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A comparison of the management of venous leg ulceration by specialist and generalist community nurses: a judgement analysis.

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ABSTRACT

Background: Venous leg ulcer management in the UK varies significantly. Judgements made by nurses contribute to this variability and it is often assumed that specialist nurses make better judgements than non-specialist nurses. This paper compares the judgements of community tissue viability specialist nurses and community generalist nurses; specifically, the ways they use clinical information and their levels of accuracy.

Objectives: To compare specialist and non-specialist UK community nurses' clinical information use when managing venous leg ulceration and their levels of accuracy when making diagnoses and judging the need for treatment.

Design: Judgement Analysis

Setting: UK community and primary care nursing services

Participants: 18 community generalist nurses working in district (home) nursing teams and general practitioner services and 18 community tissue viability specialist nurses.

Methods: Data were collected in 2011 and 2012. 18 community generalist nurses and 18 community tissue viability specialist nurses made diagnostic and treatment judgements on 110 clinical scenarios and indicated their confidence in each of their judgements. Scenarios were generated from real patient cases and presented online using text and photographs. An expert panel made judgements, and reached consensus on the same scenarios. These judgements were used as a standard against which to compare the participants. Logistic regression models and correlational statistics were used to generate various indices of judgement "performance": accuracy, consistency, confidence calibration and information use. Differences between groups of nurses with different levels of characteristics linked to expertise were explored using analysis of variance.

Results: Specialist nurses had similar cue usage to the generalist nurses but were more accurate when making diagnostic and treatment judgements.

Conclusion: It is not obvious why the tissue viability specialist nurses were more accurate. One possible reason might be the greater opportunities for 'deliberate practice' afforded to specialists. However, restricting aspects of practice only to specialist nurses is likely to hinder the judgement performance of generalists.

KEY WORDS

Bandages; Community health nursing; Decision making; Judgement Analysis; Leg ulcer; Research; Varicose ulcer; Wound healing.

HIGHLIGHTS

What is already known about the topic?

- Leg ulcer care is an important part of UK community nurses' workload but previous evidence suggests the quality of diagnosis and treatment of venous leg ulceration may be suboptimal and information to inform the design of clinical improvement interventions is needed.
- Nurses designated as 'specialist' are likely to have greater influence in terms of directing care but it is not known whether the care they deliver is of higher quality.

What this paper adds

- In this study community tissue viability specialist nurses were more accurate at making diagnoses and treatment judgements about compression therapy than generalist community nurses. The reasons for this are unclear but may be related to their greater opportunities for 'deliberate practice' rather than education.

BACKGROUND

Globally, many people are affected by leg ulceration (Briggs and Closs 2003). Diagnostic judgements and treatments are the key determinants of the quality of care delivered and the clinical outcomes achieved. In the UK, most patients with leg ulcers receive care from community nursing staff working as part of a larger multi-disciplinary team. Whilst many patients never receive care from a clinician designated as expert in leg ulcer care (e.g. a specialist tissue viability nurse), UK audit evidence suggests that practice and outcomes vary in ways that are unwarranted (Royal College of Nursing 2001; Royal College of Nursing 2008; Srinivasaiah et al. 2007; Vowden and Vowden 2009).

The title 'specialist' implicitly denotes a practitioner with greater expertise in a domain. 'Expertise' refers to the "characteristics, skills, and knowledge that distinguish experts from novices and less experienced people" (Ericsson 2006, p12). In nursing, expertise has been defined as flexibility and speed in practice (Benner 1984; Ericsson, Whyte and Ward 2007), but reliably identifying the characteristics that mark a practitioner as 'competent' or 'expert' has proved challenging (Ericsson, Whyte and Ward 2007).

Nurses designated as 'expert' through their role (such as specialist nurses) are likely to have greater influence in directing care and thus affecting healthcare processes and outcomes (RCN 2010). They may also cost more than generalists. To properly consider specialists' value it is useful to evaluate the relationship between 'expertise' and the levels of accuracy achieved in clinical practice.

Expertise can be examined as a relative or absolute concept. In the relative approach, expert practice is compared to that of novices, on the basis that novices are able to achieve an expert level of proficiency. Benner's Theory of Intuition and Expertise (Benner 1984) – based on the Dreyfus' model of skill acquisition (Dreyfus and Dreyfus 1986) - has heavily influenced nursing's view of expertise (Eraut et al. 1995; Lamond and Thompson 2000). From this perspective, novice nurses require rules to guide their action whereas experienced, expert nurses deploy internalised decision-making processes such that their practice appears intuitive and fluid. In contrast to the relative approach, the absolute approach to expertise compares individuals using performance measures, such as outcomes achieved or the speed with which a task is successfully performed (Chi 2006). The nature of such tasks matters. A task should encapsulate the essence of expertise and be specific to a particular area of practice (Ericsson 2006). One way of defining the essence of expertise from an absolutist perspective is to choose a judgement which has been tested on sufficient people and contexts to make a correct answer possible and for the uncertainty associated with the probability of achieving a correct answer to be transparent and explicit. Research evidence associated with the correlation between information in a task environment and a judgement outcome provides one such basis.

