การพัฒนาและทดสอบความเชื่อมั่นของเครื่องมือในการประเมินแผลกดทับ บนพื้นฐานทางการแพทย์แผนไทย
Development and Reliability Testing of an Assessment Tool for Pressure Ulcers Based on Thai Traditional Medicine

นิพนธ์ต้นฉบับ **Original Article**

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วารสารไทยเภสัชศาสตร์และวิทยาการสุขภาพ 2565;17(1):29-36.

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บทคัดย่อ

วัตถุประสงค์: เพื่อพัฒนาเครื่องมือในการประเมินแผลกดทับทางการแพทย์แผนไทย และเพื่อทดสอบความเชื่อมั่นของเครื่องมือระหว่างผู้ประเมิน **วิธีการศึกษา:** แบ่งเป็น 4 ขั้นตอน ได้แก่ 1) บันทึกประสบการณ์การประเมินแผลกดทับทางการแพทย์แผนไทย 2) สังเกตการรักษาแผลกดทับในผู้ป่วย 24 ราย สังเกตและวิเคราะห์ลักษณะของแผลกดทับ 47 แผล เพื่อเป็นชุดข้อมูลสำหรับใช้พัฒนาเครื่องมือ 3) เปรียบเทียบลักษณะของแผลกดทับที่ใช้ในทางการแพทย์แผนไทยและการแพทย์แผนปัจจุบัน ลักษณะแผลที่มีความเป็นวัตถุวิสัยและเข้าคู่กันได้ทั้งทางการแพทย์แผนไทยและการแพทย์แผนปัจจุบันจะถูกคัดเลือกเพื่อใช้ในเครื่องมือประเมิน 4) ทดสอบความเชื่อมั่นของเครื่องมือระหว่างผู้ประเมิน จากผู้ประเมิน 17 คน โดยคำนวณจากร้อยละของความเหมือนเปรียบเทียบกับการประเมินโดยผู้เชี่ยวชาญ ร้อยละของความเหมือนโดยรวม และ การใช้สถิติแคปปา **ผลการศึกษา:** แผลกดทับที่สังเกตได้รับการประเมินทางการแพทย์แผนไทย เป็นแผลวาตะ 37 แผล (ปัญหาของระบบไหลเวียน) และแผลปิตตะ 10 แผล (มีความร้อนที่มากเกินไป) ลักษณะของแผลในทางการแพทย์แผนไทย 8 ลักษณะ เข้าคู่ได้กับกลุ่มลักษณะของแผลทางการแพทย์แผนปัจจุบัน 9 กลุ่ม โดยมีเพียง 4 กลุ่ม ที่เป็นวัตถุวิสัยและถูกคัดเลือกเพื่อใช้ในเครื่องมือประเมินแผลกดทับทางการแพทย์แผนไทย (TTM-PUAT) ได้แก่ 1) โพรงของแผล 2) เนื้อตาย 3) ระดับความรุนแรงของแผล 4) การอักเสบ ผลการประเมินความเชื่อมั่นของเครื่องมือ TTM-PUAT ได้แก่ 78.8% ของความเหมือนเมื่อเปรียบเทียบกับการประเมินโดยผู้เชี่ยวชาญ, 73.09% ของความเหมือนโดยรวม และสถิติแคปปา 0.46 แสดงความเหมือนระดับปานกลาง **สรุป:** TTM-PUAT เป็นเครื่องมือในการประเมินแผลกดทับ ที่เชื่อมโยงลักษณะของแผลกดทับผ่านมุมมองทางการแพทย์แผนไทยและแผนปัจจุบัน

