

This is an Open Access document downloaded from ORCA, Cardiff University's institutional repository:<https://orca.cardiff.ac.uk/id/eprint/142494/>

This is the author's version of a work that was submitted to / accepted for publication.

Citation for final published version:

Gould, Dinah, Hawker, Clare , Chudleigh, Jane, Drey, Nicholas, Gallagher, Rosemary and Pursell, Edward 2021. Survey with content analysis to explore nurses' satisfaction with opportunities to undertake continuing professional education in relation to aseptic technique. *Nurse Education Today* 98 , 104749. 10.1016/j.nedt.2021.104749

Publishers page: <https://doi.org/10.1016/j.nedt.2021.104749>

Please note:

Changes made as a result of publishing processes such as copy-editing, formatting and page numbers may not be reflected in this version. For the definitive version of this publication, please refer to the published source. You are advised to consult the publisher's version if you wish to cite this paper.

This version is being made available in accordance with publisher policies. See <http://orca.cf.ac.uk/policies.html> for usage policies. Copyright and moral rights for publications made available in ORCA are retained by the copyright holders.



RESEARCH PAPER

Survey with content analysis to explore nurses' satisfaction with opportunities to undertake continuing professional education in relation to aseptic technique

Dinah Gould ^a, Clare Hawker ^b, Jane Chudleigh ^a, Nicholas Drey ^a, Rosemary Gallagher ^c, Edward Pursell ^a

^a London City University, London

^b Cardiff University, UK

^c Royal College of Nursing, London

KEYWORDS: Continuing professional education, aseptic technique, content analysis

Abstract = 294 words

Main text = 3,789 words

References = 904 words

TOTAL WORDS = 4,987

* Corresponding author: Address:

Email address:

Abstract

Objective

This study explored nurses' experiences of continuing professional education (CPE) in relation to aseptic technique.

Design

A national survey was undertaken throughout the United Kingdom. Responses were subjected to inductive quantitative content analysis.

Participants

Nurses were recruited via an electronic link placed on the website of a major nursing organisation.

Results

941 nurses responded. 253 (26.88%) were satisfied with arrangements for continuing professional education. Satisfaction was associated with a perception of good support from employers, sound preparation before qualifying and practising aseptic technique regularly. 311 (33.05%) were dissatisfied. Reasons included witnessing unwarranted variations in practice (n= 55, 5.84%), witnessing suboptimal practice requiring correction (65, 6.9%), a perception that standards had fallen through a decline in pre-registration preparation (n=109, 11.58%) and inadequate opportunities for updating (n= 124, 13.17%). Irrespective of satisfaction, amount and type of input varied. In some cases structured programmes were in place with arrangements for competency testing. Other participants reported attending a single training session or online training only. Some employers had introduced training in conjunction with organisation-wide change in practice. In other cases participants reported receiving updates when required to perform a new procedure, when moving between clinical specialties or changing employer. Train-the-trainer (cascade) teaching was used in formal and informal arrangements for updating. Nurses giving the most positive responses tended to be those employed in acute settings where there was regular updating and those who had access to frequent updates as part of their role as 'champions' or link nurses.

Conclusion

This study provides a springboard for exploring arrangements for updating and assessing nurses' competence to undertake aseptic technique. Health providers need to evaluate what is currently provided and address gaps in provision. There

is clear evidence that the current system does not meet the needs of many nurses.

Introduction

Healthcare-associated infection (HCAI) is the most common adverse event in healthcare (World Health Organization 2011). In Europe over 4 million patients develop at least one HCAI annually and there are 37,000 deaths (European Centre for Disease Prevention and Control 2013) contributing to the cost of healthcare (O'Neill Report 2016) and the global problem of antimicrobial resistance (World Health Organization 2016). Policy-makers identify three broad strategies to contain these risks: better infection prevention, guidelines to support practice and education (World Health Organization 2016, Department of Health 2014).