In the specific domain of nursing patients with leg ulcers, there is good evidence to support the use of Doppler aided assessment of ankle-brachial pressure index (ABPI) to detect arterial disease for differential diagnosis (Royal College of Nursing 2006) and robust clinical trial evidence to support the use of multi-layer high compression for promoting healing in venous leg ulceration (O'Meara et al. 2012). Therefore, a representative task (Cooksey 1996b) for evaluating expertise in managing venous leg ulceration is the accurate diagnosis of the aetiology of a leg ulcer (with an appropriate recognition of the value of Doppler assessment of ABPI) and an appropriate treatment judgement regarding whether or not to apply high compression.

METHODS

Aims

The aim of the study was to assess the impact of expertise on the judgement and decision making of community nurses in relation to the management of venous leg ulceration.

Theoretical Framework and Research Design

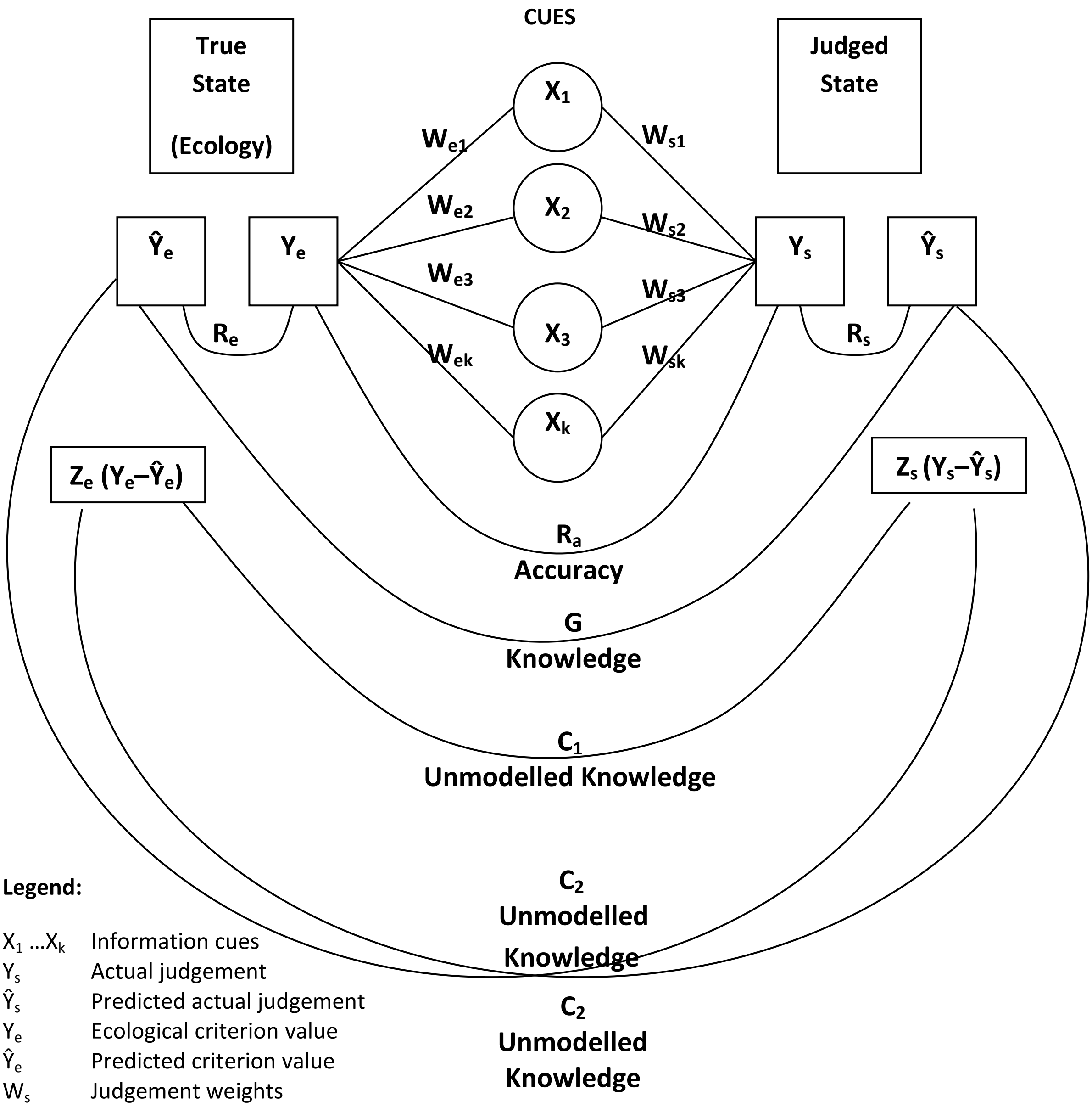
This study was nested within a judgement analysis which assessed the accuracy of the diagnostic judgements and treatment choices of UK community nurses managing venous leg ulceration and which has been previously reported in this journal (Adderley and Thompson 2015). Judgement analysis takes as its starting point that the accuracy of a judgement depends on the judge's (i.e. nurse's) use of information present in a judgement environment and the uncertainty present in an environment (Cooksey 1996b). This theoretical model can be portrayed as a form of lens in which the nurse's judgement "focuses" the information contained in a clinical situation (Figure 1).

