

# **Concurrent validity of the Qmentum pressure ulcer quick scan in measuring nurse's knowledge on the intensive care unit; a clinimetric study**

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## **ABSTRACT (ENGLISH)**

**Title:** Concurrent validity of the Qmentum pressure ulcer quick scan in measuring nurse's knowledge: a clinimetric study

**Background:** Prevalence of pressure ulcers (PU) is used as a quality indicator in healthcare. The Netherlands Institute for Accreditation in Healthcare (NIAZ) is cooperating with the Canadian international accreditation program Qmentum, since 2014. Qmentum is the most renowned accreditation program in all-healthcare settings around the world and is characterized with extensive employee engagement of the healthcare organization. The first step of the accreditation cycle is the Qmentum self-assessment, to assess PU knowledge and provides an overview of the current institutional educational level. Qmentum self-assessment consists four questions. The gold standard to assess nurses PU knowledge is the Pressure Ulcer Knowledge Assessment Tool (PUKAT) and exist of 26 questions. Currently, the Qmentum tool lacks rigours clinimetric testing.

**Aim:** The objective is to determine the concurrent validity of the Qmentum self-assessment compared with the PUKAT as gold standard.

**Method:** 90 ICU nurses filled out the Qmentum self-assessment questionnaire and PUKAT in a single session using the LimeSurvey tool. Chi square test was used to compare the PUKAT and Qmentum. A receiver operating characteristics (ROC) curve analysis and sensitivity and specificity analysis was conducted to assess concurrent validity.

**Results:** Chi Square test showed no statistical significance between the Qmentum self-assessment and PUKAT for the measurement of concurrent validity ( $p= 0.28$ ). Qmentum has shown poor concurrent validity (AUC= 0.54). The sensitivity was 35.1%, the specificity was 94.3%.

**Conclusion:** Qmentum self-assessment showed poor concurrent validity against the gold standard PUKAT. The exact measurement domain of the Qmentum self-assessment stays unclear.

**Recommendations:** Qmentum self-assessment should not be considered as a quick brief knowledge PU instrument.

**Keywords (max 5):** Pressure ulcers, Qmentum self-assessment, Pressure Ulcer Knowledge Assessment Tool, concurrent validity, intensive care unit

## NEDERLANDE SAMENVATTING

**Titel:** Concurrent validiteit van de Qmentum decubitus quickscan in het meten van kennis bij verpleegkundigen: een klinimetrische studie.

**Achtergrond:** Prevalentie van decubitus wordt gebruikt als kwaliteitsindicator in de gezondheidszorg. Het Nederlands Instituut voor Accreditatie in de Gezondheidszorg (NIAZ) werkt sinds 2014 samen met het Canadese internationale accreditatieprogramma Qmentum. Qmentum is het meest gerenommeerde accreditatieprogramma in alle zorginstellingen over de wereld en wordt gekenmerkt door uitgebreide medewerkersbetrokkenheid van de zorgorganisatie. De eerste stap van de accreditatiecyclus is de Qmentum-zelfbeoordeling, om kennis over decubitus te beoordelen en geeft een overzicht van het huidige institutionele kennisniveau. Qmentum-zelfbeoordeling bestaat uit vier vragen. De gouden standaard om kennis over decubitus van verpleegkundigen te beoordelen is de Pressure Ulcer Knowledge Assessment Tool (PUKAT) en bestaat uit 26 vragen. Momenteel ontbreekt het de Qmentum-tool aan rigoureuze klinimetrische tests.

**Doel:** Het doel is om concurrent validiteit van de Qmentum-zelfbeoordeling te bepalen in vergelijking met de PUKAT als gouden standaard.

**Methode:** 90 IC-verpleegkundigen vulden de Qmentum-zelfbeoordeling en PUKAT in één sessie in met behulp van de LimeSurvey, een online vragenlijsten tool. Chi-kwadraattest werd gebruikt om de PUKAT en Qmentum te vergelijken. Daarnaast werd een curve analyse van de receiver operating characteristics (ROC) en sensitiviteit- en specificiteitsanalyse uitgevoerd om gelijktijdige validiteit te beoordelen.

**Resultaten:** Chi-kwadraattest toonde geen statistische significantie tussen de Qmentum-zelfbeoordeling en PUKAT voor het meten van de concurrent validiteit ( $p = 0,28$ ). Qmentum heeft een slechte validiteit (AUC = 0,54). De sensitiviteit was 35,1%, de specificiteit was 94,3%.

**Conclusie:** De Qmentum-zelfbeoordeling toonde een slechte concurrente validiteit tegen de gouden standaard PUKAT. Het exacte meetdomein van de Qmentum-zelfbeoordeling blijft onduidelijk.

**Aanbevelingen:** Qmentum-zelfbeoordeling kan niet worden beschouwd als een snel beknopt decubitus kennisinstrument.

**Keywords:** Decubitus, Qmentum-zelfbeoordeling, Pressure Ulcer Knowledge Assessment Tool, concurrent validiteit, intensive care unit

## INTRODUCTION AND RATIONALE

Pressure ulcers (PU) are injuries to skin and underlying tissue resulting from prolonged pressure on the skin<sup>1,2</sup>. PU are a painful complication of a stay in a healthcare institute and is associated with decreased quality of life. It is a potentially preventable problem causing high healthcare costs<sup>3-4</sup>. The risk to develop PU increases with the length of hospital stay and morbidity<sup>5,6</sup>. Additionally, PU also increases mortality rates<sup>7,8</sup>. The PU category 2-4 prevalence differs between settings<sup>9</sup>. A grade two PU is defined as partial-thickness skin loss involving the epidermis, dermis or both. A grade four PU has extensive destruction, tissue necrosis or damage to muscle, bone or supporting structures<sup>10</sup>. Paraplegia- and intensive care unit (ICU) patients have the highest risk for developing PU<sup>11</sup>. According to the Dutch national prevalence measurement of healthcare problems (LPZ Maastricht) of 2015, the prevalence of PU most frequently appear in general hospitals (8,8%)<sup>12</sup>.

The development of PU may be prevented using special nursing measures, therefore it is considered an important patient quality and performance indicator for nursing care in hospitals<sup>13-14</sup>. Guidelines and protocols for PU prevention are consisting of risk assessment, preventative measures, skin observation, adequate communication and reporting of PU<sup>15</sup>. Training nursing staff in adequate knowledge on PU etiology and PU prevention is advised by the European Pressure Ulcers Advisory Panel (EPUAP)<sup>1</sup>.

