

# Infection

## Evidence Update September 2014

A summary of selected new evidence relevant to NICE clinical guideline 139 'Prevention and control of healthcare-associated infections in primary and community care' (2012)

### Evidence Update 64



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# Introduction

**Evidence Updates are intended to increase awareness of new evidence – they do not replace current NICE guidance and do not provide formal practice recommendations.**

Evidence Updates reduce the need for individuals, managers and commissioners to search for new evidence. For contextual information, this Evidence Update should be read in conjunction with the relevant clinical guideline.

This Evidence Update provides a summary of selected new evidence published since the literature search was last conducted for the following NICE guidance:

<sup>1</sup>  [Infection](#). NICE clinical guideline 139 (2012)

A search was conducted for new evidence from 18 April 2011 to 14 April 2014. A total of 2219 pieces of evidence were initially identified. After removal of duplicates, a series of automated and manual sifts were conducted to produce a list of the most relevant references. The remaining 22 references underwent a rapid critical appraisal process and then were reviewed by an [Evidence Update Advisory Group \(EUAG\)](#), which advised on the final list of 6 items selected for the Evidence Update. See [Appendix A](#) for details of the evidence search and selection process.

Evidence selected for inclusion in this Evidence Update may highlight a potential impact on guidance: that is, a high-quality study, systematic review or meta-analysis with results that suggest a change in practice. Evidence that has no impact on guidance may be a key read, or may substantially strengthen the evidence base underpinning a recommendation in the NICE guidance.

The Evidence Update gives a preliminary assessment of changes in the evidence base and a final decision on whether the guidance should be updated will be made by NICE according to its published processes and methods.

This Evidence Update was developed to help inform the review proposal on whether or not to update NICE clinical guideline 139 ([NICE CG139](#)). The process of updating NICE guidance is separate from both the process of an Evidence Update and the review proposal.

See the [NICE clinical guideline development methods](#) for further information about updating clinical guidelines.

## NICE Pathways

NICE Pathways bring together all related NICE guidance and associated products in a set of interactive topic-based diagrams. The following NICE Pathways cover advice and recommendations related to this Evidence Update:

- [Prevention and control of healthcare-associated infections](#). NICE Pathway
- [Urinary incontinence in neurological disease](#). NICE Pathway

## Quality standards

- [Infection prevention and control](#). NICE quality standard 61


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<sup>1</sup> [NICE-accredited guidance](#)

## Other relevant guidance

The following guidance is also of relevance to UK practice, however the Evidence Update does not discuss any potential effect the new evidence may have on their recommendations:

<sup>2</sup>

-  Loveday HP, Wilson JA, Pratt RJ et al. (2014) [epic 3: national evidence-based guidelines for preventing healthcare-associated infections in NHS hospitals in England](#). Journal of Hospital Infection 86 (Suppl. 1): S1–70
- World Health Organization (2009) [WHO guidelines on hand hygiene in health care](#).

## Feedback

If you would like to comment on this Evidence Update, please email [contactus@evidence.nhs.uk](mailto:contactus@evidence.nhs.uk)

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<sup>2</sup> [NICE-accredited guidance](#)

## Key points

The following table summarises the key points for this Evidence Update and indicates whether the new evidence may have a potential impact on NICE clinical guideline 139 ([NICE CG139](#)). Please see the full commentaries for details of the evidence informing these key points.

The section headings used in the table below are taken from [NICE CG139](#).

**Evidence Updates do not replace current NICE guidance and do not provide formal practice recommendations.**

Key point	Potential impact on guidance	
	Yes	No
<b>Standard principles</b> <b><i>Use of personal protective equipment</i></b> <ul style="list-style-type: none"> <li>Transfer of <i>Clostridium difficile</i> spores to gloved hands is just as likely from environmental surfaces touched by patients with <i>C difficile</i> infection as from the skin surfaces of such patients.</li> </ul>		✓
<b>Long-term urinary catheters</b> <b><i>Maintenance of catheters and other indwelling devices</i></b> <ul style="list-style-type: none"> <li>People in community care with urinary catheters, enteral feeding devices or both may have a higher incidence of infection with antibiotic-resistant microorganisms than people without devices, with those who have both feeding devices and urinary catheters most at risk.</li> </ul>		✓
<b>Enteral feeding</b> <b><i>Education of patients, their carers and healthcare workers</i></b> <ul style="list-style-type: none"> <li>Commercial formulas for home enteral feeding and ongoing clinical support may be associated with fewer hospital admissions and complications than unsupervised feeding with homemade diets.</li> </ul>		✓
<b>Vascular access devices</b> <b><i>Vascular access device site care</i></b> <ul style="list-style-type: none"> <li>Chlorhexidine gluconate dressings appear to be more effective than polyurethane films at inhibiting the growth of normal skin bacteria in healthy people after antiseptic preparation.</li> </ul> <b><i>General principles for management of vascular access devices</i></b> <ul style="list-style-type: none"> <li>Ethanol catheter locks may be associated with fewer catheter-related bloodstream infections than heparin locks in children with intestinal failure who are receiving parenteral nutrition.</li> </ul>		✓ ✓