คำสำคัญ: การแพทย์ทางเลือก, การแพทย์ผสมผสาน, เครื่องมือการประเมิน, แผลกดทับ

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Abstract

Objective: To develop a tool for pressure ulcer assessment based on Thai traditional medicine (TTM) and to determine interrater reliability of the tool. **Method:** There were 4 processes to develop the tool for pressure ulcer assessment. First, documentation of an experience of TTM pressure evaluation. Second, observation on pressure ulcers treatment from 24 patients. A total of 47 pressure ulcers were observed and analyzed their characteristics. Observed pressure ulcers data were used to develop the tool. Third, comparisons of wound characteristics recognized by TTM with those of modern medicine. Objective characteristics of TTM matched with modern medicine were selected to use in the tool. Fourth, evaluation of the tool's interrater reliability by 17 raters. The interrater reliability was calculated by % agreement by expert assessment, % overall agreement and Kappa statistics. **Results:** Based on TTM, the observed pressure ulcers were assessed as 37 Wata wounds (circulation problems), and 10 Pitta wounds (excessive heat). There were 8 wound characteristics in TTM matched with 9 domains of those in modern medicine. Only four domains were classified as objective characteristics and selected to establish a Thai Traditional Medicine Pressure Ulcer Assessment Tool (TTM-PUAT) inlcuidng 1) undermining, 2) necrotic tissue, 3) pressure ulcer staging and 4) inflammation. The TTM-PUAT showed interrater reliability with 78.8% expert agreement, 73.09% overall agreement, and a moderate agreement with a Kappa coefficient of 0.46. **Conclusion:** The TTM-PUAT is an assessment tool for pressure ulcer based on TTM that link characteristic of pressure ulcer through both perspectives of TTM and modern medicine.

Keywords: alternative medicine, complementary medicine, assessment tool, pressure ulcers

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Introduction

Pressure ulcers are a worldwide health problem that increases costs, hospitalizations, morbidity, and mortality, while reduces the quality of life of patients.[1] Pressure ulcer prevalence ranges from 0% to 72.5%.[2] The rates are higher in high-risk populations, especially elderly and immobile patients.[3] Appropriate treatments, patient needs, and environmental factors must be considered to address pressure ulcers.[2,4] Effective strategies for pressure ulcer treatment are always in demand.[5] The role of traditional medicine treatments

with robust research evidence has received increased attention.[2]

There is a promising practice of using Thai traditional medicine (TTM) for pressure ulcer treatment at Kabchoeng Hospital, Thailand. Honey or a Thai herbal oil preparation (THO) was selected for specific pressure ulcers that were diagnosed based on a TTM concept, Tri-Dosha. Honey was suitable for treating Wata wounds, which are wounds from wind element defects, and THO was suitable for treating Pitta wounds, which are wounds from fire element defects. Honey has been used for wound treatment worldwide from ancient to modern times.[6] THO was adopted and has been in routine practice for wound treatment at Kabchoeng Hospital for more than 20 years; it is made from *Clinacanthus nutans* (Burm. f.) Lindau (leaf) and *Zingiber montanum* Link ex A. Dietr. (rhizome).[7]

Tri-Dosha is a principle that was shared in ancient Asian texts, for example, Ayurvedic, Mahayana Buddhism, and TTM texts.[8,9] Tri-Dosha was translated to mean “three defects,” which consisted of Wata (meaning of wind or movement), Pitta (meaning of fire or heat), and Semha (meaning of water or coherence).[8,10] Based on Tri-Dosha, all diseases share some basic characteristics and can be categorized into Wata, Pitta, Semha, or a combination among these three defects.

According to the evidence-based medicine movement, scientific evidence is needed to support traditional medicine treatment. The most preferred method for evaluating the efficacy of the treatment is a randomized controlled trial (RCT).[11] Due to the different world views of traditional medicine and modern medicine, it has not always been possible to evaluate traditional medicine treatments for diseases defined by modern medicine. The RCT, which neglected the traditional medicine diagnosis, could perform limited model validity[12,13] and cause mismatching between the traditional medicine diagnosis and the right treatment.[14] To incorporate traditional medicine diagnoses into RCT designs, improving model validity was a methodological challenge.[15] To overcome this challenge, a diagnostic tool based on traditional medicine was highlighted. The diagnostic tool is beneficial as a link between traditional medicine and modern medicine, for example, the tool can be used to stratify patients with a specific defined modern disease according to traditional medicine diagnoses. Moreover, in the RCT, with accurate traditional medicine diagnoses, the diagnostic tool could facilitate replicable or standardized treatments, and it is also the most effective approach to reduce interrater variability among traditional medicine practitioners.[16]

The objectives of this study were to develop a diagnostic tool for TTM wound diagnosis with a linkage between TTM wound characteristics and modern medicine terminology and to determine interrater reliability, percentage agreement and Kappa statistic of the Thai Traditional Medicine Pressure Ulcer Assessment Tool (TTM-PUAT). This study was the first step in designing the RCT based on TTM diagnosis for further study of the efficacy of TTM practice for pressure ulcer treatment.