The Netherlands Institute for Accreditation in Healthcare (NIAZ) was founded in 1998 with the task of assessing the development of quality standards and their application in various types of healthcare institutions. A good progress of this assessment results in an accreditation, which is valid for 4 years, after which the entire process must be reassessed. Therefore, NIAZ accreditation was the most important quality mark for healthcare centers in the Netherlands. In 2014 NIAZ has switched to a new system framework to make the accreditation process less bureaucratic. With the new system - called Qmentum - NIAZ takes over the model from Accreditation Canada International (ACI). The previous method of accreditation by NIAZ mainly focused on the organization and less on the results of care and the involvement of employees. According to NIAZ, Qmentum changes this view<sup>16</sup>. NIAZ-Qmentum has been translated for the Netherlands and the Dutch-speaking part of Belgium<sup>16</sup>. Qmentum is globally developed, locally tailored accreditation program in all healthcare levels around the world. Nowadays, an accreditation of Qmentum offers the highest internationally recognized standards and quality mark, covering quality and safety in the healthcare organization<sup>17,18</sup>.

The process to Qmentum accreditation takes place in four phases. The first step is the involvement of employees, where the institution carries out a hospital wide self-assessment questionnaires using electronic questionnaires. A report is immediately generated from this with the (urgent) points for attention and improvement. Then action teams develop an action plan that is tailored on the self-assessment evaluation. Third step are internal audits. After that, external audits are taking place. The first three steps are all performed by employees, which contribute significantly to increasing employee engagement.

Qmentum acknowledges the importance of effective prevention strategies for PU and PU care. The self-assessment questionnaires are providing an overview of the current institutional level about PU standards<sup>16</sup>. Qmentum self-assessment are known to be succinctly and minimal time consuming, containing four questions in the form of statements<sup>19</sup>. It provides a global impression of the level of PU knowledge within a healthcare organisation.

Nurses' knowledge about PU provides one of the key elements for successful PU prevention<sup>20</sup>. The worldwide guideline for PU management recommends a regular assessment of nurses knowledge, using a reliable and validated assessment tool<sup>21</sup>. Tools to assess the status of nurses' knowledge are important to identify shortcomings and potential barriers. They might assist the development of organization-specific interventions and improve the quality of PU preventive care<sup>22</sup>.

The gold standard and most commonly used instrument to assess nurses PU knowledge is the Pressure Ulcer Knowledge Assessment Tool (PUKAT). The PUKAT was designed by Beeckman and have been proven to be valid and reliable<sup>23-24</sup>. PUKAT consists 26 multiple-choice questions and time to complete the instrument is 20-30 minutes. The Qmentum self-assessment questionnaires can be completed within five minutes. Currently, the Qmentum tool lacks rigorous clinimetric testing<sup>19,25</sup>.

The Qmentum self-assessment tool is used as high quality indicator to gain global Qmentum accreditation and claims to measure PU knowledge<sup>17</sup>, it is currently unknown whether the reliability and validity is comparable to the PUKAT. Therefore, the aim of the current study is to compare concurrent validity of Qmentum self-assessment with the PUKAT as gold standard.

## **AIM OR RESEARCH QUESTION**

The objective of the current study is to determine the concurrent validity of the Qmentum self-assessment compared with the PUKAT.

## **METHODS**

### **Design**

A single center cross-sectional clinimetric prospective study design to determine the concurrent validity was performed at the general adult intensive care unit (ICU) and thorax ICU/Cardiac Care ICU (CCU) at the Erasmus MC, an university hospital in Rotterdam, the Netherlands.

PUKAT and Qmentum self-assessment are the two investigational instruments to assess knowledge of PU among nurses.

### PUKAT

The PUKAT questionnaire is considered the “gold standard” and consists 26 multiple-choice questions, time to complete the instrument is 20-25 minutes<sup>26</sup>.

The instrument is divided in six themes; 1) aetiology and development, 2) classification and observation, 3) nutrition, 4) risk assessment, 5) prevention: reduction of the magnitude of pressure and shearing and 6) prevention: reduction of duration of pressure and shearing. These questions are multiple-choice questions, with three answer options and one is “I do not know” option. A score of 16 and higher (out of 26) indicates acceptable level of knowledge on PU. A score of 60% of the total score has been reported as the cut of value for an adequate indication of sufficient knowledge<sup>27</sup>.

Content validity was established by an extensive literature and expert review based on the content validity criterion. The European Pressure Ulcer Advisory Panel (EPUAP) established face validity of the instrument as well after a pilot study. Cronbachs' alpha was 0.77 for the overall instrument. Internal consistency for the themes ranged between 0.40 and 0.87. The intraclass correlation coefficient (ICC) found for single themes of the instrument varied between 0.74 and 0.94. The stability of the instrument was examined by test-retest reliability and revealed on overall ICC of 0.88 (95% CI= 0.79-0.93, P<0.001)<sup>26</sup>.

The PUKAT can be found in the appendix.

### Qmentum

Qmentum self-assessment contains four statements of PU knowledge with three ordinal answer options; ‘correct’, ‘not correct’ and ‘do not know’. Since the Qmentum consists of only four statements, the minimal requirement is a score 100%. Time to complete the instrument is approximately 5 minutes<sup>26</sup>. The Qmentum self-assessment can be found in the appendix .

## **Participants**

The study participants were ICU nurses working on the general ICU and thorax ICU/CCU. Inclusion criteria are: 1) working as a certified ICU nurse, 2) being able to understand the Dutch language in conversation and writing. Exclusion criteria were ICU nurses who are not participating in daily patient care, such as nursing supervisors and students.

The team comprises certified ICU 230 nurses. These nurses have a bachelor degree in nursing and an additional certificate in Intensive Care nursing, which is the national recognized diploma for ICU nurses in the Netherlands.

## **Data collection**

A time period of six weeks was chosen for the data collection, from February 10<sup>th</sup> 2020 till March 23<sup>th</sup> 2020. Data was collected in LimeSurvey, being the preferred application within the institution, which allows organizing and anonymously collecting responses in surveys. LimeSurvey is locally hosted in the institution in a protected environment, creating a database, which is only accessible by the principal investigator.

