ISSN 1753-044X

Volume 5 Issue 2
December 2011

INTERNATIONAL JOURNAL OF CLINICAL SKILLS

A Peer Reviewed International Journal for the Advancement of Clinical Skills
- 'docendo ac discendo' - 'by teaching and learning'

In this issue:

Executive Board

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Published by Hampton Bond

Acknowledgements

We would like to take this opportunity to show appreciation to all those involved with the production of the International Journal of Clinical Skills (IJOCS). Many thanks to all members of the Editorial and Executive Boards.

We would like to express our sincere gratitude to Dr Wing Yan Mok and Dr Adrian Hastings as they leave the IJOCS and we thank them for their invaluable support towards the international clinical skills community.

The International Journal of Clinical Skills looks forward to contributing positively towards the training of all members of the healthcare profession.

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Foreword

Clinical skills change lives…

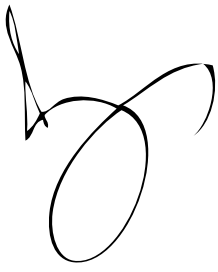
Dr. Abigail Boys & Regina (October 2010)

Amidst the fast paced achievements in international healthcare and education, it is important not to forget what clinical skills mean in reality for our patients – clinical skills change lives.

After having initiated the charitable society Willing and Abel in 2008, many health care professionals have had the pleasure of using their specialised and expert clinical skills to help children of developing nations requiring specialist surgery. An example is 13 year old Regina who was born with a tumour fatally spreading across her face (congenital lymphangioma) – she successfully underwent major surgery at The Royal London Hospital (United Kingdom) in December 2010 and now continues to lead a normal life in Ghana, West Africa (www.bbctelevision.co.uk).

Such success exemplifies a fundamental strength of the clinical skills community in its ability to evolve and adapt to meet the challenges and expectations of a modern healthcare arena. Healthcare professionals need to have clinical skills training which will allow them to meet present and future challenges, which include an ageing population, multiple morbidities and increasing patient expectations.

There is no doubt that the International Journal of Clinical Skills provides an excellent forum for the global healthcare community to further clinical skills research, as well as advancing the training of students, academics and health professionals. I wish the International Journal of Clinical Skills continued success for its admirable work in this important field.



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Refresher training for junior doctors about peripheral cannulation: what's the benefit and what's important?

Written on behalf of the Peripheral Line Training Group:

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Keywords:
Peripheral catheterization
Junior physician
Education
Clinical skills
Peripheral cannulation

Abstract

Introduction: Peripherally inserting an intravenous cannula is a clinical skill commonly performed by junior doctors and is associated with the risk of hospital-acquired infection and thrombophlebitis. Previous studies have identified that refresher training sessions about clinical skills are important for junior doctors, but have not focussed on peripheral cannulation in depth. This study investigated how useful junior doctors found refresher training sessions and identified important components of such sessions.

Methods: Ethics approval was granted for a mixed-methods qualitative and quantitative study. Staff attending peripheral cannulation training sessions at seven participating acute UK National Health Service (NHS) Trusts, between October 2008 and July 2009, were asked to complete a questionnaire. Semi-structured interviews were held with specialist clinical skills trainers, key hospital staff (such as Medical Directors) and medical students, to identify the important facets of such training sessions.

Results: 228 questionnaires were returned from junior doctors; 96% had previous experience of inserting a peripheral cannula and 95% had received previous education. Following the training session 82% would adapt their insertion technique. 62% had received previous education about aspects of continuing care and 77% would subsequently adapt their continuing care practice following the training session. 62% had increased their overall knowledge and 54% found it useful to practice on the clinical skills mannequin. Eighteen staff participated in semi-structured interviews to explore facets of peripheral cannulation training. Important themes were pre-qualification experience, the importance of training about continuing care practices, benefits of refresher training and delivery of refresher training sessions.

Discussion: Refresher training sessions about peripheral cannulation were of value to the vast majority of junior doctors surveyed. An improved insertion technique and increased familiarisation with a Trust's equipment were cited as changes following the training session. This highlights the need for an optimum sterile technique to prevent healthcare associated infection and reflects recent developments in cannulation equipment. Little research has been undertaken on the role of doctors in providing ongoing care of peripheral cannulae following insertion. Benefits from the training session included increased familiarisation with the Visual Infusion Phlebitis (VIP) scores, increased vigilance and better documentation. Training sessions should be structured to impart the major benefits of practising the technique and familiarisation with the equipment, whilst optimising the best use of time.

