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Original research article (long)

Is there is consensus for the aims of aseptic technique undertaken by nurses outside operating theatres? Delphi survey with follow-up study day

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Abstract

Background: Aseptic technique is integral to infection prevention but not clearly defined in international guidelines. Recommendations for practice lack concordance.

Aim: Establish whether there is consensus for the aims of aseptic technique and how it should be undertaken by nurses outside operating theatres.

Methods: Online modified Delphi survey in two rounds with follow-up study day.

Results: According to participants, aseptic technique is necessary to prevent transmission of potential pathogens; undertaken primarily to protect the patient undergoing the procedure; should be preceded by risk assessment; and only sterile items should enter the sterile field or contact the vulnerable site. To undertake risk assessment, information about the patient and venue are considered necessary. There is no consensus concerning whether the aim is to protect other patients and health workers; whether aseptic technique is possible in all settings; and appropriateness of personal protective equipment. Findings from the follow-up study day suggest that participants can undertake risk assessment when supplied with basic information related to patients and environment. The outcome of risk assessment is influenced by the venue where the procedure is undertaken, previous experience and perceptions about how invasive the procedure is; distinction is made between procedures considered highly invasive and those perceived to carry less risk.

Conclusion: Nurses agree on some, but not all key issues related to aseptic technique.

Decision to undertake it appears to depend on venue, experience and perceptions of how invasive the procedure is. More focus is needed on education, delivery and audit of aseptic procedures to improve consistency of understanding and practice.

Keywords: Asepsis; Aseptic technique; Clean technique; Invasive devices; Wounds

Background

Although aseptic technique is integral to infection prevention, it is not clearly defined in international guidelines and recommendations for practice lack concordance .(1) Numerous terms have been used to describe asepsis in practice manuals, textbooks and websites: ‘aseptic technique’; ‘non-touch technique’; ‘aseptic non-touch technique’; ‘standard aseptic non-touch; technique’; ‘surgical aseptic non-touch technique’; ‘sterile technique’; and ‘medical asepsis’. The authors of a recent scoping review(2) concluded that research is required to elucidate the aims of aseptic technique as it is undertaken by nurses outside operating theatres and reach consensus over definitions and terminology.

Methods

Study design

We conducted an online modified Delphi survey to establish whether there is consensus for the aims of aseptic technique and how it should be undertaken by nurses in critical care units; wards and community settings (e.g. home nursing, primary, long-term care facilities). The initial findings indicated that access to contextual information is required to facilitate clinical decision-making to aid risk assessment before deciding whether aseptic technique should be adopted. The process of this risk assessment related to aseptic technique was further explored in a follow-up study day.

Delphi procedure

Modified Delphi surveys are commonly undertaken to establish convergence and divergence of opinions about clinical practice.(3) In the study we report, the Delphi procedure took place in two rounds with a four-week interval to allow dispatch of the invitation, with weekly reminders and analysis between rounds (Figure 1). Panellists completing Round 1 were invited to take part in Round 2. Delphi statements were presented on a five-point Likert scale

with a free-text box for comments. They were requested to rate each statement on a five-point Likert scale: strongly agree (score = 5) to strongly disagree (score = 1). The mid-point (score 3) was taken as uncertain. Statements (see Table 1) were compiled from microbiological theory, nursing manuals and practice recommendations.(4–8) A statement about Aseptic Non-Touch Technique (ANTT)(9) was included because this framework is widely used in the UK where the study was conducted.

Obtaining a representative sample of experts for Delphi surveys and maintaining an acceptable response rate throughout sequential rounds and for other consensus activities is an acknowledged challenge.(3) Consequently, we did not involve any potential participants in design or piloting the Delphi statements. Instead, we drew on the expertise of the project team which included: infection prevention and control; medical microbiology; nursing; epidemiology; education; statistics; and research methodology.