Both questionnaires (Qmentum self-assessment and PUKAT) and demographic questions were uploaded in LimeSurvey. Demographic data collected existed of gender, age, current position, education, training in PU during education, years of work experience, duration of work in current unit, working hours per week, and duration of training about PU. In consultation with the ICU manager, there was chosen for a personalized invitation to all certified ICU nurses. This was necessary to prevent that participants would be able to complete the survey multiple times and this created the opportunity to send targeted reminders for optimizing study participation. The researcher and ICU nurse manager collected email addresses of all nurses working on the general ICU and thorax ICU/CCU. An email that all nurses received contained a link with an invitation to the LimeSurvey questionnaire. In the email the purpose and aim of the study were explained. The explanation also emphasized the importance that nurses should answer truthfully and that there would be no judgment about the individual's answers. Participation was anonymous. By actively clicking on the LimeSurvey link, a person started the questionnaires. The individuals' active participation was considered as informed consent.

Nurses needed to complete the questionnaire in LimeSurvey in one session. It was not possible to save answers on order to continue the questionnaire another time, to minimize the risk that answers were influenced by subsequent questions. This was the most important aspect to test concurrent validity<sup>28</sup>. The LimeSurvey link opened first to demographic



questions, followed by Qmentum self-assessment and after completion it automatically switched to the PUKAT.

A reminder by email was sent every week to all nurses to maximize the response rate. These were sent collectively, instead of anonymously to ensure privacy. The quality of the response rates was evaluated weekly. Supervising nurses and nurses of the PU workgroup were reminding and encouraging the nurses to fill in the questionnaire on LimeSurvey. After six weeks, LimeSurvey questionnaire became inactive and data collection was completed. The collected data was used as an estimate of current knowledge.

### **Data analysis**

Descriptive statistics were used for all demographic variables, including frequencies and percentages for nominal and ordinal variables. Continuous variables were described using mean or median with standard deviation or interquartile range according to their distribution. The answers of the Qmentum self-assessment and the PUKAT were recoded into a dichotomous variable (correct/not correct). The "I do not know" option was recoded as 'not correct'. Next, sum scores were calculated to obtain the total score on both knowledge instruments for the criterion being measured. Comparative statistics of the two questionnaires was performed using Chi square test. Sensitivity and specificity were calculated using the determined cut-off value of both PU knowledge instruments. Cut-off point of PUKAT was set at 60% and Qmentum self-assessment at 100%.

A receiver operating characteristics (ROC) curve analysis was conducted to assess the concurrent validity of the Qmentum self-assessment with the PUKAT. As reference for the interpretation of sensitivity and specificity, the following classification was used: <0.90 representing an excellent test, 0.80-0.90 good, 0.70-0.80 reasonable, 0.60-0.70 moderate test and <0.60 poor<sup>29</sup>. All statistical analyses were conducted using the statistical program SPSS, IBM SPSS Statistics for Windows, version 25. P-values <0.05 were considered statistically significant differences.

A sample size of at least 50 participants to assess the primary outcome of concurrent validity was sufficient for an appropriate analysis according to the Consensus-based Standards for the Selection of health Measurement Instruments (COSMIN) criteria<sup>28,30</sup>. Therefore, a sample size of at least 50 participants was sufficient and desired to assess the primary outcome.

### **Ethical considerations**

The questionnaires were voluntarily, anonymous, did not contain any privacy-related data and the subject was not emotionally charged. Completion of the questionnaires took

approximately 30 minutes. The key to the code of the data was kept in a secure digital environment, which guarantees nurses' privacy and therefore complies with the EU General Data Protection Regulation (GDPR) and the Dutch Act on Implementation of the GDPR (AVG). The use of LimeSurvey has been judged by the institutions privacy officer (PKO), according to the AVG, and has fully been approved to comply with all privacy law requirements, both national and European laws. The researcher of this study signed a confidentiality agreement with the institution to use the research data. Only the coordinating investigator had access with the approval of the principal investigator. By actively clicking on the LimeSurvey link, a person started the questionnaires. The individuals' active participation was considered as informed consent.

According to the Dutch Law regarding Medical Research with Humans (WMO), the current study does not need to be approved by the medical ethical committee, as no patients are included and no invasive procedures are applied to the participants<sup>31</sup>. Therefore no ethical approval of the medical ethical committee at Rotterdam was requested. The study was carried out according to the declaration of Helsinki, dating from October 2013<sup>32</sup>.

## RESULTS

In total 230 nurses received an invitation to participation. 106 nurses initially participated the survey (initial response rate 46%). In total 16 surveys were not completely filled out and therefore considered as missing data. A total of 90 surveys (40%) were included in current study.

### Demographic characteristics

The majority of the participants who completed the survey were working on the general ICU (73%), one third worked at the thorax ICU/CCU (26%). The majority of participants were female (74%), reflecting the current male/female ratio. Most nurses were 51-60 years of age (31%) and the minority of participants were >60 years (7%) (Table 1). The majority of nurses received in-service nursing education (44%) or higher bachelor degree in nursing (40%), whereas bachelor degree nursing (15%) and academic degree (1%) were less frequently observed. Concerning PU-training, 10 of the 90 nurses never received trained regarding etiology and prevention in their nursing education (11%). The majority of nurses had more than 20 years of work experience in health care (58%), of which most nurses worked >20 years in the ICU department (38%). The majority of participants (28%) indicated that the last training about PU preventions were less than one year ago. The same amount did not know when the last training had taking place.

Insert Table 1, Demographic characteristics of the study

### Descriptive statistics of questionnaires

#### Qmentum self-assessment

For a sufficient result of the Qmentum self-assessment a score of 100% has to be achieved. 26 out of 90 participants (29%) achieved a score of 100% and successfully completed the Qmentum self-assessment. The question 'evaluation of PU' had the most correct answers in total, which was 73%. The question 'cluster of preventative measures' was correctly answered by 49% of the respondents. See figure 1 for the descriptive statistics of Qmentum self-assessment.

Insert Figure 1, Descriptive statistic Qmentum self-assessment

### PUKAT instrument

37 out of 90 participants (32%) had a score of 60% or higher. In the theme 'prevention: reduction of the magnitude of pressure and shearing', 1% of the participants was able to answer all the seven question correct. The theme with the most correct answers was theme 'risk assessment' at 88%. However this theme only existed of two questions. See table 2 for the descriptive statistics of the PUKAT.