Conclusion: With regards to peripheral cannulation, refresher training sessions for junior doctors are of great benefit. Practice guidelines have been developed in order to highlight key facets associated with delivering peripheral cannulation refresher training sessions; pre-planning, approach on the day and subsequent follow-up.

Background

Peripherally inserting an intravenous cannula is widely recognised as having the potential to cause infection [1, 2]. Peripheral cannulae are the most frequently used type of vascular access device and cause considerable annual morbidity due to their high volume of use [2]. It is essential that these cannulae are inserted with optimal technique and cared for appropriately to prevent thrombophlebitis and healthcare associated infections.

The importance of educational programmes for health professionals about peripheral lines has been emphasized [3]. These can reduce catheter-associated infections by between one-half and two-thirds [4, 5].

Junior doctors frequently insert peripheral cannulae and a study identified that over four-fifths of UK junior doctors had inserted a peripheral cannula during the preceding month [6]. It is therefore essential that junior doctors are able to perform this task proficiently with observance of infection prevention practices. The UK Foundation Programme Curriculum provides an educational framework for the first two years of development following graduation from medical school [7]. This details a list of procedures in which junior doctors should be competent and confident, which includes intravenous (IV) cannulation [7].

Previous studies have recommended that junior doctors receive refresher training about clinical skills procedures following graduation [8, 9], and factors important for refresher training of junior doctors have also been described in the literature [10]. However, although it is important that such training sessions are designed for optimal impact, few studies have considered in-depth the logistics and facets of training junior doctors about one specific clinical skill [11], such as peripheral cannulation.

Aim

The aim of this study was to investigate how useful junior doctors found refresher training sessions regarding peripheral cannulation, and to identify important components of such sessions.

Methods

Context

This study was part of a multi-centred pilot project to improve the education of health professionals about insertion and management of peripheral cannulae in seven acute National Health Service (NHS) Trusts within one UK Strategic Health Authority. Although Trusts devised institution-wide education schemes, training sessions were broadly similar with respect to content and format. Ethics approval was granted from the University of Winchester for a mixed-methods qualitative and quantitative study to evaluate the training of health professionals about peripheral cannulation.

Questionnaire

An eleven item self-completion questionnaire was employed to explore the opinions of staff about peripheral cannulation training sessions. The survey instrument was piloted with a small sample of health professionals and necessary modifications made prior to implementation. A copy of the questionnaire is included in Appendix 1 and included the following themes:

- Staff demographics
- Prior experience and education about inserting and caring for peripheral cannulae
- Changes in insertion and continuing care practices following the training session evaluated
- General assessment of the training session (using a five-point Likert scale)
- Ideas for future session improvement (free text question)

Health professionals attending training sessions about peripheral cannulation at the seven participating acute NHS Trusts, between October 2008 and July 2009, were requested by trainers to complete the questionnaire. Data was analysed using SPSS® version 16.

Semi-structured interviews

The results of the questionnaire indicated the importance and benefit of providing refresher training about peripheral cannulation to junior doctors. This was further explored in a mixed-methods approach by holding semi-structured interviews to identify the important facets of such training sessions. A purposive sample of staff (to include trainers) from all Trusts was approached to participate and all participants gave informed consent. Semi-structured interview schedules were designed following reference to the literature, the quantitative results and project group discussions, and included the following topics:

- Peripheral cannulation - insertion and continuing care
- The role of junior doctors in inserting and managing peripheral cannulae
- Refresher training sessions for junior doctors about peripheral cannulae
- Training of medical students about peripheral cannulation

Informed consent was obtained, interviews were audio recorded and transcribed verbatim and responses anonymised. Data was analysed using an iterative grounded-theory methodology employing ATLAS.ti® version 6.

Results

Questionnaires

This paper discusses the results of the 228 questionnaires returned from junior doctors; Foundation Year One (FY1s, n = 147) and Foundation Year Two (FY2s, n = 81). Another 769 questionnaires were returned from other hospital staff (for example, senior doctors, nurses, healthcare assistants and radiographers) and are beyond the scope of this paper.

Respondents were asked if they had previous experience and whether they had received previous education (i.e. occurring before the current training session) about peripheral cannulation, insertion and continuing care. They were also asked if they would change their practice following the present training sessions. Not all respondents answered every question – the total number of respondents per question is indicated in brackets.