Key point	Potential impact on guidance	
	Yes	No
<ul style="list-style-type: none"> <li>Changing peripheral intravenous catheters (cannulae) when clinically indicated rather than every 72 to 96 hours in hospitalised or community patients may not affect the incidence of catheter-related bloodstream infections or phlebitis. Replacement of the catheter only when signs of inflammation, infiltration or blockage are present may be a more appropriate strategy than routine replacement.</li> </ul>	✓*	

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\* Evidence Updates are intended to increase awareness of new evidence and do not change the recommended practice as set out in current guidance. Decisions on how the new evidence may impact guidance will be made when the need to update guidance is reviewed by NICE. For further details of this evidence in the context of current guidance, please see the full commentary.

# 1 Commentary on new evidence

These commentaries focus on the 'key references' identified through the search process and prioritised by the EUAG for inclusion in the Evidence Update, which are shown in bold text. Supporting references provide context or additional information to the commentary. Section headings are taken from NICE clinical guideline 139 ([NICE CG139](#)).

## 1.1 [Standard principles](#)

### **Use of personal protective equipment**

[NICE CG139](#) states that gloves must be worn for invasive procedures, contact with sterile sites and non-intact skin or mucous membranes, and all activities that have been assessed as carrying a risk of exposure to blood, body fluids, secretions or excretions, or to sharp or contaminated instruments.

Gloves must be worn as single-use items. They must be put on immediately before an episode of patient contact or treatment and removed as soon as the activity is completed. Gloves must be changed between caring for different patients, and between different care or treatment activities for the same patient.

The World Health Organization's [guideline on hand hygiene in healthcare](#) outlines '5 moments for hand hygiene' to improve infection control in healthcare settings. The first step in protocol recommends that healthcare workers use hand hygiene measures before coming into contact with the patient: that is, between the last hand-to-surface contact with an object in the healthcare area and the first contact with the patient. This step aims mainly to prevent infection of the patient by transfer of healthcare-associated microorganisms from the environment to the patient through unclean hands.

A cross-sectional study by [Guerrero et al. \(2012\)](#) compared the transfer of *Clostridium difficile* spores to gloved hands after contact with the skin of infected patients and the environmental surfaces in their rooms. A convenience sample of 30 patients with *C difficile* infection at a single hospital in the USA was recruited. Within 3 days of diagnosis, a gloved hand with moistened fingertips (to more closely mimic bare hands) was applied to each patient's groin, abdomen, chest, arm and hand. A fresh pair of gloves was used each time. Imprint cultures of the gloved hands were then obtained on agar plates to recover any *C difficile* spores transferred from each skin site to the gloves. The same process was used to take environmental cultures from the bed rail, bedside table, telephone and call button in the rooms of the infected patients. Culture plates were incubated for 48 hours and the number of *C difficile* colonies on each plate was counted.

Half (50%) of all handprint cultures from skin sites were positive for any contamination with *C difficile* (for the purposes of analysis, the groin was excluded), as were half (50%) of all environment handprint cultures ( $p=0.99$ ). Likewise, the number of bacterial colonies in the cultures was similar for skin surfaces (mean=14 colony-forming units [CFU], range 1 to 200 CFU) and environmental surfaces (mean=7 CFU, range 1 to 60 CFU,  $p=0.22$ ). Of the 5 skin sites assessed, the groin produced the highest number of colonies (mean=121 CFU), followed by the abdomen (mean=29 CFU). The bed rail was the environmental site that produced the highest number of *C difficile* colonies (8 CFU).

Limitations of this study include the small sample size ( $n=30$ ). Additionally, all participants were male hospital inpatients, most of whom were elderly (mean age=63 years, range 31 to 87 years), which may limit transferability of results to other settings and populations. The colonies cultured were not molecularly typed to link them to the infected patients.

Finally, the handprint cultures were taken from simulations of physical examination and contact with environmental surfaces, rather than from episodes of routine care.

This evidence shows that transfer of *C difficile* spores to gloved hands is just as likely from environmental surfaces touched by patients with *C difficile* infection as from the skin surfaces of such patients. These data are consistent with recommendations in [NICE CG139](#) that gloves must be worn for all activities that have been assessed as carrying a risk of exposure to blood, body fluids, secretions or excretions. The guidance adds that gloves must be changed between caring for different patients, and between different care or treatment activities for the same patient. Furthermore, the World Health Organization's '5 moments for hand hygiene' emphasises measures to prevent transmission of infection from surfaces in the healthcare environment.

#### Key reference

Guerrero DM, Nerandzic MM, Jury LA et al. (2012) [Acquisition of spores on gloved hands after contact with the skin of patients with \*Clostridium difficile\* infection and with environmental surfaces in their rooms](#). *American Journal of Infection Control* 40: 556–8

#### Supporting reference

World Health Organization (2009) [WHO guidelines on hand hygiene in health care](#).

