



Research article

How aseptic technique is taught to undergraduate student nurses: A qualitative study

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ABSTRACT

Background: Aseptic technique is essential to prevent healthcare-associated infection and reduce the risk of antimicrobial resistance but little research has explored how it is taught in undergraduate nursing curricula.

Objective: Explore how undergraduate student nurses learn about aseptic technique in classroom and clinical settings and the contribution of key stakeholders in the educational process: nurse educators, mentors and infection prevention nurses.

Design: Qualitative interview study with observation of teaching.

Setting: Two contrasting sites, one reporting greater innovation in relation to the teaching and practice of aseptic technique than the other. Each site comprised a university nursing department and the organisations providing student placements.

Participants: Student nurses, university-based nurse educators, clinical mentors and infection prevention nurses.

Methods: Telephone interviews, fieldwork and unstructured observation of teaching in the universities.

Findings: Student nurses reported feeling poorly prepared to undertake aseptic technique. There were misunderstandings and confusion about its purpose and how it should be conducted among nurse educators and mentors. Suboptimal facilities, poor curriculum design and arrangements for competency assessment in both sites contributed to students' experiences. Reports of better innovation in one of the participating sites compared to standard practice in the other were not reflected in the data.

Conclusions: The findings of this study corroborate earlier research: student nurses do not feel well-prepared to undertake aseptic technique. Healthcare providers and universities need to investigate and address deficiencies in understanding among those responsible for teaching and performing this key nursing skill. University curricula should be revised to ensure that teaching takes place optimally in relation to clinical placements, improve arrangements for students' competency assessment, focus more on teaching the principles underpinning aseptic technique and promote transferability from the classroom to different types of clinical settings. Communication between university and clinical staff should be strengthened.

1. Introduction

Healthcare-associated infection (HCAI) is the most common adverse event reported in healthcare (World Health Organization, 2011). In Europe, over 4 million patients develop at least one HCAI per annum, contributing to 37,000 deaths every year, (European Centre for Disease Prevention and Control, 2013). HCAI also increases the costs of health care (O'Neill Report, 2016) and the global threat of antimicrobial resistance (World Health Organization, 2016a, 2016b, 2016c). Policy-makers recommend improving infection prevention, implementing

guidelines to support practice and educating practitioners to reduce these risks (World Health Organization, 2016a, 2016b, 2016c). Hand hygiene and aseptic technique are the cornerstones of infection prevention (Department of Health, 2019). Hand hygiene has been the subject of extensive research and is supported by internationally-agreed guidelines which are well-disseminated (Allegranzi et al., 2013). In contrast, aseptic technique has received far less attention. There is no internationally-agreed definition and different aims are suggested in the numerous guidelines available. In the United Kingdom (UK) alone, at least three official sets of guidelines exist. According to one guideline the

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aim is to: 'Minimise the risks of exposing the person being cared for to pathogenic micro-organisms' (National Infection Prevention and Control Manual Scotland, 2021), while in another guideline the aim is to: 'Ensure that sites of the body susceptible to infection do not receive contact with contaminated equipment or fluid' (National Institute for Health and Care Excellence, 2018). In a third guideline, aseptic technique is described as a way of carrying out a procedure under strictly controlled conditions (Loveday et al., 2014). Lack of consensus about the purpose of aseptic technique presents challenges for those learning and teaching this essential nursing skill and has implications for patient safety.

2. Background

Aseptic technique is a fundamental skill that all nursing students are required to learn internationally (Carter et al., 2017; Nursing and Midwifery Council (NMC), 2018a, 2018b). In the UK, competency or proficiency in aseptic technique has been a professional requirement for some years (NMC, 2010; NMC, 2018a). The NMC standards for pre-registration nursing programmes (2018b) stipulate that technology enhanced learning and simulation should be used to support practice-based learning and assessment which includes aseptic technique.

Discrepancies are reported in the way that aseptic technique is practised (Aziz, 2009; Preston, 2005; Unsworth and Collins, 2011) and how it is adapted in different settings and for different procedures (Hallett, 2000; Unsworth and Collins, 2011). Student nurses describe differences between what is taught in the university and during clinical placements (Ward, 2010; Ward, 2011; Gould and Drey, 2013) while many qualified nurses report lack of opportunities to update knowledge and skills, lack of regular competency assessment and voice concerns over clinical standards (Gould et al., 2018; Gould et al., 2021). A national survey of education and training in aseptic technique in undergraduate, pre-registration programmes in the UK demonstrated considerable variation in the amount of time devoted to teaching aseptic technique, the use of different guidelines to support practice, inaccuracies in what is taught and limited opportunities for competency testing (Hawker et al., 2020). The Aseptic Non-Touch Technique (ANTT©) framework introduced in 2001 was intended to standardise practice (Rowley and Clare, 2020) but misunderstandings about aseptic technique are still reported and may contribute to HCAI and antimicrobial resistance (Gould et al., 2020). It appears that in many countries, aseptic technique is learnt in relation to specific nursing procedures with little emphasis on the principles underpinning asepsis (Hawker et al., 2022).

Responsibility for teaching and assessing aseptic technique is shared between nurse educators employed in universities and mentors who supervise student nurses during clinical placements. Infection prevention nurses play an important role as they are responsible for implementing policies and guidelines to contain HCAI. They contribute to educational standards indirectly and may support teaching in local universities. No in-depth investigation has explored how undergraduate student nurses learn about aseptic technique and the contributions of nurse educators, mentors and infection prevention nurses.

3. Methods

3.1. Aim

The aim of the study was to explore how undergraduate student nurses learn about aseptic technique and the contribution of key stakeholders in the educational process: nurse educators, mentors and infection prevention nurses.

3.2. Study design

Qualitative interview study with observation of teaching. A multi-method approach was used to provide a richer understanding of how

nursing students learn aseptic technique (Silverman, 2021).

3.3. Study sites

Criteria to evaluate educational practice in relation to aseptic technique were developed based on data from a previous national survey of aseptic technique education and training in undergraduate, pre-registration adult nursing programmes in the UK (Hawker et al., 2020) (see Table 1).

Two contrasting sites- universities reporting differences in innovation regarding aseptic technique in their undergraduate, pre-registration adult nursing programmes were invited to take part. Greater innovation was reported from Site 2 (score 4 out of 7) than for any of the other universities responding to the survey. ANTT© was reported to be in use throughout all associated trusts. Summative and formative assessments for aseptic technique in the university and innovative approaches and developments in university teaching were reported, for example, use of virtual reality for practising aseptic technique and garments simulating wounds. ANTT© was reported to be in use throughout all associated trusts in Site 1 but no other innovation was reported (score 1). ANTT© was taught in both universities.

