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What influences chronic pain management? A best–worst scaling experiment with final year medical students and general practitioners

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Abstract

Background: Chronic pain education is an essential determinant for optimal chronic pain management. Given that attitudes and preferences are involved in making treatment decisions, identifying which factors are most influential to final year medical students' and General Practitioners' (GPs) chronic pain management choices is of importance. This study aims to explore what factors influence chronic pain management. Furthermore, by comparing final year medical students and GPs in Sweden we investigated how these influential factors change over time, and possible differences between final year medical students in Sweden and Australia.

Methods: We employed a best worst scaling experiment (BWS), a stated-preference method grounded in random utility theory, to explore the importance of factors influencing chronic pain management.

Results: All three cohorts considered the patients' pain description and previous treatment experience as being most important factors in making treatment decisions, whilst their demographics and voices or facial expressions while describing their pain were considered the least important. Factors such as social support, patient preferences and treatment adherence were, however, disregarded by all cohorts in favour of pain assessment factors such as pain ratings, description and history. Swedish medical students and GPs show very high correlation in their choices, although the GPs consider their professional experience as more important compared to the students.

Conclusion: The present study suggests that the relative importance of treatment factors are cemented early, and thus underline the critical importance of improving pain curricula during undergraduate medical education.

Keywords:

Pain management, pain education, best-worst scaling, medical students, general practitioners

Introduction

The clinical guidelines for treatment of chronic non-malignant pain have been described as inconsistent and physicians have reported chronic pain being one of the most difficult conditions to treat.[1] The current view of chronic pain treatment is that it should be approached through the biopsychosocial model, where the importance of not only traditional clinical approaches such as pain assessment and aetiology, but also psychological and social factors are emphasised for appropriate chronic pain management.[2] This requires an interdisciplinary strategy to chronic pain management that involves several health care providers.[3] Moreover, patient-centred care is becoming an integrated part of health care. The patient's role in pain management is important, and consideration of patients' preferences by doctors has been reported to improve treatment outcomes.[4]

Chronic pain education has been identified as one of the single most important barriers to optimal chronic pain management,[5] and it has been repeatedly reported that the chronic pain curriculum is fragmented and inadequate.[6] In a recent study, we reported that final year Australian and Swedish medical students are knowledgeable about current recommendations but clearly perceive chronic pain management an important subject in need of improvements in the way it is taught.[7] Little is known about the attitudes and preferences that medical students acquire during their teaching, although Hollingsworth et al.[8] have reported that students felt that patient's pain history and there pain description were key factors guiding their pain treatment decisions. In that study, the students were allowed to choose the likelihood that they would use the information, rather than being asked explicitly to rank it in order of importance. In consequence, in the present study, we have investigated Swedish and Australian students' attitudes and preferences with respect to a chronic pain condition, using a best worst scaling experiment (BWS), which is designed to rank alternatives.

Methods

Participant recruitment and survey administration

Students from two Universities in two different countries participated in this study. Our survey (described below) targeted medical students in their last three semesters at the school of medicine at Umeå University, Sweden, and final year (Year 4) medical students at the School of Medicine at Notre Dame, Sydney, Australia (for details of the training programmes and post-graduate training, see [14]). The survey was accessible as an online questionnaire in SurveyMonkey® (SurveyMonkey, San Mateo, CA, USA). In December 2016, an invitation letter and web link to the survey was sent to 327 Swedish medical students by email. During the two-month period the survey was open we sent out two reminders. In February 2017, Australian students were notified in a broadcast via their education software (blackboard) with information about the study and a link to the online survey was sent out. Australian students were also given the option to enter a draw for a gift voucher upon completion of the survey. Additionally, for the Australian students, a flyer providing details about the project and survey with contact details was also displayed in venues used by the students. Multiple distribution channels were used in order to enrol as many participants as possible.

In order to investigate whether attitudes and preferences are affected by experience, we also recruited GPs in Västerbotten county, Sweden, which is also the county of Umeå University. They were recruited through an email information letter and web link sent to heads of clinics in primary care in January 2017 who then had the choice of forwarding this web link to their employees. GPs in primary care settings were chosen as they currently are the main health care providers of chronic pain patients. The approach used was chosen as being the most effective means to reach as many GPs as possible, but since the choice of forwarding the web link to them was voluntary, the number of GPs reached is not known and thus the response rate for this cohort cannot be calculated.

