Using Digital Wound Photography to Improve Communication among Orthopaedic Health Care Professionals in Orthopeadic Patients

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Objective: *To evaluate the usefulness and reliability of digital photographs in communicating wound assessment.*

Methods: *50 open wounds from Orthopaedic inpatients.were studied. First, one senior nurse evaluated the wound and took a picture with a digital camera before verbally communicating the wound's characteristics to other nurses, Orthopaedic residents, and staff. All assessors then evaluated the digital photograph of the same wound before assessing the wound of the patient. All assessors rated the usefulness of the digital photograph compared with verbal communication.*

The second part of this study involved the reliability test. Fifty previous digital photographs were tested twice, one month apart, for inter-rater and intra-rater agreement among nurses, residents, and staff.

Results: *Most assessors agreed that communication via digital photograph was significantly better than verbal communication. Mean acceptability scores of digital photographs were significantly higher than verbal communication for clarity, details, decision guidance, and satisfaction. However, the reliability of wound care assessment was still at a fair of level of agreement among all assessors.*

Conclusion: *Digital photographs are useful for communication among members of a health care team.*

Key words: *Digital photograph, usefulness, reliability*

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Effective communication within a health care team is critical. In practice, verbal communication is the mainstay for communicating all information between health care personnel.[1] However, miscommunication can occur, resulting in mismanagement and/or a malpractice suit.[2]

Communication regarding wound assessment in routine Orthopaedic practice is usually either verbal or through documentation. But with improvements in reasonably priced digital cameras, it is now possible for nurses or practitioners to capture high-quality digital photographs of the wound and communicate with the orthopedist before making any decision.[3] In addition, these pictures can be stored as an electronic patient record and can even be sent via Internet for teleconsultation and/or telewound care.[4] There have been a number of studies demonstrating both the usefulness and reliability of digital photographs for telecommunication of wound assessment.[5-9]

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However, no previous studies have evaluated the usefulness and reliability of digital photography of Orthopaedic wounds. Therefore, this study aims to evaluate both the reliability and the usefulness of digital photography in wound care.

Material and Method

Orthopaedic inpatients over 15 years of age who were admitted to Songklanakarind hospital from January through June 2008 were invited to participate. Informed consent was obtained from each patient. This study was approved by the Ethics Committee, Faculty of Medicine, Prince of Songkla University.

First, we evaluated the usefulness of digital photography for communication with health care team members by a senior nurse.

The digital camera used in this study was an Olympus FE 240X795, 7.1 mega pixels, 2.5 inches LCD. The guidelines of Galdino et al.[10] were followed. All photographs were taken using the camera's macro function 1 megabyte JPEG setting at fine resolution. Automatic white balance was chosen. A light blue background was used for

contrast. Automatic low flash was employed given standard hospital lighting. Photographs were taken an average of 18 to 24 inches from the wound.

The nurse verbally communicated wound details to the assessors (2 nurses, 2 residents, 2 staff). All of the assessors evaluated the digital photograph before examining the wound. The assessor rated their opinion regarding the usefulness of digital photography and verbal communication.

The second part of the study was the reliability study. Fifty previously taken digital photographs of wounds were chosen by a staff member who was not involved in the study. Fifteen assessors (5 staff, 5 residents, 5 nurses) independently assessed the digital photographs regarding details of the wound twice, one month apart.

Statistical Analysis

ANOVA analysis was used to test mean scores of the opinions of nurses, residents, and staff regarding the usefulness of digital photography. Kappa statistics were used to test both inter-rater and intra-rater reliability. The scale of agreement used was as defined by Landis and Koch[11], where kappa values from 0.00 to 1.00 in 0.20 increments are assessed as slight, fair, moderate, substantial, and almost perfect, respectively.

Results

Among the open wounds, 55% were open fractures, 17% were pressure sores, 16% were infections, and 12% were tumors. More than 90% of the assessors stated that communication via digital photography was more efficacious than traditional verbal communication in terms of usefulness, efficiency, guiding decisions, minimizing miscommunication, saving time, and user friendliness. There were no statistically significantly differences in the average opinion scores of each item between nurses, residents and Orthopaedic staff (Table 1).