Figure 1. The Delphi survey process

[INSERT FIGURE 1 HERE]

Participants

Purposive sampling was undertaken to obtain opinions from nurses at different levels of seniority in critical care units, wards and community settings: intensive care; surgery; primary care; home care; tissue viability; infection prevention; accident department; vascular access; children's nursing; and social care (e.g. long-term care facilities). Panellists were identified via their professional bodies (Royal College of Nursing, London, Nursing Infection Control Network, specialist nursing forums) and invited to take part by email. Those confirming interest were sent an electronic link directing them to an information sheet, consent form and Delphi questionnaire. The link could be used once and not redirected.

Follow-up study day

The aim of the moderated follow-up study day was to explore how nurses conduct risk assessment and identify factors influencing the decision to undertake aseptic technique.

Opinions were obtained with vignettes. These are short, hypothetical accounts depicting real-world situations that can be used to explore clinical decision-making.⁽¹⁰⁾ Two researchers selected typical procedures from those listed in standard practice manuals and textbooks and used them to develop prototype vignettes. These were reviewed by the full research team to ensure they included a comprehensive range of clinical procedures and were clearly written.⁽¹¹⁾ Each vignette contained a brief description of the procedure, patient and clinical setting. Additional material was developed to provide further information that could be used to inform risk assessment to be given to participants on request during the data collection exercise. Twenty-one vignettes explored risk assessment in acute settings (e.g. hospital wards, critical care units). Fourteen vignettes explored risk assessment in non-acute settings (e.g. primary care, nursing homes, home care).

Participants worked in small groups to assess whether aseptic technique would be appropriate in the situation depicted in each vignette, giving rationale and made notes on a template developed especially for the study. Verbal feedback from each group was digitally recorded with permission. Verbatim notes were taken. Participants were advised that they could request more detailed information from the moderator at any point during the exercise to facilitate risk assessment.

Analysis

For the Delphi survey median scores and interquartile ranges (IQRs) for each response were calculated to identify the response category above and below which fifty percent of the responses fell. Responses where the median was less than or equal to 2 (high level of agreement of importance) with a small IQR (less than or equal to 1.5) were taken as

statements for which consensus had been achieved. Responses with a median score of more than or equal to 3.5, with a small IQR (less than or equal to 1.5), were taken as statements where there was consensus on lack of importance.(12) For the follow-up study day frequency counts of the number of recommendations for aseptic technique were calculated from the data collection templates. Qualitative data from the transcribed feedback were subjected to inductive content analysis(13) conducted independently by two researchers. Third party arbitration was available but not required.

Ethical approval

Ethical approvals for the Delphi survey and follow-up study day were obtained from the research ethics committee of the university leading the research (ETH2425-1806, ETH 2425-2320). Two submissions were necessary as the follow-up study day had not been planned in the original submission. Written informed consent was obtained from participants.

Results

Delphi participants

Fifty-two panellists were invited to participate in the Delphi survey. The sample for Round 1 consisted of 24 frontline nurses working in different settings who undertook aseptic technique as part of their everyday work, four nurse managers responsible for ensuring standards of clinical excellence and four educators responsible for teaching the theory and skills of aseptic technique. There were two refusals on health grounds and six refusals because panellists no longer felt conversant with contemporary nursing practice. The remainder of those approached did not reply.

Delphi survey

Forty-four panellists responded to Round 1. Consensus was achieved for 11 of 19 statements. In Round 2 consensus was reached for two further statements (see Table 1). Free text data indicated that statements were difficult to answer in the absence of contextual data describing the patient and environment in which the procedure took place and that this information would be necessary to conduct risk assessment. Inspection of the data failed to identify any patterns related to professional group or role. Round 1 commenced 23. 2. 25. Round 2 commenced 7.5.25.