## 1.2 [Long-term urinary catheters](#)

### Maintenance of catheters and other indwelling devices

[NICE CG139](#) makes several recommendations on preventing infection in people with long-term urinary catheters and other indwelling devices.

With respect to urinary catheters, the guideline states that community and primary healthcare workers must be trained in catheter insertion, including suprapubic catheter replacement, and in catheter maintenance. Healthcare workers must decontaminate their hands and wear a new pair of clean, non-sterile gloves before manipulating a patient's catheter, and must decontaminate their hands after removing gloves. To minimise the risk of catheter-associated infections in patients with a long-term indwelling urinary catheter, healthcare professionals should:

- develop a patient-specific care regimen
- consider approaches such as reviewing the frequency of planned catheter changes and increasing fluid intake
- document catheter blockages.

The patient's clinical need for catheterisation should be reviewed regularly and the urinary catheter removed as soon as possible. Catheters should be changed only when clinically necessary or according to the manufacturer's current recommendations. Catheter insertion, changes and care should be documented.

Likewise healthcare workers caring for people with enteral feeding devices should be trained in enteral feeding and management of the administration system. Effective hand decontamination must be carried out before starting feed preparation, and minimal handling and an aseptic technique should be used to connect the administration system to the enteral feeding tube. In addition, the stoma should be washed daily with water and dried thoroughly.

[Wang et al. \(2012\)](#) conducted a prospective cohort study to measure infections caused by indwelling urinary catheters, enteral feeding devices, or both in nursing home residents. A group of people with indwelling devices and a randomly selected comparison cohort of people without devices were recruited from 15 community-based skilled nursing facilities in the USA. Each month, data on infections were obtained from the patients' medical records and culture samples were taken from multiple anatomical sites and, where applicable, from device sites to



test for antibiotic-resistant microorganisms (methicillin-resistant *Staphylococcus aureus*, vancomycin-resistant *Enterococcus* spp., and ceftazidime- and ciprofloxacin-resistant Gram-negative bacteria).

A total of 483 nursing home residents were eligible for the study and 178 (37%) took part (the main reason for non-enrolment was refusal to, or inability to obtain, consent). Of those enrolled, 90 had an indwelling device (48 had a urinary catheter, 30 an enteral feeding device, 12 had both) and 88 had no device. Patients in the indwelling device group were followed up for 263 resident-months and those in the no-device group for 644 resident-months.

The infection rate in the device group was higher than in the non-device group, with 331 infections per 1000 resident-months of follow up among people with indwelling devices compared with 171 infections per 1000 resident-months in those without devices (relative risk [RR] adjusted for age, functional status, and comorbidity=1.3, 95% confidence interval [CI] 1.1 to 1.5,  $p=0.002$ ). Patients with indwelling devices also had a higher rate of colonisation with antibiotic-resistant microorganisms than did those without devices (for example, 54% of people with devices were infected with antibiotic-resistant microorganisms at baseline versus 40% of those without devices). The rate of infection with antibiotic-resistant microorganisms was highest in people with both a urinary catheter and an enteral feeding tube (2743 organisms isolated per 1000 resident-months of follow up), followed by those with a urinary catheter only (2047 per 1000 resident-months) and those with a feeding tube only (1890 per 1000 resident-months).

Limitations of this study include the possibility of residual confounders affecting the different infection rates in the 2 groups and the variable length of follow up among participants (up to a year but no minimum stipulated). In addition, no information was available on the infection prevention practices in each of the nursing homes studied.

This evidence indicates that people in community care with urinary catheters, enteral feeding devices or both may have a higher incidence of infection with antibiotic-resistant microorganisms than people without devices, with those who have both feeding devices and urinary catheters most at risk. These data are consistent with [NICE CG139](#), which recommends various strategies to prevent infection in people with indwelling devices including removing urinary catheters as soon as possible.

#### Key reference

Wang L, Lansing B, Symons K et al. (2012) [Infection rate and colonization with antibiotic-resistant organisms in skilled nursing facility residents with indwelling devices](#). *European Journal of Clinical Microbiology & Infectious Diseases* 31: 1797–804 [[NIH Public Access author manuscript – full text](#)]

## 1.3 [Enteral feeding](#)

### Education of patients, their carers and healthcare workers

[NICE CG139](#) recommends that patients and carers should be educated about and trained in the techniques of hand decontamination, enteral feeding and the management of the administration system before being discharged from hospital. Follow-up training and ongoing support of patients and carers should be available for the duration of home enteral tube feeding.

The guideline also recommends that, wherever possible, pre-packaged, ready-to-use feeds should be used in preference to feeds requiring decanting, reconstitution or dilution.