The two universities were located in different parts of the UK. They offered an undergraduate, pre-registration nursing programme only, with the award of a Bachelor of Nursing at Site 1 and a Bachelor of Science at Site 2. There were two intakes per annum at both sites, but intakes were larger in Site 1 than Site 2. The university in Site 1 provided 14 hours of teaching dedicated to aseptic technique per intake. The university in Site 2 provided 21 teaching hours per intake. Students in year one at both sites had access to a video of a practical demonstration of aseptic technique in wound care. In Site 1, teaching took place primarily in a dedicated clinical simulation centre with the support of simulation technicians. In Site 2, teaching took place in classrooms without technical support. In Site 1, student nurses' competency in aseptic technique was assessed when changing a wound dressing in each year of the programme. In Site 2, aseptic technique was assessed in the second and third years only. In Site 1, there were nine clinical placements throughout the course in three NHS trusts. In Site 2 there were six clinical placements in four NHS trusts. The trusts associated with Site 1 tended to be larger, covered a more scattered area and served a more deprived population. Rates of HCAI were higher in Site 1 than Site 2. At the time of data collection, Site 1 was not meeting national targets for methicillin resistant and sensitive *Staphylococcus aureus* or *Clostridiodes difficile*. Targets were met in Site 2.

Table 1

Criteria adopted to evaluate educational practice in relation to aseptic technique.

Criteria
Teaching/learning
1. Reported use of an innovative approach to education concerning aseptic technique
2. Reported use of a framework to guide aseptic technique (e. g. ANTT©) to support learning and teaching
Assessment in clinical practice
3. Arrangements in place for students undertake the same competency assessment as qualified staff
4. Performance-based criteria adopted for assessment of aseptic technique
5. Formative or summative competency assessment of aseptic technique in each year of the programme
University assessment
6. Summative OSCE/practical assessment
7. Formative OSCE/practical assessment

3.4. Participants

Student nurses, nurse educators, mentors and infection prevention nurses in the two study sites were invited to take part.

4. Data collection

4.1. Interviews

Telephone interviews were undertaken by the lead investigator using a semi-structured interview guide developed especially for the study by the research team. Third year student nurses were approached during taught sessions in the university and informed about the study. An advertisement was also placed on the university virtual learning environment. All students expressing willingness to take part were approached. Mentors, infection prevention nurses and nurse educators were identified through their managers and invited to participate individually via email. Three preliminary interviews were undertaken with a student, educator and mentor respectively to ensure that the interview questions captured the required information. No changes were necessary. These data were not included in final analysis. Interviews were recorded and transcribed verbatim and stored in Nvivo 10. Throughout each interview, the data collector checked with the informant to ensure that they had interpreted what had been said correctly.

4.2. Observation

Arrangements were made to undertake a site visit in both universities on days when aseptic technique was scheduled to be taught and practised or assessed. Two gatekeepers, educators interviewed as part of the study, facilitated access. The lead investigator took on the 'participant as observer' role described by Gold (1958). Adopting this role the observer would at times observe more formally sitting at the back of the room when during teaching while at other times they would observe informally, interacting with students and facilitators when students were practising aseptic technique. Semi-structured observation was undertaken for each session, an approach usually associated with qualitative research (Punch, 2014). Detailed fieldnotes providing 'thick description' were made during or immediately after the sessions. These notes included details of the teaching venue, the facilities available, and events arising during the sessions, for example any breaches of aseptic technique or departure from infection prevention principles. Awareness of any preconceptions that might influence observations were acknowledged both during and after observation sessions, and noted in a reflective diary. Furthermore, observations were guided by the research question. Anything relevant to understanding how nursing students learn aseptic technique were recorded, with particular focus on exploring areas identified from survey findings (Hawker et al., 2020) and key domains of practice from the literature (Xavier, 1999; Aziz, 2009; Preston, 2005; Fraise and Bradley, 2009; Dougherty and Lister, 2011, 2015; Wilson, 2019) (see Table 2).

Table 2
Areas of focus for observation of teaching.

Emphasis on fundamental infection prevention strategies (e.g. hand hygiene, waste disposal)
Focus of the education session (e.g. principles underpinning aseptic technique or procedure)
Use of ANTT©
Reference to any other guidelines or literature
Duration of teaching
Problems observed during student practise (e.g. difficulty donning gloves, maintaining the sterile field)
Feedback and assessment

4.3. Analysis of the interviews

The interview data were read in detail and research memos were written of key issues that might trigger later analysis (Dey, 1993). Thematic analysis was undertaken using Braun and Clarke's (2013) six step approach: familiarisation with data; generating initial codes; searching for themes; reviewing themes; defining and naming themes; and generating the report. Data collection ceased once no new findings emerged. Preliminary analysis was undertaken by the lead investigator followed by discussion about the coding and development of themes with two other members of the research team and to rationalise the decisions made within the analytical process as part of a reflexivity strategy. Codes, categories, sub-themes and themes identified (see Tables 4 & 5) during analysis were constantly reviewed, and revised against the interview data, and checked by the same two researchers increasing the credibility of the thematic analysis (Houghton et al., 2012).

4.4. Analysis of observation

Field notes of observation were first annotated, then open coded as they were read, with codes and categories finally created. An ongoing and iterative process was adopted where the codes, categories and themes from the interview data were constantly compared with those from observation fieldnotes to look for patterns and to achieve data triangulation (Denzin, 1978; Yin, 2014). Data integration was accomplished by applying Dey's Framework (1993) to link the interview and observation data, make connections and corroborate evidence.

4.5. Rigour

Expertise of the research team included qualitative interviewing, infection prevention, nurse education and collection and analysis of data collected by observation. The study adopted the Consolidated Criteria for Reporting Qualitative Research (COREQ) (Tong et al., 2007).