Table 1. Average score (SD) of opinion toward using digital images among nurses, residents, and staff (Likert scale)

Item	Nurse	Resident	Staff	P-value
• Useful	4.3 (0.8)	4.3 (0.5)	4.2 (0.6)	0.717
• Efficient	4.2 (0.6)	4.3 (0.5)	3.9 (0.8)	0.255
• Guided decision	3.9 (1.0)	4.0 (0.5)	3.7 (0.9)	0.655
• Minimize miscommunication	4.2 (0.4)	4.4 (0.5)	4.1 (0.7)	0.555
• Save time	4.1 (0.7)	4.5 (0.5)	4.0 (0.7)	0.109
• Easy to use	4.0 (0.8)	4.1 (0.8)	4.0 (0.8)	0.913
• Improve quality of care	4.0 (0.8)	3.9 (0.6)	4.0 (0.9)	0.935

The proportion of assessors who were satisfied with digital photography was significantly greater than those who preferred verbal communication for wound assessment in either clarity of information, details of information, decision guidance, or overall satisfaction (Table 2). However, a small proportion of the subjects expressed concerns about shame (11.5%) and loss of confidentiality (3.8%) if digital photographs were routinely used for wound assessment.

Table 2. Inter-rater agreement of Orthopaedic wounds among groups of assessors

Variable	Kappa			
	Nurse	Resident	Staff	Overall
• Exposed bone	0.290	0.489	0.370	0.402
• Cellulitis	0.290	0.263	0.486	0.307
• Granulation	0.390	0.382	0.438	0.408
• Necrosis	0.340	0.408	0.498	0.400
• Erythema	0.368	0.313	0.389	0.327
• Ischemia	0.366	0.318	0.410	0.368
• Slough tissue	0.392	0.301	0.550	0.356
• Wound color	0.323	0.330	0.445	0.332

The reliability of wound assessment was at a fair to moderate level of agreement in both inter-observer and intra-observer agreement. However, intra-rater agreement was better than inter-rater agreement, and the staff showed higher reliability scores than residents and nurses (Tables 2 and 3).

Table 3. Intra-rater agreement of Orthopaedic wounds among groups of assessor

Variable	Kappa			
	Nurse	Resident	Staff	Overall
• Exposed bone	0.546	0.552	0.624	0.582
• Cellulitis	0.339	0.502	0.498	0.467
• Granulation	0.907	0.858	0.958	0.907
• Necrosis	0.596	0.546	0.618	0.576
• Erythema	0.549	0.621	0.777	0.644
• Ischemia	0.235	0.226	0.470	0.322
• Slough tissue	0.439	0.570	0.577	0.546
• Wound color	0.541	0.544	0.610	0.588

Discussion

Our study confirmed that digital photography is more effective than verbal communication for assessing Orthopaedic. Digital cameras are inexpensive and readily available. Digital photographs can also be kept as electronic medical records and used for teleconsultation.

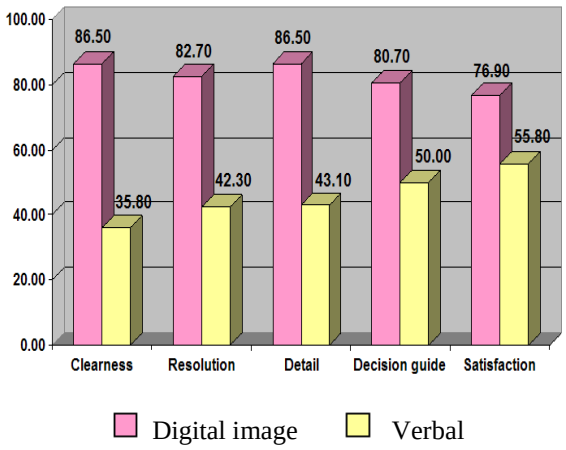

Fig. 1 Comparing usefulness between digital and verbal communication in Orthopaedic wound assessment

Effective communication among members of a health care teams is a prerequisite for good quality care. Miscommunication can originate from either human or system error. Traditional verbal communication is usually inefficient due to time constraints, and the experience and knowledge of health care personnels. Thus, a few digital photographs can describe much more detail than half an hour of verbal communication. The emergence of a new generation of "point-and-shoot" digital cameras offers doctors a compact, portable, and user-friendly way to record highly detailed digital photographs. This study highlights the use of such technology, and provides information for those who wish to record, store, and display their own medical photographs.[12]