[Klek et al. \(2011\)](#) conducted a before-and-after study in people using home enteral feeding to assess the benefits of a specialised nutrition programme comprising commercial enteral formulas and nutrition support teams. People who had been using home enteral tube feeding

with homemade diets for at least 12 months were retrospectively identified from an electronic database managed by a home nutrition company in Poland. These patients were then started on a commercial enteral feeding formula and received regular follow-up support visits every 2–3 months from clinical professionals on nutrition support teams. The rates of hospital admissions and complications were prospectively assessed 12 months after the introduction of this specialised nutrition programme.

A total of 203 people receiving home enteral feeding were included in the study cohort, most of whom were being fed via percutaneous endoscopic gastrostomy tube (61%) or nasogastric tube (21%). The mean number of hospital admissions in this cohort dropped from 1.09 admissions (95% CI 0.96 to 1.22) in the 12 months before the specialised nutrition programme was started to 0.21 admissions (95% CI 0.14 to 0.28) in the 12 months after (odds ratio [OR]=0.083, 95% CI 0.051 to 0.133,  $p<0.001$ ). The duration of hospitalisation and the duration of stay in an intensive care unit were also significantly lower after introduction of the programme ( $p<0.001$  for both). Of the types of complication that led to hospitalisation, the specialised nutrition programme was associated with a lower prevalence of pneumonia ( $p=0.012$ ), anaemia ( $p=0.012$ ), urinary tract infection ( $p=0.018$ ) and respiratory failure ( $p=0.019$ ).

Limitations of this study include that it was not clear whether the beneficial effects of the specialised programme were associated with the commercial enteral feeding formula or the supervision by clinical nutrition support teams, or the combination of both. In addition, the observational nature of the study meant that it could not show causality, and the outcomes may have been influenced by confounding factors such as feeding tube type or indication for enteral feeding.

This evidence shows that commercial formulas for home enteral feeding and ongoing clinical support may be associated with fewer hospital admissions and complications than unsupervised feeding with homemade diets. These results are consistent with recommendations in [NICE CG139](#) for follow-up training and ongoing support of patients and carers using home enteral tube feeding, and that pre-packaged, ready-to-use feeds should be used wherever possible.

#### Key reference

Klek S, Szybinski P, Sierzega M et al. (2011) [Commercial enteral formulas and nutrition support teams improve the outcome of home enteral tube feeding](#). *Journal of Parenteral & Enteral Nutrition* 35: 380–5

## 1.4 [Vascular access devices](#)

### Vascular access device site care

[NICE CG139](#) recommends that before inserting a peripheral vascular access device or a peripherally inserted central catheter, the patient's skin should be decontaminated with chlorhexidine gluconate in 70% alcohol at the insertion site. A sterile transparent semipermeable membrane dressing should be used to cover the vascular access device insertion site. A sterile gauze dressing covered with a sterile transparent semipermeable membrane dressing should be considered only if the patient has profuse perspiration, or if the vascular access device insertion site is bleeding or oozing. If a gauze dressing is used, it should be:

- changed every 24 hours, or sooner if it is soiled and
- replaced with a sterile transparent semipermeable membrane dressing as soon as possible.

The transparent semipermeable membrane dressing covering a central venous access device insertion site should be changed every 7 days, or sooner if the dressing is no longer intact or moisture collects under it. The transparent semipermeable membrane dressing at a

peripheral cannula insertion site should be left in situ for the life of the cannula, provided that the integrity of the dressing is retained.

The [epic-3 guidelines](#) for preventing healthcare-associated infections in hospitals suggest that healthcare workers consider the use of a chlorhexidine-impregnated sponge dressing in adult patients with a central venous catheter as a strategy to reduce catheter-related bloodstream infection.

A cohort study by [Bashir et al. \(2012\)](#) tested the antibacterial properties of chlorhexidine gluconate catheter dressings against normal skin flora. Two types of chlorhexidine dressing were compared with a control dressing (polyurethane film with no chlorhexidine gluconate):

- A catheter securement device that continuously released a hydrogel containing 2% chlorhexidine gluconate.
- A dry disc containing chlorhexidine gluconate.

Healthy adult volunteers were recruited at a single research facility in the USA. At the beginning of the 7-day treatment phase, samples of flora were collected from participants' backs. Antisepsis of the whole back area was then performed with a commercially available skin preparation containing 2% chlorhexidine gluconate in 70% isopropyl alcohol. Samples of flora were again collected after this antisepsis. Participants' backs were then split into 4 quadrants: in each quadrant the 2 study treatments and the control film were applied, and an antisepsis only site was designated. At 1, 4, and 7 days after baseline, dressings were removed and samples were taken from all 4 sites in each quadrant (the 2 test sites, the control site and the antisepsis site), which were then cultured for anaerobic bacteria.