Table 1. Results of the Delphi survey

[INSERT TABLE 1 HERE]

Table 2. Procedures requiring aseptic or clean technique recommended by participants in the consensus exercise

[INSERT TABLE 2 HERE]

Follow-up study day

Twenty-five nurses volunteered to take part in the follow-up study day via an advertisement placed on the website of their professional body. They were evenly divided between nurses in senior and junior positions and were from a range of acute and non-acute settings. Ten had previously participated in the Delphi survey. The event took place on 11.7.2025.

No difficulties were reported undertaking risk assessment using the brief information provided in the vignettes. Decisions were reached quickly without requests for additional contextual information available from the moderator. No divergence of opinion or disagreements during feedback and discussion were noted. Participants suggested that in acute care settings management of wounds and indwelling urinary catheters would be undertaken aseptically but in non-acute settings clean technique would be adopted (see Table

2). Qualitative analysis of the transcribed feedback indicated that decisions were based on the rationale that in home care environments, patients 'were used to their own germs' and that aseptic technique would be reserved for procedures considered highly invasive (see Box 1). Aseptic technique was recommended for inserting and handling intravenous lines in acute and non-acute settings and for inserting urinary catheters because these procedures were considered very highly invasive. Participants drew on previous experience to undertake risk assessment, describing wounds they had previously dressed, or the typical appearance they would expect of a urinary drainage system for a catheter in situ long-term. The challenge of undertaking clinical procedures in non-acute settings attracted lively discussion. Participants had witnessed poor standards of cleanliness in some homes, difficulties controlling the environment (e.g. interference from carers, incidents involving pets) and eccentricities of patients affecting ability to conduct procedures (e.g. not wanting furnishings or other items moved to allow positioning of clinical equipment). Comments revealed wasteful use of expensive consumables. Participants reported creating work surfaces to position equipment, avoid spillages and other hazards irrespective of whether a sterile or non-sterile field was considered necessary. They described opening procedure packs and discarding all the remaining contents to use the sterile inner wrapping as a work surface.

Box 1. Factors influencing risk assessment: participants' comments (qualitative analysis)

[INSERT BOX 1 HERE]

Discussion

Ours appears to be the first empirical study seeking nurses' convergence and divergence of opinion for the aims and conduct of aseptic technique outside operating theatres. The findings corroborate existing literature (2,14); there is confusion about the aims of aseptic technique,

equipment necessary and the challenges of undertaking procedures aseptically in non-acute settings, especially home care.(15–18)

In the Delphi survey consensus was achieved for key issues relating to aseptic technique. It was considered necessary to prevent transmission of potential pathogens; protect the patient undergoing the procedure; and insert and manipulate invasive devices. Risk assessment was considered necessary before deciding to undertake aseptic technique and need was expressed for contextual information to aid risk assessment related to the patient and environment in which the procedure would be conducted. There was agreement that only sterile items should enter the sterile field or contact the site vulnerable to infection. ANTT was considered a useful framework to guide aseptic technique. There was lack of consensus concerning whether aseptic technique was intended to protect other patients and health workers from cross-infection; whether it was possible only under controlled conditions; whether aseptic technique is possible in all settings where care is delivered, involves non-touch technique; and when personal protective equipment (PPE) would be appropriate. Findings from the follow-up study day suggested that participants could readily undertake risk assessment when supplied with basic information related to the patient and environment. Clinical decision-making was based largely on the venue in which the procedure would be undertaken and practitioners' previous experience. Distinction was made between procedures that were considered very highly invasive (e.g. inserting devices, manipulating intravascular lines) and procedures which although still invasive, were perceived to carry less risk (e.g. manipulating urinary catheters, dressing chronic wounds). Lack of consensus regarding PPE might have been related to heterogeneity in the Delphi sample; nurses employed in acute settings might use PPE routinely while in community settings, it might not be readily available. Lack of consensus concerning non-touch technique is hard to explain as it is the rationale underpinning ANTT which was agreed to be a useful framework for aseptic technique.

