

Improving standards of aseptic practice through an ANTT trust-wide implementation process: a matter of prioritisation and care

Stephen Rowley^{1*}, Simon Clare²

1. Lead Cancer Nurse, ANTT UK Lead, Cancer Division, Haematology, University College London Hospitals NHS Foundation Trust, London NW1 2PG. Email: stephen.rowley@uclh.nhs.uk

2. Practice Development CNS, University College London Hospitals NHS Foundation Trust

*Corresponding author

Accepted for publication: xxxx

Keywords: Aseptic Non Touch Technique (ANTT), guidelines, healthcare associated infection (HCAI), IV therapy

Abstract

Aseptic technique is a critical last line of defence between patients and clinical staff. Aseptic Non Touch Technique (ANTT) recognises this and is based on the premise that reducing the variables in aseptic practice across large clinical workforces by standardising aseptic technique will improve quality of practice and subsequently infection rates. The scale of adoption of ANTT in the National Health Service (NHS) continues to grow, with uptake currently estimated at between 150–250 NHS hospitals using ANTT as a standard aseptic technique. To better understand how effectively the implementation process was working in different trusts a convenience sample of acute trusts ($n=7$) was reviewed. The trusts used the recommended ANTT implementation framework and applicable audit tools. Feedback was requested regarding the implementation process as well as healthcare associated infection (HCAI) trends mapped before and after ANTT implementation. All seven trusts had found the ANTT implementation process an effective tool for standardising aseptic practice across large clinical workforces. Data reviewed from five of the trusts suggests the process impacted positively on HCAI trends. Limitations include appreciating ANTT implementation alongside other infection control interventions. More controlled studies appear to be warranted, especially now that ANTT is the most common standard aseptic technique in NHS hospitals.

Introduction

Brief history of ANTT

A survey of infection control nurses in 45 UK hospitals identified a complete absence of standardised aseptic practice and considerable variance in aseptic practice, policy and terminology between NHS hospitals

(Rowley, 1995). There was also a dearth of evidence supporting practice. In response, the author originated a theoretical framework for aseptic practice and termed it Aseptic Non Touch Technique, or ANTT (Rowley, 2001). The framework provided for the development of an evidence base, and the creation of peer reviewed clinical guidelines that promote aseptic practice in a range of common clinical procedures. Of these, the intravenous therapy (IV) guideline is the most established and is commonly used as a focus for aseptic competency development in NHS hospitals.

An ANTT implementation process was developed to establish compliance to the guidelines across large clinical workforces. Since 2001, this process has provided NHS trusts with a standard structure by which to train and assess, monitor and enforce best practice aseptic technique. Adoption of this process by NHS hospitals accelerated following the launch of the White Paper, *Winning Ways* (Department of Health (DH), 2003). Then Secretary of State for Health, John Reid, described ANTT as being, 'Exactly the kind of strict application of aseptic technique that this new strategy demands from NHS staff.' Acknowledging the progress made in standardising practice and developing an evidence base, ANTT was recognised as a best practice example of aseptic technique in Epic 2 (Pratt et al, 2007).

Theory and guideline development

Unlike ambiguous historical approaches to risk assessment, clinical risk in ANTT is based on the technical difficulty of each procedure rather than the diagnosis or age of the patient. Practice is termed ANTT whether procedure objectives are technically simple, such as most IV therapy, or complicated, such as peripherally inserted central cannula (PICC) line insertion. The theoretical framework reflects a working reality that all practice, in typical healthcare settings, is based upon the goal of asepsis. This is because sterile techniques by definition are not achievable due to the ever present micro-organisms in the atmosphere, unless the procedure is performed in a strictly controlled environment. It also utilises the accepted and logical practice of using

2

a non-touch technique whenever possible. Clinical staff are taught to assess risk by identifying key-parts and key-sites and assessing the challenge of protecting them throughout any procedure. The only thing that changes, according to defined criteria, is the level of infective precautions and size and management of the aseptic field.