A total of 30 people (72% male) completed the study. After initial antisepsis with the chlorhexidine gluconate commercial skin preparation (before the application of the dressings), the number of skin bacteria cultured fell from a mean of  $3.2 \log_{10}$  CFU/cm<sup>2</sup> to  $0.35 \log_{10}$  CFU/cm<sup>2</sup>. During the treatment phase, the mean level of bacteria growth under the chlorhexidine gluconate gel device was significantly lower than under the control film at day 1 ( $-0.55 \log_{10}$  CFU/cm<sup>2</sup>), day 4 ( $-0.85 \log_{10}$  CFU/cm<sup>2</sup>) and day 7 ( $-1.05 \log_{10}$  CFU/cm<sup>2</sup>,  $p < 0.001$  for all). Similarly, fewer bacteria were cultured from under the chlorhexidine gluconate disc than from under the control film at day 1 ( $-0.56 \log_{10}$  CFU/cm<sup>2</sup>), day 4 ( $-0.79 \log_{10}$  CFU/cm<sup>2</sup>) and day 7 ( $-0.62 \log_{10}$  CFU/cm<sup>2</sup>,  $p \leq 0.01$  for all). When the securement device and disc dressing were compared, significantly fewer bacteria were present under the securement device than the disc dressing at day 7 ( $-0.45 \log_{10}$  CFU/cm<sup>2</sup>,  $p = 0.0114$ ), but not at any other time point.

The authors suggested that patients' own skin flora can colonise central venous catheters and potentially cause bloodstream infections. They hypothesised that the chlorhexidine gluconate dressings they tested could possibly reduce the incidence of catheter-related bloodstream infections from skin flora in people with venous access devices.

Limitations of the evidence include that the participants were healthy and the culture samples were not taken from catheter insertion sites but from unbroken skin. The skin preparation approach meant that no longitudinal data were available from skin sites that had never been exposed to any form of chlorhexidine gluconate. In addition, this study was not able to establish whether growth of normal skin flora was associated with bloodstream infections.

This evidence indicates that chlorhexidine gluconate dressings appear to be more effective than polyurethane films at inhibiting the growth of normal skin bacteria in healthy people after antiseptic preparation. [NICE CG139](#) states that insertion sites should be decontaminated with chlorhexidine gluconate in 70% alcohol before a peripheral vascular access device or a peripherally inserted central catheter is used. It adds that a sterile transparent semipermeable membrane dressing, or a sterile gauze dressing covered with a sterile transparent semipermeable membrane, should be used to cover the vascular access device insertion site.

However, the guideline does not make any recommendations on dressings impregnated with chlorhexidine gluconate. Given the limitations of this study, this evidence is unlikely to have an impact on [NICE CG139](#).

Further research is needed to establish the efficacy of [chlorhexidine gluconate dressings applied to chlorhexidine gluconate prepped skin to prevent catheter-related bloodstream infections in people with venous access devices](#).

#### Key reference

Bashir MH, Olson LKM, Walters SA (2012) [Suppression of regrowth of normal skin flora under chlorhexidine gluconate dressings applied to chlorhexidine gluconate-prepped skin](#). *American Journal of Infection Control* 40: 344–8

#### Supporting reference

Loveday HP, Wilson JA, Pratt RJ et al. (2014) [epic 3: national evidence-based guidelines for preventing healthcare-associated infections in NHS hospitals in England](#). *Journal of Hospital Infection* 86 (Suppl. 1): S1–70

### General principles for management of vascular access devices

#### *Solutions to flush and lock catheter lumens*

[NICE CG139](#) recommends that, preferably, a sterile 0.9 percent sodium chloride injection should be used to flush and lock catheter lumens. When recommended by the manufacturer, implanted ports or opened-ended catheter lumens should be flushed and locked with heparin sodium flush solutions. Antibiotic lock solutions should not be used routinely to prevent catheter-related bloodstream infections. The guideline does not make any recommendations on the use of ethanol flush and lock solutions.

A systematic review and meta-analysis by [Oliveira et al. \(2012\)](#) compared ethanol locks with heparin locks in children receiving parenteral nutrition. The review searched for studies comparing the 2 types of locks in children with intestinal failure and an indwelling central venous catheter for parenteral nutrition. The primary outcome was the rate of catheter-related bloodstream infections per 1000 catheter-days.

A total of 4 before-and-after observational studies were identified that assessed 53 paediatric patients with intestinal failure. The rate of catheter-related bloodstream infections per 1000 catheter-days was significantly lower in patients who had ethanol locks than in those who had heparin locks (mean difference=−7.67, 95% CI −9.47 to −5.87,  $p<0.00001$ ; 4 studies,  $n=53$ ). The risk of infections was also lower in children who had ethanol locks (RR=0.19, 95% CI 0.12 to 0.32,  $p<0.00001$ ; 3 studies,  $n=38$ ). Adverse events data were not pooled; the events reported in the included studies were infrequent but often serious, such as disseminated intravascular coagulation and deep vein thrombosis.

Limitations of the analysis include the small number of patients in the studies assessed, and the heterogeneity among studies with respect to populations, protocols and definitions of outcomes. In addition, bias may have been present because of the retrospective, non-randomised design of the included studies and no formal analysis of adverse events data was conducted.