Aseptic technique and hand hygiene are the cornerstones of infection prevention (Department of Health 2014). International guidelines (WHO 2009) to promote hand hygiene have been widely disseminated and campaigns to promote adherence to hand hygiene protocols have been implemented in many countries (Allegranzi et al 2013). Aseptic technique has not received the same attention. Although guidelines exist there is no international standard, descriptions of the procedure differ (Aziz 2009), considerable variations in practice are reported (Preston 2005, Unsworth and Collins 2011) and there is some disagreement concerning whether aseptic technique is possible or necessary during the management of chronic wounds already heavily contaminated with potential pathogens (Hallett 2000, Unsworth and Collins 2011). Little practice development is apparent. The only significant advance in the last twenty years has been the introduction of the Aseptic Non-Touch Technique (ANTT[®]) Framework intended to standardise practice (Rowley et al 2010). ANTT[®] has now been implemented in many National Health Service (NHS) trusts in the United Kingdom (UK) and adopted in a number of countries. ANTT[®] introduced a new vocabulary for existing terms: key-parts (sterile equipment) and key-sites (open wounds, medical device access sites). There is concern that the additional terminology might have compounded existing confusion (Gould et al 2017) and the UK National Institute of Health and Care Excellence (NICE) recognise this as 'an example of an aseptic technique for vascular access device maintenance' that 'represents a possible framework for establishing standardised guidance on aseptic technique' rather than a generalisable theory (NICE 2017).

Despite divergences in opinion, ability to undertake aseptic technique continues to be regarded as an important nursing skill. Competence is essential for entry to

the register in many countries including the UK where the study described below took place. The situation in the UK is of particular interest. Until the mid 1990s all nursing students underwent a single test of competence before they could register and as one of a small number of formal practical assessments it was afforded great significance. In the 1990s pre-registration programmes moved from hospital-based schools of nursing to universities. The new approach was intended to change pre-registration nursing programmes from apprenticeship style training to an education-led approach but has since been criticised for failing to prepare neophyte nurses for the practical aspects of the role (Elkan and Robinson 1995). Universities introduced their own assessments and previous arrangements for competency testing in relation to aseptic technique were lost. The Nursing and Midwifery Council (2018) continues to place emphasis on aseptic technique but does not stipulate when, what or how universities should teach and assess it and the focus is on wound care at the expense of other procedures requiring asepsis. The importance of aseptic technique post-registration continues to be afforded importance. The Code of Practice on the Prevention and Control of Infections in the UK (Department of Health 2015) states that health workers' adherence to aseptic technique should be audited but the frequency and nature of audit is not specified. The absence of a robust evidence base weakens the validity of any such audit, apart from obvious gross breaches in asepsis.

Literature review

Little is known about how aseptic technique is delivered in pre-registration curricula. Few studies have been conducted and the findings are difficult to synthesise because they are small scale, poorly controlled and have taken place in countries with different arrangements for nurse education. Input appears to be delivered mainly in relation to specific procedures rather than emphasising the principles of asepsis per se and how to transfer them to different procedures and situations. Lack of proficiency has been reported (Gonzalez and Sole 2014, Cebeci et al 2015), knowledge varies (Mitchell et al 2014) and time allocated within curricula and approaches to teaching differ (Carter et al 2017). Practice witnessed by student nurses during clinical placements varies between settings, differs in quality and does not always accord with what has been taught by nurse educators (Ward 2010, Gould and Drey 2013).

Even less information is available in relation to continuing professional education (CPE). The effectiveness of interventions intended to reduce HCAI related to specific clinical procedures has been reported (Lobo et al 2010, Conway Morris et

al 2011, Marra et al 2011) but these targeted health workers in acute settings. Organisation-wide campaigns have been undertaken to increase adherence to aseptic technique in relation to intravascular lines. Outcomes are more favourable in some organisations and some wards than others and are heavily influenced by the enthusiasm of staff and leadership (Dixon-Woods et al 2014). CPE available to nurses in general wards was documented in a pilot study conducted in two NHS trusts (Gould et al 2017). Seventy two per cent (n=130) reported that they had not received updating in the last five years and 90% had not undergone competency assessment since qualifying. This appears to be the only study exploring CPE in relation to aseptic technique.

Methods

The aim of this paper is to explore nurses' experiences of CPE in relation to aseptic technique. Data were collected with an open-ended question included in a survey investigating the use of clinical guidelines to inform wider aspects of practice. The other study findings are published elsewhere.

A national cross-sectional survey was undertaken throughout the UK. Nurses were recruited via an electronic link placed on the website of their professional organisation (Royal College of Nursing). Membership is voluntary and 432,000 nurses belong. An open question invited participants to describe their experiences of CPE in relation to aseptic technique. Data were also obtained for clinical grade and clinical setting where participants were employed. The survey was conducted throughout May 2019.