The rigour of the study was ensured by applying Lincoln and Guba's (1985) criteria of credibility, confirmability, dependability and transferability. The credibility was enhanced through data triangulation, gathering data from multiple sources (interviews and observation fieldnotes). Members of the research team were university staff involved in nurse education and research external to the two participating universities and therefore had no responsibility for students or working relationship with educators recruited to the study. The lead investigator continuously critically reflected upon how their own role and position as an educator and experiences of learning and teaching aseptic technique might influence each step of the research process (Berger, 2015). All key decisions made were discussed with two independent researchers. A reflective diary was maintained to record decisions, feelings and judgements as part of a reflexive approach and to provide an audit trail, increasing the confirmability and dependability of data (Korstjens and Moser, 2018). Pre-suppositions, experiences and bias were acknowledged by 'bracketing' throughout data collection and analysis (Curry and Nunez-Smith, 2015). The criteria designed to assess innovative practice were developed by the research team and agreed by an external panel whose members were experienced in nurse education, including teaching and assessing infection prevention practice. Member checking was undertaken with four informants (one student, one mentor, one infection prevention nurse and one nurse educator) to increase the credibility of the findings (Curry and Nunez-Smith, 2015). A summary of the key findings featuring the themes and sub-themes arising from the data were presented to the participants to ensure that their views were captured.

4.6. Ethical considerations

Ethical approval was granted by a university ethics committee.

Participants received verbal and written information before agreeing to take part and signed a consent form. They were assured that their identity and that of their employing organization would not be disclosed in the study report or publications arising from it.

5. Results

5.1. Qualitative interviews

Fifteen third year student nurses, eleven mentors, seven nurse educators and fourteen infection prevention nurses were invited to participate (n = 47). There were no refusals (see Table 3). Interviews took 40–60 minutes with a median length of 50 minutes.

5.2. Observation of teaching

Thirty three hours of observation of university teaching and assessment was undertaken.

In Site 1, 18 hours of teaching was observed on six different days. This involved observing seven different facilitators and numerous sessions which were repeated for different groups of students (see Tables 6–7). In Site 2, a total of 10 hours of teaching delivered by three different facilitators was observed on three different days (see Tables 8–9) and 5 hours of assessment observed on one day. Observation of an Objective Structured Clinical Examination (OSCE) revealed that in fact aseptic technique was not assessed as reported in the earlier survey (Hawker et al., 2020), and therefore excluded from analysis. The researcher was not given access to observe all sessions and most sessions were observed on one occasion only.

Two over-arching themes and six sub-themes were identified in the interview and observation data (see Fig. 1).

5.3. Theme 1: variations in knowledge, practice and understanding

Three sub-themes were contained within this over-arching theme: Confusion; Lack of Standardised Practice; and Confidence in Levels of Competency.

5.4. Sub-theme: confusion

Student nurses' grasp of aseptic technique was mixed. It was evident from the interview responses and observation of students' practice during teaching sessions that some students demonstrated ability to apply the principles underpinning aseptic technique to practice whereas others did not:

“When opening the packaging we don't touch the dressing unless we've got sterile gloves on so it's a no touch technique ... you only touch the outside and would only touch the sterile area.”

(Student nurse 11, Site 2)

“...Non-touch, ... I would ...say minimal touch because sometimes you do have to touch but as long ... I'm not touching with my gloves I'm touching with gauze ...is that classed as ...non-touch?...”

(Student nurse 9, Site 2)

In thirteen out of fourteen observations of university teaching at both

Table 3
Details of participants.

	Site 1	Site 2
Student nurse	8	7
Mentor	6	5
Nurse educator	4	3
Infection prevention nurse	8	6
Total	26	21

Table 4
The different codes generated from the interview dataset.

Lack of knowledge & understanding	Level of competency	Newly qualified nurses better	Influence of patients
Good knowledge of understanding	Good AT in my ward area	Senior or experienced nurses better	Difference in reality between simulated environment and clinical practice
Level of knowledge and understanding	Difficulties in Mastering AT skills	Senior or experienced nurses worse	Reliance upon learning in clinical practice
Lack of understanding of the differences between AT & ANTT	Limited opportunity for assessment of AT	Following the practice of others	Revisiting learning of AT
Lack of understanding of different terminology for AT	Learning or following the steps	Not influenced by others	Loss or lack of emphasis on AT
Lack of understanding of clean, sterile and aseptic terms	Opportunities to learn and practice AT in clinical practice	Modifying practice to fit in	Depth and focus of learning
Different AT terminology	Lack of understanding of the principles	Influence of Peers	Motivation
Complacency	Learning and applying the same principles	Availability and use of equipment	Learning preferences
Confusion	Adaptation to the environment or situation	Learning resources	Personality of student
Association of use of AT	Adaptation in emergency situations	Too busy not enough time	Taking responsibility for learning
Lack of recall and retention of learning	Doing it the right way	Group size	Challenging practices
Use of made up terms/own language	Doing it the wrong way	Staffing	Relationship between staff and IPC team
Importance of AT	Learning the right way	Interruptions to AT	Opportunity to review and audit AT practice
Understanding of the aim	Learning the wrong way	Assessment of prior knowledge and skills	Maintaining standards of AT
Understanding of the Principles	Difficulties in Mastering AT skills	Level of supervision and feedback	IPC involvement or relationship with students
Understanding of the Procedure	Level of competency	Influence of the built hospital environment	Relationship between partner organisations and Universities
Differences between hospital and community	Good AT in my ward area	Opportunities to learn and practice AT in university	Roles and responsibilities for teaching, education and assessment
Controlling environmental risks	Difficulties in mastering AT	Placements	Lack of education and training updates in AT
Differences or variations in AT	Influence of mentor/teacher	Prior learning experiences	Not up to date/teaching best practice
No variations in AT taught & seen in practice	Newly qualified nurses worse	Picking up bad habits	Influence of initial training
Need for a standardised approach	Protection of patient	Not following policy/guidelines	Learning/teaching AT from scratch

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Table 4 (continued)

Lack of knowledge & understanding	Level of competency	Newly qualified nurses better	Influence of patients
Prevention of infection	No reason for importance	Avoidance of contamination or transfer of micro-organisms	ANTT principles
Protection of health professional	Taking extra steps		Clean and dirty principle

sites, students were seen to breach aseptic technique by unconsciously contaminating their gloves or sterile field when opening the dressing pack during wound care.

Nurse educators, students, mentors and infection prevention nurses variously described aseptic technique as a ‘process’, ‘procedure’ or ‘technique’ and were uncertain whether the aim was to prevent or minimise microbial transmission. The terms ‘aseptic technique’, ‘sterility’, ‘cleanliness’, ‘no-touch technique’ and ‘aseptic non-touch technique’ were often used interchangeably within the same interview response and by nurse educators when teaching:

“Aseptic technique is just a procedure that will minimise the risk of causing infection to invasive devices ... it's a way of minimising the risk of infecting and cross-contamination.”