Methods

This study was approved by the Committee on Human Rights Related to Research Involving Human Subjects, Faculty of Medicine Ramathibodi Hospital, Mahidol University, Thailand (MURA2015/27, date of approval 11 February 2015), and registered in the Thai Clinical Trials Registry (TCTR) (ID: TCTR20150313001). Data collection was conducted from 2015 to 2017. The study protocol was divided into four processes (Figure 1).

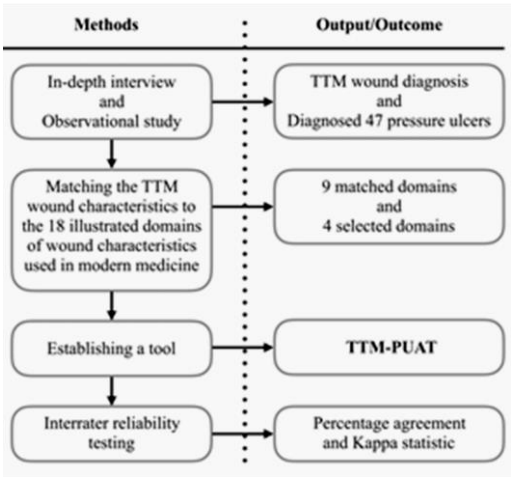

Figure 1 Study profile.

Note: TTM-PUAT = Thai Traditional Medicine Pressure Ulcer Assessment Tool.

In-depth interview and observational study

A key informant was defined as a practitioner of Applied Thai Traditional Medicine at Kabchoeng Hospital. He had experiences of using honey and THO to treat pressure ulcers for more than 5 years and developed a classification of pressure ulcer based on Tri-Dosha principle. This study focused on TTM wound diagnosis therefore only a practitioner

of Applied Thai Traditional Medicine was selected for a key informant for an in-depth interview. At Kabchoeng Hospital, physicians, nurses, and pharmacists also had experience of or recognized the practice (honey and THO for pressure ulcer) but not in TTM wound diagnosis. Information on TTM wound diagnosis was gathered by in-depth interviews and observational study. The in-depth interview was used to gather data from the key informant, including TTM concepts, wound characteristics, proper treatments and expected outcomes. Data collections were formal or informal interview with structured or semi-structured question list, as on-site meeting or online interaction.

An observational study aimed to gather samples of pressure ulcers for developing the TTM diagnosis tool. The study was conducted in a home-based care setting. The participants were recruited from 5 hospitals in Thailand. The study sites were Ramathibodi Hospital (Bangkok), Lumsonthi Hospital (Lopburi province), Wangnamyen Hospital (Sakaeo province), Wattananakorn Hospital (Sakaeo province), and Tawatburi Hospital (Roi et province). The included participants were those older than 18 years with at least one pressure ulcer of stage 2, 3, 4, or unstageable, classified by NPUAP/ EPUAP.[2] Written informed consent was obtained from each participant before inclusion. Twenty-four patients were enrolled in the observational study. Participants were observed during routine wound care at their homes every 2 weeks, for a total of 1 to 8 visits. Photos of pressure ulcers were taken with a mobile phone camera (M8 – HTC). Forty-seven pressure ulcers were diagnosed twice by the key informant at the end of follow-up and 8 months later, *via* photos. The diagnoses were compared and used to determine single observer reliability using Kappa statistic. The diagnosis of the pressure ulcer by the key informant was referred to as “expert assessment,” which was used as a reference diagnosis in the tool development process.