In this model the judgement environment is termed the ecology. The left side represents the ecology (e.g. the 'correct' diagnosis). Various information cues are linked to this side of the model (such as the ABPI, level of pain etc.) and each cue carries a weight in terms of the contribution (importance) to the judgement. The model's right side represents the nurse's judgement of the situation (their diagnosis). A more detailed description of the component parts of a lens model can be found in the previous report of the judgement analysis (Adderley and Thompson 2015). Multiple regression is used to model the relationship between the cues and the judgment and the cues and the ecology (Cooksey 1996b). The lens model equation presents achievement in terms of accuracy (Ra) as a function of knowledge (G), predictability (Re), cognitive control (Rs) and unmodelled knowledge (C).

Setting

This study was conducted in the UK and participants were recruited from primary care trusts in the north of England and one primary care trust in the south of England. The participants in this study were the same participants as those in the previously reported judgement analysis (Adderley and Thompson 2015)

Figure 1. Logistic Lens Model for comparing the judgement policy of a nurse judge against an ecological criterion (Stewart 2004; Cooksey 1996d)



Legend:

$X_1 \ldots X_k$	Information cues
Y_s	Actual judgement
$\hat{Y}_s$	Predicted actual judgement
Y_e	Ecological criterion value
$\hat{Y}_e$	Predicted criterion value
W_s	Judgement weights
R_a	Accuracy
R_s	Cognitive control
R_e	Predictability
G	Knowledge
C_1, C_2 C_3	Unmodelled knowledge
Z_e	Ecological residual
Z_s	Actual residual

Ethical considerations

Ethical approval was provided by University and local NHS ethics committees (REC Ref No 09/H1311/86). Research governance approvals were granted by local NHS research governance committees.

Construction of the judgement task

The judgement analysis task (Cooksey 1996c) which formed the basis for this study consisted of 110 leg ulcer patient scenarios presented sequentially. The data for these scenarios were drawn from the clinical records of 53 patients with venous leg ulceration, 33 patients with mixed/ arterial leg ulceration and 4 patients with ulcers of unusual aetiology. These proportions mirrored the prevalence of these ulcers in the UK population (Srinivasaiah et al. 2007; Vowden and Vowden 2009). The records of patients with venous or mixed/ arterial leg ulceration were randomly sampled from a trial data set (Watson et al. 2011). The records of the other patients were non-randomly selected from community nursing caseloads.

Nominal group consensus methods (Black 2006) were used to generate the judgement criteria and weights in the left (ecology) side of the Lens Model. A consensus panel was formed of four community tissue viability specialist nurses with advanced knowledge and experience in managing leg ulceration from four different healthcare organisations. These nurses were asked to independently complete the online survey before the consensus meeting date. These data were examined in advance of the meeting to identify areas of consensus and disagreement. At the consensus meeting, the nurses were presented with their range of answers for each scenario and asked to agree a group answer (Adderley, 2013). The consensus panel reached complete agreement for each of the scenarios. A more detailed description of the construction of the judgement task can be accessed in the previous publication (Adderley and Thompson 2015) and at http://etheses.whiterose.ac.uk/4138/.

Participants

Nurses were included in the study if they were registered nurses responsible for the care of at least one community-based patient with leg ulceration at the time of the research, or had been responsible for the care of at least two patients within the previous three months.

