

# The Inter-Rater Reliability of the Incontinence-Associated Dermatitis Intervention Tool-D (IADIT-D) Between Two Independent Registered Nurses of Nursing Home Residents in Long-Term Care Facilities

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**Background and Purpose:** Incontinence-associated dermatitis (IAD) is the clinical manifestation of moisture related skin damage (Beeckman, Woodward, & Gray, 2011). Valid assessment instruments are needed for risk assessment and classification of IAD. Aim of the quantitative-descriptive cross-sectional study was to determine the inter-rater reliability of the item scores of the German Incontinence Associated Dermatitis Intervention Tool (IADIT-D) between two independent assessors of nursing home residents ( $n = 381$ ) in long-term care facilities. The 19 pairs of assessors consisted of registered nurses. **Methods:** The data analysis was computed first with the calculation of the total percentage of agreement. Because this value is not randomly adjusted, the calculation of the Kappa-coefficients and  $AC_1$ -Statistic was done as well. **Results:** The total percentage of the inter-rater agreement was 84% ( $n = 319$ ). In a second step of analysis, the calculation of all items determined high ( $\kappa = .70$ ) and very high agreement ( $AC_1 = .83$ ) levels, respectively. For the risk assessment ( $\kappa = .82$ ;  $AC_1 = .94$ ), the values amounted to very high agreement levels and for the classification ( $\kappa_w = .70$ ;  $AC_1 = .76$ ) to high agreement levels. **Conclusions:** The high to very high agreement values of IADIT-D demonstrate that the items can be regarded as stable in regards to the inter-rater reliability for the use in long-term care facilities. In addition, further validation studies are needed.

**Keywords:** incontinence; incontinence-associated dermatitis; IADIT-D; long-term care; inter-rater reliability

Incontinence-associated dermatitis (IAD) is the clinical manifestation of moisture-related skin damage, which is a problem for people with urinary and/or fecal incontinence (Beeckman et al., 2011). This leads to inflammation with erythema and/or blistering as well as erosions of the perineal and perigenital area (Gray et al., 2007). The etiology of

IAD is complex and multifactorial (Beeckman, Schoonhoven, Verhaeghe, Heyneman, & Defloor, 2009). Junkin and Selekof (2007) assessed that 13.5% of the patients with urinary incontinence ( $n = 37$ ) and 21.5% of the patients with stool incontinence ( $n = 107$ ) had IAD. Shigeta et al. (2009) analyzed diarrhea as a significant factor for developing an IAD (odds ratio; 9.0, 95% confidence intervals [2.5–32.1],  $p < .001$ ).

Worldwide, 200 million people are affected by urinary incontinence (Hayder, Müller, & Kuno, 2008). The older people get, the more this number will increase (Milsom et al., 2009). In Austria (Lohrmann, 2009) and Germany (Dassen, 2008, 2010), the number of nursing home residents with incontinence are on average 4 times higher than the number of incontinent patients in hospitals. Incontinence can lead to complications such as IAD in particular in the older adult (Gray, 2010). In addition, older people are at a higher risk because of the intrinsic aging process of the skin (Haslinger-Baumann & Burns, 2009). In a study completed in 31 states of the United States, 5.7% ( $n = 3,405$ ) out of the 59,588 examined long-term care residents suffered from IAD (Bliss, Savik, Harms, Fan, & Wayman, 2006). Long, Reed, Dunning, and Ying (2012) reported in their work about 22.8% ( $n = 171$ ).

For the risk assessment and classification of IAD, assessment instruments—such as the German Incontinence-Associated Dermatitis Intervention Tool (IADIT-D; Steininger, Jukic-Puntigam, & Müller, 2012)—are needed. Bartholomeyczik (2007) demands a test of the quality criteria before an assessment instrument should be used in nursing practice. To ensure the quality of the IADIT-D for the nursing practice and research, the question of the reliability of the measurement results needs to be investigated between independent assessors. Studies on the inter-rater reliability of the German IADIT are missing from the national and international literature. The aim of this research study was to determine the inter-rater agreement for the item scores of the IADIT-D between two independent registered nurses of nursing home residents in long-term care facilities. The researchers established the following hypothesis: the items of the IADIT-D have high inter-rater agreement between two independent registered nurses.