Survey design

The survey had four parts: A, attitudes towards chronic pain using the Health Care Providers'

Pain and Impairment Relationship (HC-PAIRS) scale; B, the Best-worst discrete choice

experiment (BWS) reported here; C, open-ended questions about chronic pain education and

D, demographic questions (for details see Rankin et al.[7], where the findings in parts A and C

are reported in detail for the medical students). The initial version of the survey was created in

English and then translated into Swedish, thereafter back-translated to English to ensure that

the two versions were internally consistent. The Swedish student survey was pilot tested by a

former medical student who recently graduated from Umeå University and by one final year

medical student from another university in Sweden. The Swedish GP survey was pilot tested

by four GPs from counties other than Västerbotten. The Australian survey was tested by two

former University of Notre Dame school of medicine students undertaking their intern year.

The clinical vignette, factors and BWS choice tasks in this survey were also evaluated by four

Swedish general practitioners. A feed-back questionnaire was sent out together with an online

link to the survey. Pilot testers where asked to give critical feedback in relation to language

congruity, survey design and medical plausibility. The Australian pilot testers were given a

$20 gift card as incentive to participate. Minor changes were made as result of the pilot

testing. Furthermore, specialist medical doctors with specialities strongly linked to chronic

pain in both Sweden, United Kingdom (UK) and Australia were consulted to assure general

medical authenticity of the survey.

Best-worst scaling discrete choice experiment

The present study utilises a Case 1 best worst scaling discrete choice experiment. Discrete

choice experiments allow respondents to choose one preferred alternative between a finite set

of alternatives in a hypothetical situation. However, in best worst scaling (BWS) the task is not just to choose the best alternative but also the worst.[9] There were different steps involved in the selection of the attributes (factors) for this BWS. In their study, Hollingshead et al.[8] suggested 18 influential factors that could be important in guiding chronic pain treatment decisions. After a consultation with specialists in the field, a list of 11 of these 18 factors for our study were chosen. The factors selected were: a, Patients' preferences for treatment; b, Patients' pain history; c, Patients' pain description; d, Patients' social support; e, Your professional experience; f, Patients' voice or facial expressions when describing their pain (two separate factors in [8]); g, Patients' demographics; h,. Patients' previous treatment experiences; , Patients' average pain rating over the past week; j, Patients' current pain rating and k, Patients' history of treatment adherence. These were presented to the participants in a table that they could access throughout completion of the choice tasks. Five important factors from [8] were integrated in our clinical vignette, e.g. no use of alcohol or illicit drugs, patient's good physical health, no mental health symptoms and stable employment/disability status to avoid their influence on the general treatment decision for a general new chronic pain patient. Thus, the only factor from [8] that was not incorporated was "your intuition".

Experimental design and choice set construction

We used a Balanced Incomplete Block Design (BIBD) experimental design. A Youden type design for 11 objects and 11 choice sets was selected from the library of BIBDs.[10] In this design, each choice set contains 5 objects and each object is repeated 5 times and paired twice.

Clinical vignette

The BWS choice sets were preceded by a clinical vignette describing an example of a typical novel chronic pain patient met in a health care centre setting:

"John is a 41-year old male who has been suffering from lower back pain for the last 7 months. He experienced the first symptoms when he was lifting heavy furniture. John's ability to perform everyday routines has become somewhat limited and he has been forced to call in sick to work a couple of times because of his pain. Sometimes he has trouble sleeping because of the pain. John has tried over the counter NSAIDs in full dose for two weeks without results. He has no contraindications when it comes to treatment such as aspirin allergy or possible interactions with other drugs. He has no other physical health problems and he is physically active at a normal level. He has no history of drug addiction and is in good health besides his chronic back pain. When you examine John you find following status: pulse 74, BP 110/70, weight 78kg, height 177 cm. Heart and lungs are auscultated without remarks. When examining John's back and spine you notice partial stiffness and slightly reduced mobility." This vignette was followed by an example choice set explaining what task the participants was expected to perform (see Figure 1). The task was to answer the following question for each individual choice set: "Imagine that you will chose treatment for John. Amongst these factors, select which one is the most important and least important by ticking the boxes".