(Mentor 3, Site 1)

“It's a process of dealing with any patient's wound, it's a technique that allows a clean technique where you have a sterile area. It prevents any kind of bacteria getting into the wound...”

(Student 11, Site 2)

This confusion was confirmed by the findings of observation. The following extract is taken from observation field notes made of teaching sessions for aseptic technique in wound care:

When facilitators demonstrated how to clean the trolley in preparation for undertaking a wound dressing, reference was made to the top of the trolley being sterile

(Site 2. Observation 2)

When asked to identify the principles of aseptic technique, mentors, nurse educators and infection prevention nurses appeared to have difficulty understanding the question, frequently sought clarification from the investigator before responding and then supplied a description of the steps in the procedure:

“What do you mean by that (aseptic technique)?... washing hands first off, ensuring they're wearing sterile gloves, making sure the area has been cleaned.”

(Infection prevention nurse 6, Site 1)

Nurse educators in Site 2 (which met most criteria for good educational practice) were doubtful of students' ability to transfer learning to more complex situations. They thought that it would be impossible to conduct procedures aseptically in the domiciliary setting. This belief was reinforced during teaching as demonstrated in the following interview quote and observation fieldnote below:

“...They (students) haven't got steel trolleys.... in the community, you have to find as best as possible surface that you can that is clean... I think it's difficult... there could be some invention where you have got a better surface to perform it on... a collapsible trolley...”

(Nurse educator 2, Site 2)

Table 5

Categories and codes presented under sub-themes from interview and observation data.

Learning the steps versus the principles	Relationships, roles and responsibilities for education and training in aseptic technique	Human, physical & Environmental Factors
Category-Learning the steps <u>Codes</u> Learning or following the steps Doing it the right way Doing it the wrong way Learning the right way Learning the wrong way Category-Learning the principles <u>Codes</u> Lack of knowledge and understanding of the meaning of principles Learning and applying the same principles Adaptation to the environment or situation Adaptation in emergency situations	Category-Relationships in education and training <u>Codes</u> IPC involvement or relationship with students Category-Roles and responsibilities in education and training <u>Codes</u> Relationships between NHS Trusts and universities Roles and responsibilities for teaching, education and assessment	Category-Human resources <u>Codes</u> Too busy not enough time Group size Staffing Interruptions to AT Level of supervision and feedback Category-Physical resources <u>Codes</u> Availability and use of equipment Learning resources Category-Physical Environment <u>Codes</u> Influence of the built hospital environment Opportunities for learning & ability to transfer learning
Relationships, roles and responsibilities for maintaining and improving standards of AT	The shaping & cascade of AT practices	
Category-Relationships for maintaining and improving standards <u>Codes</u> Relationships between staff and IPC team Category-Roles and responsibilities for maintaining and improving standards <u>Codes</u> Opportunity to review and audit AT practice Maintaining standards of AT Changing AT practice	Category-Cascade of practice <u>Codes</u> Mentor/teacher -Level of experience -Initial training -Not up to date/teaching best practice Peers Learning environment and culture Category-Positive behaviours <u>Codes</u> Seeing or learning good practices Not influenced by others Challenging poor practices Category-Negative behaviours <u>Codes</u> Seeing or learning poor practices Picking up bad habits Following the practice of others Not following policy and guidelines Modifying practice to fit in	Category-Opportunities to learn & practice in clinical practice <u>Codes</u> Learning & practice opportunities in clinical placements Prior learning experiences Assessment of prior knowledge and skills Influence of patients Category-Opportunities to learn & practice in university <u>Codes</u> Learning & practice opportunities in university Loss or lack of emphasis on AT Depth and focus of learning Revisiting learning of AT Category-Individual Learner Characteristics <u>Codes</u> Learning preferences Motivation Personality of student Taking responsibility for learning Category-Transfer of learning from university to practice <u>Codes</u> Difference in reality between simulated environment and clinical practice

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Table 5 (continued)

Learning the steps versus the principles	Relationships, roles and responsibilities for education and training in aseptic technique	Human, physical & Environmental Factors
		Reliance upon learning in clinical practice Time from learning in university to opportunity to practice in clinical practice

Students were told by one facilitator that ‘an aseptic technique in the community was not possible’ when practising female urinary catheterisation upon a manikin at a skill station

(Site 2. Observation 2 and 3)

In contrast, nurse educators at Site 1 were observed to have a different opinion about an aseptic technique being achievable:

Discussion with students about performing an aseptic technique in wound care in the community and having to adapt to the circumstances for example in the home

(Site 1. Observation 4)

5.5. Sub-theme: lack of standardised practice

Nurse educators, infection prevention nurses and mentors from both sites perceived the need to standardise the teaching of aseptic technique as illustrated by the following typical interview quote:

“... If you have one standard and everybody is taught the same, then you're more likely to get compliance if everybody is singing from the same hymn sheet ...”

(Infection prevention nurse 3, Site 2)

Students perceived variation to exist in the practice of aseptic technique undertaken by qualified nurses, which was often not in accordance with university teaching. This is reflected in the following interview quote and observation fieldnotes:

“On the same placement I was taught by one nurse to double glove, take one pair off but I was taught by someone else put one pair on,

then take them off, wash your hands and then put a clean pair...I've been told by the university not to double glove...”

(Student 6, Site 1)

When students were advised not to double glove when being taught aseptic technique in wound care in university, they reported observing this in clinical practice

(Site 1 Observation 2 and 4)

5.6. Sub-theme: confidence in level of competency

Student nurses in Site 1 expressed greater confidence than those in Site 2 although with some reservations:

“I think my skill in doing it is better than the knowledge I have on it ... I do feel confident doing it on a scale of one to ten, about eight.”

(Student nurse 15, Site 2)

“I've got medium knowledge and competence ...I'm in my third year now so I should feel that I am fully competent to do it.”

(Student nurse 7, Site 1)

5.7. Theme 2: sources of influence on learning and practice

Three sub-themes were contained within this over-arching theme: Learning Steps of the Procedure versus Learning the Principles Underpinning Asepsis; Role Models; and Limited Opportunity for Learning, Practice and Competency Assessment.

5.8. Sub-theme: learning steps of the procedure versus learning the principles underpinning asepsis

In universities, greater emphasis was seen to be placed on teaching the steps of aseptic procedures than the underpinning principles. This was evident in eight of ten observations of teaching at Site 1, and in all four observations of teaching at Site 2. Students and nurse educators thought that any deviations should be regarded as incorrect:

“In university they talk you through every step of how it should be done.”