The responses were subjected to quantitative content analysis. This is an inductive approach that allows codes to emerge from the data and is considered appropriate when the topic has attracted little previous research (Miles and Huberman 1994). We undertook analysis based on the sequence described by Hsieh and Shannon (2005). Initially members of the research team became conversant with the data by reading and re-reading all the responses. Notes were made to give overall impressions of the data. Each response was then read in detail and preliminary codes were identified by highlighting words in the text that captured key concepts. Codes reflecting more than one concept were brought together and sorted into categories according to the way they related to each other or reflected the same or linked concepts. We counted the number of ideas within each code and sub-code and selected typical examples to illustrate each. Finally we developed a hierarchy of codes demonstrating the relationships

between one code and another. Two members of the research team coded the data independently. Divergent opinions were discussed and where necessary, subjected to independent, third party arbitration.

Ethical approval for the survey was given by the research ethics committee of the university leading the study. All participants gave informed consent.

Results

There were 2,928 responses to the survey. Most participants (n= 1,886, 81%) worked in the NHS. The remainder were employed in general practice, private practice, the non-NHS public sector or charities. Most participants (n=1,528, 65.63%) were ward managers or in more senior posts. They practised throughout the UK, had been qualified for a mean of fifteen years with a range of three months to forty years and worked in a wide variety of clinical settings including acute and long-term care. Some delivered care or managed services in both sectors.

Data relating to CPE were received from 941 (32.14%) participants. Inductive quantitative content analysis demonstrated that 253 (26.88%) appeared satisfied with opportunities for CPE and 311 (33.05%) appeared dissatisfied. The relationships between codes and sub-codes within these categories are shown in Figure 1. The remaining participants expressed neither satisfaction nor dissatisfaction with current arrangements but made a number of observations relating to the importance of CPE or infection prevention in general and the need to receive updating to maintain professional standards.

Satisfaction with continuing professional education

Most participants reporting satisfaction claimed to receive good support for CPE from their employing organisation (n=219, 86.55%). Of these, 189 (86.4%) claimed to receive good or satisfactory opportunities for updating. The amount and type of input varied, however. In some cases a structured programme was in place with arrangements for competency testing ranging from annually to every three years. Other participants reported attending a single training session or input was online and completion might or might not be mandatory. Some employers had introduced training in conjunction with the implementation of ANTT[®]. In other cases participants had received updating when they were required to perform a new clinical procedure, moved between clinical specialties or changed employer. Thirty (13.6%) participants suggested that updates were

unnecessary because aseptic technique formed an integral part of their daily work and as a result, their practice was under constant scrutiny:

'I Insert central lines and arterial lines frequently. I received significant training and get colleagues to review my practice frequently.'

'I work as a theatre scrub nurse and practice within and maintain a sterile field in the course of my daily work.'

Thirty four (13.45%) participants satisfied with CPE indicated that pre-registration teaching and competency testing had been very good, obviating the need for further input. Thirty nine (4.14%) participants in the overall sample suggested that updating should be unnecessary because aseptic technique is a skill that once learnt, is never forgotten:

'The basic principles were drummed in during (pre-registration) training and are now an essential part of everyday practice. Updates are needed for new equipment or techniques but the principles remain the same.'

Some participants seemed to be indignant that updating might be considered necessary:

'I trained in 1976 and I find it incredible that you are asking. Isn't it part of today's nursing syllabus? It was drummed into us and we had to be assessed. If we didn't pass we had to retake it.'

Lack of satisfaction with continuing professional education

Four sources of dissatisfaction emerged. Participants reported witnessing variations in practice that they considered to be unwarranted (n= 55, 5.84%), practice that they considered to be suboptimal and in need of correction (65, 6.9%), expressed a view that standards had fallen because pre-registration nurses are no longer taught about aseptic technique adequately and a single, formal assessment no longer takes place (n=109, 11.58%) or thought that their employer had not provided adequate opportunities for updating (n= 124, 13.17%). Fifty five (5.84%) participants in the sample overall remarked on variations in practice between organisations, clinical settings or individuals within the same clinical setting:

'I'm new to my current trust and have noticed vast differences and sometimes what I believe to be poor technique particularly with regards to IV connections using aseptic technique. It would be good to raise the standard throughout the trust.'