Data analysis

In BWS the main outcome is the "ranking" for best to worst. These scores can be derived in several ways. A count (by considering the number of times a factor was chosen as most and the number of times it was chosen as least across all choice sets and respondents) followed by a conditional logit (clogit) analysis was undertaken using the function bws.dataset in the

support.BWS package (version 0.1-4) for the R statistical programme (version 3.5.0). [11] The output gives both aggregate and individual Best, Worst and Best-Worst scores as well as the clogit coefficients relative to a prechosen reference factor. The output gives both aggregate and individual Best, Worst and Best-Worst scores as well as the clogit coefficients relative to a prechosen reference factor. The conditional logit analysis used (model ="marginal", delete.best = TRUE) assumed a sequential best worst decision-making, this means that individuals chose the best alternative first and thereafter the worst alternative from the four remaining choices in each block. However, very similar coefficients were obtained using the default "Maxdiff" conditional logit built into the bws.dataset function, suggesting that this assumption is not a critical determinant for the present datasets (data not shown). The robustness of the Best-Worst scores and clogit coefficients was evaluated by determining the range of scores for all combinations of the datasets excluding three participants at random (see Supplementary Material File 1). Chi squared tests on the responses best, worst and not chosen to identify potential cohort differences were undertaken using the function chi.square in the stat package built in to R version 3.5.0. Post-hoc tests were undertaken using the function pairwiseNominalIndependence in the R package rcompanion version 1.13.2, with the p-adjustment set to "fdr" (false discovery rate[12]). Scores and percentages were calculated on an aggregate level per country and cohort.

Ethical considerations

Ethics approval for this study was granted by The University of Notre Dame ethics committee (HREC Ref 0170025). The Regional Ethics Review Board in Umeå reviewed this study on 8 September 2015 and returned it with an advisory opinion: because participation in the survey was fully anonymized, it was not considered to require a formal approval. Consent was obtained from all study participants.

Results

Participant characteristics and responses to survey tasks

The total number of Swedish students who undertook the survey was 80 of 327 invited to participate, response rate 25% and the number of Australian students that undertook the survey was 30 (of 110 invited, response rate 27%).[7] There was a considerable attrition rate throughout the survey, particularly at the level of Section 2, the BWS choice task. One Australian participant withdrew from the survey during the choice tasks, therefore we had to exclude the complete BWS data for this individual. In all, 30 and 21 Swedish and Australian students, respectively, completed the BWS experiment. For the GPs, 16 of the 30 (53%) physicians who clicked the survey initiated and completed the BWS task. Since each individual factor appears five times in the BIBD design, the final number of BWS observations were thus 150 for the Swedish students, 105 Australian students and 80 for Swedish GPs. The demographic section was located last in the survey which means there was chance for further attrition in number of participants for this section. However, only one GP who completed the BWS section failed to complete the demographic section and all students remained.

The majority of students were females (76% for Australian and 63 % for Swedish) and aged between 25-29 years. When asked what speciality they would choose if they were to choose today, the Swedish student's top choices were surgery and general practice (n= 4, 13% each). For the Swedish GP responders, a slight majority were male and most GP participants belonged to the age range 30-34. All GPs were currently working in primary care, and 73% (n=11) of GPs had completed or were currently undertaking speciality training towards general practice. Their experience within their speciality ranged from less than six months to 21 years (median ± interquartile range 3±11 years). See Table 1 for a summary of the demographic data.

Best-worst scaling experiment

In BWS experiments, data is normally presented as best minus worst scores (B-W) and in logit analyses as coefficients relative to a chosen reference factor.[9] The number of times each factor was chosen as either best or worst amongst the different cohorts are presented in Tables 2, 3 and 4 together with the individual standardized (i.e. fractional) B-W scores and the conditional logistic regression model (clogit) analysis where factor d (patients' social support) was chosen as reference due to non-significant differences between the score distributions for this factor (see below). As expected from the literature,[13,14] a high correlation between the Best-Worst scores and the clogit coefficients for each factor was seen (Supplementary Material File 2). The observed clogit coefficients and their significance are, of course, dependent upon the choice of reference factor. For the Swedish GPs, for example, use of factor g ("Patient's demographics") as reference in rather than factor d gave significant (P<0.002 in all cases) clogit coefficients for all the other 10 factors (data not shown).