Table 6

Site 1-description of aseptic technique teaching sessions observed.

Year	Session	Description of session	Duration (h)	Number of observation days/ time periods	No. of facilitators observed	Total observation time (h)
1	Session 1 -Medication management-subcutaneous & intramuscular injections	Injection technique was part of a medicines management session. This took place in a classroom prior to students' first clinical placement. Students practised individually using an injection training model under the supervision of two facilitators.	3	1	2 (1 lecturer (Facilitator 1) & 1 clinical skills tutor (Facilitator 2))	3
	Session 2 -Simulated scenario of an adult following a seizure including wound care	Performing aseptic technique in wound care was part of a simulation, managing an adult with learning disabilities, following a seizure. Students practised dressing a laceration on a manikin in the simulated ward in groups of 2-4 students, supervised by one facilitator. Students had not previously practised an aseptic technique in wound care in university but, having completed two placements might have practised this in clinical placements.	3	3	5 clinical skills tutors (Facilitator 2, 4, 5 & 7) & 2 lecturers Facilitator 3 & 6)	9
3	Session 3 - Care of tracheostomy & Video	Students first received a lecture/theory session in a classroom and then practised an aseptic technique when changing a tracheostomy dressing in groups of 4-5 students in the simulated ward supervised by one facilitator.	3	2	1 clinical skills tutor (Facilitator 4) 1 clinical skills tutor Facilitator 4)	6
Total				6	11	18

Table 7
Summary of observations at Site 1.

	Observation period									
	1	2	3	4	5	6	7	8	9	10
Session	1	2	2	3	2	2	2	2	2	3
Facilitators (1–7)	1 & 2	3	2	4	5	6	2	7	4	4
Ratio of facilitators to students	2:16	1:3	1:3	1:25	1:3	1:2	1:2	1:4	1:6	1:25
Teaching approach										
Principle led approach	N	N	N	N	N	Y	N	N	Y	N
Procedural/step by step approach	Y	N	Y	Y	Y	Y	Y	Y	Y	Y
Full practical demonstration given	Y	N	N	N	N	Y	N	N	N	N
Comments	No sinks, gloves or aprons used	Extra steps taken hand-washing, use of gloves & aprons	Refers to steps as principles			Adaptation in the community discussed. Extra steps taken	Facilitator discussed trolley being 'sterile' then 'clean'	20 min spent cleaning trolley. Adaptation to the community & different situations discussed	Demo of cleaning trolley only. Discussed adaptation in the community.	Demo of opening equipment & donning gloves only
Reference or use of guidelines										
Royal Marsden Clinical skills.net	Y	N	N	N	N	N	N	N	N	N
ANTT Clinical Practice Framework	N	N	N	Y	N	N	N	N	N	N
Other	Y	N	N	N	N	N	N	N	N	N
ANTT principles or similar taught										
Asepsis is the aim for all invasive clinical procedures	N	N	N	N	N	N	N	N	N	N
Asepsis is achieved by key part & site protection	N	N	N	N	N	N	N	N	N	N
Needs to be efficient & safe	N	N	N	N	N	N	N	N	N	N
Risk assessment for surgical or standard ANTT	N	N	N	N	N	N	N	N	N	N
Basic infective precautions	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Identification & protection of key sites & parts	N	N	N	Y	N	N	N	N	Y	Y
Non-touch technique	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
Aseptic field management	N	N	N	N	N	N	N	N	N	N
Other principles taught										
Clean hand, dirty hand	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
One wipe and discard	N	Y	Y	Y	N	N	Y	N	Y	Y
Sterile items should not be in contact with non-sterile items	N	N	N	Y	N	Y	N	N	Y	Y

(continued on next page)

Table 7 (continued)

	Observation period									
	1	2	3	4	5	6	7	8	9	10
Evidence of ANTT knowledge being taught										
ANTT definition of asepsis	N	N	N	N	N	N	N	N	N	N
States the ANTT risk assessment question	N	N	N	N	N	N	N	N	N	N
Discusses the risks to be considered	N	N	N	N	N	N	N	N	N	N
Identifies different types of aseptic fields in ANTT	N	N	N	N	N	N	N	N	N	N
Definition of a Key-Part	N	N	N	Y	N	N	N	N	N	N
Definition of Key-SITE	N	N	N	Y	N	N	N	N	N	N
Discusses Key-Part/Key-Site 'Rule'	N	N	N	N	N	N	N	N	N	N
Discusses two different types of ANTT	N	N	N	N	N	N	N	N	N	N
Practice										
Do students get opportunity to practice?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Do all students get to practice the full procedure?	Y	N	N	N	N	Y	N	N	N	N
Practice 1or 2 person technique	1	2	2	1	2	1	2	2	2	1
Duration of practice time (minutes)	30	30	30	20-30	30	40	30	40	30	30
Any common difficulties observed/ reported by students?	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
Donning gloves	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
Clean hand dirty hand	N	Y	Y	Y	N	N	Y	N	Y	Y
Breaches in aseptic technique?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observed breaches/contamination	Needle in tray	Gloves	Disposal bag on bed	Gloves Disposal bag on bed	Sterile field, & fluid waste on chair	Gloves	Gloves, Sterile field, cleaning fluid, disposal bag on bed	Gloves, Sterile field & cleaning fluid	Gloves & sterile field	Gloves, sterile field & waste left on bed
Feedback on performance										
Students receive facilitator feedback on their performance?	Y	Y	Y	N	Y	Y	Y	N	Y	Y
Students receive other feedback on their performance?	N	N	N	N	N	N	N	N	N	N
Comments				No time for de-		Students made hand conscious	Students made aware of contamination	Students looking for feedback	Discussed what is sterile or not & told	Highlighted areas of contamination

(continued on next page)

Table 7 (continued)

Observation period					
1	2	3	4	5	6
		brief or feedback			to start again if they contaminate

Key Y – Yes N – No.

Table 8

Site 2-description of aseptic technique teaching sessions observed.