This evidence suggests that ethanol catheter locks may be associated with fewer catheter-related bloodstream infections than heparin locks in children with intestinal failure who are receiving parenteral nutrition. [NICE CG139](#) recommends that heparin sodium flush solutions should be used with implanted ports or opened-ended catheter lumens when recommended by the manufacturer. The guideline does not make any recommendations on ethanol locks. However, given the limitations of this analysis, this evidence is unlikely to have an impact on [NICE CG139](#).

Further research is needed in the form of randomised controlled trials to confirm the efficacy and safety of [ethanol locks to prevent catheter-related bloodstream infections in paediatric patients with intestinal failure undergoing parenteral nutrition](#).

#### Key reference

Oliveira C, Nasr A, Brindle M et al. (2012) [Ethanol locks to prevent catheter-related bloodstream infections in parenteral nutrition: a meta-analysis](#). *Pediatrics* 129: 318–29

#### **Changing intravenous administration sets**

[NICE CG139](#) recommends that, in general, intravenous administration sets in continuous use do not need to be replaced more frequently than at 72-hour intervals, unless they become disconnected or a catheter-related infection is suspected or documented. Administration sets for blood and blood components should be changed every 12 hours, or according to the manufacturer's recommendations. Administration sets used for total parenteral nutrition infusions should generally be changed every 24 hours. If the solution contains only glucose and amino acids, parenteral nutrition administration sets in continuous use do not need to be replaced more frequently than every 72 hours.

The [epic-3 guidelines](#), which focus on preventing healthcare-associated infections in hospital, recommend that central venous access devices should not be routinely replaced to prevent catheter-related blood stream infection. Peripheral vascular catheter insertion sites should be inspected at a minimum during each shift, and a [Visual Infusion Phlebitis score](#) should be recorded. The catheter should be removed when complications occur or as soon as it is no longer required. Peripheral vascular catheters should be re-sited when clinically indicated and not routinely, unless device-specific recommendations from the manufacturer indicate otherwise.

[Webster et al. \(2014\)](#) conducted a Cochrane review to compare outcomes when replacing peripheral intravenous catheters (cannulae) only when clinically indicated versus replacing catheters routinely. The review sought randomised controlled trials of patients in hospitals, nursing homes or community settings who had peripheral intravenous catheters for at least 3 days. Studies had to compare the effects of removing and re-siting catheters when clinically indicated – for example, for blockage, pain, redness, infiltration, swelling, leakage or phlebitis – with replacing catheters routinely. The primary outcomes were catheter-related blood stream infection, thrombophlebitis and cost.

A total of 7 trials with 4895 patients were identified. In the routine replacement groups, catheters were changed every 72 to 96 hours in 5 trials and every 48 hours in 2 studies. Of the 5 studies (n=4806) that assessed catheter-related bloodstream infections, only 2 (n=4038) reported any infections. Pooled analysis of these 5 studies showed no significant difference in the incidence of catheter-related bloodstream infections with clinically indicated catheter removal versus routine removal every 72 to 96 hours (RR=0.61, 95% CI 0.08 to 4.68, p=0.64; n=4806). Likewise no difference was seen in the rates of phlebitis with the two strategies (RR=1.14, 95% CI 0.93 to 1.39, p=0.20; 5 studies, n=4806). The 3 trials that measured cost showed that cannulation costs were lower in the clinically indicated catheter removal group than in the routine removal group (mean difference=−6.96 Australian dollars, 95% CI −9.05 to −4.86, p<0.00001; n=4244).

Limitations of this evidence include that 5 of 7 the studies analysed were conducted in Australia (n=4806) and only 1 took place in a community setting (n=200). Blinding of investigators was not possible in the included studies because of the nature of the intervention. In addition, the confidence interval for the pooled analysis of catheter-related bloodstream infections was wide, creating uncertainty around the relative risk. The data on phlebitis were too heterogeneous when all 7 trials were combined ( $I^2=65\%$ ), so the analysis for this outcome used only 5 of the included studies.

This evidence indicates that changing peripheral intravenous catheters (cannulae) when clinically indicated rather than every 72 to 96 hours in hospitalised or community patients may not affect the incidence of catheter-related bloodstream infections or phlebitis. Replacement of the catheter only when signs of inflammation, infiltration or blockage are present may be a more appropriate strategy than routine replacement. This approach will also benefit the patient by reducing the number of cannulations.

[NICE CG139](#) indicates that, in general, administration sets in continuous use need not be replaced more frequently than at 72-hour intervals unless they become disconnected or a catheter-related infection is suspected or documented. The EUAG members were of the view that in practice this guidance has been interpreted as recommending that administration sets and peripheral intravenous catheters (cannulae) should be replaced every 72 hours in all instances. This evidence may therefore have a potential impact on [NICE CG139](#), in that it suggests a change in practice. The details of any impact are outside the scope of the Evidence Update. Decisions on how the new evidence may impact guidance will be made when the need to update guidance is reviewed by NICE.

