The content validity of the Dutch-Early-Nurse-Worry-Indicator-Score (DENWIS); does it capture the nurse's worry?

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ABSTRACT: The content validity of the Dutch-Early-Nurse-Worry-Indicator-Score (DENWIS)

BACKGROUND Early recognition and treatment of clinical deterioration in hospitalized patients is essential and performed by nurses. Clinical deterioration can be detected using the (Modified) Early Warning Score ((M)(EWS)-criteria) or the nurse's worry. The nurse's worry is an intuitive feeling nurses develop over time and experience. Studies have shown that nurses find it difficult to describe their worries. The Dutch-Early-Nurse-Worry-Indicator-Score (DENWIS), is developed for nurses to objectify their worry, and consists of nine individual indicators. However, content validity (CV) of the DENWIS has not been established.

AIMS The primary aim was to determine the CV of the DENWIS. Secondary aims were to explore the correlations between the individual DENWIS-indicators and the years of work experience of the nurse, the type of ward, and the type of hospital.

METHOD A prospective validation multicenter study was conducted using a digital quantitative survey. This survey was sent to (student) nurses working on internal medicine/surgical wards in one university hospital and one general hospital in the Netherlands. The relevance of each item was scored on a 4-point Likert scale. Additional questions were added to the survey.

RESULTS All DENWIS-indicators except "Agitation" scored an Item-Content Validity Index of 0.79 or higher (range 0.77-0.99). The correlations between "Change in Mentation" and years of work experience (phi = .28, p=0.001), and "Unexpected Trajectory" and type of hospital (phi = -0.25, p=0.01) were statistically significant. There were no other significant correlations.

CONCLUSION All the DENWIS-indicators except "Agitation" are content valid. Revision and adaption of items are needed by the developer. There were significant correlations established, but weak. Therefore, they do not seem clinically relevant.

RECOMMENDATIONS After revision and/or adaption, nurses in current daily practice can use the DENWIS to give words to their worry, added to the (M)EWS, and therefore early recognize and treat the clinically deteriorating patient.

SAMENVATTING: De inhoudsvaliditeit van de Dutch-Early-Nurse-Worry-Indicator-Score (DENWIS)

ACHTERGROND Het herkennen en vroegtijdig behandelen van klinische achteruitgang bij patiënten die opgenomen liggen in het ziekenhuis is essentieel. Hierin is een onmisbare rol weggelegd voor de verpleegkundige. Klinische achteruitgang kan worden herkend met de (Modified) Early Warning Score, ofwel (M)(EWS)-criteria en het niet-pluis gevoel van de verpleegkundige. Dit niet-pluis gevoel is een intuïtief gevoel en is gebaseerd op werkervaring en de klinische status van de patiënt. Literatuur beschrijft dat verpleegkundigen aangeven het lastig te vinden om hun niet-pluis gevoel te verwoorden. Hierom is de Dutch-Early-Nurse-Worry-Indicator-Score(DENWIS) ontwikkeld, welke bestaat uit negen indicatoren die het verpleegkundigen zou moeten vergemakkelijken om hun niet-pluis gevoel te objectiveren. Echter, de inhoudsvaliditeit van dit instrument is nog niet formeel vastgesteld.

ONDERZOEKSDOEL Het primaire doel was het bepalen van de inhoudsvaliditeit van de DENWIS. Secundair wilden we vaststellen of er een correlatie was tussen de individuele DENWIS-indicatoren en de jaren werkervaring van de verpleegkundige en het soort afdeling en ziekenhuis waar de verpleegkundige werkt.

METHODE Een digitale kwantitatieve vragenlijst is uitgezet onder (leerling)verpleegkundigen werkend op een beschouwende/chirurgische afdeling binnen twee ziekenhuizen in Nederland. De relevantie van de indicatoren werd gescoord op een 4Punt-Likertschaal. Daarnaast zijn aanvullende vragen toegevoegd aan de vragenlijst.

RESULTATEN Alle DENWIS-indicatoren, behalve agitatie, scoorden een Item Content Validiteit Index $\geq$ 0.79 (range 0.77 - -0.99). Twee significante maar zwakke correlaties zijn bevonden: 1) "Verandering in Mentatie" en jaren werkervaring (phi = -.28, o=0.001) en 2) "Onverwacht Verloop" en type ziekenhuis (phi= -.025, p=-0.01). Er waren geen andere significante correlaties.