The nurses were given specialist or non-specialist labels using their job title. Generalist nurses (which included nurses working in general/ family practice and district/home care nurses) were classified as 'non-specialist' while tissue viability nurses were classified as 'specialist'. In addition, data considered relevant to nurse decision making (Thompson 1999) and expertise (Lamond and Farnell 1998; Lauri and Salantera 2002; Hoffman, Donoghue and Duffield 2004; Ashton and Price 2006) were collected from all participants. These data included length of experience, level of education, knowledge, seniority, degree of clinical autonomy, and peer nomination as experts.

Sample size

Judgement Analysis is an idiographic research approach aimed at capturing the judgement policy of individual judges and thus requires very few participants (Cooksey 1996b). However, this study sought to identify whether there was a difference between the performance of non-specialist nurses and specialist nurses and so required a larger sample size. The sample size calculation for seeking to identify a difference in the mean accuracy between two groups of nurse participants takes into account the required mean difference between the two samples (Bland 2000b). Since the detection of only a very small difference would be unlikely to lead to organisational change in terms of investment in those factors believed to foster expertise, we sought a difference of effect size of 0.2 to inform the sample size calculation (Cohen 1988; Bland 2000b) An effect difference of 0.2 would mean that an average tissue viability nurse would score higher (i.e. be more accurate) than 58% of the generalist nurse group(Coe 2002) .

Thirty eight participants consisting of 19 non-specialist generalist nurses and 19 specialist tissue viability nurses were sought to provide 90% power to detect such a difference with alpha set at 0.05. Nurses were contacted via community nurse managers, GP practices and regional networks of tissue viability nurses, by letter and e mail.

Data collection

Each nurse was presented with 110 scenarios, each based on one clinical record. The scenarios were presented and responses gathered using an on-line survey tool (surveymonkey.com). Data were collected in 2011 and 2012. Participants independently completed the online judgement task which asked them to diagnose each scenario and recommend a type of compression (if any).

Data analysis

Two 'double system' (Cooksey, 1996) lens models were constructed. Logistic regression was used to calculate the lens model equations and the weighting attached to the information nurses viewed in the scenarios (these relative cue weights are analogous to having 100 points to divide up between the cues, according to their importance to the ecology or nurses) (Cooksey 1996a; Adderley 2013). The total pool of 110 scenarios contained 20 replicated scenarios. Judgement consistency was examined by calculating the Phi coefficients for the diagnostic judgement and treatment judgements for the ecology and for the overall nurse participant group. (Bland 2000a). The Phi coefficients were normally distributed.

We operationalised expertise in two ways. First, we separated the participants into generalist (less expert) or specialist (more expert) groups by their job role. We also hypothesised 'experience', 'education' and 'knowledge and expertise' would positively correlate with expertise (Ericsson, Whyte and Ward 2007). However, although demographic data had been collected with the aim of examining the impact of these different attributes, the participants were very similar in terms of experience and knowledge and expertise so statistical analyses could only be carried out in relation to job role and education.

A larger proportion of the specialist nurses were more highly educated so it was possible that there was an interaction effect between job role and level of education. Sensitivity (the probability of correctly judging a venous leg ulcer when in truth the scenario indicated VLU) and specificity (probability of saying no VLU when in truth the scenario did not indicate a VLU) were calculated using 2 x2 tables for both the diagnostic judgements and treatment judgements (Sackett et al. 1991) and two way repeated measures ANOVAs conducted. The dependent variables were sensitivity and specificity and the independent variables were job role (tissue viability specialist nurse or generalist community nurse) and level of education(Field 2005b).

The aggregated strategy for each group was calculated as the mean (cue weighting, lens statistic, sensitivity or specificity) for each group and Student's t test or the Mann-Whitney test was used to compare different groups of participants (Bland 2000a; Field 2005a).

RESULTS

The subjects

36 community nurses completed the judgement task of whom 18 were community generalist nurses (GCNs) and 18 were community tissue viability specialist nurses (TVSNs). Table 1 shows most of the participants had over 10 years nursing experience and both groups had spent a similar number of years caring for patients with leg ulcers. The specialist nurses worked, on average, slightly more hours per week but they spent more than twice as much time on leg ulcer care compared to the generalist nurses. The specialist nurses were more highly educated in terms of general post-graduate qualifications, leg ulcer related post graduate qualifications and non-medical prescribing qualifications. There was little variation between the two groups in relation to seniority as shown by job title. Most participants were either specialist nurses or senior generalist nurses who usually