Year	Session	Description of session	Duration (h)	Number of observations	Number of observation days/ time periods	No. of facilitators observed	Total observation time (h)
1	Session 1 -Aseptic technique in wound care (theory & practical) & Video	Students had a combined theory (Powerpoint presentation) and practical session upon aseptic technique in wound care in a classroom prior to their first placement. A practical demonstration of aseptic technique was provided. Each student practised donning gloves and opening up wound packs under the supervision of one facilitator.	3	1	1	Skills tutor (Facilitator 1)	3
2	Session 2 -Continenence session including urinary catheterisation	Insertion of a female catheterisation station, was one of four 25 min practice stations in a continence session. Students in groups of 3–4, practised applying an aseptic during female catheterisation on a model in a classroom. One facilitator supervised all stations.	2	2	1-am & pm	1 Skills tutor (Facilitator 2)	4
3	Session 3 -Community visit scenario (wound assessment & care)	Students had a community visit scenario to work through. Students were required to assess, plan and implement wound care for an immobile patient with a pressure sore. Students practised an aseptic technique in groups of 4–5, with a trolley under the supervision of one facilitator.	3	1	1	1 Lecturer (Facilitator 3)	3
Total				5		5	10

(Student nurse 7, Site 1)

“We have to break it down into steps to ensure that the students don’t miss a step out, so ... they know it off by heart.”

(Nurse educator 2, Site 2)

A contrasting opinion was presented by two of the infection prevention nurses, one from each site, however. They suggested that while the steps of the procedure might vary, the principles should remain constant:

“The principles will never change but the actual way that you might go about it might.”

(Infection prevention nurse 11, Site 1)

5.9. Sub-theme: role models

Student nurses reported encountering both good and poor role models in the universities and during clinical placements:

“I’ve never felt the need to question aseptic technique, the way they (nurses) do it.”

(Student nurse 15, Site 2)

“If you’re doing a leg ulcer dressing and there’s an open area, you should have sterile gloves on. I said ‘But shouldn’t you wear sterile gloves?’ They said ‘Oh no, it doesn’t matter, it’s fine.’ I thought it should be sterile.”

(Student nurse 3, Site 1)

Nurse educators and infection prevention nurses assumed that students would encounter poor practice during clinical placements and

were concerned that they would imitate it:

“When students go onto a ward the nurses might teach them bad habits.”

(Infection prevention nurse 3, Site 2)

“It can be quite difficult for students, especially if they want to do it (aseptic technique) a particular way or their mentor says ‘No, this is the way we do it here.’”

(Nurse educator 1, Site 2)

There was a feeling that poor practice could readily become entrenched and disseminated:

“If mentors have been told something wrong then that will cascade down and they’ll teach it to the next student and the next one and the next one ... and then that student will teach another student and that’s how things will go to pot.”

(Nurse educator 5, Site 2)

There was disagreement regarding staff likely to offer the most effective role models:

“Nurses with years of experience seem to be the best, more at ease with aseptic technique and more accurate.”

(Nurse educator 3, Site 1)

“There’s an assumption that somebody that’s been doing the job for twenty years is doing it the correct way which sometimes isn’t the case.”

(Infection prevention nurse 13, Site 2)

Students were critical of university teaching:

Table 9
Summary of observations at Site 2.

	Observation period			
	1	2	3	
Session	3	1	2	2
Facilitator 1–3	1	2	3	3
Ratio of facilitators to students	1:13	1:25	1:16	1:16
Teaching approach				
Principle led approach	N	N	N	N
Step by step approach	N	Y	Y	Y
Practical demonstration given	N	Y	N	N
Comments	Facilitator talks of the use of a clean technique	Extra steps- hand-washing, glove & apron use & facilitator contaminated gloved hands touching mouse to move on Powerpoint slides & forgot to open dressing. Talks of discussing principles but no mention of any, only demonstrates steps. Facilitator refers to top of trolley as sterile Taught using trolley in acute setting	Facilitator refers to top of trolley as sterile. Students told to double glove or change gloves after cleaning area and aseptic technique could not be done in community as environment different & no trolley but still need to use a sterile field	Facilitator refers to top of trolley as sterile. Students told to double glove or change gloves after cleaning area & aseptic technique could not be done in community as environment different & no trolley but still need to use a sterile field
Reference or use of guidelines				
Royal Marsden	Y	N	Y	Y
Clinical skills.net	N	N	N	N
ANTT Clinical	N	Y	N	N
Practice Framework				
Other	N	N	N	N
Comments	Procedural guidelines for reference	ANTT in reference list	Procedural guidelines at station	
ANTT principles or similar taught				
Asepsis is the aim for all invasive clinical procedures	N	Y	N	N
Asepsis achieved by key part & site protection	N	N	N	N
Needs to be efficient & safe	N	N	N	N
Risk assessment for surgical or standard ANTT	N	N	N	N
Basic infective precautions	Y	Y	Y	Y
Identification & protection of key sites & parts	N	N	N	N
Non-touch technique	Y	Y	Y	Y
Aseptic field management	N	N	N	N
Other principles taught (Key Y – Yes N – No)				
Clean hand, dirty hand	Y	Y	Y	Y
One wipe and discard	Y	Y	N	N
Sterile items/field should not be in contact with non-sterile items	N	N	N	N
Evidence of ANTT knowledge being taught				
ANTT® definition of asepsis	N	N	N	N
States the ANTT® risk assessment question	N	N	N	N
Discusses the risks to be considered	N	N	N	N
	N	N	N	N

(continued on next page)

Table 9 (continued)

	Observation period			
	1	2	3	
Identifies different types of aseptic fields in ANTT				
Definition of a Key-Part	N	N	N	N
Definition of a Key-Site	N	N	N	N
Discusses Key-Part/Key-Site 'Rule'	N	N	N	N
Discusses two different types of ANTT	N	N	N	N
Practice				
Do students get opportunity to practice?	Y	Y	Y	Y
Do all students get to practice the full procedure?	Y	N	N	N
Practice as 1 or 2 person technique	1	1	2	2
Duration of practice time	25 min	15 min	25 min	25 min
Any common difficulties observed/ reported by students?	Y	Y	Y	Y
Donning gloves	Y	Y	Y	Y
Clean hand dirty hand	N	N	Y	Y
Breaches in aseptic technique?	Y	Y	Y	Y
Observed breaches/ contamination	Sterile field, gloves & Wrist & hand jewellery, loose hair	Gloves	Sterile field, gloves & cleaning fluid	Sterile field, gloves & cleaning fluid
Comments	Students not taking it seriously Use of trolley for a community scenario Classroom-no hand-washing facilities	Practice donning gloves and opening up pack only Classroom-no hand-washing facilities	Lack of resources (handwashing facilities, gloves) and time to practice Students not taking it seriously	Lack of resources (handwashing facilities, gloves) and time to practice
Feedback on performance				
Did students receive facilitator feedback on their performance?	Y	Y	Y	Y
Students receive other feedback on performance?	N	N	N	N
Comments	Limited feedback to students.	Limited feedback to students.	Limited feedback to students.	Limited feedback to students. Lack of resources (handwashing facilities, gloves) and time to practice

“There was something wrong on the video in the first year... something that wasn't aseptic.”