CONCLUSIE De DENWIS lijkt inhoudsgevalideerd, op één indicator na. De DENWIS zal iets aangepast moeten worden. Er zijn significante maar zwakke correlaties gevonden. Hierdoor zijn ze klinisch niet relevant.

AANBEVELINGEN Toegevoegd aan de (M)EWS kan de DENWIS een waardevolle aanvulling zijn voor verpleegkundigen om de klinisch verslechterende patient vroegtijdig te herkennen en te behandelen.

TREFWOORDEN

Klinische achteruitgang; Verpleegkundigen; Niet-pluis gevoel; Content Validiteit; Patiëntenzorg

INTRODUCTION

In the past years, the care for hospitalized patients on a ward has increased in complexity(1). This is due to an aging population and multi-morbidity(2). When hospitalized patients deteriorate clinically, an adequate and rapid response is necessary to prevent further clinical deterioration(1). Clinical deterioration is defined as a serious physiologic disturbance or a sudden worsening of a patient's physiological condition(3). Nurses have a fundamental role in recognizing patient deterioration(4). They are often the first professionals to encounter, judge, and interpret the severity of the problem and consult a physician if needed(4). Nurses can detect clinical deterioration by routine measurement of the vital signs(5–7). If these vital signs deviate from their normal values, it is likely that the patient is deteriorating. This can be assessed with validated tools like the Early Warning Score (EWS) or Modified Early Warning Score (MEWS) (8–10). However, the vital signs are not the only signs of a patient's clinical deterioration. Studies have highlighted the importance of the nurse's worry about patients(11,12). In fact, some hospitals have acknowledged the nurse's worry and added the nurse's worry to the EWS as a reason for activating a "Rapid Response Team" even when vital signs have not deteriorated yet(6,13,14). These Rapid Response Teams could prevent unplanned ICU-admissions, ICU-length of even mortality(15).

The nurse's worry is often an intuitive feeling about a patient(16,17), and is defined as *"a judgment without a rationale, a direct apprehension and response without recourse to calculate rationality"*(18). The nurse's worry is a skill that nurses develop over time and experience (11,19); a more experienced nurse has a better predictive worry-indicator than a less experienced nurse due to the development of their nurse's worry skill(11). Because worry is an intuitive feeling, nurses find it difficult to specify what their worry exactly is when they call a physician(12).

Douw et al. developed a clinical assessment tool for nurses to objectify their worry(12). This tool is called the Dutch-Early-Nurse-Worry-Indicator-Score (DENWIS), see Table 1. Based on a systematic review, a set of 9 indicators was derived from 37 signs and symptoms(12). Since this assessment tool can help nurses to give words to their worry, it may contribute to better communication about the patients' deterioration with the physician(12).

[INSERT TABLE 1]

The DENWIS has been studied in a tertiary hospital in the Netherlands and had shown to be a good predictor of patient deterioration (Positive Predict Value 8.4%)(1,12,20). To implement the DENWIS into daily practice, it is important to further validate the DENWIS. There are three kinds of validation, namely criterion validity, content validity (CV), and construct validity(21). Based on the study of Douw et al(20), we conclude that the face validity and predictive validity has been established for the DENWIS. Face validity refers to whether an instrument looks like it measures the target construct, but it is not considered a critical measurement property(22). Predictive validity is a form of criterion validity and refers to the extent to which a score on a test predicts scores on some criterion measures. To date, the content validity of the DENWIS has not been established. The CV is an essential step of a new measuring device since it represents a mechanism for linking abstract concepts and measurable indicators(23), and is considered as a critical measurement property. Lack of CV can affect other measurement properties of the device(24).

Since nurses develop their nurse's worry skills over time and experience(11,19), we expect that there could be a correlation between the perceived relevance of the DENWIS-indicators and the nurse's years of work experience. Nurses with more work experience may be better at objectifying their nurse's worry due to their prolonged work experience. However, this has not been determined yet. Further, the patient population and the complexity of illnesses treated on the wards (surgical or internal medicine), or even hospital (general or university) might influence the nurse's worry and therefore the perceived relevance of the individual DENWIS-indictor. However, this has also not been determined yet.