Figure 2 shows the fractional best, worst and no choice responses for the three cohorts. Significant differences between groups (Chi square test) were seen for factors "b", "e", "i" and "j". Post-hoc tests indicated that for factors "b" and "i", the distribution of the data for the Australian groups was significantly different from the other two cohorts, for factor "e", all groups differed significantly from one another; and for factor "j", the Australian and Swedish cohorts differed significantly. The data is further visualized in Figure 3, where the best minus worst scores are shown. Patients' pain description ("c") was the most important factor to both Swedish students and Swedish GPs while the Australian students considered both this factor and patients' previous treatment experience ("h") being the most important. For the factors being chosen as being least important, patients' voice or facial expressions when describing their pain ("f") and patients' demographics ("g") were clearly chosen as worst the most on an

aggregate level by all cohorts. For complete comparison between the 3 cohorts see Figure 3 for the aggregate fractional scores and Figure 2 for aggregate scores as percentages.

Differences between Swedish and Australian medical students were further explored by a simple linear regression of the exp logit coefficients (Figure 4A and C): in this case, differences can easily be spotted as the points outside the 95% confidence intervals (dotted curves in the figures). Swedish students more often considered their own professional experience ("e") as an important factor compared to Australian students who often picked this factor as least important (see Figure 3). Other factors outside the 95% confidence interval lines (the dotted lines in Figure 4), were the patients' pain history ("b"), previous treatment experiences ("h") and current pain rating ("j"). These tie in well with the Chi squared data for the aggregate data summarised in Fig. 3 (see above).

In general, Swedish students and GPs considered the same factors as most important and least important when asked to choose treatment for a new chronic pain patient (Figure 4B and D). However, GPs relied more on their professional experience ("e") and it was also their second ranked most important factor (Table 4). Patient preferences were seldom considered as a factor by any of the cohorts, indeed it was the middle-ranked factor being chosen as most or least important the least number of times (see Fig. 3).

Discussion and conclusion

The present study investigated the relative importance of factors affecting final year Swedish and Australian medical students' choice of chronic pain treatment. Our study shows that students favour typical pain assessment factors when choosing pain treatment for a new chronic pain patient. Factors such as patients' pain description, treatment history, average pain rating over the past week and previous treatment experiences were chosen as the most important factors influencing chronic pain management. The factors considered to be of least influence were patient demographics, voice and facial expression, history of treatment adherence and social support.

Sweden and Australia have comparable pain prevalence rates and management approaches, and Australia was the first country to create a national pain strategy.[15] However, several differences were observed between the cohorts. Australian students showed low confidence in their own professional experience as a factor for chronic pain management, while the Swedish students considered this factor more often. In their study, Hollingsworth et al.[8] included a group of physicians and reported that they chose their personal experience as a factor guiding treatment decisions more often than the students, and a similar result was seen here in our Swedish GPs. Indeed, it was their second most important choice when comparing aggregate best minus worst scores. Perhaps the difference between the student cohorts for this factor can be explained by differences in their education, as the Swedish students encounter more patients during their undergraduate training.[7]

Australian students further considered "patients' pain history" as the most important factor more often than both Swedish students and GPs, and the same result was seen for "patients' pain rating over the past week". Regarding the factor "current pain rating", this factor was highly rated by the Swedish students compared to the Australian who often picked it as being of least importance. Thus, Australian students were more concerned with pain ratings over a

longer period whilst Swedish students were more interested in the current pain rating. GPs gave little attention to the pain rating factors which seem to be in line with the literature showing that health care providers give little consideration to pain ratings, and even more so if psychosocial factors are present, or if there is insufficient diagnostic evidence for the pain.[16,17]

Patient preferences were surprisingly neglected by all cohorts compared to the other factors. Aggregate best minus worst scores places this factor in the middle which means that it was not considered as either best or worst the most number of times out of all available factors. It is important to note that the patient vignette was a relatively straightforward case of back pain with less complexity and so the students (and GPs) were presumably content to use a biomedical management strategy. This vignette of an ordinary patient in primary care was chosen in order not to overwhelm the students with a more complicated case, in particular the Australian students, who receive their pain education early relative to their clinical experience (see [7]). We do not rule out the possibility that in a more complicated vignette, such as a patient with fibromyalgia and psychological symptoms and a history of unsuccessful treatment decisions, considering patient preferences would have been given more importance. As mentioned, previous research has shown that considering patient preferences is beneficial to treatment outcomes.[4] Additionally, studies have demonstrated that GPs have limited understanding for patients' preferences, for instance, they seem to overestimate their own importance to the patients.[18] In the Chief Medical Officer of Scotland's report on Realistic Medicine[19], it was pointed out "The training of doctors has been mainly in a traditional model of care with patients reliant on healthcare professionals for information, diagnosis and referral, and with interventions decided mainly by healthcare professionals." Our data would indicate that this model is still dominant in their training, despite the development of more patient-physician interactive approaches, such as Scotland's House of Care model[19]. We do

not exclude the possibility that aspiring or established physicians consider this factor, but demonstrate that when forced to choose between factors, patient preferences are not considered.