(Student nurse 14, Site 2)

In Site 1 students thought that teaching was overly focused on the use of personal protective equipment (PPE) and how to set up the dressing trolley rather than performing the procedure which was observed:

“They (nurse educators) said...how you put your apron...gloves on... clean the trolley down and that was about it, we should have been taught how you do it ...”

(Student 3, Site 1)

One facilitator spent twenty minutes showing students how to the clean the trolley rather than allowing them to practise an aseptic technique in wound care.

(Site 1, Observation 5)

Students in Site 2 were more critical of the learning environment and resources than those in Site 1:

“We haven't got a trolley each - we're in a classroom with the chairs and tables - the resources don't really fit.”

(Student nurse 13, Site 2)

However, limitations of the physical environment and lack of equipment were not confined to Site 2 as shown in the following observation field note:

Infection prevention precautions were discussed when undertaking an intramuscular or subcutaneous injection but there were no gloves, aprons or hand-washing facilities for the facilitator to demonstrate or students to practice in the classroom.

(Site 1, Observation 1)

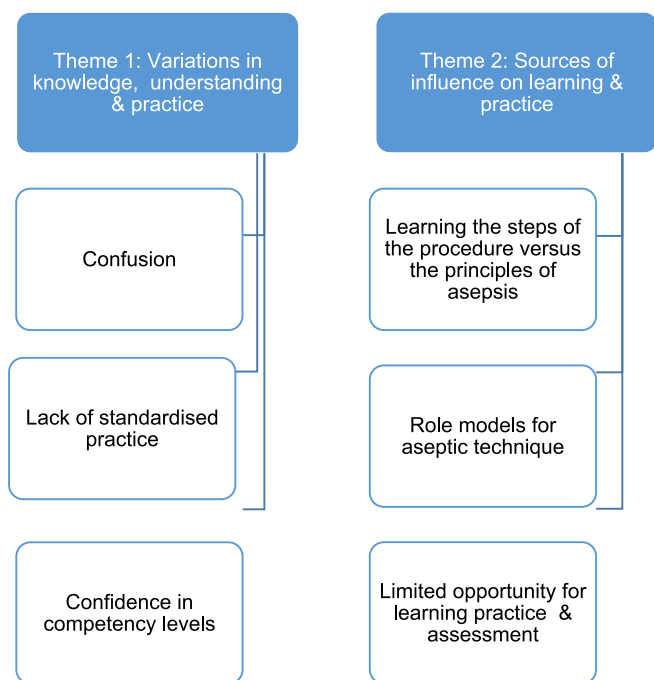


Fig. 1. Themes and sub-themes in the interview and observation data.

5.10. Sub-theme: limited opportunity for learning practice and competency assessment

It was apparent that in the universities, aseptic technique was taught mainly in relation to injections and straightforward wound dressing changes. Students complained that simulation did not prepare them adequately for practice in different settings:

“In university we’re taught the ideal situation. We’re never taught how to deal with anything other than in a hospital with a quiet, cooperative patient.”

(Student nurse 7, Site 1)

“It’s all well and good learning how to do things in a controlled environment ... in the classroom it’s nice and quiet but when you’ve actually got a patient behind a curtain in a bed-space that’s really crowded, that’s reality.”

(Student nurse 13, Site 2)

The timing and frequency of university teaching was not always ideal. In Site 1, students reported that aseptic technique was not introduced until after their first clinical placement. In Site 2, there was a long interval between university teaching and opportunity to practise in the clinical setting:

“It was taught right at the beginning, in September. I didn’t really put it into practice until the summer of the next year. I’ve been taught in the university but I can’t remember what I actually have to do.”

(Student nurse 5, Site 1)

Students perceived the need to revisit the topic of aseptic technique regularly throughout the programme:

“There was such a big gap... we’ve been shown aseptic technique in the first year ... towards the end of the second year when I actually got to do it, I relied on the mentor talking me through it.”

(Student nurse 10, Site 2)

Students and mentors suggested that opportunities to learn and transfer skills were limited. In clinical areas opportunities depended on the placement and pressure of clinical work:

“Opportunity depends where you’re placed. I haven’t had that many opportunities. That’s probably where my downfall is.”

(Student nurse 3, Site 1)

These sentiments were echoed by mentors:

“Time and general pressures definitely impact on student nurse’s learning and opportunities to do aseptic technique.”

(Mentor 10, Site 2)

In the universities opportunities to engage in practical sessions were also curtailed as illustrated by the interview quote and observation field note below:

“There wasn’t enough time for every student to practice, so the lecturer said if someone was already confident with aseptic technique, they should give the time to other students and let them have a go.”

(Student nurse 7, Site 1)

Students did different parts of the procedure (aseptic technique in wound care), not all students practised it from start to finish (Site1 Observation 2). Duration of practice time ranged from 30 to 40 minutes at site 1 compared to 15–20 minutes at Site 2.

6. Discussion

This study provides an in-depth account of how student nurses perceive teaching in relation to aseptic technique and the contributions of nurse educators, mentors and infection prevention nurses. In previous studies student nurses (Gould and Drey, 2013) and practising nurses have been asked about their experiences (Gould et al., 2020) and information about teaching arrangements have been obtained by survey (Hawker et al., 2020) but observation of teaching does not appear to have been reported. In the study reported here, the interview findings were corroborated by direct observation, increasing confidence in the findings. Data were collected in two sites, one selected because an innovative approach to aseptic technique had been reported, the other because practice appeared to be standard. However, very little difference was detected between the two sites. Given that all undergraduate, pre-registration nursing programmes are required to meet the same educational standards for NMC approval (NMC, 2018b), it is perhaps not surprising that approaches to learning aseptic technique were found to be similar across the two sites. Simulation is likely to be the cornerstone of educational approaches to develop clinical skills until haptic technology improves to support the use of immersive technologies such as virtual reality (Choi et al., 2022).