'It's mixed. Everyone does different things (I think depending on when/where they trained) and everyone disagrees on what is necessary for what. We tend to do whatever the "cleanest" person wants to do at the time.'

Four international nurses compared practice in the UK unfavourably to the standards expected in their home countries:

'Aseptic technique was assessed in the clinical lab at college before going onto wards and we had to be signed off. University assessors would come onto placement and work with us, assess us and sign us off. If there was any slip in aseptic technique, even if everything else was perfect, it was an automatic fail.'

Fifty nine (6.27%) participants had attempted to update themselves in their own time, with variable success. Most attempts had involved reading, discussions with colleagues who had been able to access CPE or by viewing demonstrations online. Some participants who had resorted to web-based learning were able to identify limitations:

'Videos should be utilised more to teach practical skills. YouTube is full of poor quality videos that can be misleading. It would be great to have some "gold standard" videos produced to a high standard and freely available for teaching and/or to indicate best practice. It would result in far less deviation.'

In a few cases colleagues had collaborated to undertake informal peer review of each other's practice. The disadvantages of relying solely on informal teaching and peer review were readily appreciated: participants were aware that information and assessment would depend on the foibles of those assuming responsibility, with possible 'drift' in standards:

'If the person reviewing competence has poor practice, it's poor practice that gets passed on.'

Forty four (4.67%) participants identified challenges adapting aseptic technique to constraints in the working environment outside hospital, especially in relation to the management of chronic wounds and in emergency care or because of a lack of equipment (e.g. sterile dressing packs, gloves) in these environments. They were in favour of guidelines tailored to meet clinical need:

'The current guidelines for aseptic technique where I work suggest that you implement the same technique for a chronic wound as a central line. That is not possible, especially in a community setting. Some common sense has to be involved. One rule does not suit all scenarios.'

Conversely eight participants wanted national guidelines to standardise practice and prevent unwarranted variations.

The remaining causes of dissatisfaction were miscellaneous, each involving fewer than five participants: for example specific queries in relation to practice or confusion relating to individual aspects of practice.

Other findings

Ninety six (10.2%) of the participants mentioned opportunities for CPE specifically in relation to ANTT[®]. Of these five (5.2%) commented favourably, remarking on its transferability between different clinical procedures or that implementation had provided a good opportunity to update the workforce about the importance of asepsis. Seventeen (17.7%) commented negatively. A range of criticisms were offered. ANTT[®] was perceived as ritualistic, likely to cause confusion because the procedure and its associated terminology had been superimposed on what already existed, lack of difference between ANTT[®] and traditional approaches and a perception that ANTT[®] could more easily result in contamination.

It was also apparent that considerable reliance was placed on 'cascade' (train-the-trainer) arrangements for CPE regardless of whether a traditional approach or ANTT[®] was in place. A typical comment is reproduced below:

'(Teaching aseptic technique) has not been given adequate priority ... it's passed on from one practitioner to another without correct training or being signed off. It is a concern that we have allowed this to happen.'

Arrangements for cascading might be formal with properly organised preparation of trainers and assessors (e.g. link nurse schemes or as part of the process used to introduce ANTT[®]) but in other cases individuals appeared to be transferring knowledge and skills on an informal basis and without accreditation. Twenty five (43.27%) of those who had updated their own practice had done so to enable them to inform junior staff or supervise student nurses.

Trends were apparent in the data. Nurses giving the most positive responses tended to be those employed in acute care settings where updating took place on a regular basis and those who had access to frequent updating as part of their role as 'champions' or link nurses. Inspection of the data failed to identify any association between satisfaction and whether traditional aseptic technique or

ANTT[®] was mentioned. Those who had been qualified the longest and had completed pre-registration courses before the education reforms in the mid-1990s were most likely to remark on failings in current arrangements for teaching and assessing aseptic technique.