As discussed by Hollingshead et al.,[8] patient demographics can have biased influence on treatment decisions. In their study, they observed that more than half of their participants reported using this factor in their chronic pain treatment decisions. In our study, students and GPs gave little priority to this factor compared to other factors. Another treatment influencing factor seen amongst the least important were "patients' voice and facial expression when describing their pain". It can be speculated that our participants thought the factor "patients' pain description" gave them the information needed from this emphatic point of view. Regardless, a patient-centred approach to managing chronic pain is dependent on the ability to understand patient' pain, and empathic attributes such as described by this factor could thus be of importance in this context.

Less satisfactory were the low scores seen with factors "patients' social support" and "previous treatment adherence". Our results are consistent with previous data[8] showing that social support has low priority. Social support has proven to be important factor for better treatment outcomes, with respect to recovery *per se*, decreased risk of opioid misuse, and acting as a buffer against depression which commonly co-occurs with chronic pain.[8] Treatment adherence is another factor that greatly impacts treatment outcomes. This factor is highly considered by pharmacists who have been proposed to be an important addition to the current multidisciplinary organization.[20] The finding here that this factor has low priority with physicians, supports the contention that pharmacists, who are specialists in safe and effective medication use, should be more actively involved in multidisciplinary care.

Studies have concluded that physicians' knowledge and attitudes are formed during undergraduate training and that there is a need for improved chronic pain

curriculum.[6,21,22] Our results show that Swedish GPs consider their professional experience more highly than Swedish students, although besides this we observe a remarkably similar ranking of factors for these cohorts, implying that their strategies for chronic pain management do not change with gained experience. These results underline the need for thorough and appropriate undergraduate education to accurately address the complexity of chronic pain management and improve treatment outcomes.

There are both strengths and limitations to the present study. It adds to the limited literature on what factors medical students and physicians consider when they choose chronic pain treatment. We have elicited important information about what factors are considered most and least important when selecting treatment for a new chronic pain patient typically encountered in primary health care settings. The limitations to our study include the relatively uncomplicated vignette used, and not least the low response rate of the students (25-27%). This low response rate is, unfortunately, not unusual in studies of this type (see e.g. [23]). Indeed, web-based surveys usually have lower response rates than other survey modes, and factors such as the length and salience of the survey are important determinants of response rates.[24] Expert opinions as to acceptable response rates vary widely, but increasing response rates does not necessarily reduce non-response bias.[25] Nonetheless, we cannot exclude the possibility that the participants who chose not to complete the survey may have different preferences, and this should be borne in mind as a caveat. Furthermore, we surveyed students from one university in each country and GPs working in one Swedish county, thus we cannot be conclusive about the generalization of these findings. It could however be assumed because of the structural similarities between counties regarding both primary care and medical education in Sweden and Australia (see [7]) that the samples are fairly representative. It would however be interesting to explore this further by including additional cohorts. The factors in this study were selected based on the literature, and then evaluated

through pilot-testing and several clinical experts in the field. There is however a possibility that important factors were missed. Additionally, it might be argued that eliciting most and least important factors in such a complex field as chronic pain is oversimplified, and this is a disadvantage of using the BWS case 1 method to elicit preferences.

In conclusion, we found that similar factors were considered to be the most and least important when considering treatment for a new chronic back pain patient between our cohorts, however, the relative importance of several chosen factors differed between cohorts, primarily between the two countries. These revealed differences between the Swedish and Australian cohorts could suggest to be due to differences in cultural view of pain and differences in medical education. Important factors such as social support, patient preferences and treatment adherence are disregarded by all cohorts in favour to more traditional and objective pain assessment factors such as pain ratings, pain description and pain history. Swedish medical students and GPs show very high correlation in their choices of influential factors, although the GPs consider their professional experience as more important compared to the students. This close correlation indicates that the importance of treatment factors are not changed with experience and thus underline the critical importance of satisfying the need for an improved pain curricula for the undergraduate medical education.

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research,

authorship and/or publication of this article.