Table 1 Demographic Characteristics		Types of Nurses							
		Generalist Community Nurses (GCNs)				Tissue Viability Specialist Nurses (TVSNs)			
		n	%	Mean	SD	n	%	Mean	SD
Gender	Female	18	100			18	100		
	Male	0	0			0	0		
Area of Practice	General practice	9	50			0	0		
	District Nursing	9	50			0	0		
	Tissue Viability Specialist	0	0			18	100		
Mean Age (in years)				48	4.13			45	10.34
Nursing Experience	0-2 years	1	6			0	0		
	2-5 years	0	0			1	6		
	5-10 years	2	10			4	22		
	>10 years	15	84			13	72		
Mean Leg Ulcer Experience (in years)				12	5.27			13	6.56
Mean Hours Per Week Nursing				30	7.90			35	4.56
Mean Hours Per Week on Leg Ulcer Care				7	6.26			15	6.92
Nursing Qualifications	Nursing degree	2	11			8	44		
	Post graduate qualification	4	22			8	44		
Prescribing Qualifications	Nurse Prescriber	5	28			6	33		
	Non-medical Prescriber	2	11			7	39		
Leg Ulcer Education	Study Days	12	67			6	33		
	Diploma level	5	28			5	28		
	Degree level	1	6			6	33		
	Master's level	0	0			1	6		
Job Title	Staff Nurse	2	11			0	0		
	Sister/ Team leader	16	90			0	0		
	Specialist Nurse	0	0			18	100		
Level of Supervision	Usually	2	11			2	11		
	Sometimes	3	17			1	6		
	Occasionally	6	33			3	17		
	Rarely / Never	7	39			12	67		
Allocated Time per Leg Ulcer Treatment	10 minutes	1	6			0	0		
	20 minutes	1	6			0	0		
	30 minutes	4	22			1	6		
	40 minutes	2	11			2	11		
	As long as is needed	10	56			15	83		
Level of Perceived Expertise	Some skills	3	17			1	6		
	Considerable skills	11	61			2	11		
	Advanced skills	3	17			8	44		
	Expert	1	6			7	39		

worked with minimal supervision and thus a high level of autonomy. In response to being asked how others perceived their knowledge and skills regarding leg ulceration, a larger proportion of the specialist nurse group indicated that they thought that others viewed them as having advanced skills or expertise in leg ulcer care but over three-quarters of the generalist group thought others perceived them as having considerable or advanced skills for leg ulcer care.

How did expertise impact on the accuracy of the nurses?

Achievement is presented in terms of accuracy (Ra) as a function of knowledge (G), predictability (Re), cognitive control (Rs) and unmodelled knowledge (C_1). Table 2 shows that the specialist nurses' diagnoses were more accurate ('accuracy' or 'Ra') than the generalists and made more appropriate use of the evidence-based cue information ('knowledge or 'G') and the non-evidence-based information ('unmodelled knowledge' or 'C_1'). However, no difference was found between the specialist nurses' and the generalist nurses' levels of consistency in assigning a similar amount of 'weight' to a cue ('cognitive control' or 'Rs'). There was no difference in diagnostic accuracy between those with more education and those with less education although those with more education made greater use of unmodelled knowledge (C_1 - information not modelled in the scenarios).

When judging whether high compression was warranted, the specialist nurses were more accurate in choosing high compression and made more linear use of the evidence-based cue information (G) than the generalist nurses. The specialist nurses also made greater use of unmodelled knowledge (C_3 - information not modelled in the scenarios) but the correlations were so small as to be negligible. Nurses with more education were more accurate at choosing high compression than those with less education. No other differences were found.