Peer reviewed ANTT clinical guidelines (Figure 1) are available for peripheral and central access intravenous therapy, wound care, cannulation, venepuncture, PICC line insertion and urinary catheterisation. Using pictures and minimal instructions the guidelines are designed to translate best practice visually and simply. The guidelines incorporate accepted best practice infection control 'steps', for each procedure – for example, glove application, aseptic field selection, hand washing etc, as advocated by Epic 2 (Pratt et al, 2007) and other key guidance.

Testing and ongoing evaluation of the guidelines is undertaken to ensure a logical and efficient sequencing of steps that promotes asepsis.

Special emphasis is given to addressing problematic themes identified by ANTT observational audits of practice. For example, audits have shown that in IV therapy, clinical staff commonly compromise asepsis by searching for equipment on an ad hoc basis throughout the preparation phase. Users are therefore instructed to collect and gather all equipment at a specific point prior to final hand cleaning and glove application.

The implementation model used to gain clinical compliance to the guidelines is based upon an audit cycle (Figure 2). Practice is first audited. Staff are then trained and assessed in relevant ANTT competencies. Thereafter, practice is monitored annually. Busy ward Sisters and other area leads have all the required audit and training resources provided to them. This makes it easier for them to facilitate the process and ensures implementation is standardised. These resources are provided to trusts on DVD/CD media and then typically disseminated to staff via local intranet sites.



Figure 1. xxxx

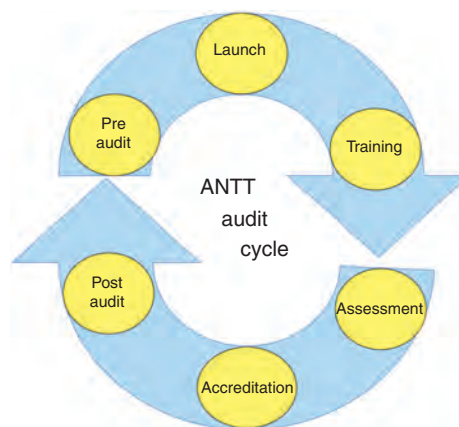


Figure 2. xxxx



**The ANTT implementation model (Figure 2)
(standard ANTT training and education resources are
highlighted in italics)**

Step 1. Pre-audit

Practice is first audited using a standard ANTT audit tool to establish the degree of variable practice and to provide a benchmark for later evaluation.

Step 2. Launch

The implementation process is communicated as being mandatory by the Chief Executive Officer, the Chief Nurse and/or other key stakeholders. A *Project Overview Board* is displayed in all areas to introduce ANTT to staff. Relevant *ANTT Guidelines* are displayed in all clinical prep and procedure rooms.

Step 3. Education and training

ANTT link trainers are nominated for each area and are trained to assess staff. The trainer directs all staff to watch the *ANTT DVD*, which provides an introduction to ANTT. A *Self running PowerPoint* presentation is then used to provide a one-to-one style step by step demonstration of the guidelines. Ward or team progress is fed into a centrally monitored database.

Step 4. Assessment

When staff have watched the educational materials they start using ANTT referring to the guidelines on display. They are assessed using a standard *ANTT assessment tool*.

Step 5. Accreditation

When all relevant ward/team staff are assessed ANTT accreditation is achieved.

Step 6. Post-audit

A post-ANTT implementation audit is performed at either 6 or 12 months to assess the 'ANTT-effect' on clinical practice.

ANTT project

The ongoing ANTT project supports NHS trusts in implementing ANTT and in doing so aims to further develop the ANTT theoretical framework. This initiative has afforded a unique insight into aseptic practice in the NHS. By the utilisation of the standard implementation model above, common themes have been identified in clinical practice enabling our team to gain both a better understanding of the 'ANTT effect' (the quantifiable improvement in both standards of aseptic practice and a lowering of healthcare associated infection (HCAI) trends), and of the challenges of establishing compliance with clinical guidelines in large clinical workforces.