Further research, using large study populations and standard definitions of phlebitis, is needed to confirm the safety of [clinically-indicated replacement versus routine replacement of peripheral venous catheters](#). Further studies should include patient-reported measures of pain and satisfaction and cost-effectiveness analyses.

#### **Key reference**

Webster J, Osborne S, Rickard CM et al. (2013) [Clinically-indicated replacement versus routine replacement of peripheral venous catheters](#). Cochrane Database of Systematic Reviews issue 4: CD007798

#### **Supporting reference**

Loveday HP, Wilson JA, Pratt RJ et al. (2014) [epic 3: national evidence-based guidelines for preventing healthcare-associated infections in NHS hospitals in England](#). Journal of Hospital Infection 86 (Suppl. 1): S1–70

## 2 New evidence uncertainties

During the development of the Evidence Update, the following evidence uncertainties were identified for the UK Database of Uncertainties about the Effects of Treatments (UK DUETs).

### Vascular access devices

- [Chlorhexidine gluconate dressings applied to chlorhexidine gluconate prepped skin, to prevent catheter-related bloodstream infections](#)
- [Ethanol locks to prevent catheter-related bloodstream infections in paediatric patients with intestinal failure undergoing parenteral nutrition](#)
- [Clinically-indicated replacement versus routine replacement of peripheral venous catheters](#)

Further evidence uncertainties for infection control can be found in the [UK DUETs database](#) and in the [NICE research recommendations database](#).

UK DUETs was established to publish uncertainties about the effects of treatments that cannot currently be answered by referring to reliable up-to-date systematic reviews of existing research evidence.



# Appendix A: Methodology

## Scope

The scope of this Evidence Update is taken from the scope of the reference guidance:

- [Infection](#). NICE clinical guideline 139 (2012)

NICE clinical guideline 139 ([NICE CG139](#)) was a partial update of, and replacement for, NICE clinical guideline 2 ([NICE CG2](#); 2003). The scope of [NICE CG139](#) was slightly different from that of [NICE CG2](#), and some of the recommendations from [NICE CG2](#) were retained in [NICE CG139](#) without any new evidence being considered (details can be found [here](#)).

The literature searches for this Evidence Update covered all areas looked at for both [NICE CG2](#) and [NICE CG139](#). Areas covered in [NICE CG2](#) for which new evidence was not considered for [NICE CG139](#) have been included. A specific call for evidence was made to members of the Evidence Update Advisory Group (EUAG) to identify any major papers published between 2003 and 2011 in the areas that [NICE CG139](#) did not cover.

## Searches

The literature was searched to identify studies and reviews relevant to the scope. Searches were conducted of the following databases, covering the dates 18 April 2011 (the end of the search period of [NICE CG139](#)) to 14 April 2014:

- CDSR (Cochrane Database of Systematic Reviews)
- CENTRAL (Cochrane Central Register of Controlled Trials)
- CINAHL (Cumulative Index to Nursing and Allied Health Literature)
- DARE (Database of Abstracts of Reviews of Effects)
- EMBASE (Excerpta Medica database)
- HTA (Health Technology Assessment) database
- MEDLINE (Medical Literature Analysis and Retrieval System Online)
- MEDLINE In-Process
- NHS EED (Economic Evaluation Database)

The Evidence Update search strategy replicated the strategy used by [NICE CG139](#) and [NICE CG2](#) (for key words, index terms and combining concepts) as far as possible. Where necessary, the strategy was adapted to take account of changes in search platforms and updated indexing language.

Top level searches for hand hygiene, hand decontamination, personal protective equipment, sharps, long-term urinary catheters, percutaneous endoscopic gastrostomy, vascular access devices and asepsis were combined using “AND” with intervention/exposure facets.

Evidence relating to patient information/patient views/patient motivation has been included in this Evidence Update where it is an included evidence type (that is, systematic review, randomised controlled trial or observational study), although no separate searches were made for patient information or of PsycINFO. Similarly, the search for this Evidence Update did not include a separate guidelines/policies search, because this evidence type is not usually included in Evidence Updates.

Table 1 provides details of the search strategies used, which was adapted to search the databases listed above. The search strategies were used in conjunction with validated Scottish Intercollegiate Guidelines Network [search filters for systematic reviews, randomised controlled trials and observational studies](#).



Figure 1 provides details of the evidence selection process. The list of evidence excluded after review by the Chair of the EUAG, and the full search strategies, are available on request from [contactus@evidence.nhs.uk](mailto:contactus@evidence.nhs.uk).