Matching the wound characteristics used in TTM to those used in modern medicine

Wound characteristics in TTM were grouped from the information collected. The wound characteristic domains in modern medicine were drawn up from a classification system and three monitoring tools recommended for wound assessment in the pressure ulcer treatment guideline:[2] the international NPUAP/EPUAP pressure ulcer classification system, the Pressure Ulcer Scale for Healing (PUSH),[17] the Bates-Jensen Wound Assessment Tool (BWAT),[18] and the DESIGN-R.[19]

Establishing the TTM Pressure Ulcer Assessment Tool (TTM-PUAT)

The wound characteristic domains were selected to represent the minimum number needed to diagnose the pressure ulcers in the expert assessment. The domains with physical characteristics to distinguishable between Wata wounds and Pitta wounds were mainly considered. The selected domains were used to develop the tool. For practical use, the categories of the selected domains were simplified to binary options. The sensitivity and specificity of the tool were calculated by 2x2 table, comparing the diagnosis of 47 pressure ulcers using the selected domains by a researcher (SC) to the expert assessment. The selected domains were compared to the pressure ulcer classification of NPUAP/ EPUAP to show the relationship between TTM wound diagnosis and pressure ulcer classification.

Interrater reliability testing

Seventeen participants (sixteen TTM practitioners and a nurse) were recruited by convenience sampling who were expected to use the tool in further study, a clinical trial. They were trained with photos of pressure ulcer, the definitions, the diagram of TTM wound diagnosis, the TTM-PUAT and the NPUAP/EPUAP pressure ulcer classification. There were 2 sets of photos of pressure ulcer. The first set of 10 photos was used for diagnosis training and learning the expert assessment. The second set of 10 photos was used for an interrater reliability testing. The assessment of the second set were compared with the expert assessment and reported as the interrater reliability.

Statistical analysis

Single observer reliability was evaluated by percentage of agreement, by 2x2 table, and Kappa statistic.[20,21] The sensitivity and specificity of the tool were calculated by 2x2 table and percentage. The interrater reliability was evaluated by mean of percentage agreement comparing the assessment of each participant to the expert assessment, by percentage overall agreement and Fleiss’ Kappa statistic. The Kappa statistic (k) was interpreted according to Landis and Koch.[22] Statistical analysis was performed using SPSS software and online Kappa calculator.[23]

Results

TTM wound diagnosis

The key informant applied the Tri-Dosha concept to pressure ulcer diagnosis, categorizing the wound characteristics into 3 groups: 1) Wata wounds related to circulation problems, with pale red to whitish red wound beds, with undermining, or with necrotic tissue; 2) Pitta wounds related to an excess of heat, with bruising, intact or ruptured blisters, intense red wound edges (in shallow wounds), or inflammation; 3) Semha wounds related to an imbalance in moisture with an excessive amount of exudate. A wound could be diagnosed as a combination of Wata, Pitta, and/or Semha, and the diagnosis could be changed during wound progression or during the process of wound healing (Figure 2).

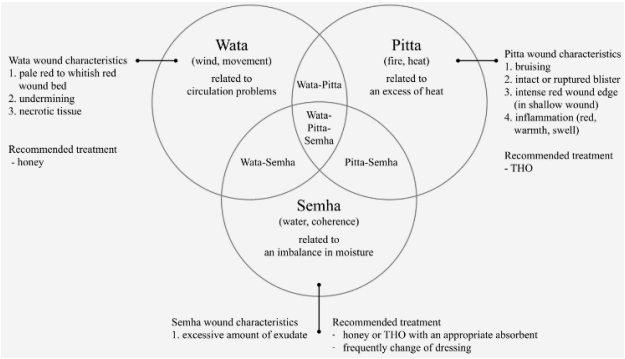

Figure 2 TTM wound characteristics for Tri-Dosha concept and recommended treatment.

Note: THO = Thai herbal oil preparation.

The key informant recommended honey to treat Wata wounds and the Thai herbal oil preparation (THO) to treat Pitta wounds. This was based on the TTM perceptions that honey possesses moisture and warmth properties that are suitable for treating the circulation problems of Wata wounds and THO possesses the cold and oily properties that are suitable for reducing the heat of Pitta wounds. Improper treatment could delay wound healing. Using honey with Pitta wounds could cause wound enlargement because heat increases those wounds. Semha wounds could be treated with honey or THO. For heavy exudate wounds, the dressing had to be changed frequently with suitable absorbent material.