### **Insert Table 2, Descriptive statistics PUKAT**

### Demographic variables statistics

Next, the demographic characteristics of PUKAT and Qmentum were compared. The percentage of participants who completed the PUKAT with a sufficient result is significantly higher on the thorax ICU/CCU compared with the general ICU ( $p=0.04$ ), whereas a similar though not statistically different trend was found for the Qmentum ( $p=0.10$ ).

No other statistically significant differences were found for the remaining demographic characteristics. See table 3 for the effect on demographic variables statistics of the Qmentum self-assessment and the PUKAT.

### **Insert Table 3, Comparison of effect of demographic variable statistics**

### Predictive value of Qmentum

A pre-specified cut-off point of for acceptable knowledge regarding PU was defined for the PUKAT at 60% correct answers and Qmentum self-assessment at 100%. The numbers of participants with sufficient results for the tests are shown in table 4.

The sensitivity was 35.1%, the specificity was 94.3%. The positive predictive value was 0.50 and the negative predictive value was 0.63.

### **Insert Table 4, Classification table of Qmentum and PUKAT**

### Concurrent validity

No statistical significance was observed with Chi square test, between the Qmentum self-assessment and the PUKAT ( $p= 0.28$ ) for the measurement of concurrent validity. For the exact numbers, see classification table 4.

Area under the curve (AUC) was determined using ROC curve analysis; the AUC was 0.54 (95%, CI 0.42- 0.66,  $p=0.54$ ). The ROC curve analysis is shown in figure 2.

## Insert Figure 2, ROC curve analysis

### Predictive values for acceptable PU knowledge

Lastly, logistic regression analysis was performed to determine which variables were predictive for acceptable knowledge for the PUKAT and the Qmentum. Demographic data (ICU department, gender, educational level and PU prevention during education) were used as predictive variables. The other demographic data (age of participant, years of working experience in healthcare, years of working experience at the ICU and time from last PU training until filling out the study questionnaire) are time dependent variables with uneven time intervals in the standardized questionnaires. Therefore these variables are not suitable for categorical logistic regression analysis.

The univariate logistic regression model with gender, ICU department, PU prevention education and educational level as predictive variables showed that gender was significant predictor for sufficient answering the PUKAT ( $p= 0.049$ , figure 3). Men performed better than women. The other variables were not significant (all  $p>0.05$ ).

## Insert Figure 3, Gender predictive analysis

## DISCUSSION

The concurrent validity of the Qmentum self-assessment tool compared with the golden standard (PUKAT) indicated that Qmentum couldn't be used as a brief instrument to measure nurse's knowledge on PU or PU prevention.

This study compared two instruments to measure concurrent validity to assess nurses' knowledge of PU, which is clinically relevant since literature shows significant correlations of knowledge with the quality of care provided<sup>33</sup>. Tools to assess the current status of nurses' knowledge are important to identify shortfalls and potential barriers. They can assist in the development of organisation-specific interventions and improve the quality of PU preventive care. The poor validity of the Qmentum are concerning given the instrument is increasingly being used in large-scale quality accreditations worldwide. Qmentum is claiming to measure knowledge with the self-assessments. According to Hunt et al, knowledge is often defined as a belief that is true and justified<sup>34</sup>. This definition has led to its measurement by methods that rely solely on the correctness of answers. A correct or incorrect answer is interpreted to mean simply that a person knows or does not know something. It is known that these methods of measurement have serious deficiencies<sup>34</sup>. The Qmentum doesn't seem to measure knowledge and it is more likely that they measure 'the current quality status' of the institution. The researcher works as an ICU nurse in the hospital herself and recognizes the level of PU knowledge in current practical observations in PU care.

These results demonstrate that short instrument surveys about knowledge need to be profound and extensive to ensure a full depth of the construct of interest<sup>35</sup>. There are conflicting results in literature about short versus long instrument surveys and their reliability and validity. The study by Kost (2018) concludes that shorter surveys incorporating core questions, which might provide similar, key performance information<sup>36</sup>. A possible explanation is that it will likely decrease participant burden and improve response rates. However, the main outcome of interest may vary whether the aim is to establish the broad in-depth knowledge or to evaluate in a quick matter<sup>37</sup>. The methodology of how Qmentum develops the self-assessment for accreditation and based on what literature is still unknown. The PUKAT is the only PU knowledge assessment tool for nurses and therefore no comparisons to other instruments can be made.

First strength of this study was the sample size. According to the COSMIN criteria a sample size larger than 50 participants is necessary to measure a 'good' criterion/ concurrent validity. This study was conducted with a relatively large sample size, which decreases the influence of random variation and improves generalizability. This sample also contains the full

range of scores, high and low, reflecting all possible knowledge levels. The data collection was from February 10<sup>th</sup> 2020 till March 23<sup>th</sup> 2020 and the last few weeks took place in the beginning of the covid-19 outbreak in the Netherlands. The covid-19 outbreak also affected our hospital's ICU's and increased the workload enormously. Luckily, the desired population size for the clinimetric analysis was already reached in the first three weeks of the data collection. Without the worldwide covid-19 outbreak, we've expected an even higher sample size of at least 50% response rate. Second strength is that the study consist a sample between the two ICU units. However, the general ICU was overrepresented compared to the thorax ICU/CCU, which is logical since the general ICU has a larger bed capacity than the thorax ICU/CCU. The researcher works as an ICU nurse on the general ICU herself, which might influence the colleagues to cooperate. Differences on PU knowledge between the thorax ICU/CCU and general ICU were measured borderline significant with the PUKAT most definite this was due the sample size lacked power. Another influencing factor could be that the thorax ICU/CCU had a theme week that focuses on PU and PU prevention, a short period before the data collection of this study started. This is in line with the expectation that paying attention and raising awareness of PU influences knowledge and behaviour in a positive way<sup>38</sup>. This confounding factor might have influence in the sufficient knowledge results of the thorax ICU/CCU on the PUKAT.

It is known that the incidence of PU is higher in the general ICU than the thorax ICU/CCU. A possible explanation is that length of stay on the general ICU is longer than on the thorax ICU/CCU<sup>9</sup>. On the thorax ICU/CCU the policy is to have a stay as short as possible.

Therefore, after approximately two weeks stay, patients will be transferred to the general ICU. Third strength is the homogenous group of participants. Members of the sample size were comparable, as all of the participants were responsible for patient care. This study also gains insight information in the current PU knowledge status of ICU nurses working in a university hospital.

A limitation of the study is that the sample consists of participant of one single center and single department study, preferably a multicentre design was used to compare knowledge and hospitals strategies about PU prevention training<sup>20</sup>.