Insertion of peripheral cannulae

- 96% (215 from 224 respondents) of junior doctors had previous experience of inserting a peripheral cannula.
- 95% (216 from 228 respondents) had previously received education about inserting peripheral cannulae.
- 82% (181 from 220 respondents) responded that they would adapt their insertion technique following the training session evaluated. Of these, 109 (50%) provided at least one explanation, including: an improved technique - specific aseptic technique (n = 34) and general technique (n = 21) and improved familiarisation with equipment (n = 37).
- Of those 216 who had previously received education about cannula insertion, over three-quarters would change their technique (79%, n = 170) following the training session evaluated.

Continuing care of peripheral cannulae

- 62% (136 of 218 respondents) of junior doctors had previously received education about aspects of continuing care.
- 77% (166 of 216 respondents) would adapt their technique of continuing care following the training session evaluated. Of these, 89 (54%) specified at least one explanation. Reasons included an improved knowledge of the Visual Infusion Phlebitis score (n = 34), increased vigilance about infection control practices (n = 20) and improved familiarisation about required documentation (n = 19).
- Of those 136 who had previously received education about continuing care of peripheral cannulae, approximately two-thirds (68%, n = 92) would change their practice following the training session evaluated.

Impressions of the training session

Respondents were asked to evaluate the training session by indicating their agreement with statements; the results are summarised in Table 1.

Table 1: Junior doctors' impressions about peripheral cannulation training sessions

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
The session increased my knowledge about cannulation (n = 217)	46 (21%)	90 (42%)	33 (15%)	33 (15%)	15 (7%)
The session increased my skill in cannulation (n = 214)	39 (18%)	71 (33%)	40 (19%)	44 (21%)	20 (9%)
It was useful to practice cannulation on the mannequin arm (n = 209)	41 (19%)	71 (34%)	39 (19%)	35 (17%)	23 (11%)

Semi-structured interviews

Eighteen staff participated in semi-structured interviews to explore facets of peripheral cannulation training; medical students (n = 3), hospital trainers (e.g. clinical skills facilitators and others, n = 9) and senior hospital staff (e.g. Directors of Infection Prevention & Control, n = 6). Themes were identified about peripheral cannulation training and these are described next.

Pre-qualification experience

Pre-qualification experience in peripheral cannulation was variable and it seems important for hospitals to assess practitioners' competence for quality control purposes:

Medical student: *"it is very self-motivated experience. If you don't feel confident doing it or don't particularly want to do it, then there's no way you would have to. And then, when it came to F1* [Foundation Year 1 doctor], *if you hadn't taken the opportunity to attempt it a couple of times - I think you'd probably find it quite difficult to probably even remember the technique…"*

Senior hospital staff: *"it is part of a general ethos, where if you are going to do something, you should know what you are doing and we should know that you know what you are doing."*

Continuing Care

Ongoing continuing care of peripheral cannulae was seen as an important area where training and practice of junior doctors had previously been poor:

Clinical skills trainer: *"sometimes nurses will ring them up and say, you know, "my patient's got a VIP* [Visual Infusion Phlebitis] *score of three, can you come and change the cannula?" If they don't know what the nurses are talking about, they'll go, "What?!" So they need to know what that is."*

Benefits of refresher training

The main potential benefits of refresher training included an opportunity to practice technique and improved familiarisation with the equipment and documentation used in different Trusts:

Medical student: *"I think I understand the technique quite well, but…… if I was to have no further training until I was an F1 doctor, I think I would …probably have a few bad experiences of doing it before I actually got it right and did it properly."*

Medical student: *"it probably would be useful just to have a short session to show what equipment is available in that hospital and then whether or not there is an obligation to put a VIP* [Visual Infusion Phlebitis] *score in the drug chart, whether you need to document that you've put it in or not - just to make that sort of thing clear, because I think it's those sort of things which people are often a bit unclear about."*

Delivery of refresher training sessions

It became apparent that the style of delivery for the peripheral cannulation training session was important in engaging junior doctors in the training agenda:

Medical student: *"if the person who's being trained doesn't think it's useful then they're not going to pay attention, they're not going to take it in and there's no point in doing it. If you identify a reason why it's being done then the trainee has a better idea of why it's being done and we're more likely to pay attention, and take it on board."*

Clinical skills trainer: *"some of them implied, "oh, I can do this", so we actually approached it, "we're not training you to cannulate, we're showing you how we require you to do it in this Trust, and you have the opportunity to practice on a mannequin as opposed to the first time you do it on a patient."*

Discussion

Insertion of peripheral cannulae

The vast majority of junior doctor questionnaire respondents had previous experience in inserting peripheral cannulae and most had received prior training about this. This is as would be expected, due to the inclusion of this skill in the UK pre-registration medical curriculum [7]. However, the results of the interviews highlighted that the quality of such pre-qualification experience was variable.