## BACKGROUND

Residents of long-term care facilities are at a higher risk for developing IAD (Gray, 2010; Nix & Haugen, 2010). Beeckman et al. (2010) explained that the distinction between IAD and a pressure ulcer is deemed as a common problem in nursing practice. The distinction between IAD and a pressure ulcer is necessary to set an appropriate intervention or a prevention (Gray, 2010). Nursing assessment instruments contribute to make a distinction and a professional decision possible (Jukic-Puntigam, Steininger, Kendlbacher, Haselwanter-Schneider, & Müller, 2009). Assessment instruments for the detection of a risk for a pressure ulcer are not suitable for the risk assessment of IAD (Brown, 1995; Gray et al., 2007).

### Description of Already-Developed Assessment Instruments for IAD

For the early diagnosis of IAD and for the classification of an existing IAD, assessment instruments for the risk assessment and instruments for the classification were developed in the United States. Table 1 presents a brief overview of these instruments.

The “Incontinence-Associated Dermatitis Intervention Tool” (IADIT) by Junkin (2008) serves as risk assessment and classification of IAD with intervention possibilities and was

TABLE 1. Overview of the Assessment Instruments for the Assessment of IAD

Author, Year, Country	Instrument	Type of Instruments	Categories + Items for the Assessment	Quality Criteria of the Instruments
Brown, 1993 Brown & Sears, 1993 USA	Perirectal Skin Assessment Tool (PSAT)	Classification of IAD	4 Items (3 Items with rating scales and 1 Item with centimeter rule)  No Total score	Not specified
Kennedy & Lutz, 1996 USA	Skin Assessment Tool	Classification of IAD	3 Item rating scale Total score: High score indicates a high degree of IAD	Not specified
Nix, 2002 USA	Perineal Assessment Tool (PAT)	Risk assessment of IAD	4 Categories with 3 severities each Total score: Lowest risk: 4 P. Highest risk: 12 P.	Inter-rater reliability ( $n = 40$ ): $r_p = .970$ , (95 % CI: .923–.988, $p < .001$ ) Content validity: WOC-Nurses ( $n = 102$ ) Mean = 7.64 ( $SD \pm 1.74$ )
Junkin, 2008 USA	Incontinence-Associated Dermatitis Intervention Tool (IADIT)	Risk assessment, classification + Recommendation for Intervention	5 categories • 1 high risk • 3 severities • 1 complication verbal explanations + photos	Not specified
Borchert, Bliss, Savik, & Radosevich, 2010 USA	Incontinence-Associated Dermatitis and Its Severity Instrument (IADS)	Identification and assessing IAD and its severity	4 Items: • Localization (13) • Erythema (3 graduations) • Denudation (Yes/No) • Exanthema (Yes/No)	Solid face and content validity Criterion validity between staff nurses ( $n = 347$ ) and WOC-Nurses ( $n = 3$ ): ICC = .98 ( $p = .006$ ) between the WOC-Nurses: ICC = .91 ( $p = .008$ ) Solid inter-rater reliability

Steininger, Jukic-Puntigam, Urban, & Müller, 2011 Austria	German Perineal Assessment Tool (PAT-D)	Risk Assessment of IAD	4 Items Each item contains 3 subscale factors with score values of 1–3 Rating: Lowest risk: 4–6 P. High Risk: 7–12 P.	Content validity: ( $n = 70$ ) A content valid and comprehensible instrument overall impression: high agreement (Mean = 4.11; $SD \pm .733$ ) Inter-rater reliability in primary care ( $n = 70$ ) and long-term care facilities ( $n = 70$ ) $K_w = .49-.69$ $PA = 72.4\%-85.0\%$ ICC = .80 (95% CI: .72–.85) $AC_1 = .63-.82$
Jukic-Puntigam, Steininger, Urban, & Müller, 2011 Austria	German Incontinence-Associated Dermatitis Intervention Tool (IADIT-D)	Risk assessment and classification	5 categories: • 1 high risk • 3 severities • 1 complication Verbal explanations + photos	Content validity Modified Delphi-Study 1st testing ( $n = 46$ ): 84, 76%–93, 48% 2nd testing ( $n = 44$ ): 95, 46%–100%

Note. WOC = Wound, Ostomy, Continence; ICC = Intraclass-correlation coefficient.

developed on the basis of expert opinions and through a systematic literature review (Junkin, 2008). The special feature of this instrument is the visual representation of the classification grades and a complication (fungal infection) of IAD. The practicability of the instrument (manageability, comprehensibility, and time saving) is highlighted by Junkin & Selekof (2008) as well as its application for professional nurses and untrained caregivers alike.