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Table 1. Demographic characteristics of participants.

	Australian medical students (n=21) n (%)	Swedish medical students (n=30) n (%)		Swedish GPs (n=15) n (%)
Female / Male	16 / 5 (76/24)	19 (63)	Female / Male	7 / 8 (47/53)
Age:			Age:	
Under 25	3 (14)	10 (33)	25-29	1 (7)
25-29	15 (71)	16 (53)	30-34	5 (33)
30-34	2 (10)	2 (7)	35-44	2 (13)
35-39	1 (5)	1 (3)	45-49	3 (20)
45-49	-	1 (3)	50-54	2 (13)
Wish to pursue general medicine as medical specialty	2 (8)	4 (13)	55-75	2 (13)
			Currently working in primary care	15 (100%)
			Completed/undertaking GP specialist training	11 (73)
			Experience as GP specialist	<6 months – 21 years (median ± interquartile range 3±11 years)

Table 2. BWS scores for the Swedish students (N=30)

Factor	total scores (150 max)			individual scores		clogit analysis (d chosen as reference)			
	best (B)	worst (W)	B-W	mean	SD	coeff	exp(coeff)	CI exp(coeff)	p
1. Patients preferences for treatment (a)	16	14	2	0.013	0.268	0.84	2.32	1.47-3.65	0.00028
2. Patients' pain history (b)	39	5	34	0.227	0.261	1.60	4.95	3.12-7.87	1.3×10^{-11}
3. Patients' pain description (c)	110	1	109	0.727	0.322	3.27	26.3	16.1-43.0	$< 2 \times 10^{-16}$
4. Patients' social support (d)	12	43	-31	-0.207	0.409				
5. Your professional experience (e)	16	13	3	0.020	0.299	0.93	2.54	1.60-4.03	7.2×10^{-5}
6. Patients' voice or facial expressions when describing their pain (f)	6	76	-70	-0.467	0.384	-0.87	0.42	0.27-0.65	0.00013
7. Patients 'demographics (g)	3	111	-108	-0.720	0.291	-1.72	0.18	0.11-0.29	9.1×10^{-13}
8. Patients' previous treatment experiences (h)	47	10	37	0.247	0.296	1.65	5.18	3.28-8.18	1.6×10^{-12}
9. Patients' average pain rating over the past week (i)	40	18	22	0.147	0.371	1.28	3.60	2.26-5.72	6.0×10^{-8}
10. Patients' current pain rating (j)	29	14	15	0.100	0.378	1.07	2.91	1.82-4.66	8.0×10^{-6}
11. Patients' history of treatment adherence (k)	12	25	-13	-0.087	0.271	0.53	1.70	1.09-2.64	0.019

Aggregate scores, individual scores (as standardized means ranging from -1 to +1 and SD) and conditional logit (clogit) analyses were undertaken using the the support.BWS package (version 0.1-4) for the R statistical programme (version 3.5.0). The clogit analyses used the function from the survival package and used the sequential rather than the maxdiff model. The clogit output gave $R^2 = 0.182$ (max possible= 0.486); Likelihood ratio test= 597 on 10 df, p=0; Wald test = 407 on 10 df, p=0; and Score (logrank) test = 568 on 10 df, p=0.

Table 3. BWS scores for the Australian students (N=21)*

Factor	total scores (105 max)			individual scores		clogit analysis (d chosen as reference)			
	best (B)	worst (W)	B-W	mean	SD	coeff	exp(coeff)	CI exp(coeff)	p
1. Patients preferences for treatment (a)	18	8	10	0.095	0.393	0.82	2.26	1.29-3.96	0.0043
2. Patients' pain history (b)	45	0	45	0.429	0.239	1.86	6.45	3.78-11.0	7.6×10^{-12}
3. Patients' pain description (c)	45	3	42	0.400	0.424	1.77	5.85	3.41-10.0	1.4×10^{-10}
4. Patients' social support (d)	16	29	-13	-0.124	0.492				
5. Your professional experience (e)	6	34	-28	-0.267	0.381	-0.48	0.62	0.36-1.04	0.070
6. Patients' voice or facial expressions when describing their pain (f)	1	56	-55	-0.524	0.366	-1.24	0.29	0.17-0.49	5.3×10^{-6}
7. Patients 'demographics (g)	1	51	-50	-0.476	0.338	-1.13	0.32	0.19-0.55	2.9×10^{-5}
8. Patients' previous treatment experiences (h)	50	4	46	0.438	0.280	1.90	6.71	3.92-11.5	4.1×10^{-12}
9. Patients' average pain rating over the past week (i)	24	3	21	0.200	0.323	1.11	3.04	1.78-5.22	5.2×10^{-5}
10. Patients' current pain rating (j)	8	23	-15	-0.143	0.364	-0.18	0.83	0.48-1.44	0.51
11. Patients' history of treatment adherence (k)	17	20	-3	-0.029	0.411	0.34	1.41	0.84-2.37	0.20