Four-fifths of junior doctors surveyed indicated that they would change their insertion practice following the training session. This includes junior doctors that had received some cannulation training prior to the refresher session. Two possible reasons for this include that the sessions refreshed their memory about the technique after having slipped back into bad practice and also that the refresher sessions served as a means to further their understanding and skills about cannulation.

The two most cited reasons for changing insertion practice were an improved technique and improved familiarisation with a Trust's equipment. It is important that peripheral cannulae are inserted with reference to the optimum sterile technique to prevent healthcare associated infection [2]. Different brands of cannulation equipment are available on the market (cannulae, dressings, tourniquets) and differences can affect the peripheral cannulation process. Recent years have seen developments in cannulation equipment, including safety cannulae and needle-free access devices, and it is essential that medical staff are informed about their existence and use [12].

Continuing care of peripheral cannulae

There has been little previous research on the role of doctors in providing ongoing care of peripheral cannulae following insertion. It is concerning that two-fifths of junior doctors surveyed in this study had never received training about aspects of ongoing care of peripheral cannulae. The findings from the semi-structured interviews also emphasised that this is an area of training that has been poorly covered for junior doctors.

It is important that all members of the multidisciplinary health team are vigilant about infection prevention associated with peripheral cannulae [13, 14]. The lack of information available to junior doctors about the importance of ongoing cannulation care in training sessions and lack of appropriate skill updates perpetuates poor cannulation practice. Important aspects of continuing care of peripheral cannulae include ensuring the cannulation process is adequately documented, monitoring cannulae for signs of infection and appropriate cannulae removal [15, 16].

Over three-quarters of respondents would change their practice in this area following the training session evaluated. The most frequently cited reasons included increased familiarisation with the Visual Infusion Phlebitis (VIP) scores, increased vigilance and better documentation. This is an encouraging finding, because the literature contains reference to poor practices of ongoing management of peripheral cannulae, poor documentation of insertion [17 – 20], and poor vigilance for complications [19, 21]. The importance of these different interventions have been highlighted [22 – 25] and it is important that junior doctors, as key members of the multidisciplinary health team, contribute to factors decreasing the likelihood of healthcare infection associated with peripheral cannulation [26].

Benefits of training

This study indicates that junior doctors found refresher training about peripheral cannulation beneficial, because they acquired new knowledge; three-fifths of respondents felt that they had increased their knowledge and approximately half felt that their skill in peripheral cannulation had increased. Improvement in skill and familiarisation with an individual institution's equipment were the main cited indications of benefit. Over half found it useful to practice peripheral cannulation on mannequin arms. Although there are limitations to the use of artificial limbs for training, they are useful for practice purposes and for gaining confidence [27, 28, 29]. These findings were echoed in semi-structured interviews where the benefits of a training session were seen as increasing familiarisation with a Trust's equipment, documentation and appreciation of the opportunity for practising the skill on mannequins.

The traditional way of learning this clinical skill was via the medical tradition of 'see one, do one, teach one' or 'learning by lurking' [30]. Although most medical students are now taught the fundamentals of peripheral cannulation in a Clinical Skills Laboratory [31], skill in peripheral cannulation prior to medical registration can be variable. Variability and lack of uniformity in training about bedside procedures means that competence in a skill should not be assumed [32]. It is therefore vital to ensure standardisation of practice which might be variable for those from different UK medical schools, and for doctors from overseas [33].

Historically, many junior doctors fail to refer to others for advice, possibly due to overconfidence in their own ability or a reluctance to disturb busy senior colleagues [34]. However, this brings the danger of 'learning by doing' in the absence of feedback and incorrect technique [35].