The ANTT project team estimates that between 150–250 NHS hospitals use ANTT as a standard aseptic technique. This assessment involved the following measures: A review showing that since 2004, 76 (43%) acute NHS trusts in England ($n=175$) have requested an implementation pack from the ANTT project team with a further 103 packs requested by primary care trusts (PCT), private hospitals, charities, medical and nursing schools and overseas hospitals; a review of ANTT correspondence (2004 emails); a basic email survey (endorsed by the Chief Medical Officer); an internet-based literature review identifying hospitals using sourced ANTT materials within infection control policies and data collected from two national ANTT conferences.

Method

The aim of this review is to explore the effectiveness of the implementation process in standardising aseptic practice in NHS trusts and to consider any subsequent impact on HCAI. Of the 76 trusts that

requested an ANTT implementation pack a convenience sample of acute trusts ($n=7$) was reviewed. These trusts used the recommended ANTT implementation framework and applicable audit tools. Feedback was requested regarding the implementation process as well as HCAI trends mapped before and after ANTT implementation.

Findings

The trusts below kindly and openly shared their experiences in implementing ANTT. A short synopsis of this is provided below giving examples of learning experiences and common themes.

In 2003, a large university hospital NHS trust in London became the first NHS trust to implement ANTT trust-wide using the approach of a mandatory audit cycle. Pre-implementation, practice was audited using existing nurse educators from all areas. One hundred and seventy six completed cycles of IV preparation and administration were observed covertly and overtly. A standard ANTT audit tool was developed to evaluate compliance with essential infection control precautions, such as hand washing and non-touch technique.

Practice trust-wide was found to be highly variable. Averaged out, audited steps were identified as being about 53% effective and 47% suboptimal. Particular weak areas were pre-procedure hand cleaning, aseptic field selection and key-part cleaning. The tool also identified variability in equipment choices such as aseptic field and glove choice, etc. The audit results helped engage trust management and staff. The Chief Executive Officer and the Chief Nurse were actively supportive of the subsequent ANTT implementation. A post-implementation audit at 12 months identified an improved 78% average compliance with the IV guideline.

Prior to implementation of ANTT in 2006, another large university hospital NHS trust in northern England faced rising meticillin resistant *Staphylococcus aureus* (MRSA) and *Clostridium difficile* infection and some of the highest rates of glycopeptide resistant enterococci (GRE) in the country. It was felt that infection control initiatives were having little impact at the time. The trust implemented ANTT and developed a trust-wide compliance to the IV ANTT guideline. ANTT principles were then applied to the development of other clinical practice competencies.

This trust was notable for an atypically high level of involvement and leadership given by the trust's executive board. Implementation was led by the Chief Nurse and Director of Infection Prevention and Control. The Chief Nurse and the Medical Director were the first staff to be assessed in ANTT, which helped facilitate a credible trust-wide training cascade 'down' through the consultant body and senior nursing staff. Every week the Chief Nurse chaired a trust-wide meeting in which senior staff from all clinical areas had to account 'publicly' for two things. Firstly, any new infections required explaining with root-cause-style analysis. Secondly, each area had to account for their 'ANTT position', i.e. the progress they had made in meeting the trust's staff training objectives. After a successful implementation the trust established an ANTT maintenance programme involving ongoing monitoring of standards of practice on a quarterly basis.

Where no standard aseptic technique and defined clinical competencies previously existed in the trust, the first post-ANTT audit of staff compliance in 2007 identified compliance to policy at around 75% and at 90% in 2008. At 12 months, meticillin susceptible *Staphylococcus aureus* (MSSA) was reduced by 27%, MRSA by 63% (Figure 3) and GRE by 57% (Figure 4). Other interventions in this period were improved prescribing of antibiotics, hand washing campaigns and increased MRSA screening. The trust considered ANTT to be a particularly significant intervention in this period due to its size and scope; namely, the one-to-one training and monitoring of approximately 2000 clinical staff to an aseptic practice standard. Perhaps further evidence of an ANTT effect was the reduction of GRE. Mapping of GRE on a haematology ward piloting ANTT demonstrated a halt in



the incidence of GRE followed by a reduction (Figure 4). In the same period, GRE incidence continued to increase on the trust's wards awaiting ANTT implementation.