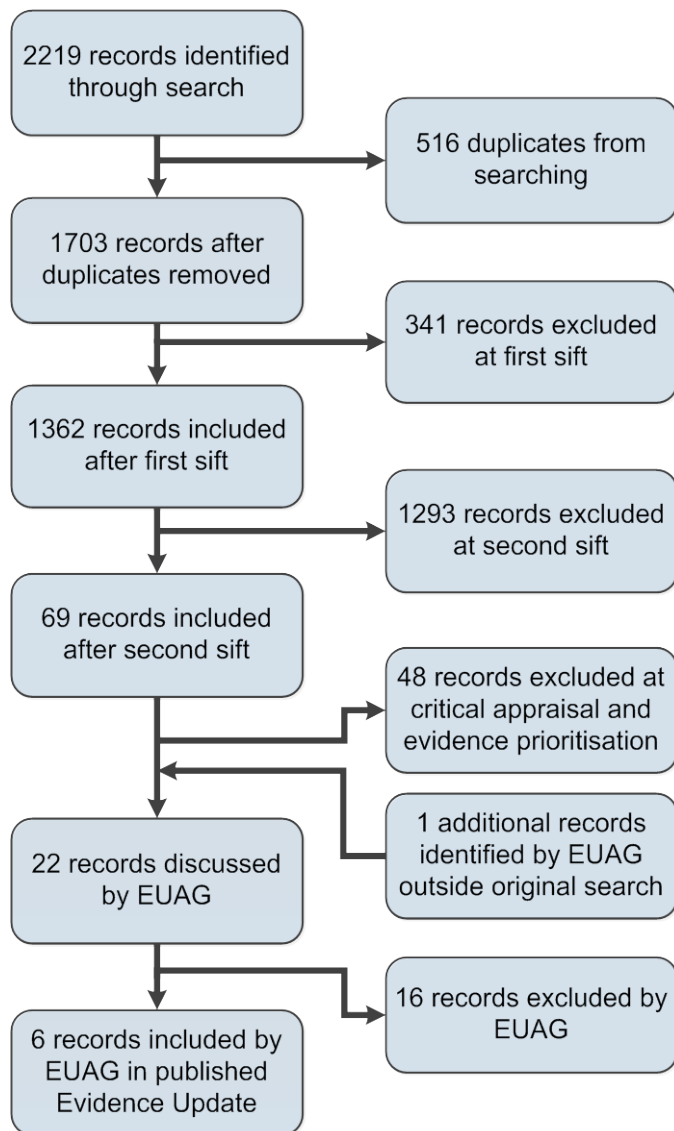
See the [NICE Evidence Services](#) website for more information about [how NICE Evidence Updates are developed](#).

**Table 1 Search strategies (adapted for individual databases)**

<b>Population/top-level searches</b>	<b>Intervention/exposure search</b>
<b>F.1.1* Hand hygiene</b>	
	F.3.1 Patient views, motivation (p.194)
	F.3.2 Guidelines, policies (p.198)
	F.3.3 Cleaning preparations (p.199)
	F.3.4 Wrists (p.201)
<b>Hand decontamination</b>	
F.3.5 Infection terms	F.3.5 Bare below the elbows (p.201)
<b>Personal protective equipment</b>	
F.3.7 Infection terms	F.3.7 Gloves (p.202)
	F.3.8 Aprons, gowns (p.204)
<b>Sharps</b>	
F.3.10 Infection/needlestick terms (p.205)	F.3.10 Safety devices (p.205)
<b>F.1.2 Long term urinary catheters</b>	
F.1.2 Long term urinary catheters	F.3.11 Catheter types (p.207)
	F.3.13 Bladder washout/irrigation/ installation (p.208)
	F.3.14 Antibiotics (p.209)
F.3.12 Intermittent catheterisation	F.3.12 Single use catheters (p.207) or multiple use catheters
<b>F.1.3 Percutaneous endoscopic gastrostomy</b>	
Percutaneous endoscopic gastrostomy terms	F.3.15 Syringes (p.211)
<b>F.1.4 Vascular access devices</b>	
Vascular access devices terms	F.3.16 Dressings (p.212)
	F.3.17 Decontamination (p.213)
	F.3.18 Vials (p.214)
<b>F.1.5 Asepsis</b>	
F.3.19 Asepsis terms	
	F.3.19 Long term urinary catheter terms
	F.3.19 Percutaneous endoscopic gastrostomy
	F.3.19 Vascular access devices

\* Alphanumerical references and page numbers relate to the full guideline appendix F (literature search strategies).

**Figure 1 Flow chart of the evidence selection process**



EUAG – Evidence Update Advisory Group

# Appendix B: The Evidence Update Advisory Group and Evidence Update project team

## Evidence Update Advisory Group

The Evidence Update Advisory Group is a group of topic experts who reviewed the prioritised evidence from the literature search and advised on the development of the Evidence Update.

### **Dr Carol Pellowe – Chair**

Senior Lecturer, Guy's and St Thomas' NHS Foundation Trust, London

### **Ms Daphne Colpman**

Consultant Nurse – Continence, Epsom and St Helier University Hospitals NHS Trust, Surrey

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Associate Director of Nursing, British Pregnancy Advisory Service (bpas), Stratford upon Avon

### **Dr Julian Spinks**

General Practitioner, Court view Surgery, Rochester

### **Professor Mark Wilcox**

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### **Ms Sue Wright**

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## Evidence Update project team

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