AIMS

The primary aim of this study was to determine the content validity of the Dutch-Early-Nurse-Worry-Indicator-Score (DENWIS). Secondary aims were to explore the correlation between the Item-Content Validity Index of the individual DENWIS-indicators and the years of work experience of the nurses, the type of ward and hospital the nurse works at.

METHODS

This prospective validation study used an online survey, generating quantitative data.

Population and sample

This study was conducted in one university hospital and one general hospital in the Netherlands. The study population consisted of registered nurses (RNs) and nursing students from these hospitals. Participants were eligible if they were an RN or a nursing student working at internal medicine or surgical wards. Other inclusion criteria were that they had to be involved in direct patient care and had to be fluent in Dutch.

Procedures

Participants were recruited by convenience sampling using the existing networks of the researchers in the participating hospitals. Potential participants were informed during nursing staff meetings and by e-mail. In meetings, they were informed about the background of this study and what was expected from them. After this meeting, participants received an e-mail with a link to the survey with the request to fill this in. This e-mail was sent by the team leader or the researcher. When the researcher sent the e-mail, it was sent to a general email address of the ward which the nursing staff was part of. In addition, a poster was made to remind the team of the survey. This poster was hung out at the nurse's team posts. If participants filled out the survey, they were included.

Data collection and outcomes

Data were collected anonymously through Qualtrics™ which is an online survey tool.

The primary outcome of this study is the content validity of the DENWIS. The CV is defined as *"the extent to which an instrument adequately samples the research domain of interest when attempting to measure phenomena"*(21,23,25). It refers to the relevance, comprehensiveness, and comprehensibility to the construct the device attempts to measure(24,26). An empirical technique to measure this, is the Content Validity Index (CVI) which is the most widely used approach in measurement properties research(23,27). This is a proportion agree procedure that allows two or more raters to independently review and evaluate the relevance of the sample of items to the domain of interest which is represented in the instrument(23,28). To measure the Item-Content Validity Index (I-CVI) of the individual DENWIS-indicator and its underlying signs and symptoms, we used a 4-point Likert scale. Participants were asked how relevant the individual DENWIS-indicators were to capture their worry about a patient. Response options were: 1=not relevant, 2=somewhat relevant, 3=quite relevant and 4=very relevant(29). The comprehensiveness of the DENWIS was explored using an open question in the survey; participants were asked if they found any notable omissions in the DENWIS. Secondary

outcomes are the correlations between the I-CVI of the individual DENWIS-indicators and 1) years of work experience, 2) type of ward and 3) type of hospital. Included in the survey were questions about the nurse's years of work experience, the type of ward (surgical or internal medicine), and hospital (general or university) they worked at. The survey included a total of 15 questions.

Statistical analysis

Primary outcome analysis

The scores on the 4-Likert scale were dichotomized: ratings of 1 and 2 were considered irrelevant, while ratings of 3 and 4 were considered relevant(22,30,31). For each individual item, the I-CVI was calculated as the number of participants rating each item as relevant divided by the total number of participants(22,27). An item should be considered as relevant if the I-CVI was above 0.79, and revision should be considered if the I-CVI varied between 0.71 and 0.79. An item should be eliminated if the I-CVI was under 0.70(31). However, eliminating and revision of items of the DENWIS was not part of this study. If items need revision or elimination, the developer of the DENWIS will be contacted.

The comprehensiveness of the DENWIS was analyzed by reading and coding the data from the open text field. These labels were subsequently compared with each other, and if there was overlap, a general term was chosen by the researchers. These terms are shown in a frequency table that is made to give a summary of missing items of the DENWIS.

Secondary outcomes analysis

To be included in the secondary analysis, participants had to fill out the additional questions. Prior to exploring if there were correlations between the perceived relevance of the individual DENWIS-indicators and the years of work experience of the RN's, we made subgroups of their years of work experience. Groups were "<2 years", "2-5 years", "5-10 years" and ">10 years". To explore if there were correlations, a Phi correlation was calculated. We used Schober's interpretation for the coefficient of the correlation (32). If this coefficient had a range of 0.00 - 0.09, we considered it negligible. We considered it a weak correlation if the coefficient was between 0.10 and 0.39. A moderate correlation was interpreted if the coefficient was between 0.40 and 0.69. We considered it a strong correlation if the coefficient was between 0.70 and 0.89, and if the coefficient was between 0.90 and 1.00, we considered it as a very strong correlation (32). Statistical significance was set at p <0.05. All statistical analyses were executed using IBM SSPS Version 24.