With the IADIT-D (Steininger et al., 2012), the German-speaking countries have an assessment instrument for the detection of a risk and classification of IAD available for the first time.

## **Description of the Incontinence-Associated Dermatitis Intervention Tool-D**

The IADIT-D consists of the category risk assessment with the item “high risk” and the category classification of IAD with four items “early IAD, moderate IAD, severe IAD” as well as a complication item “fungal appearing rash.” In using the instrument, an allocation is placed according to the nursing assessment of the patient in high risk, early, moderate, or severe IAD with or without complications according to the given visual images and verbal definitions. The instrument was not developed to calculate a total score. For each component—as with the original English version by Junkin (2008)—there are visual images coupled with comprehensive definitions available.

The instrument was translated from English into German according to the principles of the “International Society for Pharmacoeconomics and Outcome Research (ISPOR)” (Steininger et al., 2012). The testing of the content validity was completed through a modified Delphi-study with 46 (1. testing) and 44 (2. testing) national and international nursing experts (Table 1; Steininger et al., 2012). Recommendation of nursing interventions for the risk assessment, classification, and complications are missing and will be developed by the authors supported by the literature in the near future (Steininger et al., 2012).

## **METHOD**

### **Sample**

For this study, the selection of the nursing home residents ( $n = 381$ ) and the 38 assessors was determined by a convenience sample (Burns, Grove, & Hornung, 2005). For the investigation, three geriatric care centers of the Hospital Association of Vienna (Austria) had voluntarily agreed to participate. In three long-term care facilities, 19 pairs of assessors were formed, the data was collected on 381 residents ( $n = 381$ ) by the means of a double assessment. All assessors were licensed nursing professionals (registered nurses) with at least 1 year of professional experience in geriatric care. The patients were selected by the participating registered nurses according to the inclusion and exclusion criteria (all were patients with urine and/or stool incontinence, with absorbent incontinence pads supplied).

### **Procedures and Data Analysis**

Before the start of data collection, each pair of assessors received a 60-min standardized training by the researchers in each participating geriatric center. This included a professional input about the definition, etiology, and pathophysiology of IAD as well as the presentation and implementation of the assessment instrument as well as instructions for

data collection. A pretest was carried out before the actual investigation. The aim of the pretest was to test the collection process and the survey before the actual start of the data collection and to correct the process if necessary. The researchers conducted the pretest.

For the assessment, one pair of assessors had to assess the chosen resident only once independently of each other and within 1 hr via visual inspection of the perineal area. The duration of the observation was up to the registered nurses. During data collection, the two assessors were not allowed to exchange results. The researcher was not able to map the collected data during any phase of the survey. Existing pressure ulcers were not collected in this study.

To clarify ethical aspects of the study, the investigation plan was reviewed by the Research Committee for Scientific and Ethical Questions (RCSEQ) of the UMIT, the Health & Life Sciences University, Hall in Tyrol/Austria, and approved the implementation of the study.

The statistical analysis was performed with the Windows SPSS program (Version 17.0) and the Windows office program Excel (2010). The verification of the normal distribution was carried out with the Kolmogorov-Smirnov Test (K-S Test) with a sample size of  $>50$  and with the Shapiro-Wilk Test with a sample size of  $<50$  (Untersteiner, 2007, S. 137). The calculation of the randomly adjusted inter-rater agreement was done first by using Cohen's Kappa-coefficient ( $\kappa$ ) for the nominal data (Cohen, 1960) and then by using the Weighted Kappa-coefficient ( $\kappa_w$ ) for the ordinal categories (Cohen, 1968). The second calculation was done by using  $AC_1$ -statistic according to Gwet (2002). This has the advantage that the randomly adjusted corrections are more resistant to the unequal marginal probabilities (Gwet, 2008). "The simulation results tend to indicate that the  $AC_1$  [ . . . ] statistics have reasonably small biases for estimating the 'true' inter-rater reliability, whereas the Kappa [ . . . ] statistics tend to underestimate it" (Gwet, 2008, S. 47). The Kappa-values and  $AC_1$ -Statistic (Schori, Kersten, & Abderhalden, 2006) were interpreted as recommended by Landis and Koch (1977).