The same trust board demonstrated commanding leadership again in 2007 in an initiative to further reduce levels of blood culture contamination which had plateaued. Root-cause analysis (RCA) identified that the junior medical staff required more training. Again, the ANTT framework and *Saving Lives* (DH, 2005) guidance was used to structure this. The board communicated that any medical staff not identified on the training records within a set time frame would not be paid. Compliance to training was 100% and blood culture contamination fell further.

Having introduced ANTT, a university hospital NHS trust in the south-east of England used the audit cycle approach to monitor aseptic practice standards at one of its hospitals in 2006, 2007 and 2008. Each annual audit cycle involved approximately 40 clinical areas and 120 observations. Where poor practice was identified constructive criticism was given. For example, in 2008, 27 (22%) observed practice opportunities ($n=125$) had to be interrupted by the observer due to diversion from the guideline, such as staff not allowing IV hubs to dry before use. By identifying common weaknesses like key-part cleaning, incremental trust-wide improvements in practice have been made year on year. The Head Nurse and ANTT trust lead reported that the peer review audit cycle approach provided a useful two way

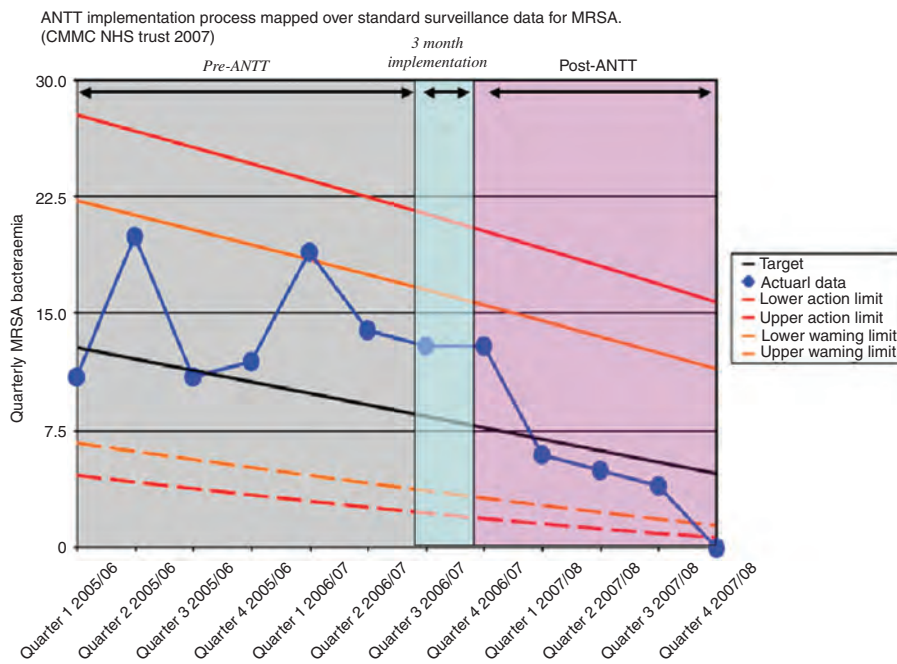


Figure 3. xxxx

ANTT implementation process mapped over standard surveillance data for glycopeptide resistant enterococci (GRE). (CMMC NHS trust 2007)