Discussion

A number of studies have explored pre-registration education in relation to aseptic technique (Gonzalez and Sole 2014 Mitchell et al 2014, Cebeci et al 2015) but apart from a pilot study in two NHS trusts (Gould et al 2017) this appears to be the first study to investigate CPE and aseptic technique. It established that a quarter of participants were satisfied with existing arrangements. Reasons suggested were sound initial preparation during pre-registration education, support from employers and ample opportunity to rehearse skills requiring asepsis during everyday practice. A number of different reasons were given for dissatisfaction but collectively they were made by a third of the sample. They related to variations in practice by colleagues within the same clinical setting, poor practice, falling standards as a result of poor pre-registration teaching and assessment and lack of CPE. There appeared to be a link between satisfaction and clinical setting. Those employed in acute settings reported greater opportunities for CPE and ability to practise aseptic technique as an integral part of their work. Participants employed outside hospital often reported concerns about variations in practice and were unsure which patients and procedures might require asepsis and the practicality of undertaking it within the constraints of the workplace and resources available. A tension emerged throughout the responses between the need for aseptic technique to be standardised to ensure best practice for all patients under all circumstances versus the need to adapt the procedure for different patients and clinical settings. Although many good examples of CPE were reported it was also apparent that provision was often informal: restricted to online updating, peer review conducted unofficially between colleagues and practitioners assuming responsibility for their own updating in order to teach and assess others as well as to inform themselves. Considerable reliance appeared to be placed on the cascade model of education during formal and informal approaches to CPE. Ten per cent of participants mentioned ANTT[®]. Opinions were mixed. Some found it very helpful but negative comments were also reported.

The data were derived from a survey conducted with a sample that had not been randomly obtained. It attracted a very large number of responses but of these, only a third chose to comment on experiences of CPE, although still resulting in a

large number of responses. Although trends were apparent in the data, inferential statistical testing was not attempted as the limitations inherent within the sample meant that no reliance could be placed on the results as a reflection of a wider population. Other limitations are that the sample was drawn from members of the same professional organisation further introducing the risk of bias and that collecting the data by questionnaire meant that probes could not be used to explore any of the issues emerging in depth. Responses varied in detail and some were more complete than others. Data collection employing semi-structured interviews with probes would have generated more comprehensive and standardised information.

The findings of our study corroborate existing research. As in the earlier pilot study (Gould et al 2017), many nurses had not received opportunities for updating or competency testing once qualified and as in earlier studies (Preston 2005, Unsworth and Collins 2011) there was confusion, especially about the need for aseptic technique during the management of chronic wounds. Participants who were registered before the nursing reforms in the UK in the 1990s criticised contemporary approaches to pre-registration teaching and assessment. Their comments supported criticisms in relation to university-based programmes reported soon after implementation (Elkan and Robinson 1995). Whether these views are valid or reflect long-held prejudice is unknown. Reliance on the cascade model of education was apparent. Some participants could identify the same problems with this approach identified in earlier evaluations applied to different clinical services and procedures. The effectiveness of cascading depends on champions' knowledge and skills, willingness to teach and assess others and to ring-fence time in busy clinical settings (Levine et al 2007). Much also depends on the context in which cascading takes place because organisational climate and support are important contributory factors (Gould et al 2012). Leadership and organisational context are important in the implementation of interventions to improve the management of central venous catheters (Dixon et al 2014). It is possible that satisfaction with CPE in this study owed more to organisational support than whether traditional or innovative approaches to aseptic technique were being promoted.

This study should be viewed as a springboard for further, more rigorous enquiry taking into account the methodological shortcomings identified above. Although the study is limited in many regards, it has identified major changes made in relation to educational provision in the absence of a strong underpinning evidence

base and proper evaluation. Randomised surveys conducted at national level are time-consuming and challenging to undertake. Bias may still be introduced because some individuals or organisations may not take part, especially those concerned that they will not emerge well from the investigation. A practical and useful alternative might be for individual health providers to review local arrangements in conjunction with their associated educational institutions to ensure consistency between what students are taught and witness during clinical placements. Local studies will not have external validity but the approach is likely to be more manageable than a major survey. Such an approach has potential to be more useful as any changes indicated to improve CPE will need to meet the needs of the specific organisation. Recommendations for conducting local enquiries are made in Box 1.

The findings of this study contain important messages for policy-makers in relation to infection prevention as well as for education. Although aseptic technique is a key component of multimodal care bundles to prevent HCAI (e.g. surgical site infections, central venous catheter infections) (Health Foundation 2015) our findings suggest that more could be done to keep nurses updated and monitor proficiency, especially those employed outside acute care settings. Despite recommendations from the Department of Health (2015) at present there appear to be no reports of audit and continuous quality improvement for aseptic technique based on performance feedback, no universally accepted guidelines and no national or global promotional campaigns. This situation reflects the lack of evidence in relation to many aspects of aseptic technique as it is traditionally conducted. Further work needs to be undertaken to explore whether ANTT[®] offers a solution. Where it has been adopted, ANTT[®] is applied to all procedures requiring asepsis but is recognised by the National Institute of Health and Care Excellence (2018) as 'an example of an aseptic technique for vascular access device maintenance ...which represents a possible framework for establishing standardised guidance on aseptic technique'. NICE does not advocate the use of ANTT[®] for all clinical procedures requiring asepsis.

