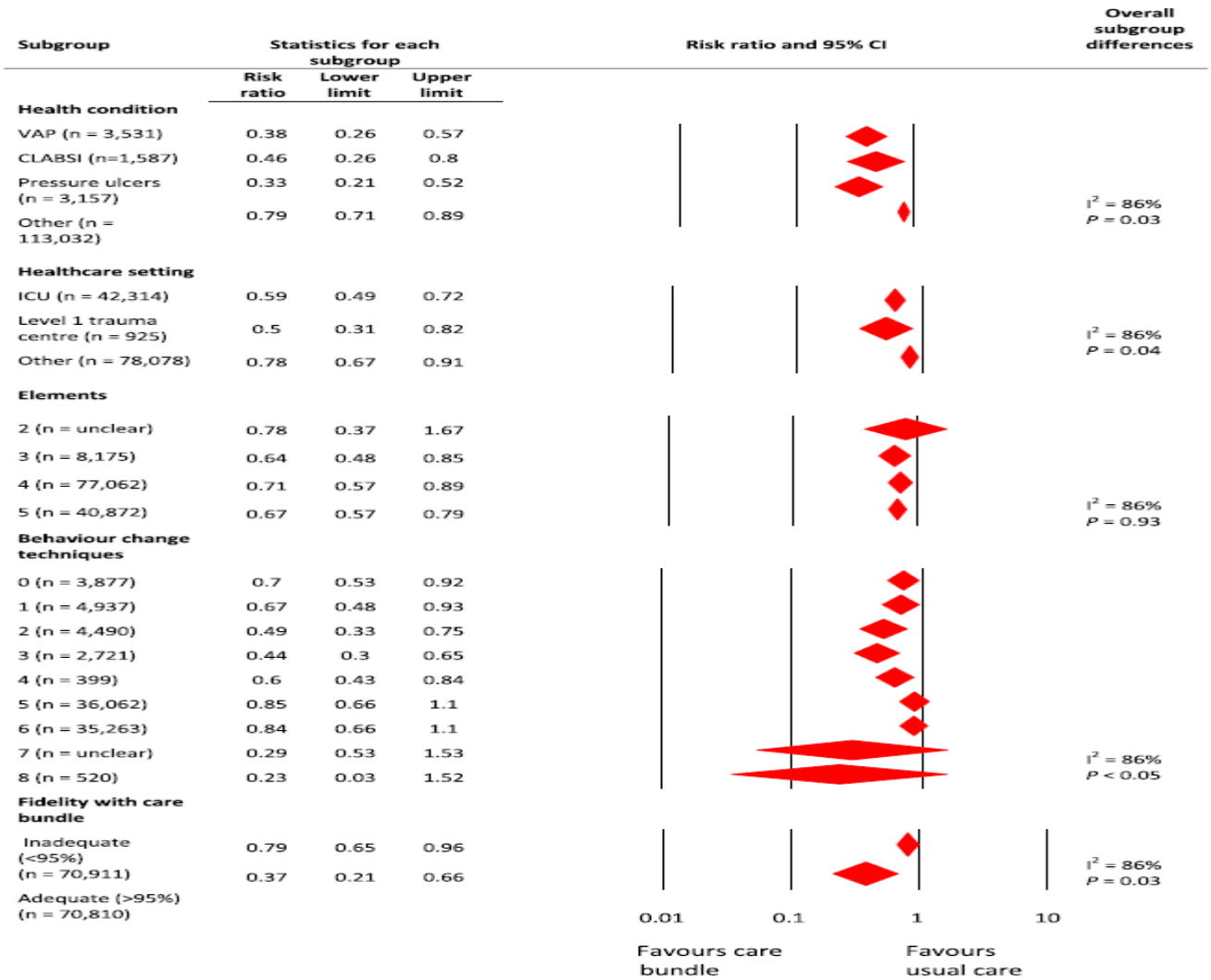
SYSTEMATIC REVIEW Open Access

The effects of care bundles on patient outcomes: a systematic review and meta-analysis

Jacqueline F. Lavallée[1,2,3*], Trish A. Gray[1,2], Jo Dumville[1,2], Wanda Russell[4] and Nicky Cullum[1,2,5]