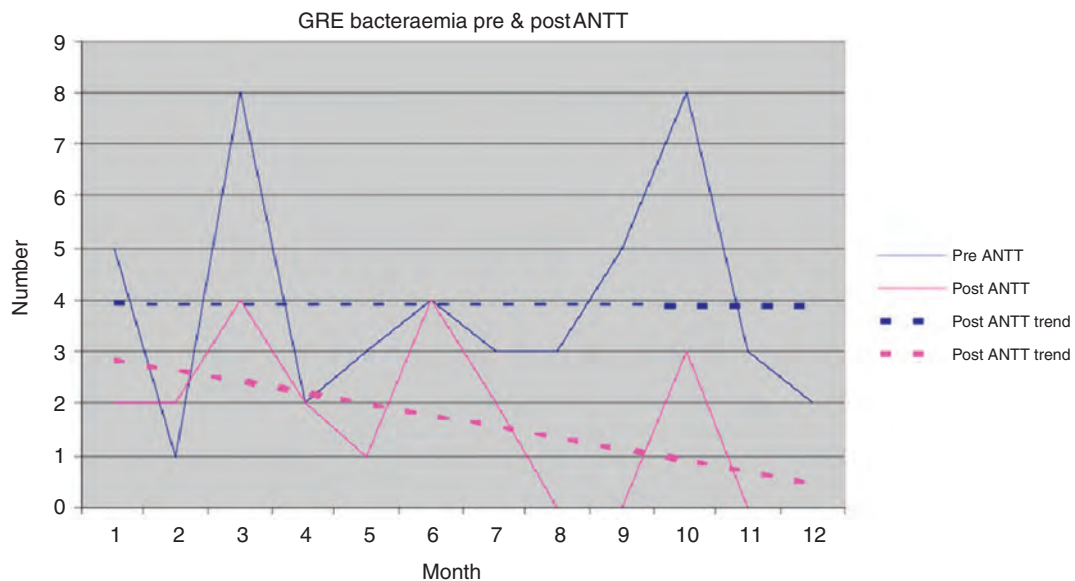


Figure 4. xxxx



communication process. It enabled staff to receive constructive practice feedback as well as enabling staff to give feedback to the trust about issues such as equipment provision.

As more trusts implement ANTT in liaison with the ANTT team, common themes have been identified. In the absence of an enforced aseptic standard, such as ANTT, approaches to, and standards of, aseptic technique across the NHS have been identified as highly variable. In addition, the prerequisite components of aseptic technique, such as hand cleaning, key-part protection, non-touch technique, aseptic field use etc, are typically found to be around 50% ensured and 50% suboptimal.

Before standardisation, a trust in central London fared slightly worse than this average. This was mainly due to equipment provision which, once identified, the trust quickly rectified as part of the ANTT implementation. A university hospital trust in the north-west of England fared generally better than average but still poorly in the most commonly observed practice failure; the effective cleaning of IV hubs. In ANTT audits to date, typically only 20% of observed practice has reflected accepted best practice technique in this critical component, namely, a large size 2% chlorhexidine and 70% alcohol wipe applied with friction for 20 seconds and allowed to dry (Kaler and Chinn, 2007). Even when using the optimum style wipes, staff typically cleaned IV hubs in a way more likely to support infection than protection of the patient, by cleaning around the last third of the length of the line and so removing dry and fixed dirt that was probably not presenting a significant risk and then transferring it to the tip of the hub by giving the injectable port only a cursory wipe. In not waiting for the tip to dry, any pathogenic organisms on, or transferred to the hub, are then administered into the patient on injection.

Poor aseptic standards applied to cannulation insertion and maintenance was another common theme identified. This was often exacerbated by the high prevalence of cannulae with flip top vertical ports. Such ports are difficult to clean, and the lids can't be replaced. Using these ports inadvertently exerts vertical pressure and trauma to the vein which is likely to cause mechanical phlebitis when used routinely. This is of concern in light of an informal consensus requested by the ANTT team of leading cannula manufacturers, as >80% of cannulas manufactured in the UK appear to be of this design.

Aseptic technique needs to be supported by clinical environments conducive to aseptic working. However, a common theme observed was poor organisational management of clinical preparation areas. Often due to the presence of unnecessary clutter such as outdated dusty policy folders, vomit bowls and even chocolate boxes and occupied denture pots, workbench space was compromised and insufficient for aseptic working. IV drugs were also commonly prepared in an ad hoc manner using nursing station surfaces.

Common themes counterproductive to aseptic working were also often observed in equipment selection. For example, aseptic fields promote aseptic practice by providing an aseptic working area for the preparation and utilisation of aseptic equipment. Poor equipment provision and choice of aseptic fields commonly included usage of vomit bowls, postcard sized cardboard trays, bed table tops and sometimes even window sills and bed sheets. The use of postage stamp sized alcohol wipes to clean IV hubs also remains commonplace. These 'traditional' wipes are too small for an effective cleaning technique and do not contain 2% chlorhexidine and 70% isopropyl alcohol, as recommended by Epic 2 (Pratt et al. 2007).