This study indicates that refresher training sessions about peripheral cannulation were of value to the vast majority of junior doctors surveyed. This is in line with previous studies that have identified the positive effects of training junior doctors on their confidence and competence in peripheral cannulation [27, 28]. There is a need to make the distinction between experience, competence and confidence [36]. The benefits of cannulation training can be two-fold because alongside improving the ability of individual practitioners, it is an important quality assurance measure for a hospital Trust. There is a political need for Trusts to ensure demonstration of competency of staff for accountability and standard setting [37].

Delivery of training sessions

Moving beyond the 'see one, do one, teach one' [38] medical paradigm requires the delivery of effective training sessions. An important finding from the semi-structured interviews was the emphasis by medical students, clinical trainers and influential hospital staff about the importance of an effective training style when delivering training sessions about peripheral cannulation. Such training sessions should be delivered in a way that imparts

the major benefits of practising the technique and improving familiarisation with the technique whilst optimising the use of time. There is a need to strike a balance between requiring evidence of competence and avoiding patronisation. Training sessions should be tailored to explicit relevance of junior doctors who should feel they are being taught something new. It is also an ideal chance to combine other topics within the infection control agenda, such as the avoidance of needlestick injuries.

Key facets to providing such clinical skills training sessions include providing a non-threatening and facilitating learning environment [39, 40]. Barriers centre around lack of time for junior doctors to attend, an inconvenient location, inappropriately timed training & lack of resources [41, 42]. It is important that such training sessions are mandatory to enable junior doctors to attend [41] and that there is 'bleep-free' / 'pager-free', protected time that does not clash with their rotas [42, 43]. There can sometimes be differences in understanding between junior doctors and consultants about educational objectives and training opportunities available and this should be made explicit [44].

There is evidence that junior doctors appreciate constructive feedback to inform their practice as 'you don't know what you don't know' [43, 45 – 48]. A previous study indicated the importance of feedback with a statistically significant correlation between those who had attended a formal training session and those that had felt they had been trained to do a procedure safely [46]. Junior doctors appreciate tangible assessments [44], and one of the aims of the UK Foundation Programme for junior doctors was to emphasise the necessity of constructive assessment feedback [49]. There is also a need for documented appraisal evidence that withstands litigation of competence by educationalists [40]. It would therefore seem vital to include a formal assessment of competence in peripheral cannulation training sessions, for professional and institutional indication of competence.

Logistics of training sessions

Peripheral cannulation training sessions should be appropriately structured to yield the optimum benefit. Appropriate pre-planning, approach on the day and follow-up are all important and facets of these processes have been summarised in the boxes below.

Box 1: Before the Training Session

- **Engage key Trust staff such as the Chief Executive, Medical Director and Head of Postgraduate Education** to harness their support of the training agenda. The importance of the training will be emphasised if junior doctors see support from senior and influential staff.
- **Ensure that the training session is mandatory so that it must be factored into junior doctors' workload.** It is especially useful if the session is early in a training programme.
- **Plan the session carefully, in terms of format & logistics.** It is important to ensure that timings and numbers of participants allow for emphasis on the practical skill.
- **Liaise with staff from other departments, to give joint sessions**. For example, staff from the Infection Control Department can advise about the avoidance of needlestick injuries.
- **Contact the administrator of your hospital's training slots & book in as far as possible.** This will ensure that an adequate room will be available; space is required for laying out the mannequins.
- **Buy as many dummy arm mannequins as finances allow.** It is key that staff will be able to practice the skill without 'hanging around waiting' for mannequins to become available.
- **Conduct a 'train the trainer' programme** so that all session facilitators are teaching the same technique.
- **Design an Objective Structured Clinical Examination (OSCE) style format of the assessment.**
- **Prepare & print training session evaluation forms.** Feedback on this new training session is vital for quality improvement purposes.
- **Prepare & print certificates.**

Box 2: During the training session

- **Keep a register of attendance** to enable follow-up of non-attenders.
- **Combine the session with other related topics,** such as blood culturing and infection control.
- **Provide data about your Trust's bacteraemia rates.** Such tangible data will emphasise the importance of sterile peripheral cannulation and infection control practices.
- **Inform about your Trust's equipment, policy & associated documentation.** Illustrate with examples where applicable.
- **Concentrate on the practical component of practice on 'dummy arm' mannequins.**
- **Have a phone in the training room.** This means that participants can answer their bleep/pager without leaving the sessions (or ensure the session is 'bleep-free').
- **Have a good number of session facilitators.** This will decrease the time staff must wait until their competence is assessed.
- **Consider having other doctors as session facilitators.** The use of junior and senior doctor colleagues as 'peer trainers' can be very effective.
- **Assess competency with an OSCE style examination.** Request attendees to complete a training evaluation form prior to issuing their certificate.