The observational study

Twenty-four patients were enrolled in the observational study. The demographic data are shown in Table 1. The mean age was 58.5 ± 16.61 years. Ten participants (41.7%) had more than one pressure ulcer. In total, 47 pressure ulcers were diagnosed twice by the key informant. The single observer reliability was 80.9% agreement, and k = 0.482 was interpreted as moderate agreement.

The single observer reliability was not in perfect agreement (100%, k = 1) because there were 11 wounds that presented both Wata and Pitta wound characteristics. The key informant could mix both honey and THO as an individual preparation or create a sequential treatment that could begin with either Wata or Pitta. In this study, a sequential treatment was preferred. For the Wata-Pitta wound, honey was used before using THO. The “expert assessment” of 47 pressure ulcers was performed afterward. There were 37 Wata wounds (78.7%) and 10 Pitta wounds (21.3%).

Table 1 Demographic data of participants and wound characteristics in the observational study.

Characteristics	Participants (N = 24), Pressure ulcers (N = 47)
Age (years), mean = 58.5 ± 16.61	
> 65	9 (37.5%)
≤ 65	15 (62.5%)
Gender	
Female	6 (25.0%)
Male	18 (75.0 %)
Diabetes: Yes	2 (8.3%)
Number of pressure ulcer	
1 ulcer	14 (58.3%)
2 - 3 ulcers	7 (29.2%)
> 3 ulcers	3 (12.5%)
Pressure ulcer classification	
Stage 2	6 (12.8%)
Stage 3	11 (23.4%)
Stage 4	26 (55.3%)
Unstageable	4 (8.5%)
Body region	
Coccyx	13 (27.7%)
Trochanter	9 (19.1%)
Sacrum	6 (12.8%)
Ischium	4 (8.5%)
Iliac crest	3 (6.4%)
Heel	3 (6.4%)
Scapula	3 (6.4%)
Others	6 (12.8%)
With tunnel: yes	16 (34.0%)
With necrotic tissue: yes	20 (42.6%)
TTM wound diagnosis	
Wata wound	37 (78.7%)
Pitta wound	10 (21.3%)

Data are mean ± SD and n (%).

Wound characteristics for TTM diagnosis

The 18 unique domains of wound characteristics were drawn up from the international pressure ulcer classification system (7 domains), the Bates-Jensen Wound Assessment Tool (BWAT) (13 domains), the Pressure Ulcer Scale for Healing (PUSH) (6 domains), and the DESIGN-R (7 domains)

and wound characteristics in TTM diagnosis (8 domains) (Table 2). Eight TTM wound characteristics were matched with 9 illustrated domains: 3 domains for characteristics of Wata wounds (domains 10, 11, and 15); 4 domains for characteristics of Pitta wounds (domains 2, 3, 7 and 12); and 2 domains for characteristics of Semha wounds (domains 13 and 14). Four of the nine domains were selected. These included 2-intact/ruptured blister, 10- undermining and tunneling, 12-inflammation/infection, and 15-necrotic tissue. The four domains consisted of physical characteristics that were clearly distinguishable between Wata wounds and Pitta wounds. Another five domains were excluded, which were related to the color of the wound and the characteristics of the Semha wound. Three domains of wound color (3, 7, and 11) were subjective and dependent on individual experience. It was problematic to classify shades of red, among pale red (Wata wounds), intense red (Pitta wounds), and the red of granulation (healthy). Two domains for the characteristics of the Semha wounds (13 and 14) were beyond our scope because the Semha wounds could be treated with both honey and THO. The characteristics of Semha wounds made it impossible to distinguish between wounds that were suitable for honey or for THO.

Table 2 Domains of wound characteristics based on modern medicine and TTM.