Our findings suggest that there is no single way of conducting procedures aseptically. It is likely that nurses adjust practice to meet the needs of specific patients, procedures and the setting in which aseptic technique is conducted. The speed of clinical decision-making witnessed in the follow-up study day and nurses' reliance on previous experience may reflect the reality of contemporary health care and rapid patient throughput, in which they are obliged to conduct risk assessment swiftly without access to detailed information about individual patients. Periodically there are calls to audit aseptic technique to ensure practitioners' competency, compliance with guidelines and avoid unwarranted variations in practice.(4) Based on our findings, audit would not be straightforward. Assessors would need to consider risk, feasibility and practicality which in turn would depend on the setting in which the procedure was undertaken, the patient's condition and specific procedure.(19) It would also be necessary to explore practitioners' rationale for their actions as these would influence actions witnessed during practical assessment. Further research is needed to replicate or refute the findings of the study we report with a larger sample. Research is also needed to explore how risk assessment is undertaken by individual practitioners directly responsible for patient care and the most effective ways approaches to education. This is an important issue. The UK Covid Inquiry established a record of poor risk assessment and decision-making at senior level by the public health authorities during the 2020 pandemic(20) and there is a dearth of research exploring how it is undertaken at the level of the individual practitioners. This is despite recommendations to conduct risk assessment in national guidelines for infection prevention.(21) Our study has implications for nurse education and the evolution of clinical practice where 'clean' technique may be sufficient and offer, a safe, cheaper alternative. Nurses should be aware that the process of sterilisation carries a heavy carbon footprint, its financial implications for cash-strapped healthcare services and how to use resources wisely to improve sustainability and planetary health.(22)

Study strengths and limitations

Delphi surveys have been criticised because reliance is placed on non-randomly obtained samples and findings reflect opinion, not fact.(3,23,24) Many Delphi surveys are conducted with 'expert' panellists. In our survey we recruited panellists with expertise in clinical nursing practice and infection prevention as well as those who conduct aseptic technique every day, with a mixture of senior and junior practitioners. There is no guarantee, however, that panellists had insight into their own knowledge or ability to practise.(25) The same criticism can also be applied those taking part in the follow-up study day. Vignettes may not reflect 'real world' situations, affecting the validity of findings, (9Evans). This drawback can be overcome if, as in our study, care is taken to ensure that information is clearly presented and reflects existing practice.(26) **Failure to undertake more extensive preparatory work to design and pilot the Delphi statements and vignettes is a limitation which should be addressed in future studies.** Group pressure may influence the findings of face-to-face data collection events, jeopardising validity(27) but can be avoided or reduced if as in our study, the encounter is carefully moderated, setting clear ground rules at the outset.(28) Finally, our findings reflect the opinions of a non-randomly obtained, relatively small sample of nurses. Maximum variability sampling ensured that they reflected the opinions of nurses employed in a wide range of clinical settings and with different experiences, however.

In conclusion, we established agreement for some, but not all key issues related to aseptic technique among nurses practising in a range of acute and non-acute settings. Decision to undertake procedures aseptically appears to depend on venue, practitioners' experience and perceptions about how invasive of procedure is. These findings indicate that more focus is needed on education, delivery and audit of aseptic procedures to improve consistency of understanding and practice.

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Conflict of interest statement

Georgia Oxley-Smith, Caroline Fellows, John Hines, and Kevin Ormandy are employed by SC Johnson Professional Ltd, Denby, United Kingdom.

Dinah Gould has given evidence to the UK Covid enquiry.

No other authors have any conflict of interest to declare.

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Table 1. Results of the Delphi survey

Key:

Unshaded statements: high level of agreement reached concerning importance.