Ethics

The Medical Research Ethics Committee of UMC Utrecht declared this study not WMO mandatory, and approved of this study (20-098/C). Participants gave informed consent, which was the first question in the survey, before they could continue the survey.

RESULTS

A total of 163 participants responded to the survey. Only 134 (82.2%) participants filled out the perceived relevance of the individual DENWIS-indicators and 127 (77.9%) participants filled out the additional questions. Of these 127 participants, 118 (92.9%) were a RN. We had 71 (55.9%) participants working on a surgical ward. The majority of our participants (N=89, 70.1%) worked in a general hospital. Demographics of the participants are described in Table 2.

[INSERT TABLE 2]

Content Validity Index of the DENWIS

The relevance of the individual DENWIS-indicators is described in Table 3. All items except the DENWIS-indicator "Agitation" were relevant, i.e. scored an I-CVI higher than 0.79 (range 0.77 – 0.99). The "Agitation"-indicator scored an I-CVI of 0.77.

[INSERT TABLE 3]

DENWIS' comprehensiveness

From the 127 participants, 104 (81.9%) participants filled out that they thought the DENWIS was complete. However, twenty-three participants indicated that some items were missing (see Table 4). The most frequently mentioned items were deteriorated urine production (N=5), family indicates (N=5), heartrate (N=3) and a deteriorated EMV-score (N=2).

[INSERT TABLE 4]

Correlation between the individual DENWIS-indicators and the nurse's years of work experience

Table 5 describes the correlation between the DENWIS-indicators and the nurse's years of work experience. Only "Change in Mentation" was significantly associated nursing students (phi = 0.28, p=0.001). There were no other significant correlations.

[INSERT TABLE 5]

Correlation between the individual DENWIS-indicators and type of ward

The correlation between the individual DENWIS-indicators and type of ward are described in Table 6. There were no significant correlations. Nonetheless, a weak correlation was established for the "Pain"-indicator (phi = 0.17, p=0.05). All other correlations between type of ward and the individual DENWIS-indicators were not statistically significant.

[INSERT TABLE 6]

Correlation between the individual DENWIS-indicators and type of hospital

The correlation between the individual DENWIS-indicators and type of hospital is described in Table 7. No items except "Unexpected Trajectory" showed a statistical significant correlation (phi = -0.25, p=0.01). All other correlations were not statistically significant. For the following DENWIS-indicators, the following weak negative correlations were established: "Temperature" (-0.13), "Agitation" (-0.17), "Patient Indicates" (-0.15) and "Subjective nurse observation" (-0.13).

[INSERT TABLE 7]

DISCUSSION

The aim of our study was to determine the content validity of the DENWIS. Our study showed that 8 of the 9 items of the DENWIS could be considered content valid. This means that these items were considered relevant by the participants to capture their nurse's worry in practice. The "Agitation"-indicator scored a lower I-CVI which means that revision of this item should be considered by the developer. Some participants thought that items were missing from the DENWIS. However, some of these items were already captured in the "signs and symptoms"-section of the DENWIS or even in the (M)EWS-criteria (i.e. urine production, heart rate).

Another missing item was "Family Indicates". This is in line with Albutt et al. who showed in their systematic review that patients and their relatives are likely to possess an unique expertise in the patients' status(33). Their review also stated that the patients' relatives did not activate "Rapid Response Teams" unnecessarily(33). Therefore, it makes sense for them to contribute towards the recognition of the deteriorating patient(33). Some countries have even acknowledged the patient and their relatives' expertise and have included them in escalating in-hospital clinical deterioration as an intervention(33,34). We want to suggest including the patients' relatives next to the "Patient Indicates"-Indicator in the DENWIS.