Limitations of this review

ANTT evaluation methods are aimed at identifying an 'ANTT-effect', defined as, 'The effect of a robust ANTT implementation on aseptic practice and/or healthcare associated infection'. In response to a particularly robust implementation at the NHS trust in the Midlands, the mapping of ANTT implementation over HCAI trends has strongly

suggested a positive ANTT effect. A similar effect has also more cautiously been suggested by data from five other trusts spread across England. This method of course requires consideration of any other significant infection control interventions introduced in the same period. Although the size and scope of a trust-wide robust ANTT implementation usually stands out against other infection control interventions, it has yet to be isolated or tested in a controlled study. However, the underlying premise of the process; that ensuring aseptic technique competency in large clinical workforces will impact positively on HCAI, is probably undisputed.

Discussion

ANTT has become the first standard approach to aseptic technique to exist across different acute NHS trusts and some primary care trusts. This adoption, publication and widespread usage of sourced ANTT material in trust policies has helped develop a more common language for aseptic practice; defined terms such as 'key-parts' and 'key-sites' are now widely used to describe and teach practice at both pre-and post-graduate level. Although basic, the original ANTT theoretical framework was surprisingly the first of its kind and on the above evidence has set a new paradigm for aseptic practice in the NHS.

The ANTT family of clinical guidelines do not profess to be the only way to practise effective aseptic technique. They have demonstrated that a standard approach to aseptic practice is important and advantageous. The ANTT standard has been shown to reduce practice variables and enabled peer and central monitoring of practice quality. The standard has aided evaluation and enabled ongoing systematic development of the peer reviewed guidelines. Not least, it has provided continuity of aseptic practice for a mobile clinical workforce and patients.

Historically, getting clinical staff to comply with infection control practice has proved problematic for NHS and other healthcare organisations (DH, 2003; Aziz, 2009). It became apparent to the ANTT team that establishing compliance with the guidelines would largely depend on encouraging and actively supporting NHS trusts to adopt a robust implementation model which was as standardised as the guidelines themselves. Very different levels of 'Board to Ward' style engagement were observed between hospitals (DH, 2008). This was ultimately reflected in the level of staff compliance with training and assessment. Such board-level leadership from the Chief Executive Officer, or more typically the Chief Nurse, appeared to be the single most determining factor of successful implementation.

The White Paper *Winning Ways* suggested that many healthcare associated infections are preventable, and highlighted aseptic technique as an area for improvement (DH, 2003). Although root-cause analysis is helping, the exact causes of infections are often not proven. Specific breakdowns in aseptic practice have been identified as common themes in ANTT audits and it is logical, if not probable, that these themes reflect the root cause of many HCAs. Clinical staff groups need to more often consider this 'invisible' connection between the cause and effect of HCAI.

A number of trusts have demonstrated improvements in clinical practice as a result of ANTT implementation. For practice improvements to be sustained, better understanding of the causes of poor practice is required. The risks presented by factors such as poor hand hygiene are well established. Less established are the risks posed by short staffing, poor skill mix, poor management support and poor equipment. For example, ANTT audits highlighted a theme of poor aseptic practice among phlebotomists in different NHS trusts. In interviewing phlebotomists, this did not reflect any lack of regard for patient care; but rather, a culture and pressure of work that inadvertently appeared to have 'programmed' phlebotomists to prioritise speed and quantity over quality. Compared to nursing, many trusts implementing ANTT struggled to gain the compliance of medical staff and





3

in particular anaesthetists. The relative effect of this lack of training in specific groups is beginning to be highlighted in some trusts through root-cause analysis. Perhaps Lord Darzi's quality agenda will also help address such issues (Darzi, 2008).

Our findings have highlighted that aseptic technique is dependent upon good wider aseptic management. For example, systems need to be put in place to ensure clinical preparation rooms are conducive to aseptic working and that aseptic equipment within them is stored correctly. The Productive Ward programme provides a structure to support this (NHS, 2008).