Box 3: After the training session

- **Use the results of training feedback forms to improve the format & content of training sessions.**
- **Have arrangements for those not deemed competent** – e.g. specific 'one to one' follow-up sessions.
- **Provide regular drop-in sessions** for those who wish to practice their technique in a 'non-threatening environment'.
- **Informally monitor actual performance of staff on wards** – e.g. by observing practice and feedback from colleagues.
- **Formally monitor actual performance by staff on wards** – e.g. by spot check audits – of both insertion & continuing care.
- **Provide update sessions as applicable** – e.g. about new equipment and changes to documentation and policy.
- **Hold regular sessions to capture overseas doctors and new starter doctors.**

Limitations of the study

The questionnaire respondents and interview subjects were drawn solely from seven hospitals within one Strategic Health Authority in the South of England (UK). Therefore it is difficult to estimate the extent to which the results can be generalised to other areas of the UK. The training sessions within these hospitals were not standardised, meaning that variability could have existed between them. However, statistical analysis of differences between Trusts is beyond the scope of this paper.

It was not possible to calculate an overall response rate for questionnaire completion, due to the fact that it was not known how many doctors were requested to complete a questionnaire by the clinical skills trainers. However, all staff who attended training sessions were strongly requested to complete a questionnaire.

The questionnaire responses capture respondents' intended practice. However, it is not possible to know whether this intention was actually translated into change in practice, which would require the employment of sophisticated audits. Where junior doctors indicated that they would change their practice, it has been presumed that such changes would be for the better.

Conclusions

This study has explored the potential benefits of providing refresher training to junior doctors about peripheral cannulation. The majority of junior doctors said they would modify their peripheral cannulation insertion technique and continuing care practice following the training session. In addition, over half of the respondents thought that the training sessions had increased their knowledge about, and skill in, peripheral cannulation. In the light of these findings key facets of running such training sessions have been discussed.

In summary, it has been determined that training sessions for junior doctors about peripheral cannulation are beneficial, in terms of self-reported change in practice. Important aspects of running such training sessions have been described.

Acknowledgments

The authors would like to acknowledge members of the Peripheral Line Training Group: Elizabeth Aylward, Barry Buchanan, Ali Clark, John Campbell, Jo Davison, Kathy Fitzgerald, Rachel Glass, Amanda Harper, Penie Harris, Billy Hatifani, Jan Heath, Claire Higginson, Jessica Higson, Susan Laight, Carol Low, Sophie Macadie, Angie McClarren, Gladys Mhandu, Joan Potterton, Nick Purkis, Matthew Sandham, Jo Schofield, Thomas Simms, Fiona Sparkes, Fay Summers, Catherine Swailes, Alison Turner, Anne de Verteuil, Rachel Wright, Chi Yau.

The authors also wish to acknowledge participating staff from: Buckinghamshire Hospitals NHS Trust, Heatherwood & Wexham Park Hospitals NHS Foundation Trust, Milton Keynes Hospital NHS Foundation Trust, NHS Education South Central, Oxford Radcliffe Hospitals NHS Trust, Portsmouth Hospitals NHS Trust, Royal Berkshire NHS Foundation Trust, Southampton Hospitals University NHS Trust, South Central Strategic Health Authority, Winchester & Eastleigh NHS Trust.

Declaration

The authors have no financial or other interests to declare in relation to this paper.