In the final analysis step, the collected data was checked for possible incongruities in the course of action of the assessors (Wirtz & Caspar, 2002, S. 62). Thereby, the effect of the different basic probabilities was checked (assessors chose single categories of different probabilities) with the aid of the test of marginal homogeneity (two-tailed category system: McNemar Test; three-tailed category system: Stuart-Maxwell Test). It checks if the marginal cumulative distribution of the two raters is randomly or systematically different from each other (Wirtz & Caspar, 2002, S. 64). Wirtz & Caspar (2002, S. 65) recommend for the McNemar Test and the Stuart-Maxwell Test the choice of a very progressive alpha level ( $\alpha = 25\%$ ) to minimize the risk of a  $\beta$ -error.

To determine the effect of a lack of consistency (assessors are not in a position to assess the characteristic appropriately), the Yules-Coefficient (Yules-Q; Wirtz & Caspar, 2002, S. 106f) and the Phi-Coefficient (Schuhmann, 2006, S. 211) was calculated for the nominal scaled data. The Spearman's rank correlation coefficient Rho ( $r_s$ ; Weiß, 2010, S. 94f) was used to verify the ordinal scaled data.

## RESULTS

### Sample Demographics

In the study, 381 nursing home residents were assessed; 71.5% ( $n = 270$ ) of the assessed nursing home residents ( $n = 378$ ; 3 missing) were older than 80 years at the time of the survey and between a week and 216 months ( $n = 358$ , Mean = 43.82,  $SD \pm 35.87$ ) in the

nursing home (23 missing). More than half (75.6%) of the residents suffered from urinary and fecal incontinence, 16.5% suffered from urinary incontinence and 6.4% suffered from fecal incontinence ( $n = 374$ ). For an average of 41 months (Mean = 41.07,  $SD \pm 34.96$ ), the residents ( $n = 356$ ) had lost the ability for the voluntary control of bodily excretion of urine and/or stool, and more than half of those (51.7%) had lost the ability for 60 months already (13 missing). The mean is not normally distributed according to the K-S Test ( $p < .001$ ).

The 19 pair of assessors, which consisted of 38 registered nurses, had an average age of 45.7 years ( $SD \pm 11.21$ ). Of the 30 valid data sets (8 missing), slightly more than two-thirds (78.9%) of the registered nurses had more than 10 years of nursing experience. The mean is normally distributed, which is in accordance with the results of the Shapiro-Wilk Test (Age:  $p = .131$ , nursing experience: = .217).

### Inter-Rater Reliability Assessment

Out of 380 patients, 64 suffered from varying degrees of IAD (1 missing; Table 2).

The calculation of the total percentage agreement was 83.7%. Out of 381 samples, 380 could be used for the testing of the inter-rater reliability by using Cohen's Kappa (Cohen, 1960, 1968) and  $AC_1$ -Statistic (Gwet, 2002). One exclusion was caused by a single assessment of an assessor because no contingency table could be created. According to the interpretation of Landis and Koch (1977), a high agreement ( $0.61 \leq \kappa \leq 0.80$ ) and a very high agreement ( $0.81 < \kappa > 1.00$ ) was obtained for the total assessment (Table 2).

For the item High risk, both values correspond with a very high agreement ( $0.81 \leq \kappa \leq 1.00$ ; Table 2). For the items of the classification of an IAD, high agreement could be obtained ( $0.61 \leq \kappa \leq 0.80$ ; Table 2). For the items "early IAD or severe IAD with fungal infection," very high agreement values ( $0.81 \leq \kappa \leq 1.00$ ) were obtained (Table 2).