Study name	Outcome	Risk ratio	Lower limit	Upper limit
Anthony et al. (2011)*	SSIs	1.875	1.244	2.827
Chaboyer et al. (2016)*	HAPU	0.478	0.222	1.025
Chipps et al. (2016)*	MRSA/MSSA	0.447	0.146	1.365
Jennings et al. (2015)*	Readmissions	0.849	0.475	1.518
Loftus et al. (2012)*	Contamination	0.782	0.408	1.499
Al-Tawfiq et al. (2010)	HAP/1000	0.269	0.067	1.083
Anderson et al. (2015)	Pressure ulcers	0.133	0.041	0.428
Antworth et al. (2013)	Candidemia	0.541	0.270	1.087
Battersby et al. (2014a)	Exclusive MBM	0.978	0.931	1.027
Battersby et al. (2014b)	Any MBM	0.932	0.860	1.009
Berenholtz et al. (2011)	VAP/1000	0.083	0.005	1.490
Boesch et al. (2012)	Trache-PU	0.037	0.001	1.402
Conway-Morris et al. (2011)	VAP/1000	0.375	0.194	0.724
Duzkaya et al. (2016)	CAUTI	0.295	0.056	1.552
El Azab et al. (2013)	VAP/1000	0.340	0.130	0.890
Eom et al. (2014)	VAP/1000	0.284	0.036	2.232
Hakko et al. (2015)	CLABSI/1000	0.078	0.004	1.380
Hocking & Pirrett (2013)	CLAB/1000	0.285	0.055	1.467
Huddart et al. (2014)	Mortality	0.750	0.506	1.112
Jeong et al. (2013)	CLABSI/1000	0.383	0.069	2.130
Levy et al. (2014a)	Mortality	0.749	0.725	0.774
Levy et al. (2014b)	Mortality	0.966	0.935	0.998
Lim et al. (2015)	CAP mortality	0.648	0.428	0.981
Lindsay et al. (2013)	Systolic BP	0.750	0.677	0.830
Muzsynski et al. (2013)	VAT/1000	0.462	0.079	2.693
Pena-Lopez et al. (2016)	VARI/1000	0.568	0.214	1.509
Rinke et al. (2013a)	CLABSI/1000	0.508	0.007	35.743
Rinke et al. (2013b)	Bacteraemia	0.465	0.021	10.177
Salama et al. (2016)	CLABSI/1000	0.744	0.343	1.610
Schindler (2009)	Pressure ulcers	0.362	0.205	0.638
Schweizer et al. (2015)	SSIs	0.668	0.443	1.007
Silva Resende et al. (2011)	CABI/1000	0.618	0.326	1.172
Stano et al. (2013)	MRSA/1000	0.163	0.052	0.513
Steiner et al. (2015)	CLABSI/1000	0.338	0.119	0.959
Stolbrink et al. (2014)	HAP	0.369	0.232	0.589
Subramanian et al. (2013)	VAP/1000	0.385	0.213	0.693




Subgroup
Statistics for each subgroup
Risk ratio
Lower limit
Upper limit
Risk ratio and 95% CI
Overall subgroup differences
Health condition
VAP (n = 3,531) 0.38 0.26 0.57
CLABSI (n=1,587) 0.46 0.26 0.8
Pressure ulcers (n = 3,157) 0.33 0.21 0.52
Other (n = 113,032) 0.79 0.71 0.89
I² = 86%
P = 0.03
Healthcare setting
ICU (n = 42,314) 0.59 0.49 0.72
Level 1 trauma centre (n = 925) 0.5 0.31 0.82
Other (n = 78,078) 0.78 0.67 0.91
I² = 86%
P = 0.04
Elements
2 (n = unclear) 0.78 0.37 1.67
3 (n = 8,175) 0.64 0.48 0.85
4 (n = 77,062) 0.71 0.57 0.89
5 (n = 40,872) 0.67 0.57 0.79
I² = 86%
P = 0.93
Behaviour change techniques
0 (n = 3,877) 0.7 0.53 0.92
1 (n = 4,937) 0.67 0.48 0.93
2 (n = 4,490) 0.49 0.33 0.75
3 (n = 2,721) 0.44 0.3 0.65
4 (n = 399) 0.6 0.43 0.84
5 (n = 36,062) 0.85 0.66 1.1
6 (n = 35,263) 0.84 0.66 1.1
7 (n = unclear) 0.29 0.53 1.53
8 (n = 520) 0.23 0.03 1.52
I² = 86%
P < 0.05
Fidelity with care bundle
Inadequate (<95%) (n = 70,911) 0.79 0.65 0.96
Adequate (>95%) (n = 70,810) 0.37 0.21 0.66
I² = 86%
P = 0.03
0.01
0.1
1
10
Favours care bundle
Favours usual care

Take Home Practice

- Your setting !
- Not ‘silver bullet’ solutions for all infections
- Targeted group of patients and in a common hospital location
- Concise, simple, and prescriptive - (Institute for Healthcare Improvement)
- Not be static, but must adapt to changing evidence
- Obtain approval, commitment and endorsement from leadership, clinicians, nursing staff, and HCW
- Be clear on the purpose and collective goal of the desired process and communicate this message
- Identify members of the healthcare team to test the implementation of the proposed bundle elements
- Create awareness and provide the team with the applicable guidelines, evidence, toolkits and supplies
- Implement the interventions of each bundle element every time for every eligible patient
- Track compliance to the care bundle as an “all or nothing” measure and feedback results
- Adjust the delivery system and address logistical concerns
- Plan-Do-Study-Act (PDSA)
- Identify bundle champion or leader

Thank You