To our best knowledge, no studies have examined concurrent/criterion validity of Qmentum PU self-assessment or any other self-assessment of Qmentum.

The results of this study indicate that Qmentum self-assessment doesn't measure PU knowledge and can't be used as a predictor of nurses' knowledge of PU. The exact measurement domain of the Qmentum self-assessment stays unclear.

### **Implications for clinical practice and future research**

The advice for follow-up research is to further investigate the validity of the Qmentum self-assessment to assess exact domains, which are covered by Qmentum. Future studies might also investigate concurrent validity of another brief PU knowledge instrument against the PUKAT, since the PUKAT is very time consuming. For a good representation in clinical practice of actual PU knowledge among nurses, a validated instrument like the PUKAT is advised.

### **Conclusion**

Qmentum self-assessment has a poor concurrent validity (AUC= 0.54) against the gold standard PUKAT. The exact measurement domain of the Qmentum self-assessment stays unclear.

### **Recommendations**

Qmentum self-assessment should not be considered as a quick brief knowledge PU instrument.



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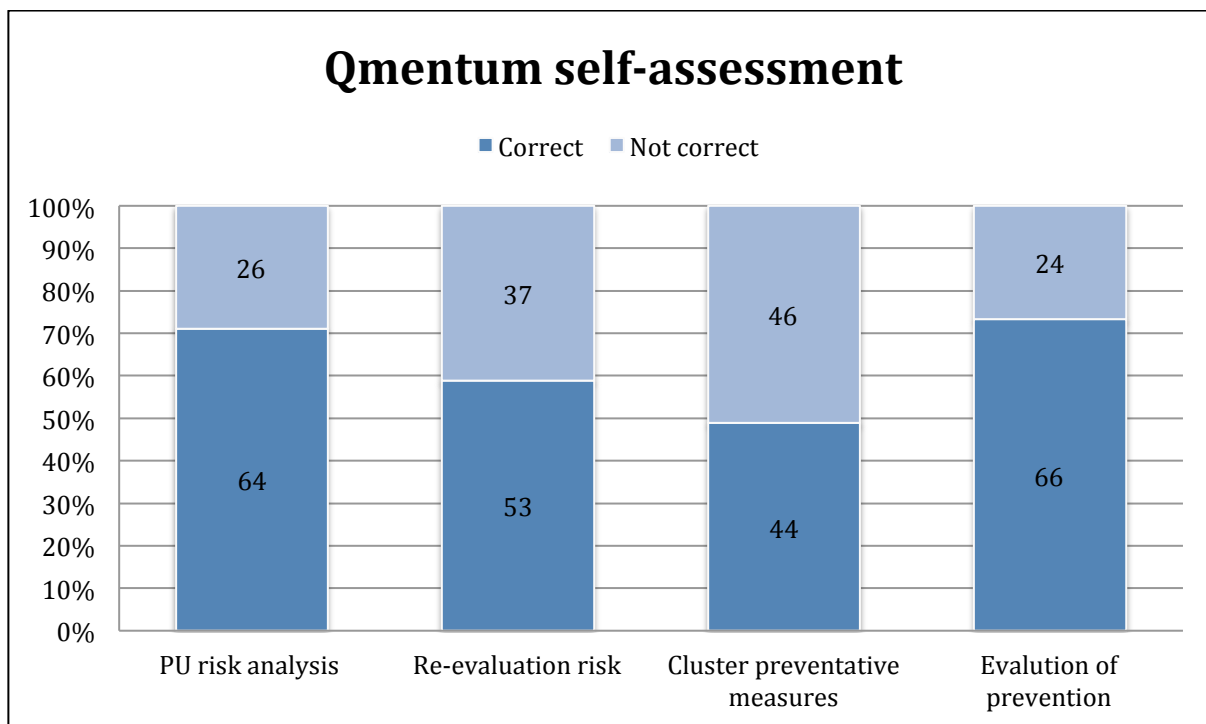
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## APPENDIX

**Table 1. Demographic characteristics of the study**

| <b>Variable</b>                   | <b>n</b> | <b>%</b> |
|-----------------------------------|----------|----------|
| ICU department                    |          |          |
| General ICU                       | 66       | 73.3     |
| Thorax ICU/CCU                    | 24       | 27.6     |
| Age                               |          |          |
| 18-30 years                       | 13       | 14.4     |
| 31-40 years                       | 22       | 24.4     |
| 41-50 years                       | 20       | 22.2     |
| 51-60 years                       | 28       | 31.1     |
| >60 years                         | 7        | 7.7      |
| Gender                            |          |          |
| Female                            | 66       | 73.3     |
| Male                              | 24       | 26.6     |
| Education level                   |          |          |
| In-service education              | 40       | 44.4     |
| MBO-V                             | 13       | 14.4     |
| HBO-V                             | 36       | 40.0     |
| Academic degree                   | 1        | 1.1      |
| PU/PU prevention during education |          |          |
| Yes                               | 80       | 88.9     |
| No                                | 10       | 11.1     |
| Working experience healthcare     |          |          |
| <5 years                          | 1        | 1.1      |
| 5-10 years                        | 12       | 13.3     |
| 10-20 years                       | 24       | 26.6     |
| >20 years                         | 53       | 58.9     |
| Working experience ICU            |          |          |
| <5 years                          | 18       | 20.0     |
| 5-10 years                        | 12       | 13.3     |
| 10-20 years                       | 25       | 27.7     |
| >20 years                         | 35       | 38.8     |
| Last PU training                  |          |          |
| <1 year                           | 25       | 27.7     |
| 1-2 years                         | 9        | 10.0     |
| 2-5 years                         | 12       | 13.3     |
| >5 years                          | 8        | 8.8      |
| I don't know                      | 25       | 27.7     |