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References

1. Department of Health (UK). (2007). Hospital organisation, speciality mix and MRSA. Crown copyright.
2. O'Grady N P, Alexander M, Dellinger E P, Gerberding J L, Heard S O, Maki D G, Masur H, McCormick R D, Mermel L A, Pearson M L, Raad I I, Randolph A, Weinstein R A. (2002). Guidelines for the prevention of intravascular catheter-related infections. Infection Control and Hospital Epidemiology. **23**(12):759-769.
3. Lopez V, Molassiotis A, Chan W K, Ng F, Wong E. (2004). An intervention study to evaluate nursing management of peripheral intravascular devices. Journal of Infusion Nursing. **27**(5):322-331.
4. Eggimann P. (2007). Prevention of intravascular catheter infection. Current Opinion in Infectious Diseases. **20**(4):360-369.
5. Parras F, Ena J, Bouza E, Guerrero M C, Moreno S, Gálvez T, Cercenado E. (1994). Impact of an educational program for the prevention of colonization of intravascular catheters. Infection Control and Hospital Epidemiology. **15**(4 Pt 1):239-242.
6. Goodfellow P B, Claydon P. (2001). Students sitting medical finals--ready to be house officers? Journal of the Royal Society of Medicine. **94**(10):516-520.
7. Department of Health (UK). (2007). The Foundation Programme Curriculum. Crown copyright.
8. Evans D E, Roberts C M. (2006). Preparation for practice: how can medical schools better prepare PRHOs? Medical Teacher. **28**(6):549-552.
9. Ward S J. (1998). Improving quality in hospital induction programmes. British Medical Journal. **316**:S2-7136. Available at www.bmj.com [Accessed Jul 2011].
10. Kendall M L, Hesketh E A, Macpherson S G. (2005). The learning environment for junior doctor training--what hinders, what helps. Medical Teacher. **27**(7):619-624.
11. Liddell M J, Davidson S K, Taub H, Whitecross L E. (2002). Evaluation of procedural skills training in an undergraduate curriculum. Medical Education. **36**(11):1035-1041.
12. Maki D G. (2008). Improving the safety of peripheral intravenous catheters. British Medical Journal. **377**:a630.
13. Jerassy Z, Yinnon A M, Mazouz-Cohen S, Benenson S, Schlesinger Y, Rudensky B, Raveh D. (2006). Prospective hospital-wide studies of 505 patients with nosocomial bacteraemia in 1997 and 2002. Journal of Hospital Infection. **62**(2):230-236.
14. Sherertz R J, Ely E W, Westbrook D M, Gledhill K S, Streed S A, Kiger B, Flynn L, Hayes S, Strong S, Cruz J, Bowton D L, Hulgan T, Haponik E F. (2000). Education of physicians-in-