Body part	Domains of wound characteristics	NPUAP/ EPUAP	BWAT	PUSH	DESIGN – R	Wound characteristics for TTM diagnosis
Skin	1) Skin damage	X	-	X	-	-
	2) Intact / ruptured blister*	X	-	-	-	Blister (Pitta)
	3) Color of skin	X	X	-	-	Bruising (Pitta)
	4) Edema	-	X	-	-	-
	5) Induration	-	X	-	-	-
	6) Edges appearance	-	X	-	-	-
	7) Color of wound edge	-	-	-	-	Intense red wound edge (Pitta)
Wound bed	8) Depth	X	X	-	X	-
	9) Size	-	X	X	X	-
	10) Undermining / tunneling*	X	X	-	X	Undermining (Wata)
	11) Color of wound bed	X	-	-	-	Pale red to whitish red wound bed (Wata)
	12) Inflammation / Infection*	-	-	-	X	Inflammation (Pitta
Exudate	13) Exudate type	-	X	-	-	Excessive amount of exudate (Semha
	14) Exudate amount	-	X	X	X	Excessive amount of exudate (Semha
Tissue type	15) Necrotic tissue*	X	X	X	X	Necrotic tissue (Wata)
	16) Necrotic tissue amount	-	X	-	-	-
	17) Granulation tissue	-	X	X	X	-
	18) Epithelial tissue		X	X	-	-

* Four selected domains for developing the TTM wound diagnostic tool.

Establishment of the TTM wound diagnosis tool

Four selected domains were used to evaluate 47 pressure ulcers. The diagnosis showed 92.5% sensitivity and 100% specificity comparing the diagnosis using the selected domains by a researcher to the expert assessment. The Thai Traditional Medicine Pressure Ulcer Assessment Tool (TTM-PUAT) was established from these four domains. The relationship between the four domains and the pressure ulcer classification system[2] was illustrated (Figure 3). A pressure ulcer with undermining or necrotic tissue was diagnosed as a Wata wound, which was classified as pressure ulcer stage 3, stage 4 or unstageable. A pressure ulcer with intact/ruptured blister and other characteristics in pressure ulcer stage 2 was diagnosed as a Pitta wound. Therefore, the domain for blister was adjusted to pressure ulcer staging based on the pressure ulcer classification system. Moreover, a pressure ulcer stage 3 or stage 4 without undermining and necrotic tissue was diagnosed as a Wata wound when the inflammation was absent, or it was diagnosed as a Pitta wound when inflammation was present. For practical use of the TTM-PUAT, the four domains were simplified to binary categories and rearranged as follows: 1) undermining (absent/present), 2) necrotic tissue (absent/present), 3) blister or staging of pressure ulcer (stage 2/stage 3, stage 4, or unstageable), and 4) inflammation (absent/present) (Table 3).

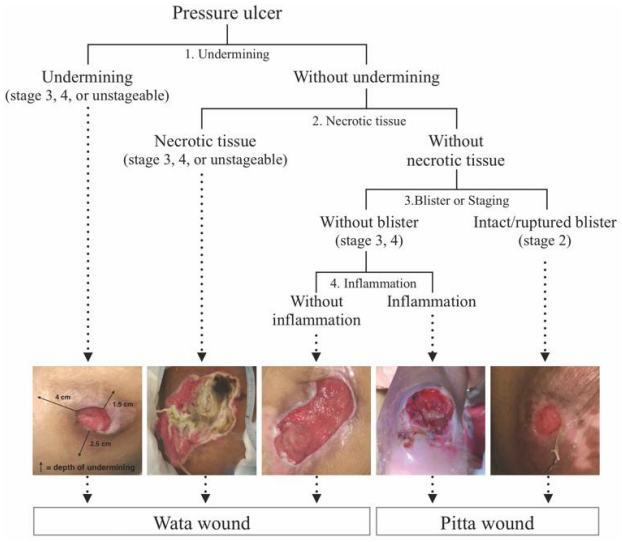

Figure 3 Relationship between the four selected domains of wound characteristics and pressure ulcer classification system.

Table 3 Thai Traditional Medicine Pressure Ulcer Assessment Tool (TTM-PUAT).