Shaded statements: no consensus has been reached concerning importance/lack of importance

First round	Median	IQR	Second round	Median	IQR
<i>1. The aim of aseptic technique is to avoid the transmission of potentially pathogenic organisms.</i>	1	0		NA	NA
<i>2. Aseptic technique is primarily intended to protect the individual patient undergoing the procedure.</i>	1	1.25		NA	NA
<i>3. Aseptic technique is intended to protect other patients who are at risk through cross-infection.</i>	2	3		3	3
<i>4. Aseptic technique is intended to protect the health worker undertaking the procedure.</i>	2	4		2.5	3
<i>5. Aseptic technique can be fully undertaken only under controlled conditions (e. g. operating theatre, beneath laminar flow).</i>	4	4		4	2
<i>6. Aseptic technique can be undertaken in any setting where patients receive care.</i>	2	2.25		1	1
<i>7. Aseptic technique is necessary whenever undertaking invasive procedures (e. g. cannulation,</i>	1	1		NA	NA

<i>inserting a urinary catheter).</i>					
8. Aseptic technique is necessary whenever manipulating an indwelling invasive device (e.g. intravenous line, urinary catheter).	1	1		NA	NA
9. Risk assessment should always be undertaken before deciding to conduct aseptic technique.	1	1.25		NA	NA
10. Hand hygiene is essential before undertaking and completing an aseptic procedure.	1	0		1	1
11. Aseptic technique is undertaken with a non-touch technique.	1	2		1	1
12. Aseptic technique means ensuring that only sterile items enter the sterile field.	1	0.25		NA	NA
13. Aseptic technique means that only sterile fluids and equipment contact the vulnerable site.	1	1		NA	NA
14. Some vulnerable sites (e. g. wounds) may be contaminated. Here the aim of aseptic technique is to avoid introducing additional contamination.	1	1		NA	NA
15. To undertake aseptic technique, it is necessary to wear sterile gloves.	2	2		2.5	3
16. To undertake aseptic technique, it is necessary to wear a gown or apron.	3	1.25		2	3
17. To undertake aseptic technique, it is necessary to wear a face protection (mask, goggles)	3	2		2	3
18. Aseptic technique can be undertaken by incorporating a framework such as the Aseptic Non-Touch Technique (ANTT™) or another named approach.	1	1		NA	NA
19. ANTT™ terminology (e. g. 'key part', 'key site') is valuable when understanding the principles underpinning aseptic technique.	1	1.25		NA	NA

Table 2. Procedures requiring aseptic or clean technique recommended by participants in the consensus exercise

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Asepsis recommended by participants**ACUTE CARE SETTINGS**

- Dressing a newly created surgical wound (surgery less than 3 days ago)
- Dressing a chronic wound (e.g. pressure ulcer, venous ulcer) in hospital
- Changing the dressing of a central venous catheter
- Obtaining a urine specimen from a catheterised patient in hospital.
- Administering an IV injection in hospital (peripheral line).
- Dressing a surgical wound, immunocompromised patient, surgery was 7 days ago.
- Inserting a central intravenous catheter (CVC) in ITU
- Inserting a urinary catheter in hospital
- Undertaking a catheter washout in hospital
- Obtaining a blood specimen from a central venous line (CVC).
- Inserting an IV cannula (peripheral line).
- Administering IV medication
- Packing a deep wound surgical scalp wound; healing is by secondary intention in hospital
- Inserting an IV cannula for a patient in a ward (peripheral line).
- Measuring central venous pressure for ITU patient in ITU
- Inserting an IV cannula, difficult venous access

NON-ACUTE CARE SETTINGS

- Dressing a chronic wound (e.g. pressure ulcer, venous ulcer)
- Packing a deep surgical scalp wound for a patient at home
- Dressing a surgical wound that dehisced 7 days ago
- Changing the dressing of a Hickman line for a cancer patient at home

Asepsis not recommended by participants**ACUTE CARE SETTING**

Replacing an endotracheal tube for a ITU patient

Emptying a urinary catheter drainage bag

Re-connecting the catheter and drainage bag tubing following accidental disconnection.

Undertaking routine eyecare for ITU patient

NON- ACUTE CARE SETTING

Emptying the urinary catheter drainage bag (long-term urinary catheter)

Re-connecting the catheter tubing and drainage bag tubing after accidental disconnection.