*Twenty-two individuals took part in the study, but one only answered half of the questions, and so the data for this individual was excluded. Aggregate scores, individual standardized scores and conditional logit (clogit) analyses were undertaken as described in Table 1. The clogit output gave $R^2 = 0.146$ (max possible= 0.486); Likelihood ratio test= 328 on 10 df, p=0; Wald test = 237 on 10 df, p=0; and Score (logrank) test = 297 on 10 df, p=0.

Table 4. BWS scores for the Swedish GPs (N=16)

Factor	total scores (105 max)			individual scores		clogit analysis (d chosen as reference)			
	best (B)	worst (W)	B-W	mean	SD	coeff	exp(coeff)	CI exp(coeff)	p
1. Patients preferences for treatment (a)	10	16	-6	-0.075	0.392	0.25	1.29	0.71-2.35	0.41
2. Patients' pain history (b)	22	3	19	0.238	0.312	1.38	3.96	2.15-7.29	1.0×10^{-5}
3. Patients' pain description (c)	45	0	45	0.563	0.344	2.40	11.1	5.97-20.5	2.2×10^{-14}
4. Patients' social support (d)	10	22	-12	-0.150	0.476				
5. Your professional experience (e)	26	3	23	0.288	0.413	1.59	4.90	2.65-9.08	4.2×10^{-7}
6. Patients' voice or facial expressions when describing their pain (f)	3	32	-29	-0.363	0.374	-0.68	0.51	0.28-0.91	0.024
7. Patients 'demographics (g)	0	58	-58	-0.725	0.326	-1.79	0.17	0.089-0.31	2.3×10^{-8}
8. Patients' previous treatment experiences (h)	24	4	20	0.250	0.288	1.38	3.98	2.17-7.27	7.2×10^{-6}
9. Patients' average pain rating over the past week (i)	14	12	2	0.025	0.349	0.53	1.70	0.93-3.09	0.085
10. Patients' current pain rating (j)	14	13	1	0.013	0.416	0.47	1.61	0.86-2.99	0.14
11. Patients' history of treatment adherence (k)	8	13	-5	-0.063	0.348	0.35	1.41	0.79-2.54	0.25

Aggregate scores and conditional logit (clogit) analyses were undertaken as described in Table 1. The clogit output gave $R^2 = 0.149$ (max possible= 0.486);

Likelihood ratio test= 255 on 10 df, p=0; Wald test = 184 on 10 df, p=0; and Score (logrank) test = 232 on 10 df, p=0.

Figure legends

Figure 1. Example best-worst scaling choice set for the task: "Imagine that you will chose treatment for John. Amongst these factors, select which one is the most important and least important by ticking the boxes".

Figure 2. Best, worst and no choice responses (as % of the total response rate) for the for the Swedish (SWE) and Australian (AUS) students and the Swedish GPs (S-GP). The items have been ordered from highest to lowest best scores for the Swedish student cohort. For two of the factors ("c" and "g", see Fig. 3 for explanation of the factors), the group distributions precluded Chi-square analysis. For the other groups, however, factors "b", "e", "i" and "j" had Chi-square P values that were smaller than the critical value of P of 0.022 assuming a 5% false discovery rate.[12] Factor "a" had a P value of 0.037 and the other factors had P values >0.05.

Figure 3. Standardized best-worst (B-W) scores for the for the Swedish and Australian students and the Swedish GPs. The items have been ordered from highest to lowest best minus worst scores for the Swedish student cohort. The standardized scores are taken from Tables 2-4.

Figure 4. Correlation between the A, B: mean standardized B-W scores and C, D, the exp logit coefficients for the Swedish students (N=30) vs. either the Australian students (N=21; A,C) or the Swedish GPs (N=16; B,D). The letters indicate the item in question (see Tables 2-4 for explanations). The dotted lines show the 95% confidence bands for the regression line.