CONCLUSION

This is the first study to explore CPE for aseptic technique. There is clear evidence that the current system does not meet the needs of many nurses. Overall the findings suggest that much more could be done to improve practice of aseptic technique.

Figure 1. Codes emerging from inductive quantitative content analysis

Box 1. Recommendations for local evaluations of continuing professional education in relation to aseptic technique

Areas for scrutiny:

- When CPE and competency testing take place e.g. induction, annual mandatory training, new procedures, move to different clinical setting
- Frequency of updating
- Content of CPE
- Format of CPE: formal versus informal approaches, face-to-face instruction, online packages, recommended reading, demonstrations, discussion
- Arrangements for cascade training: preparation, updating and competency assessment of trainers
- Audit of clinical practice and feedback, reporting at senior management level
- Evaluation by staff
- Evaluation by managers

References

Allegranzi, B, Gayet-Ageron, A, Damani, N, Bengaly, L, McLaws, ML, Moro, L, Memish, Z, Urroz, O, Richet, H, Storr, J, Donaldson, L 2013. Global implementation of WHO's multimodal strategy for improvement of hand hygiene: a quasi-experimental study. *Lancet Infectious Diseases* 13: 843-851.

Aziz, A M 2009. Variations in aseptic technique and implications for infection control *British Journal of Nursing* 18 26-31.

Carter, J E., Mancino, D., Hessels, J. A., Kelly, M. A. ,Larson, L. A. 2017. Reported hours of infection education received positively associated with student nurses' ability to comply with infection prevention practices: Results from a nationwide survey. *Nurse Education Today* 53 19-25.

Cebeci, F., Karazeybek, E., Sucu, G. and Kahveci, R. 2015. Nursing students' medication errors and their opinions on the reasons of errors: A cross-sectional survey. *Journal of Pakistan Medical Association* 65(5) 457-462.

Clare S, Rowley S 2018. Implementing the Aseptic Non Touch Technique (ANTT®) clinical practice framework for aseptic technique; a pragmatic evaluation using a mixed methods approach in two London hospitals. *Journal of Infection Prevention* 19 6-15.

Conway Morris A, Hay AW, Swann DG, Everingham K, McCulloch C, McNulty J, Brooks O, Laurenson IF, Cook B, Walsh TS 2011. Reducing ventilator-associated pneumonia in intensive care: impact of implementing a care bundle. *Critical Care Medicine* 39 1- 7.

Department of Health 2015. The Health and Social Care Act (2008): Code of Practice on the prevention and control of infections and related guidance. London: Department of Health. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/449049/Code_of_practice_280715_acc.pdf. Accessed 20.10. 2019.

Department of Health 2014. UK 5 Year Antimicrobial Resistance (AMR) Strategy 2013-2018; Annual progress report and implementation plan, 2014. London: HM Government. Available at:

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/385733/UK_AMR_annual_report.pdf. Accessed 20.10. 2019.

Dixon Woods M, Leslie M, Tarrant C, Bion J 2014. Explaining Matching Michigan: an ethnographic study of a patient safety program. *Implementation Science* 8: 70-76.

European Centre for Disease Prevention and Control 2013. Surveillance report; point prevalence survey of healthcare associated infections and antimicrobial use in acute care hospitals. Stockholm: ECDC <https://ecdc.europa.eu/en/healthcare-associated-infections-acute-care-hospitals/surveillance-disease-data/report> Accessed 20.10. 2019.

Elkan R, Robinson J 1995. Project 2000; a review of published research. *Journal of Advanced Nursing* 22 386-392.

Gonzalez, L. and Sole, M. L. 2014. Urinary Catheterization Skills: One Simulated Checkoff Is Not Enough. *Clinical Simulation in Nursing* 10(9) 455-460.