training can decrease the risk for vascular catheter infection. Annals of Internal Medicine. **132**(8):641-648.
15. Creamer E. (2000). Examining the care of patients with peripheral venous cannulas. British Journal of Nursing. **9**(20):2128-2144.
16. Hill S. (2004). The fight against MRSA is not just a nursing problem. British Journal of Nursing. **13**(22):1311.
17. Couzigou C, Lamory J, Salmon-Ceron D, Figard J, Vidal-Trecan G M. (2005). Short peripheral venous catheters: effect of evidence-based guidelines on insertion, maintenance and outcomes in a university hospital. Journal of Hospital Infection. **59**(3):197-204.
18. Bravery K, Dougherty L, Gabriel J, Kayley J, Malster M, Scales K. (2006). Audit of peripheral venous cannulae by members of an i.v. therapy forum. British Journal of Nursing. **15**(22):1244-1249.
19. Biswas J. (2007). Clinical audit documenting insertion date of peripheral intravenous cannulae. British Journal of Nursing. **16**(5):281-283.
20. Ahlqvist M, Berglund B, Wirén M, Klang B, Johansson E. (2009). Accuracy in documentation - a study of peripheral venous catheters. Journal of Clinical Nursing. **18**(13):1945-1952.
21. Smith T, Pritchard-Howarth M, King D. (1996). Are intravenous cannulae still being misused? British Journal of Clinical Practice. **50**(8):466-467.
22. Kennish S J. (2008). Peripheral intravenous catheters. It's who looks after the catheters that counts. British Medical Journal. **337**:a1001.
23. Perencevich E N, Pittet D. (2009). Preventing catheter-related bloodstream infections: thinking outside the checklist. Journal of the American Medical Association. **301**(12):1285-1287.
24. Raad I, Hanna H, Maki D. (2007). Intravascular catheter-related infections: advances in diagnosis, prevention, and management. Lancet Infectious Diseases. **7**(10):645-657.
25. Rubinson L, Haponik E F, Wu AW, Diette G B. (2003). Internists' adherence to guidelines for prevention of intravascular catheter infections. Journal of the American Medical Association. **290**(21):2802.
26. Coello R, Charlett A, Ward V, Wilson J, Pearson A, Sedgwick J, Borriello P. (2003). Device-related sources of bacteraemia in English hospitals--opportunities for the prevention of hospital-acquired bacteraemia. Journal of Hospital Infection. **53**(1):46-57.
27. Evans D E, Wood D F, Roberts C M. (2004). The effect of an extended hospital induction on perceived confidence and assessed clinical skills of newly qualified pre-registration house officers. Medical Education. **38**(9):998-1001.
28. Morton J, Anderson L, Frame F, Moyes J, Cameron H. (2006). Back to the future: teaching medical students clinical procedures. Medical Teacher. **28**(8):723-728.
29. Cooper J B, Taqueti V R. (2008). A brief history of the development of mannequin simulators for clinical education and training. Postgraduate Medical Journal. **84**(997):563-570.
30. Swanwick T. (2008). See one, do one, then what? Faculty development in postgraduate medical education. Postgraduate Medical Journal. **84**(993):339-343.
31. Al-Yousuf N H. (2004). The clinical skills laboratory as a learning tool for medical students and health professionals. Saudi Medical Journal. **25**(5):549-551.
32. Boots R J, Egerton W, McKeering H, Winter H. (2009). They just don't get enough! Variable intern experience in bedside procedural skills. Internal Medicine Journal. **39**(4):222-227.
33. Sandhu D P. (2005). Current dilemmas in overseas doctors' training. Postgraduate Medical Journal. **81**(952):79-82.
34. Walker A. (1991). Teaching junior doctors practical procedures. British Medical Journal. **302**(6772):306.
35. Fischer T, Chenot J F, Simmenroth-Nayda A, Heinemann S, Kochen M M, Himmel W. (2007). Learning core clinical skills--a survey at 3 time points during medical education. Medical Teacher. **29**(4):397-399.
36. Morgan P J, Cleave-Hogg D. (2002). Comparison between medical students' experience, confidence and competence. Medical Education. **36**(6):534-539.
37. Carr S J. (2004). Assessing clinical competency in medical senior house officers: how and why should we do it? Postgraduate Medical Journal. **80**(940):63-66.
38. Rodriguez-Paz J M, Kennedy M, Salas E, Wu AW, Sexton J B, Hunt E A, Pronovost P J. (2009). Beyond "see one, do one, teach one": toward a different training paradigm. Postgraduate Medical Journal. **85**(1003):244-249.
39. Brown J, Chapman T, Graham D. (2007). Becoming a new doctor: a learning or survival exercise? Medical Education. **41**(7):653-660.
40. Ben-David M F, Snadden D, Hesketh A. (2004). Linking appraisal of PRHO professional competence of junior doctors to their education. Medical Teacher. **26**(1):63-70.
41. Flett A, Baker M, Williams J. (2001). Formal education programmes for senior house officers: comparison of experience in three hospital specialities. Postgraduate Medical Journal. **77**(912):650-653.
42. Higgins R, Cavendish S, Gregory R. (2006). Class half-empty? Pre-registration house officer attendance at weekly teaching sessions: implications for delivering the new Foundation Programme curriculum. Medical Education. **40**(9):877-883.
43. Anderson F, Hesketh E A. (2006). On-the-job assessment of practical skills performance: experiences from a feasibility study. British Journal of Hospital Medicine (London, England). **67**(6):318-321.
44. Baker M, Sprackling P D. (1994). The educational component of senior house officer posts: differences in the perceptions of consultants and junior doctors. Postgraduate Medical Journal. **70**(821):198-202.
45. Berridge E J, Freeth D, Sharpe J, Roberts C M. (2007). Bridging the gap: supporting the transition from medical student to practising doctor--a two-week preparation programme after graduation. Medical Teacher. **29**(2-3):119-127.
46. Mason W T, Strike P W. (2003). See one, do one, teach one--is this still how it works? A comparison of the medical and nursing professions in the teaching of practical procedures. Medical Teacher. **25**(6):664-666.
47. Baldwin P J, Newton R W, Buckley G, Roberts M A, Dodd M. (1997). Senior house officers in medicine: postal survey of training and work experience. British Medical Journal. **314**(7082):740-743.
48. Brown J, Graham D, Chapman T. (2003). Factors influencing teaching and learning in the preregistration year. Hospital Medicine. **64**(12):740-742.
49. Dolphin T. (2006). Foundation programme assessment: the trainee's guide. British Journal of Hospital Medicine (London, England). **67**(4):M64-M66.

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