Table 2– Lens model statistics Diagnosis of venous leg ulceration	TVSNs (n=18)		GCNs (n=18)			Sig
	Mean	SD	Mean	SD	t(df34)	(2-tailed)
R_a Accuracy	0.57	0.13	0.38	0.16	-3.89	*<0.01
R_s Cognitive Control	0.62	0.10	0.54	0.14	-1.98	0.06
G Knowledge	0.34	0.08	0.25	0.12	-2.61	*0.01
C_1 Unmodelled Knowledge	0.23	0.08	0.12	0.07	-4.11	*<0.01
C_2 Unmodelled Knowledge	0.00	0.01	0.00	0.00	-.99	0.33
C_3 Unmodelled Knowledge	0.00	0.01	0.01	0.02	1.45	0.16
Diagnosis of venous leg ulceration	**More education (n=18)**		**Less education (n=18)**			**Sig**
	Mean	**SD**	**Mean**	**SD**	**t(df34)**	**(2-tailed)**
Ra Accuracy	0.53	0.15	0.42	0.18	-1.92	0.06
Rs Cognitive Control	0.59	0.10	0.58	0.15	-.120	0.91
G Knowledge	0.32	0.08	0.29	0.13	-1.38	0.18
C_1 Unmodelled Knowledge	0.21	0.10	0.14	0.07	-2.23	*0.03
C_2 Unmodelled Knowledge	0.00	0.01	0.00	0.01	1.63	0.11
C_3 Unmodelled Knowledge	0.00	0.01	0.01	0.01	1.29	0.21
Treatment with high compression	**TVSNs (n=18)**		**GCNs (n=18)**			**Sig**
	Mean	**SD**	**Mean**	**SD**	**t(df34)**	**(2-tailed)**
R_a Accuracy	0.57	0.14	0.41	0.18	-3.04	*0.01
R_s Cognitive Control	0.80	0.11	0.76	0.15	-0.93	0.36
G Knowledge	0.39	0.11	0.26	0.13	-3.19	*0.00
C_1 Unmodelled Knowledge	0.09	0.03	0.02	0.03	0.52	0.60
C_2 Unmodelled Knowledge	0.11	0.08	0.09	0.07	-0.57	0.58
C_3 Unmodelled Knowledge	0.06	0.03	0.03	0.03	-2.47	*0.02
Treatment with high compression	**More education (n=18)**		**Less education (n=18)**			**Sig**
	Mean	**SD**	**Mean**	**SD**	**t(df34)**	**(2-tailed)**
Ra Accuracy	0.56	0.15	0.42	0.18	-2.70	*0.01
Rs Cognitive Control	0.79	0.12	0.77	0.15	-0.29	0.77
G Knowledge	0.36	0.13	0.29	0.14	-1.69	0.10
C_1 Unmodelled Knowledge	0.03	0.03	0.01	0.03	-1.64	0.11
C_2 Unmodelled Knowledge	0.12	0.08	0.08	0.07	-1.68	0.10
C_3 Unmodelled Knowledge	0.05	0.03	0.04	0.03	-1.52	0.14

*Statistically significant

A larger proportion of specialist nurses were more highly educated so it was possible that there was an interaction effect between job role and level of education. However, two way repeated measures ANOVAs found no evidence to suggest an interaction between the effect of education and the effect of job role in diagnostic sensitivity (F (1,32) = 0.15, p = >0.05), diagnostic specificity (F (1,32) = 0.22, p = >0.05), treatment sensitivity (F (1,32) = 0.29, p = >0.05) or treatment specificity (F (1,32) = 0.34, p = >0.05) so in this study, education alone was not related to the level of accuracy of diagnosis or treatment.

How did expertise affect which information was considered important?

The cue weights as shown in Table 3 show the importance of each cue in the nurses' judgements about diagnosis and treatment. Table 3 reveals no difference between in specialist and generalist nurse weighting of the information relevant for diagnosing venous leg ulceration or for deciding whether or not to apply high compression. Differing levels of education also did not impact on nurse weighting of this information.

Table 3 – Relative Cue Weights
Diagnosis of venous leg ulceration

Cue	Ecology		TVSN (n = 18)			GCN (n= 18)			t(df34)	Sig (2-tailed)
	Rank	Weight	Rank	Mean Weight	SD	Rank	Mean Weight	SD		
ABPI	1	53	1	54	12.21	1	50	20.32	-1.36	0.18
Medical History	2	28	2	14	9.96	2	14	8.27	-0.55	0.59
Appearance	3	15	5	10	6.57	5	8	5.78	-0.97	0.34
Pain	4	2	3	11	6.26	2	14	8.78	0.73	0.47
Age	5	2	3	11	7.12	2	14	12.79	0.55	0.58

Cue	Ecology		More Education (n=18)			Less Education (n = 18)			t(df34)	Sig (2-tailed)
	Rank	Weight	Rank	Mean Weight	SD	Rank	Mean Weight	SD		
ABPI	1	53	1	54	12.21	1	50	20.32	-0.61	0.55
Medical History	2	28	2	14	9.96	2	14	8.27	-0.14	0.89
Appearance	3	15	3	10	6.57	5	8	5.78	-1.84	0.08
Pain	4	2	3	11	6.26	4	14	8.78	01.14	0.26
Age	5	2	3	11	7.12	2	14	12.79	0.51	0.51

Treatment with high compression

Cue	Ecology		TVSN (n = 18)			GCN (n= 18)			t(df34)	Sig (2-tailed)
	Rank	Weight	Rank	Mean Weight	SD	Rank	Mean Weight	SD		
Diagnosis of leg ulcer type	1	68	1	58	18.72	1	55	20.10	-0.81	0.42
Pain	2	13	4	8	8.57	6	6	6.43	-0.71	0.48
Infection	3	8	2	11	15.75	2	12	11.87	*NA	0.47
Exudate levels	4	7	5	7	4.74	5	7	5.55	-0.06	0.95
Patient preferences re compression	5	4	2	11	6.57	2	12	9.82	0.24	0.81
Gender	6	1	6	5	4.72	4	8	8.08	1.14	0.26