Telemedicine has been used to remotely manage many medical problems. Given the ever-expanding demands to provide increasing service with increasingly limited resources, quality care and practice efficiency can be enhanced by telemedicine.[13] It is possible to accurately evaluate a wound based on a digital photograph. Although wound care has been practiced for centuries, telewound care is a relatively new concept. Currently, only a few pilot programs are in existence. Telewound care has yet to achieve the popularity and recognition of its other telemedicine predecessors amongst members of the health care industry and the public. The tremendous potential of incorporating this technology into wound care needs to be realized.[14-19]

Furthermore, digital photographs can be stored as part of the patient's electronic record, which uses a sequence of photographs and measurement to evaluate the response to treatment.[20,21] Specialists can assess wounds and treatment responses remotely using electronic patient records, without visiting the hospital.

However, there are some considerations to be aware of. First, correct usage of the digital camera is required to take consistently high quality digital photographs. Photographs should use standard lighting and background conditions because glare and shadows can sometimes result in errors in interpretation. In addition, patient consent should be obtained to ensure confidentiality.[22,23]

In conclusion, digital photographs are useful and reliable for wound assessment in Orthopaedic patients. We recommend routinely using digital photography in wound care to improve communication among health care personnel, especially for complex wounds.

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การใช้ภาพดิจิตอลของแผลเพื่อพัฒนาการสื่อสารระหว่างทีมรักษาในผู้ป่วยออร์โธปิดิกส์

วิลาวรรณ ทิพย์มงคล, วทบ, หัทย์ฤทัย เทพกำเหนิด, วทบ, บุญสิน ตั้งตระกูลวนิช, พบ. ปรด

วัตถุประสงค์เพื่อประเมินประโยชน์และความน่าเชื่อถือของการใช้ภาพจากกล้องดิจิตอลในการสื่อสารลักษณะของแผล ศึกษาจากแผล 50 แผล ในผู้ป่วยออร์โธปิดิกส์ มีขั้นตอนดังนี้ พยาบาลที่มีประสบการณ์ประเมินลักษณะแผลและถ่ายภาพด้วยกล้องดิจิตอล หลังจากนั้น พยาบาลจะนำข้อมูลเกี่ยวกับลักษณะของแผลสื่อสารด้วยวาจา ให้ทีมผู้ประเมิน คือ พยาบาลที่มีประสบการณ์ อาจารย์แพทย์ และแพทย์ใช้ทุน หลังจากนั้นให้ทีมผู้ประเมินดูภาพดิจิตอลของแผลเดียวกันเพื่อประเมินลักษณะแผล ทีมผู้ประเมิน ประเมินประโยชน์ของการสื่อสารด้วยภาพดิจิตอลเปรียบเทียบกับการสื่อสารด้วยวาจาโดยเปรียบเทียบกับบาดแผลจริงของผู้ป่วย ส่วนที่ 2 ศึกษาถึงความน่าเชื่อถือของการประเมินแผลจากภาพดิจิตอล โดยใช้ภาพดิจิตอลของแผล 50 ภาพ ทำการประเมินลักษณะของแผล โดยทีมผู้ประเมิน ประเมิน 2 ครั้ง ห่างกัน 1 เดือน ผลการศึกษาพบว่า ผู้ประเมินเกือบทั้งหมดมีความเห็นว่า การสื่อสารด้วยภาพดิจิตอลดีกว่าการสื่อสารด้วยวาจา และคะแนนการยอมรับต่อการสื่อสารด้วยภาพดิจิตอลสูงกว่าทั้งในด้านความชัดเจน รายละเอียด การตัดสินใจต่อการรักษาและความพึงพอใจอย่างมีนัยสำคัญทางสถิติ ส่วนความน่าเชื่อถือของการประเมินภาพแผลจากกล้องดิจิตอลอยู่ในเกณฑ์ปานกลาง โดยสรุป การศึกษานี้แสดงให้เห็นว่า การสื่อสารระหว่างทีมรักษาโดยใช้ภาพถ่ายจากกล้องดิจิตอลมีประโยชน์และดีกว่าการสื่อสารด้วยวาจา