*ICU: Intensive care unit, PU: pressure ulcers*



**Figure 1. Descriptive statistic Qmentum**

**Table 2. Descriptive statistic for PUKAT scores**

| <b>Pressure Ulcers Knowledge Assessment Tool (PUKAT) results</b> |     |     |       |     |     |     |     |    |
|--|-----|-----|-------|-----|-----|-----|-----|----|
| <b>Sumscore % of correct answered questions</b>                  |     |     |       |     |     |     |     |    |
| <b>Theme:</b>  | 0   | 1   | 2     | 3   | 4   | 5   | 6   | 7  |
| Aethiology and development                                       | 3%  | 12% | 16%   | 23% | 26% | 18% | 2%* |    |
| Classification and observation                                   | 4%  | 10% | 21%** | 43% | 20% | 2%  |     |    |
| Nutrition  | 30% | 49% | 21%   |     |     |     |     |    |
| Risk assessment  | 11% | 88% |       |     |     |     |     |    |
| Prevention: reduction of the magnitude of pressure and shearing  | 1%  | 13% | 19%   | 22% | 21% | 18% | 5%  | 1% |

|  |    |     |     |     |    |  |  |  |
|--|----|-----|-----|-----|----|--|--|--|
| Prevention: reduction of duration of pressure and shearing | 1% | 11% | 37% | 45% | 6% |  |  |  |
|--|----|-----|-----|-----|----|--|--|--|

\*2% of the nurses had 6 correct answers in the theme: aethiology and development

\*\* 21 % of the nurses had 2 correct answers in the theme: classification and observation

**Table 3. Comparison of demographic characteristics between PUKAT and Qmentum**

| <b>Variable</b>   | <b>PUKAT Sufficient</b>              | <b>PUKAT p-value</b> | <b>Qmentum Correct</b>              | <b>Qmentum p-value</b> |
|---|--------------------------------------|----------------------|-------------------------------------|------------------------|
| ICU department<br>General ICU<br>Thorax ICU/CCU                                     | 23/66*<br>14/24                      | 0.04**               | 16/66<br>10/24                      | 0.10                   |
| Age<br>18-30 years<br>31-40 years<br>41-50 years<br>51-60 years<br>>60 years        | 8/13<br>8/22<br>6/20<br>12/28<br>3/7 | 0.47                 | 5/13<br>4/22<br>7/20<br>7/28<br>3/7 | 0.55                   |
| Gender<br>Female<br>Male  | 30/66<br>7/24                        | 0.16                 | 19/66<br>7/24                       | 0.97                   |
| Education level<br>In-service education<br>MBO-V<br>HBO-V<br>Academic degree        | 17/40<br>4/13<br>16/36<br>0/1        | 0.68                 | 12/40<br>1/13<br>13/36<br>0/1       | 0.24                   |
| PU/PU prevention during education<br>Yes<br>No                                      | 31/80<br>6/10                        | 0.19                 | 23/80<br>3/10                       | 0.93                   |
| Working experience healthcare<br><5 years<br>5-10 years<br>10-20 years<br>>20 years | 1/1<br>6/12<br>9/24<br>21/53         | 0.57                 | 0/1<br>3/12<br>8/24<br>15/53        | 0.86                   |
| Working experience ICU<br><5 years<br>5-10 years<br>10-20 years<br>>20 years        | 8/18<br>6/12<br>8/25<br>15/35        | 0.71                 | 7/18<br>3/12<br>7/25<br>9/35        | 0.76                   |
| Last PU training<br><1 year<br>1-2 years<br>2-5 years<br>>5 years                   | 13/25<br>5/9<br>5/12<br>4/8          | 0.29                 | 8/25<br>3/9<br>4/12<br>3/8          | 0.84                   |

|              |       |  |      |  |
|--------------|-------|--|------|--|
| I don't know | 10/36 |  | 8/36 |  |
|--------------|-------|--|------|--|

*P-value of <0.05 is stated significant.*

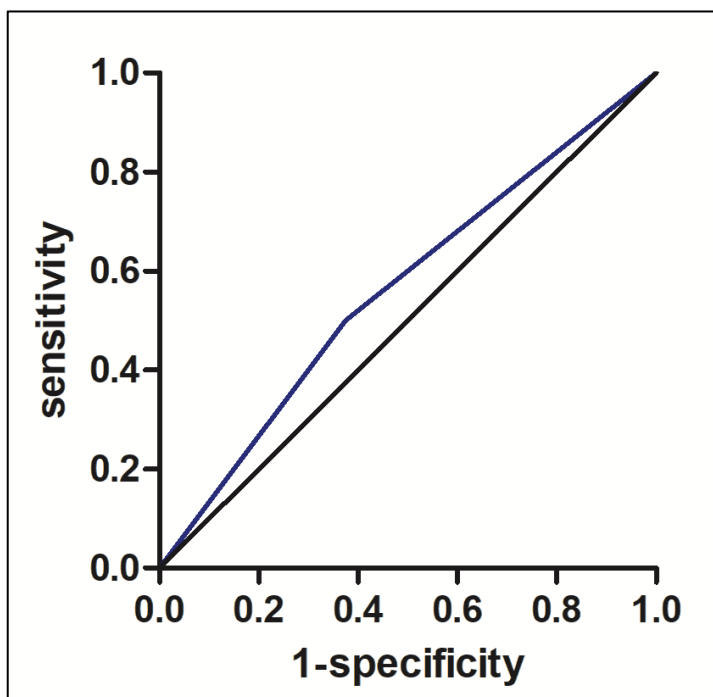
*\* 23 nurses of the 66 nurses in total of the general ICU answered the PUKAT sufficiently*

*\*\* The p-value of the variable in ICU department on the PUKAT was 0.04*

**Table 4. Classification table PUKAT and Qmentum**

| PUKAT    | Qmentum  |          |
|----------|----------|----------|
|          | Negative | Positive |
| Negative | 40       | 13       |
| Positive | 24       | 13       |

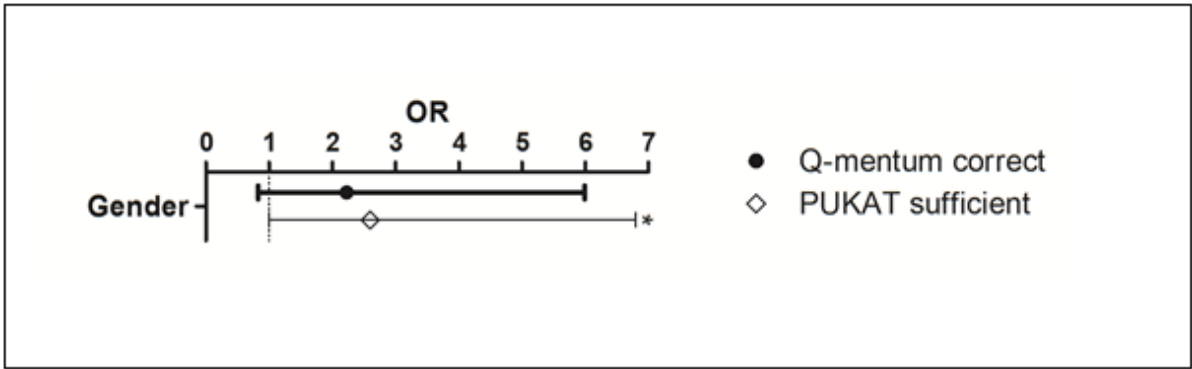
*Negatives and positives of Qmentum and PUKAT*



**Figure 2. ROC curve analysis**

*Area under the curve analysis of Qmentum versus golden standard PUKAT*





**Figure 3. Gender predictive analysis.**

*Predictive analysis for gender for acceptable results of the PUKAT*

*OR: Odds ratio*

## Pressure Ulcers knowledge Assessment Tool- PUKAT

KENNIS-Thema 1: Etiologie en ontstaan van decubitus.