Name of patient: ..... Age.....years Check ✓ in the [ ] according to assessed wound and diagnosis Body region: Sacrum, Coccyx, Ischium [R][L], Trochanter[R][L], Heel[R][L], Other		
Domain	Wound characteristics – Diagnosis guide	Date ___/___/___
1. Undermining	Present - Wata	[ ]
	Absent - see further domain	[ ]
2. Necrotic tissue	Present - Wata	[ ]
	Absent - see further domain	[ ]
3. Staging	Stage 2 - Pitta	[ ]
	Stage 3, or Stage 4 - see further domain	[ ]
4. Inflammation	Present - Pitta	[ ]
	Absent - Wata	[ ]
Diagnosis	Wata wound - honey or Pitta wound - THO	[ ] Wata or [ ] Pitta

R = right, L = left.

Interrater reliability of the TTM-PUAT

The mean of percentage agreement when compared with the expert assessment was 78.8%. The percentage overall agreement was 73.09% and the corresponding Kappa statistic (k) was 0.46 which was interpreted as “moderate agreement” (k = 0.4 - 0.6) according to the interpretation of Landis and Koch.[22]

Discussions and Conclusion

The TTM-PUAT could assist users in correcting the TTM wound diagnosis for selecting the proper treatment and diagnosing consistently. In this pilot study, the TTM-PUAT demonstrated 92.5% sensitivity, 100% specificity and acceptable reliability (78.8% agreement, 73.09% overall agreement, and k = 0.46). Moreover, the TTM-PUAT provided a linkage between TTM wound diagnosis and the international pressure ulcer classification system. The linkage will be beneficial for communicating among healthcare providers in the modern healthcare system and for designing RCTs based on the TTM concept.

Our findings are relatively comparable to previous studies. A systematic review of 24 studies on pressure classification systems reported Kappa statistics (k) ranging between 0.12 and 0.97.[24] The reliability was related to experience in pressure ulcer classification of the participants.[25-27] Inadequate experience of participants caused lower reliability.[28] However, training can increase the reliability.[29] The training materials with photos and clear definitions were found to lead to higher interrater reliability compared to photos alone.[25,30]

In this study, the participants received training based on knowledge of pressure ulcers from both traditional medicine and modern medicine. The training was an important process to enhance the participants’ experience, especially for those who were unfamiliar with TTM wound diagnosis. We prepared the training materials with photos of pressure ulcers at different stages and definitions accompanying the TTM wound characteristics. This was an effort to familiarize the participants with the definitions and appearance of wound characteristics and to familiarize them with TTM wound diagnosis. However, we recommended that users of the TTM-PUAT who were unfamiliar with TTM wound diagnosis should remind themselves of TTM wound diagnosis, wound terminology, and the appearance of the wound characteristics before using the tool.

Limitation in this study was a limited dataset of pressure ulcer from the observational study. More reliability of the tool will require larger dataset of pressure ulcer to include more possible variety of wound characteristics. Information of the larger dataset will be beneficial to improve the tool and the training contents and to define wound prognosis and wound healing process with TTM perspective.

The TTM-PUAT have been used in a clinical trial to prove the efficacy of the TTM practice for pressure ulcer treatment using honey and THO based on TTM wound diagnosis.[31] The hypothesis was that the TTM practice for pressure ulcers would be comparable to standard practices in modern medicine. On the other hand, further studies will focus on improving the tool and the training materials using a larger dataset of pressure ulcer photos. The reliability study could be evaluated with a larger group of multidisciplinary participants.

In conclusion, this study linked TTM wound diagnosis with the terminology used in modern medicine and established a tool, the TTM-PUAT, to assist with TTM wound diagnosis and selection of the proper medicine for pressure ulcer treatment. In the development process, the sample pressure ulcers were obtained as part of an observational study and were diagnosed using the TTM concept, Tri-Dosha, by the TTM practitioner. These findings could help health care providers understand TTM wound diagnosis from a modern medical perspective. The content validity and interrater reliability of the

TTM-PUAT encouraged use of this tool for correcting TTM wound diagnoses and for diagnosing consistently.

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