Cue	Ecology		More Education (n=18)			Less Education (n = 18)			t(df34)	Sig (2-tailed)
	Rank	Weight	Rank	Mean Weight	SD	Rank	Mean Weight	SD		
Diagnosis of leg ulcer type	1	68	1	58	20.10	1	55	18.66	-0.72	0.42
Pain	2	13	4	8	8.42	5	5	6.49	-1.00	0.48
Infection	3	8	3	11	11.58	2	10	15.89	*NA	0.64
Exudate levels	4	7	5	7	4.94	5	5	5.38	-0.66	0.95
Patient preferences re compression	5	4	2	12	8.28	3	9	8.49	-0.23	0.81
Gender	6	1	6	4	4.77	4	7	7.71	1.81	0.26

* Mann Whitney Test

DISCUSSION

In this study, job role, as a proxy indicator for expertise, impacted on accuracy as the diagnoses of the tissue viability specialist nurses were more accurate than those of the generalist community nurses. The effect size calculated from the results in Table 2 mean that in this study an average tissue viability nurse scored higher than 84% of the generalist nurse group for accuracy of diagnosis (Coe, 2002). The most important cue in the treatment judgement was diagnosis, which in turn, was the most important cue for treatment. Whilst specialist nurses were also more accurate than the generalist nurses regarding suitability for high compression treatment, the difference between the groups was smaller than the difference for the diagnostic judgment. However, the effect size calculated from the results in Table 2 mean that in this study an average tissue viability nurse still scored higher than 81% of the generalist nurse group for accuracy of suitability of high compression (Coe, 2002).

In this study, no difference was found in how much importance the specialist nurses and generalist nurses gave to the individual cues that the literature states are important to diagnosis of venous leg ulceration and whether or not to apply compression. Nearly all the specialist nurses and generalist nurses had similar high levels of years of leg ulcer experience so it was not possible to assess whether this contributed to higher levels of accuracy.

The greater accuracy of the specialist nurses might have been related to opportunities for *deliberate* practice. On average, the specialist nurses spent almost twice as much time per week on leg ulcer care, compared to the generalist nurses. Although there is only limited evidence to suggest that increased experience is linked with improved patient outcomes, hours of *deliberate* practice have been found to be positively correlated to higher levels of performance (Ericsson, Krampe and Tesch-Romer 1993; Ericsson 2004). A recent meta-analysis investigating the relationship between deliberate practice and performance suggests that although deliberate practice is important in developing expertise, other equally important factors are likely to explain the development of expertise (Macnamara, Hambrick and Oswald 2014). It is not clear what these factors might be but it is possible that individual generalist nurses who also seek out education and deliberate practice (for example, by developing an in-house leg ulcer clinic) may also achieve higher levels of accuracy. Frequency of contact with the task and availability (and quality of) feedback on task performance, rather than a job title seem to determine judgement performance.

Although the specialist nurses were more highly educated than the generalist nurses there was no evidence to suggest an interaction effect between job role and education for either the diagnosis or treatment task. In line with current uncertainties around academic education's contribution to the development of expertise - as measured by better patient outcomes (Aiken et al. 2014) - education alone was not related to the level of accuracy of diagnosis or treatment. Expert performance might be related to the innate personality attributes of individuals who constantly seek to improve and develop their knowledge and skills in a particular field (Ericsson, Whyte and Ward 2007). The high correlation between academic attainment and tissue viability specialist nursing may be more closely related to academic study as one of the activities that specialist nurses undertake as a requirement of their role, or because they have an innate desire to seek knowledge and information, rather than education itself being a causal factor for expertise.

There may be other reasons for the specialist nurses' higher levels of achievement. The specialist nurses were better at managing relevant information for diagnosis and treatment. Linear combinations of available information almost always outperform alternative clinical/intuitive methods of reaching judgements (Meehl 1954) and the specialist nurses made more linear use of the available evidence-based information. However, this was the only notable difference in the lens statistics. Therefore, the lens model statistics shed little light on why the specialist nurses were generally more accurate. The components of expert performance remain elusive, but the results of this study suggest that nurses who are designated expert by their job title (i.e. the tissue viability specialist nurses) have a higher probability of being more accurate in their diagnostic and treatment judgements.