The effects of the different basic probabilities and the effects of a lack of congruency played only a minor role for the course of action of the assessors during the assessment (Table 3). The marginal homogeneity test (McNemar Test and Stuart-Maxwell Test) checks the marginal cumulative distribution. Because the marginal distributions are significantly different from each other for the ordinal scaled data, it must be assumed that the values of Cohen's kappa is significantly reduced by the effect of the different basic probabilities (Wirtz & Caspar, 2002, S. 64).

**TABLE 2. Inter-Rater Reliability Assessment**

IADIT-categories	<i>n</i>	%	Kappa-Coefficient	$\kappa_w$	$AC_1$ (95% CI)
Total	380	83.7	.69 ( $p < .001$ )*		.83 (.87–.79)
High risk	273	95.6	.82 ( $p < .001$ )		.94 (.99–.91)
Early/moderate/ severe IAD	59	81.3	.57 ( $p < .001$ )	.70	.76 (.87–.65)
Early IAD with fungal infection/ Severe IAD with fungal infection	5	100.0	1.00 ( $p = .025$ )	1.00	1.00

\*two-tailed significance.

**TABLE 3. Verification of the Course of Action of the Assessors on the Effect of Different Basic Probabilities and the Effect of Lack of Consistency**

Rater assessment	<i>n</i>	High Risk	Early, Moderate, Severe IAD
McNemar Test	273	$\chi^2_{\text{krit } df = 1, \alpha = 0,25} = 2.71$ $> \chi^2_{df = 1} = 2.52$ $p = .284$	
Stuart-Maxwell Test	59		$\chi^2_{\text{krit } df = 2, \alpha = 0,25} = 2.77$ $< \chi^2_{df = 2} = 4.83$ $p = .089$
Spearman's Correlation-coefficient <i>r<sub>s</sub></i> (95% CI)	273		0, 77*, (.784–.756)
Phi-coefficient, (95% CI)	59	.831*, (.834–.828)	
Yules Q (95% CI)	59	.8896, (.8898–.8893)	

\*two-tailed significance,  $p < .001$ .

## DISCUSSION

The determined results of the percentage inter-rater agreement of >80%, a Kappa-coefficient and an AC<sub>1</sub>-Statistic with very high agreement for the risk assessment as well as a high agreement for the classification indicate a stable inter-rater reliability of the IADIT-D.

The IADIT-D, in comparison with the nursing assessment instrument IADS (Borchert et al., 2010), which can be used only for the classification of an IAD and contains photos for support similar to the IADIT-D, offers an equally stable inter-rater reliability. Borchert et al. (2010) developed four scenarios with case descriptions and photos for the verification of the inter-rater reliability that was evaluated by 347 nurses. Other investigation findings in the area of reliability do not exist at the time of the IADIT-D.

Wirtz and Caspar (2002) speak only of an exact agreement if the source of errors, the different basic probabilities and the lack of consistency, are as low as possible. The present results show that both reasons for an incongruence of the course of action of the assessors play only an insignificant role. Only for the classification of the severity of the IAD can the control of the effect of the different probabilities be seen in the course of action of the assessors. This could be an indication of the assessors' still limited expertise in the distinction between early, moderate, and severe IAD and, subsequently, they use different thresholds. In comparison to the other high agreement values in this article, the low Kappa- and AC<sub>1</sub>-values in the area of severity classification seems to confirm these findings. Beeckman et al. (2010) explained that the distinction between IAD and a pressure ulcer is deemed as a common problem in nursing practice. According to the European Pressure Ulcer Advisory Panel (EPUAP) Guideline (2009), a Category 2 pressure ulcer should not to be confused with IAD. Schröder (2011) states that sometimes more than half of the documented pressure ulcers are maceration of the skin. Generally, the definition and categorization of pressure ulcers are more often discussed than skin damage caused by incontinence (Kottner, Dassen, & Heinze, 2009).



As a limitation of this study, it must be disclosed that a convenience sample was used (LoBiondo-Wood & Haber, 2005). The main disadvantage is in the risk of biased results because the available subjects might be atypical for the population (Polit, Beck, & Hungler, 2004, S. 236). For this reason, the sample was carefully chosen by taking into account the inclusion and exclusion criteria (LoBiondo-Wood & Haber, 2005).