Student nurses’ reports of poor-quality teaching were supported by data from the fieldnotes and semi-structured observation and their complaints of a focus on peripheral issues rather than on demonstrating the key components of aseptic technique were borne out. For example, the fieldnotes showed that a facilitator in Site 1 devoted twenty minutes to demonstrating how a dressing trolley should be cleaned but did not allow students to practise changing a dressing. No difference in the quality or approach to teaching between the sites was apparent. The only difference that could be detected between the two sites was that some student nurses in Site 2 reported feeling more confident and receiving more university input about conducting aseptic technique than in Site 1. Despite any preconceptions about what might be observed or reported in interviews, the qualitative findings were surprising given the experience of educators.

With a dedicated simulation centre and the services of a technician, teaching facilities were superior in Site 1 compared to Site 2 but in both sites, observation demonstrated that classroom teaching was frequently constrained by poor access to essential facilities (e. g sinks, PPE). The focus of teaching was on practical aspects of undertaking aseptic technique with little discussion of its purpose or underpinning principles and

student nurses commented unfavourably on the amount of attention paid to peripheral issues (e. g. use of PPE, trolley cleaning) compared to maintaining asepsis per se. Students were aware that their grasp of aseptic technique were suboptimal and attributed this failing to the poor timing of teaching in relation to clinical placements, lack of opportunity to practice aseptic technique in either setting, inadequate competency assessment and lack of transferability of university teaching to the clinical setting. These findings were supported by observation of teaching. Nurse educators, mentors and infection prevention nurses were confused about what aseptic technique was supposed to entail and what it should achieve. Nurse educators tried to teach the skills of aseptic technique by rote and thought that it was impossible to undertake aseptic technique outside acute care settings. There was an assumption that student nurses would encounter poor practice during clinical placements and disagreement concerning the staff likely to provide effective role models.

The findings of this study corroborate the limited research that has previously explored teaching and practice in relation to aseptic technique (Gould et al., 2020; Gould et al., 2021; Hawker et al., 2020; Hawker et al., 2022). It confirms widespread confusion concerning what aseptic technique should entail or is supposed to achieve and that teaching focuses on practical skills at the expense of the underpinning principles (Aziz, 2009; Hawker et al., 2020, 2022). The study also confirms the belief that in community settings, it is impossible to conduct procedures aseptically (Hallett, 2000; Unsworth and Collins, 2011; Gould et al., 2021).

The study confirms that student nurses' experiences of education in relation to the core skill of aseptic technique are not good. This situation is multifactorial and appears to have arisen through misunderstandings and confusion on the part of those who contribute directly and indirectly to teaching and learning in university and the clinical setting, suboptimal facilities even when a simulation suite and full technical support are available, poor curriculum design and arrangements for competency assessment. Reports of better innovation in one of the participating sites compared to standard practice in the other were not reflected in the data.

The findings of this study add support to the growing literature describing anomalies in the understanding of aseptic technique by qualified nurses (Gould et al., 2020, 2021) and reports of suboptimal pre-registration nursing education (Hawker et al., 2020, 2022). The findings are a cause for concern as lack of proficiency undertaking aseptic technique may contribute to HCAI and operate as a driver for antimicrobial resistance. Dissatisfaction with this important aspect of nursing education may also contribute to course attrition at a time when shortfall in the nursing workforce is of global concern and a particular problem in the UK (Rocks et al., 2021). Healthcare providers and universities need to investigate and address deficiencies in nurses' understanding of aseptic technique and instigate regular competency assessment. Additional factors that need to be addressed as a matter of urgency in universities include overhaul of the curriculum to ensure that the timing of teaching takes place optimally in relation to clinical placements with more organised arrangements for students' competency assessment, greater focus on the principles underpinning aseptic technique and ensuring the transfer of skills taught in university to different types of clinical settings, especially in the community where in the UK, many services are nurse-led. Communication between university staff and staff in the clinical setting, including local infection prevention teams, should be strengthened.

7. Strengths and weaknesses of the study

Methodologically this study represents an advance on previous research exploring the same topic. In-depth interviews were conducted with four different groups of stakeholders and supported by observation. Limitations of the study include restricting data collection to only two sites, the small number of teaching sessions observed in one site and lack

of observation in the clinical setting. Therefore, although our research findings provide a snapshot of aseptic technique education, they may not be reflective of practice in all universities. Greater observation of teaching at these sites and others, might reveal greater insight into how nursing students learn aseptic technique, and whether sub-optimal teaching is more widespread. Observation was undertaken by a single data collector who might unconsciously have recorded events to match the interview data which had already been collected or might have been influenced by their own values and beliefs concerning effective educational practice.

The study was designed to compare and contrast educational practice in two sites selected because greater innovation in relation to aseptic technique was reported in one compared to a standard approach reported in the other, yet no differences emerged in analysis. The criteria designed to assess level of innovation were developed by a research team and agreed by an external panel whose members were experienced in nurse education, including teaching and assessing infection prevention practice but they did not take into account more subtle differences that may have existed between the sites related to organisational culture. Finally, the criteria did not consider the working relationship between the university and the associated trusts which might have been an influential factor.

The failure to identify two contrasting sites may be considered a weakness of the study, and specifically the criteria used to select sites. This exposes the difficulty in establishing the 'whole truth' in educational research. That innovations reported in the survey work (Hawker et al., 2020) did not come to fruition, suggests that the one site might have embellished their innovative teaching practices, or, that these were aspirational or in development rather than embedded.

8. Conclusion

The findings of this study corroborate earlier research: student nurses do not feel well-prepared to undertake aseptic technique. Healthcare providers and universities need to investigate and address deficiencies in understanding among those responsible for teaching and performing this key nursing skill. University curricula should be revised to ensure that teaching takes place optimally in relation to clinical placements, improve arrangements for students' competency assessment, focus more on teaching the principles underpinning aseptic technique and promote transferability from simulated practice to different types of clinical settings. Communication between university staff and clinical should be strengthened. The findings have stimulated debate about how aseptic technique is taught and practised at a national level in the UK where the study was conducted. Further research is being undertaken to agree what should be included in pre-registration programmes. The study findings have wider implications for teaching of other core clinical skills in the curricula which have proliferated following the emergence of the new NMC Standards (NMC, 2018a, 2018b).

CRediT authorship contribution statement

I can confirm that I have fully addressed the reviewer's comments made following review of the manuscript.

I cannot find any guidance upon what to write in the author's statement, so many apologies if I have omitted any necessary information.

Declaration of competing interest

No authors report any conflict of interest.

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