1 Welke stelling is correct? \*

Kies a.u.b. een van de volgende mogelijkheden:

- Ondervoeding veroorzaakt decubitus.
- Zuurstoftekort veroorzaakt decubitus.
- Verweking van de huid veroorzaakt decubitus.
- Ik weet het niet.

2 Extreem magere patiënten hebben een groter risico op het ontwikkelen van decubitus dan obese (extreem dikke) patiënten.

Kies a.u.b. een van de volgende mogelijkheden:

- Correct. De grootte van het contactoppervlak is kleiner waardoor de grootte van de uitgeoefende druk groter is.
- Fout. De druk is kleiner omdat het lichaamsgewicht lager is dan bij obese patiënten.
- Fout. Het risico op het ontwikkelen van een vasculaire aandoening is groter bij obese patiënten. Hierdoor verhoogt het risico op het ontwikkelen van decubitus.
- Ik weet het niet.

3 Een patiënt zit in halfzittende houding (60 graden) in bed en glijdt onderuit. Welke stelling is correct?

Kies a.u.b. een van de volgende mogelijkheden:

- De druk neemt toe wanneer de huid aan de onderlaag blijft kleven.
- De wrijving neemt toe wanneer de huid aan de onderlaag blijft kleven.
- De schuifkracht neemt toe wanneer de huid aan de onderlaag blijft kleven
- Ik weet het niet.

4 Welke stelling is correct?

Kies a.u.b. een van de volgende mogelijkheden:

- Zeep kan de huid uitdrogen. Hierdoor neemt het risico op de ontwikkeling van decubitus toe.
- Decubitus wordt veroorzaakt door verweking van de huid door urine, faeces en wondvocht.
- Schuifkracht ontstaat wanneer het lichaam onderuit zakt en wanneer de huid aan de onderlaag blijft kleven.
- Ik weet het niet.

5 Welke stelling is correct?

Kies a.u.b. een van de volgende mogelijkheden:

- Recent gewichtsverlies, waardoor het gewicht lager is dan het ideale lichaamsgewicht, verhoogt het risico op de ontwikkeling van decubitus.
- Obese patiënten die medicatie gebruiken die de perifere bloedcirculatie vermindert, hebben geen hoger risico op het ontwikkelen van decubitus.
- De voedingstoestand en de leeftijd van de patiënt hebben geen impact op de weefseltolerantie indien de patiënt een normaal lichaamsgewicht heeft.
- Ik weet het niet.

6 Er bestaat GEEN verband tussen het risico op decubitus en: \*

Kies a.u.b. een van de volgende mogelijkheden:

- Leeftijd
- Dehydratie
- Hypertensie
- Ik weet het niet.

## KENNIS-Thema 2: Classificatie en Observatie

7 Welke stelling is correct?

Kies a.u.b. een van de volgende mogelijkheden:

- Een decubitusletsel dat zich uitstrekt tot aan de fascia is een graad 3 decubitus.
- Een decubitusletsel dat zich uitstrekt tot onder de fascia is een graad 3 decubitus.
- Een decubitusletsel graad 3 wordt altijd voorafgegaan door een decubitusletsel graad 2.
- Ik weet het niet.

8 Welke stelling is correct?

Kies a.u.b. een van de volgende mogelijkheden:

- Een blaar op de hiel is steeds een decubitusletsel graad 2.
- Bij alle graden van decubitus (1, 2, 3, 4) is er beschadiging aan de weefsellagen van de huid.
- Bij aanwezigheid van necrose is het letsel een graad 3 of graad 4 decubitus.
- Ik weet het niet.

9 Welke stelling is correct?

Kies a.u.b. een van de volgende mogelijkheden:

- Wrijving of schuifkrachten kunnen ontstaan wanneer een patiënt wordt verplaatst in bed.
- Een oppervlakkig huidletsel, voorafgegaan door niet- wegdrukbaar roodheid, is waarschijnlijk een frictieletsel.
- Een kopieletsel wordt veroorzaakt door druk en schuifkrachten.
- Ik weet het niet.

10 In een zittende houding in de stoel is het risico op het ontwikkelen van decubitus het grootst ter hoogte van:

Kies a.u.b. een van de volgende mogelijkheden:

- Bekken, elleboog en hiel.
- Knie, enkel en heup.
- Heup, schouder en hiel.
- Ik weet het niet.

11 Welke stelling is correct?

Kies a.u.b. een van de volgende mogelijkheden:

- Bij alle risicopatiënten dient de huid systematisch 1 keer per week geobserveerd te worden.
- Bij een immobiele patiënt die opzigt in een zetel dient de huid elke 2 tot 3 uur geobserveerd te worden.
- Bij patiënten die op een drukspreidende matras liggen, dienen de hielen minstens 1 keer per dag geobserveerd te worden.
- Ik weet het niet.

## KENNIS-Thema 3: Risico

12 Welke stelling is correct?

Kies a.u.b. een van de volgende mogelijkheden:

- Een risicoschaal identificeert alle hoog risico patiënten die decubituspreventie nodig hebben.
- Het gebruik van een risicoschaal reduceert de kosten van preventie.
- Een risicoschaal zou het ontwikkelen van decubitus niet accuraat voorspellen en dient

gecombineerd te worden met klinische expertise.  
- Ik weet het niet.

13 Welke stelling is correct?

Kies a.u.b. een van de volgende mogelijkheden:

- Het risico op het ontwikkelen van decubitus dient dagelijks beoordeeld te worden bij alle bewoners van een rust- en verzorgingstehuis.
- Vochtabsorberende onderleggers dienen onder de patiënt gelegd te worden om het risico op decubitus te verminderen.
- Een patiënt die reeds decubitus gehad heeft in het verleden, heeft een groter risico op het ontwikkelen van decubitus.
- Ik weet het niet.