The DENWIS can be of added value to the (M)EWS to early recognize and treat the clinically deteriorating patient. Therefore, we also want to suggest using the DENWIS next to the (M)EWS in daily practice when nurses worry about their patients and want to give words to what their worry exactly is. Literature states that if nurses worry about their patients, they often verify their worry with vital signs measurements or increase the frequency of vital signs measurements (35). When the nurses subsequently call the physician or even the "Rapid Response Team" to help them assess the patient, they can give words to their worry using the DENWIS and therefore contribute to better communication to early recognize and treat the clinically deteriorating patient. To our knowledge, most Dutch hospitals have integrated the (M)EWS in the patient's electronic medical chart. We can suggest integrating the DENWIS in this chart too. However, since there is a registration burden in Dutch hospitals and if we suggest standardizing the DENWIS in current practice; it will likely increase the burden on nurses to register. Therefore, we cannot make it mandatory for nurses to fill in the DENWIS in the electronic patient's chart. Also, this burden will likely differ for every ward and/or even hospital. More research is then required to investigate if the DENWIS is feasible in every hospital (ward) in the Netherlands with the electronic patient's medical charts and in daily practice.

Overall, we found no or weak correlations in our secondary outcomes. However, two correlations were statistically significant. First, we established a significant correlation between the "Change in Mentation"-indicator if you compared nursing students with RN's (years of nurse's work experience). This correlation could be explained by the fact that the nurse's assessment of a patients' consciousness (i.e. "Change of Mentation") is associated with the nurse's knowledge and experience (36). Chan et al. conducted that nurses with more experience are better at assessing the patients' mental state, compared to nurses who are less experienced which student nurses are (36). However, in our secondary outcomes analysis we only had a small group of student nurses compared to RN's. Therefore, these results should be considered explorative and therefore they should be interpreted with caution. The second correlation was between the "Unexpected Trajectory"-indicator and type of hospital. This correlation could be due to the patient complexity in a university hospital compared to a general hospital, resulting in more unstable patients and therefore more unexpected trajectories of the patient's illness in university hospitals(37). —However, the subgroup working in a university hospital was small compared to the one working in a general hospital. Therefore, these results should also be interpreted with caution.

Strengths and limitations

This study has contributed to understanding what is relevant for nurses to objectify their nurse's worry and determining the content validity of the DENWIS. This was an essential step before further implementing the DENWIS in daily practice on nursing wards. We had more than 100 participants responding to the survey which is considered an appropriate sample size(26). Also, the inclusion of both a general and a university hospital adds to the generalization of these study results. This study has also some limitations. First, most of the participants worked on surgical wards and/or in a general hospital. This means that participants on the internal medicine wards and/or academic hospitals are not represented sufficiently and therefore the DENWIS may be only content valid for nurses working in a surgical ward or in a general hospital. Second, for the analysis of our secondary outcomes, the number of participants was small. Therefore, these analyses should be considered explorative. Third, to determine the comprehensiveness of the DENWIS, we did not include the DENWIS in the question itself. Therefore, participants could have forgotten what was included in the DENWIS and what not. Participants were not familiar with the DENWIS and its underlying signs and symptoms, so they could have thought that some items (e.g. temperature, patient's color) that were already included in the DENWIS, were missing. Finally, a mixed methods-design would have allowed us to better understand why participants considered something relevant or irrelevant in the DENWIS and their reasoning behind this.

In conclusion, the DENWIS seems content valid, with the exception of one item, for all nurses working on general wards in general or academic hospitals. However, the DENWIS might need some adaption and/or revision. Our study showed that nurses recognize their worry in the DENWIS. Therefore, we want to suggest that if nurses worry about their patients, they can use the DENWIS to give words to their worry and therefore early recognize and treat the clinically deteriorating patient in daily practice.

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Tables and figures

Table 1. The Dutch-Early-Nurse-Worry-Indicator-Score (DENWIS)-assessment tool(12).

Indicator	Underlying signs and symptoms
Change in respiration	Noisy breathing and/or short of breath or/and unable to speak full sentences and/or use of accessory muscles
Change in circulation	Color changes and/or clammy and/or coldness and/or impaired perfusion and/or edema
Temperature	Rigors and/or fever and/or hypothermia
Change in mentation	Lethargic and/or confused and/or sensory change in level of consciousness
Agitation	Restless and/or anxious
Pain	New pain and/or increasing pain
Unexpected trajectory	No progress and/or abdominal distension and/or nausea and/or bleeding and/or dizzy/fall and/or hypoglycemia
Patient indicates	Not feeling well and/or feeling impending doom
Subjective nurse observation	Change in behavior and/or doesn't look good and/or look in the eyes

Table 2. Demographics of respondents (N=127)

		RNs	Nursing students	Total (N)
Years of work experience	Nursing students	-	9	9
	< 2 years	16	-	
	2 – 5 years	42	-	111
	5 – 10 years	23	-	
	> 10 years	30	-	
	Not mentioned*	7	-	7
Type of ward	Internal medicine	47	1	48
	Surgical	71	8	79
Type of hospital	General	89	7	96
	University	29	2	31

* These participants did not fill out what their years of work experience were as a RN.