Dressing an exudating wound for a patient who had surgery 7 days ago.

Attaching an overnight drainage bag for a resident catheterised long-term.

Dressing a chronic wound (e.g. pressure ulcer, venous ulcer)

Obtaining a urine specimen from a catheterised patient

Undertaking a catheter washout

Dressing a surgical wound for immunocompromised patient surgery was 7 days ago

Self-catheterisation; patient unable to empty their bladder

Emptying the urinary drainage bag, long-term urinary catheter

Attaching an overnight bag for a patient catheterised long-term

Box 1. Factors influencing risk assessment: participants' comments (qualitative analysis)**Clinical setting**

'Clean technique because it's a chronic wound and the patient is in their own home.'

'Aseptic technique because the patient is in hospital.'

'Clean technique. In the community, in people's own homes, to a certain degree, they're used to their own germs.'

'So, in hospital we tend to be a lot more clinical because we're frightened of introducing bacteria that the person wouldn't be normally exposed to.'

'A clean technique because it's a patient in their own home and you could do it (change urinary catheter bag) using a non-touch technique.'

'Undertaking a bladder washout for a patient at home whose catheter has blocked - it could be a clean technique, and you would be protecting yourself with non-sterile gloves.'

'Dressing a chronic wound in the patient's own home - it is a clean technique.'

'To dress a surgical wound for a patient at home who is immunocompromised and whose surgery was seven days ago we thought a clean technique, even though they were immunocompromised because they're at home and they're exposed to their own microbiome.'

'Aseptic technique. The patient is in intensive care and ITU patients are generally compromised to begin with. They've usually got something.'

Invasiveness of the procedure

'Undertaking a bladder washout for a patient in the accident department whose urinary catheter is blocked - it's an invasive technique.'

'A central venous intravenous catheter in the intensive care unit. Definitely an aseptic technique because you're going into a major vessel.'

'You're not actually breaking the seal (of the catheter drainage system), so you're not introducing outside organisms.'

'As long as you've got a closed (urinary catheter system) it's a non-touch technique.'

'This is a scalp wound surgically created, healing by secondary intention. So, we said aseptic technique and the rationale was that there's a risk of microbial introduction to the tissue.'

Condition of the site vulnerable to infection

'To remove the dressings from the leg (venous ulcer) we would use clean technique. They're usually contaminated with exudate and they're a bit mucky.'

'They (urinary catheters) get a bit discoloured.'

'Yeah, the whole set (urinary catheter and drainage system) can look very nasty. Some nasty community ones.'

'Aseptic technique because it's a fragile wound following recent surgery.'

'Healing is by secondary intention, granulation. It should be aseptic because it's recent surgery. We reasoned that granulation healing wouldn't have started.'

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Box 1. Factors influencing risk assessment: participants' comments (qualitative analysis)**Clinical setting**

'Clean technique because it's a chronic wound and the patient is in their own home.'

'Aseptic technique because the patient is in hospital.'

'Clean technique. In the community, in people's own homes, to a certain degree, they're used to their own germs.'

'So, in hospital we tend to be a lot more clinical because we're frightened of introducing bacteria that the person wouldn't be normally exposed to.'

'A clean technique because it's a patient in their own home and you could do it (change urinary catheter bag) using a non-touch technique.'

'Undertaking a bladder washout for a patient at home whose catheter has blocked - it could be a clean technique, and you would be protecting yourself with non-sterile gloves.'

'Dressing a chronic wound in the patient's own home - it is a clean technique.'

'To dress a surgical wound for a patient at home who is immunocompromised and whose surgery was seven days ago we thought a clean technique, even though they were immunocompromised because they're at home and they're exposed to their own microbiome.'

'Aseptic technique. The patient is in intensive care and ITU patients are generally compromised to begin with. They've usually got something.'

Invasiveness of the procedure

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