KENNIS- Thema 4: Voeding

14 Welke stelling is correct?

Kies a.u.b. een van de volgende mogelijkheden:

- Ondervoeding veroorzaakt decubitus.
- Voedingssupplementen kunnen dure preventieve maatregelen vervangen.
- Het optimaliseren van de voeding kan de algemene toestand verbeteren en zo bijdragen tot een verminderd risico op decubitus.
- Ik weet het niet.

KENNIS-Thema 5: Preventie; de vermindering van de grootte van druk- en schuifkracht

15 De zithouding met de laagste contactdruk tussen het lichaam en de zitting is:

Kies a.u.b. een van de volgende mogelijkheden:

- Rechtop zittend met beide voeten rustend op een voetbankje.
- Rechtop zittend met beide voeten rustend op de grond.
- Achterover zittend met beide benen rustend op een voetbankje.
- Ik weet het niet.

16 Welk wisselhouding schema reduceert het risico op decubitus het meest?

Kies a.u.b. een van de volgende mogelijkheden:

- Ruglig – zijlig 90° – ruglig – zijlig 90° – ruglig - ...
- Ruglig – zijlig 30° – zijlig 30° – ruglig – ...
- Ruglig – zijlig 30° – zitten – zijlig 30° – ruglig – ...
- Ik weet het niet.

17 Welke stelling is correct?

Kies a.u.b. een van de volgende mogelijkheden:

- Aan patiënten die zich kunnen herpositioneren in een zetel wordt aanbevolen om zich minstens om het uur te herpositioneren.
- Patiënten in zijlig dienen in een 90° houding ten opzichte van het bed gepositioneerd te worden.
- De schuifkracht is maximaal ter hoogte van het sacrum wanneer het hoofdeinde van het bed in een 30° positie staat.
- Ik weet het niet.

18 Wanneer een patiënt onderuit glijdt in de zetel kan de druk best gereduceerd worden door:

Kies a.u.b. een van de volgende mogelijkheden:

- Een luchtkussen.
- Een ringkussen.

- Een gelkussen.
- Ik weet het niet.

19 Bij het gebruik van een traag foam matras bij een risicopatiënt voordecubitus...

Kies a.u.b. een van de volgende mogelijkheden:

- wordt de druk voldoende gereduceerd waardoor geen wisselhouding dient te worden toegepast.
- dient om de 2 uur wisselhouding te worden toegepast.
- dient om de 4 uur wisselhouding te worden toegepast.
- Ik weet het niet.

20 Een nadeel van een watermatras is:

Kies a.u.b. een van de volgende mogelijkheden:

- De schuifkracht ter hoogte van de billen neemt toe.
- De druk ter hoogte van de hielen neemt toe.
- Kleine spontane lichaamsbewegingen worden gereduceerd.
- Ik weet het niet.

21 Wanneer een patiënt op een drukverlagende foam matras ligt...

Kies a.u.b. een van de volgende mogelijkheden:

- dient het principe van zwevende hielen niet te worden toegepast.
- is het toepassen van het principe van zwevende hielen belangrijk.
- dient de patiënt minstens twee keer per dag te worden geïnspecteerd op "bottoming out".
- Ik weet het niet.

KENNIS- Thema 6: Preventie; de vermindering van de duur van druk- en schuifkracht

22 Wisselhouding is een adequate preventieve methode omdat...

Kies a.u.b. een van de volgende mogelijkheden:

- de grootte van de druk en schuifkrachten wordt gereduceerd.
- de grootte en de duur van de druk en schuifkrachten worden gereduceerd.
- de duur van de druk en schuifkrachten wordt gereduceerd.
- Ik weet het niet.

23 Welke stelling is correct?

Kies a.u.b. een van de volgende mogelijkheden:

- Risicopatiënten die op een foam matras zonder drukreducerende eigenschap liggen, dienen om de 2 uur wisselhouding te krijgen.
- Risicopatiënten die op een alternerende matras liggen, dienen om de 4 uur wisselhouding te krijgen.
- Risicopatiënten die op een traag foam matras liggen, dienen om de 2 uur wisselhouding te krijgen.
- Ik weet het niet

24 Wanneer een patiënt op een alternerende matras ligt, wordt de volgende hielpreventie aanbevolen:

Kies a.u.b. een van de volgende mogelijkheden:

- Er dienen geen maatregelen te worden genomen.
- Een drukreducerend kussen onder de hielen.
- Een kussen onder de onderbenen dat de hielen opheft.
- Ik weet het niet.

25 Aanbevolen preventie bij een bedlegerige patiënt die geen wisselhouding kan krijgen is:

Kies a.u.b. een van de volgende mogelijkheden:

- Een drukspreidende traag foam matras.
- Een alternerende matras.
- Lokale behandeling van de risicoplaatsen met zinkoxide pasta.
- Ik weet het niet.

26 Minder patiënten zullen een drukletsel ontwikkelen als:

Kies a.u.b. een van de volgende mogelijkheden:

- Voedingssupplementen worden toegediend.
- De risicoplaatsen worden gemasseerd.
- Patiënten worden gemobiliseerd.
- Ik weet het niet.

### Qmentum self-assessment instrument

| <b>Qmentum self-assessment</b>  |                  |
|---|------------------|
| Vragen  | Antwoorden       |
| Er wordt een erkende standaardmethode voor risico-evaluatie gehanteerd om bij opname van patiënten de risico's op decubitus vast te stellen                               | Juist            |
|   | Onjuist          |
|   | Ik weet het niet |
| Het risico op decubitus wordt bij iedere patiënt steeds opnieuw beoordeeld, zowel op afgesproken momenten (eens per drie dagen) als bij veranderingen in het ziekteproces | Juist            |
|   | Onjuist          |
|   | Ik weet het niet |
| Bij een verhoogd risico wordt de bundel 'preventieve maatregelen' opgenomen in het zorgplan en besproken met de patiënt   | Juist            |
|   | Onjuist          |
|   | Ik weet het niet |
| De effectiviteit van de decubituspreventie wordt geëvalueerd en de uitkomst hiervan wordt gebruikt om waar nodig verbeteringen door te voeren                             | Juist            |
|   | Onjuist          |
|   | Ik weet het niet |