Table 3. Item-Content Validity Index of the DENWIS (N=134)

DENWIS-Indicator	N of participants found relevant	I-CVI*
Change in respiration	131	0.98
Change in circulation	133	0.99
Temperature	125	0.93
Change in mentation	124	0.93
Agitation	103	**0.77**
Pain	113	0.84
Unexpected trajectory	119	0.89
Patient indicates	118	0.88
Subjective nurse observation	125	0.93

*Item-Content Validity Index

Table 4. Comprehensiveness of the DENWIS (N=127)

	The number of participants which found this item was missing
Were there items found missing in the DENWIS?	
No	104
Yes	23
The following items were found missing	
Deterioration urine production	5
Family indicates	5
Heartrate	3
Deterioration in EMV-score	2
Sudden feeling having to defecate	1
All vital signs and lab results	1
Peer consultation colleague	1
Change in blood pressure $\geq$ 20mmHg	1
Breathing frequency	1
Saturation	1
Temperature	1
Medical history of the patient	1
Patients' color	1
Change of behavior	1
Feeling of the nurse	1
Sudden changes in the vital signs	1
Change intake/output	1

Table 5. The correlations between the individual DENWIS-indicators and years of work experience (N=127)

DENWIS-indicators	N of nursing students found relevant*	N of RNs found relevant**	Correlation	Sign.	Registered nurses				Correlation	Sign.
					< 2 years N of RNs scored this item as relevant**	2 – 5 years N of RNs scored this item as relevant**	5 – 10 years N of RNs scored this item as relevant**	> 10 years N of RNs scored this item as relevant**		
Change in respiration	9	115	-.04	.63	14	42	23	29	.26	.05
Change in circulation	9	117	-.03	.78	16	41	23	30	.12	.65
Temperature	7	111	.16	.07	14	40	20	30	.21	.17
Change in mentation	6	112	.28	**.001**	14	40	23	28	.16	.39
Agitation	5	93	.14	.11	10	33	19	27	.22	.16
Pain	6	102	.14	.11	13	33	20	30	.26	.06
Unexpected trajectory	8	104	-.01	.95	12	39	19	27	.19	.26
Patient indicates	8	105	.00	.99	13	36	22	28	.17	.38
Subjective nurse observation	7	111	.16	.67	15	40	21	28	.06	.94

* The total number of nursing students scored the DENWIS-indicator as relevant

** The total number of RNs scored the DENWIS-indicator as relevant

Table 6. The correlations between the individual DENWIS-indicators and type of ward (N=127)

DENWIS-Indicator	N of participants scored this item as relevant*		Correlation	Sign.
	Surgical ward (Ntotal= 79)	Internal medicine ward (Ntotal= 48)		
Change in respiration	77	47	-.01	.87
Change in circulation	78	48	-.07	.43
Temperature	74	44	.04	.67
Change in mentation	72	46	-.09	.32
Agitation	59	39	-.08	.39
Pain	71	37	.17	.05
Unexpected trajectory	71	41	.07	.45
Patient indicates	72	41	.09	.32
Subjective nurse observation	73	45	-.03	.78

* Number of participants (RNs and nursing students) scoring this indicator as relevant

Table 7. The correlations between the individual DENWIS-indicators and type of hospital (N=127)

DENWIS-Indicator	N of participants scored this item as relevant*		Correlation	Sign.
	General hospital (Ntotal= 96)	**University hospital** (Ntotal = 31)		
Change in respiration	94	30	-.03	.72
Change in circulation	95	31	.05	.57
Temperature	91	27	-.13	.15
Change in mentation	89	29	.01	.87
Agitation	78	20	-.17	.05
Pain	80	28	.08	.34
Unexpected trajectory	89	23	-.25	**.01**
Patient indicates	88	25	-.15	.09
Subjective nurse observation	91	27	-.13	.15

* Number of participants (RNs and nursing students) scoring this indicator as relevant