With regard to aseptic technique in the majority of centres we examined, clinical staff in practice remain more focused on the concept of treating patients than protecting them during treatments. To this end, Florence Nightingale's mantra, 'First do no harm,' still holds particular resonance in modern day aseptic practice (Nightingale, 1898). In other words, the first priority of any non-emergency clinical procedure is to ensure safe aseptic practice. The second priority is the procedure objective. This requires a mindset change.

The fact that so many staff did not know how to clean a key-part effectively is of concern and is an indication of a significant theory/practice gap in NHS hospitals. Advances in practice, such as the work of Kaler and Chinn (2007), need improved dissemination and monitoring.

Conclusion

The ANTT project has generated a huge amount of interest and this article has hopefully served as a useful update. It is hoped that evidence to date will encourage NHS trusts to adopt and implement ANTT in a robust manner with the required top level support.

Asepsis was developed 150 years ago. Arguably, aseptic practice has been randomly, arbitrarily, and haphazardly provided to patients by

healthcare professionals ever since. Infection rates would suggest that patients have paid a price for this incongruity over many years. As a result of initiatives like ANTT and *Saving Lives*, aseptic practice is showing signs of improving, though many challenges remain.

ANTT is based on the premise that reducing the variables of aseptic practice across large workforces by standardising aseptic technique, will naturally improve the quality of practice and subsequently infection rates. Standardising and monitoring aseptic practice trust-wide with ANTT appears to impact positively on practice and HCAI. Experiences to date suggest further enquiry is warranted. It is plausible that a coordinated NHS-wide ANTT initiative could have significant benefits for patients.

Reflecting the Department of Health's, 'Board to Ward' message, the success of ANTT implementations reviewed have been largely dependent upon the level of executive-board leadership and support given to them. In other words, when an NHS trust board truly wants something, it can usually make it happen. This phenomenon has previously been demonstrated in other NHS initiatives such as the transformation in accident and emergency trolley waits. Therefore, achieving safe standards of aseptic practice in NHS trusts appears to be mostly a matter of prioritisation and care.

The ANTT team would like to acknowledge, the work and contribution of ANTT adopters around the country. It should also be recognised that while some of the hospitals mentioned above have experienced challenges with practice, they are by no means alone and have equally been open and honest in their commitment to improve it.

Conflict of interest statement

None declared.

References

Aziz AM. (2009) Variation in aseptic technique and implications for infection control. *British Journal of Nursing*, **18**(1): 26–31.

Darzi A. (2008) *High quality care for all*. Department of Health: London. [DOH ISBN 978-0-10-174322-8].

Department of Health. (2003) White Paper. *Winning ways: working together to reduce healthcare associated infection in England*. Department of Health: London.

Department of Health. (2005) *Clean, safe care. Saving lives campaign*. Department of Health: London.

Department of Health. (2008) *Board to ward: how to embed a culture of HCAI prevention in acute trusts*. Department of Health: London. [Gateway reference 1004.]

Kaler W, Chinn R. (2007) A matter of time and friction. *Journal of the Association for Vascular Access* **12**(3): 140–2.

National Health Service Institute for Innovation and Improvement. (2008) *Releasing time to care: the productive ward*. NHS Innovation and Improvement. www.institute.nhs.uk

Nightingale F. (1898) *Notes on nursing: what it is, and what it is not*. D. Appleton and Company: New York.

Pratt RJ, Pellowe CM, Wilson JA, Loveday HP, Harper PJ, Jones SRLJ, McDougall C, Wilcox MH. (2007) Epic 2. National evidence based guidelines for preventing healthcare associated infection in NHS hospitals in England. *Journal of Hospital Infection* **65S**: S1–S64.

Rowley S. (2001) Aseptic non touch technique. *Nursing Times* **97**(7). Infection Control Supplement.

Rowley S. (2005) Great Ormond Street Hospital internal report. Unpublished. Available from www.antt.co.uk.

2

Peer reviewed paper