Whilst correct judgements by specialists benefit patients, they come at a cost. In the UK, specialists cost more than generalists. The cost of patient contact for a clinical specialist nurses is currently estimated to be between £64-£80 per hour compared to £44- £57 per hour for a non-specialist community nurse (Personal Services Social Research Unit 2014). Specialists may also spend more time with patients. This study did not examine the cost effectiveness of specialist vs. generalist care in leg ulcer management but the better performance of the tissue viability specialist nurses may not automatically translate into more cost-effective care.

Furthermore, in order to sustain nurse specialists, it is also necessary to have novices – i.e. those who are developing their knowledge and skills. Restricting aspects of practice to only specialist nurses (e.g. diagnosis) increases the risk of restricting feedback on generalist performance and thus diminished learning by non specialists. Heuristics and biases such as over/under confidence and poor judgement-outcome calibration could feasibly lead to poorer nursing performance overall (Yang and Thompson 2010).

Limitations

Ecological validity was reduced by the need to use written/ photographic scenarios rather than real patient consultations although this did make the Judgement Analysis task a reliable tool since the same task was administered to all participants. Complete data were obtained from all participants and the inclusion of twenty replicated scenarios within the judgement task enabled predictive validity and judgement consistency to be checked. Internal validity was also increased by selecting real patient clinical records as the basis for scenarios that reflected the diagnostic labels used in the UK population for people with leg ulcers. The inclusion of most of the cues reported as relevant by the literature and their presentation in naturally occurring measurement units of information (such as wound photographs and actual ABPI measurements) also increased internal validity.

Whilst all the nurse judges were familiar with the task requirements, the use of non-random sampling resulted in a sample that may not adequately represent the nurse population who undertake assessment and treatment of leg ulceration (Bryman 2001). Recruitment of sufficient generalist nurse participants was difficult because many of the nurses who were approached declined to take part because they did not feel sufficiently confident about their own knowledge and skills. Most of the generalist nurses who did participate had high levels of seniority, autonomy and clinical experience, and were perceived as having advanced knowledge and skills in leg ulcer care. This may not be typical of generalist community nurses who are responsible for making diagnostic and treatment choices for patients with leg ulceration. Furthermore, the generalist nurses were only sampled from one geographical region in the UK so the results may not accurately estimate the level of achievement of UK generalist community nurses in general.

However, external validity was increased by using a much larger number of scenarios than the standard recommendation (Cooksey, 1996c) which succeeded in deriving stable logistic regression estimates. The recruitment of an adequate number of nurses regularly making these sorts of judgements in real life also increased external validity.

Implications for practice and research

The most recent UK guidelines (SIGN 2010) recommend that all patients with leg ulceration should receive Doppler assessment of ABPI but notes that there is “complexity of clinical reporting and methodological issues around interpretation and reproducibility of results”. The guideline recommends that Doppler assessment of ABPI should be undertaken by “appropriately trained practitioners who should endeavour to maintain their skills”. The expertise literature discussed in this article and the results of this study support this recommendation by raising doubts about the effectiveness of education alone in developing expertise. It seems likely that the opportunity for 'deliberate practice' is more likely to lead to expertise so those with responsibility for Doppler assessment of ABPI are more likely to develop expertise by not only having access to education but having the opportunity for frequent practice of this procedure. In the UK, such opportunities are likely to be limited within generalist district nursing or practice nursing due to the relative infrequency of opportunities for undertaking Doppler assessment of ABPI. Therefore, nurses with responsibility for measuring ABPI should seek out frequent and regular opportunities to undertake assessment and receive feedback on their judgements to maintain adequate competence/ expertise. This might be achieved through participating in specialist leg ulcer clinics with high patient throughput, perhaps augmented by regular and judgement focused clinical audit.

Tissue viability specialist nurse specialists were more accurate when both diagnosing ulcers and judging the need for high compression, but it is not clear whether this difference would translate into meaningful cost-effectiveness for healthcare providers. Future studies should consider gains in performance and the costs of achieving such gains from a variety of perspectives.

CONCLUSION

In this study, UK tissue viability specialist nurse specialists were more accurate in both diagnosis and their treatment choices around high compression but the reasons for this increased accuracy are not obvious. It might be related to greater opportunities for 'deliberate practice' but restricting certain aspects of practice to only specialist nurses may compromise the performance of generalists. This study was conducted in a UK setting but the roles of specialist and generalist nurses is likely to be an issue for the global and clinical community involved in managing leg ulceration. In sum, this study suggests that the role of specialist and generalist nurses in leg ulcer management requires careful consideration and evaluation in order to optimise clinical performance cost-effectively.

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