Gould DJ, Chudleigh J, Purssell E, Hawker C, Gaze S, James D, Lynch M, Pope N, Drey N 2017. Survey to explore understanding of the principles of aseptic technique: qualitative content analysis with descriptive analysis of confidence and training. *American Journal of Infection Control* 46:393-96.

Gould, DJ, Drey, NS 2013. Student nurses' experiences of infection prevention and control during clinical placements. *American Journal of Infection Control* 41 760-763

Gould, D J, Papadopoulos, I, Kelly, D 2012. Using the cascade model in antenatal screening. *Journal of Continuing Education in the Health Professions* 32 181-187.

Hallett C E 2000. Infection control in wound care: A study of fatalism in community nursing. *Journal of Clinical Nursing* 9 103-109.

Health Foundation 2015. Infection prevention and control: lessons from acute care in England. Towards a whole health economy approach. Health Foundation Learning Report. Health Foundation. London.

Hsieh HF, Shannon SE 2005. Three approaches to qualitative content analysis. *Qualitative Health Research* 15 1277-1288.

Levine, SA, Brett, B, Robinson, BE, Stratos, GA, Lascher, SM, Granville, L, Goodwin, C, Dunn, K, Barry, PP 2007. Practicing physician education in geriatrics: lessons learned from a train-the-trainer model. *Journal of the American Geriatric Society* 55 1281-1286.

Lobo R D, Levin A S, Oliveira M S, Gomes L M B, Gobara S, Park M, Figueiredo V B, De Vasconcelos Santos E and Costa S F 2010. Evaluation of interventions to reduce catheter-associated bloodstream infection: Continuous tailored education versus one basic lecture. *American Journal of Infection Control* 38: 440-448.

Marra, A. R., Sampaio Camargo, T. Z., Gonçalves, P., Sogayar, A. M. C. B., Moura, D. F., Guastelli, L. R., Edmond, M. B. 2011. Preventing catheter-associated urinary tract infection in the zero-tolerance era. *American Journal of Infection Control* 2011 39 817-822.

Miles MB, Huberman AM 1994. *Qualitative data analysis; an expanded sourcebook*. Thousand Oaks, CA. Sage.

Mitchell, B. G., Say, R., Wells, A., Wilson, L., Cloete, L. and Matheson, L. 2014. Australian graduating nurses' knowledge, intentions and beliefs on infection prevention and control: a cross-sectional study. *BioMedCentral (BMC) Nursing* 13(43) 1-7.

National Institute for Health and Care Excellence 2018. *Healthcare associated infections: prevention and control in primary and community care (updated 2017)*. London: National Institute for Health and Care Excellence.
www.nice.org.uk/guidance/cg139 Accessed 22.9.2019

O'Neill Report 2016. Review on antimicrobial resistance: tackling drug-resistant infections globally. (O'Neill Report) March 2016. Infection prevention, control and surveillance: limiting the spread and development of drug resistance. <http://amr->

review.org/sites/default/files/Health%20infrastructure%20and%20surveillance%20final%20version_LR_NO%20CROPS.pdf. Accessed 20.10.2019.

Preston R 2005. Aseptic technique: evidence-based approach to patient safety. *British Journal of Nursing* 14 540-546.

Rowley S, Clare S, McQueen S, Molyneaux R 2010. ANTT v2: An updated practice framework for aseptic technique. *British Journal of Intravenous Therapy* 19 Supplement S1-S11.

Ward D J 2010. Infection control in clinical placements: experiences of nursing and midwifery students. *Journal of Advanced Nursing* 66 1533-1542.

World Health Organization. WHO guidelines on hand hygiene in healthcare: 2009 http://whqlibdoc.who.int/publications/2009/9789241597906_eng.pdf.2009. Accessed 20.10.2019

World Health Organization. Report on the burden of endemic healthcare-associated infection worldwide: a systematic review of the literature. Geneva; WHO, 2011. http://apps.who.int/iris/bitstream/handle/10665/80135/9789241501507_eng.pdf;jsessionid=B3FCA1393363D4EC9AB4F7B76296DB9A?sequence=1 Accessed 20.10. 2019.

World Health Organization AMR Prevention and Containment 2016 <http://www.who.int/drugresistance/AMR-aidememoire-may2016.pdf>. Accessed 20.10. 2019.

Unsworth, J., Collins, J. 2011. Performing an aseptic technique in a community setting: fact or fiction? *Primary Health Care Research & Development* 12(1) 42-51.