The Cohen's Kappa-coefficient is the "Gold Standard" for the evaluation of the agreement quality for categorical data (Wirtz & Caspar, 2002). However, the Kappa statistic showed its limits in the course of the study. For the agreement assessment of all nine categories and the items High risk, it revealed both paradoxes of Kappa. The first paradox concerns the property of Cohen's Kappa, to significantly decrease with increasing rater prevalence (high agreement; Feinstein & Cicchetti, 1990). If the total agreement reliability does not change and the divergent total assessments lead to higher Kappa-values with less divergent total assessments, then it's called the second paradox (Mayer, Nonn, Osterbrink, & Evers, 2004).

According to these facts, in addition to using Cohen's Kappa coefficient in respective to the weighted kappa, the  $AC_1$ -statistic according to Gwet (2002) was also chosen for the calculation of the inter-rater reliability. The  $AC_1$ -Statistic seems to contain the better statistical properties compared to Cohen's Kappa (Gwet, 2008). "The simulation results tend to indicate that the  $AC_1$  [ . . . ] statistics have reasonably small biases for estimating the true inter-rater reliability, whereas the Kappa [ . . . ] statistics tend to underestimate it" (Gwet, 2008, S. 47). The higher values of the  $AC_1$ -Statistic in this investigation reflect this statement again. It may still not be completely ruled out that the small numbers of nursing home residents with IAD are caused by a small participation variance (Bortz, 2005, p. 124), the selection of the assessors or the effect of the training concept of the participants (Mortsiefer et al., 2012).

The high to very high agreement values of IADIT-D demonstrate that the items can be regarded as stable in regards to the inter-rater reliability for the use in long-term care facilities. The results of the calculation of the inter-rater reliability of the German IADIT can only be applied to the specific setting chosen for this study and for the assessment completed by registered nurses (Streiner & Norman, 2008).

## **Implication for the Nursing Practice**

The IADIT-D, supported by the combination of visual representations and verbal explanations, can make an important contribution when completing a risk assessment of IAD or for the early detection of IAD. In addition, the use of this assessment instrument can make it possible for the nurses to differentiate between IAD and a Category 1 or 2 pressure ulcer. The instrument initiates the chance for the assessment of a better nursing diagnosis, gathering precise information about the current skin condition of the affected person and to reflect nursing actions. Preventive measures are limited only to vulnerable persons and thus, a more effective and efficient use of resources can be achieved (Reuschenbach & Mahler, 2011). The use of assessment instruments in the nursing practice is mainly not only because of legal and economic motives but also because of the related improvement of the quality of care (Reuschenbach & Mahler, 2011).

## **Outlook for the Nursing Practice and Research**

To sensitize nurses to the topic of IAD, this nursing phenomenon should be taught already during nursing training and an instrument needs to be introduced for the assessment of the

risk and classification of IAD. In the German standard nursing textbooks on health care, there is no entry on incontinence-associated dermatitis.

More test-theoretical quality criteria are needed for the validation of the IADIT-D instrument. Reuschenbach and Mahler (2011) recommend to test, in addition to instrument-related quality criteria, also application-related quality criteria. This study tested the inter-rater reliability in long-term care facilities. Testing in the acute care setting is still pending. Other instrument-related (e.g., construct validity, prognostic validity) and user-oriented (e.g., practicability) quality criteria are needed in the context of scientific studies for the acute care as well as the long-term care setting.

The expenditure on health care and the pressure for quality assurance is on the rise. All this reinforces the commitment to justify and make nursing actions comprehensible. This, however, implies to empirically investigate if the use of the IADIT-D has a positive impact on the outcome of the affected person (e.g., better detection or reduction of incontinence-associated dermatitis).

The developer of the IADIT (Junkin, 2008) advocates for its widespread use for professional nurses as well as for untrained caregivers. Whether the use of the instrument for untrained caregivers is really possible or even useful remains, for now, unanswered. It is therefore recommended to test the use of the instrument for untrained caregivers.

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