

# Evaluation of the National Database of Nursing Quality Indicators (NDNQI) Training Program on Pressure Ulcers

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## abstract

The National Database of Nursing Quality Indicators (NDNQI) Pressure Ulcer Training Program was developed to improve nursing accuracy and reliability in identifying and staging pressure ulcers and differentiating hospital- and unit-acquired from community-acquired pressure ulcers. Of 5,200 individuals who completed the training program within 5 months of release, 937 provided written evaluation comments. Four major themes emerged from content analysis of the evaluation remarks: pressure ulcer and other wound pictures; accuracy and clarity of content; program design and technology; and the educational/informational experience. Reviewers most frequently commented on their positive learning experience. Program components that enhanced the educational experience included the array of pressure ulcer pictures at each stage and pictures of other wounds. Clarity of content, program design, and technological problems were barriers to reviewer satisfaction. Findings suggest the NDNQI Pressure Ulcer Training Program was effective for educating staff nurses on pressure ulcer identification and staging.

*J Contin Educ Nurs* 2009;40(6):252-258.

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Pressure ulcers are a significant health care problem, increasing patient pain and suffering, prolonging hospital stay, and increasing health care costs (Allman, Goode, Burst, Bartolucci, & Thomas, 1999; Hopkins, Dealey, Bale, Defloor, & Worboys, 2006). Pressure ulcers are a leading cause of preventable medical error in the United States (Institute of Medicine, 1999), and state and federal regulators now consider their presence an indicator of poor-quality health care.

Accurate identification of pressure ulcers and tissue

damage from pressure is important for appropriate patient treatment, comparison of pressure ulcer rates across health care facilities, and evaluation of quality improvement programs to prevent pressure ulcers. Inappropriate classification of other wounds as pressure ulcers or inaccurate staging of pressure ulcers can have economic and regulatory implications. For example, the Centers for Medicare and Medicaid Services (CMS) will no longer reimburse hospitals for treating Stage III or IV pressure ulcers that develop after admission (CMS, 2008). Nursing homes jeopardize CMS reimbursement due to high rates of pressure ulcers among Medicare patients and inadequate prevention programs.

The ability to identify and stage pressure ulcers is an essential nursing skill (National Pressure Ulcer Advisory Panel, 2005). However, few nurses receive enough education to ensure these competencies (Ayello, Baranoski, & Salati, 2005; Zulkowski, Ayello, & Wexler, 2007). This article reports the evaluation of a pressure ulcer training

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*The authors disclose that they have no significant financial interests in any product or class of products discussed directly or indirectly in this activity, including research support.*

*Supported by a contract with the American Nurses Association.*

*Presented in part at the 2nd Annual NDNQI conference in Orlando, Florida, January 31, 2008.*

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*doi:10.9999/00220124-20090522-05*

program developed by the National Database of Nursing Quality Indicators (NDNQI) to teach nurses and other health care professionals to identify and stage pressure ulcers, differentiate hospital- and unit-acquired pressure ulcers from community-acquired pressure ulcers, and collect pressure ulcer data.

## BACKGROUND

### Impetus for the Development of the NDNQI Pressure Ulcer Training Program

The NDNQI Pressure Ulcer Training Program was developed in response to recommendations made by studies conducted on the reliability of the NDNQI pressure ulcer indicator. The NDNQI receives unit-level patient data on “nurse-sensitive” process and outcome indicators from more than 1,400 hospitals nationwide, including data on the rate and stage of hospital-acquired pressure ulcers. Established by the American Nurses Association (ANA) in 1998, NDNQI provides nurse managers and administrators in participating hospitals with comparison reports to monitor the quality of their patient care.

Two studies were conducted in 2004 and 2005 that established the overall reliability of the pressure ulcer indicator within NDNQI hospitals and provided evidence for the accuracy of NDNQI comparison reports (Bergquist-Beringer, Dunton, Gajewski, & Klaus, 2006; Hart, Bergquist, Gajewski, & Dunton, 2006). However, the study by Hart et al. found that the reliability of pressure ulcer staging among staff nurses from web-based photographs was marginally acceptable and significantly lower than that of nurses who were certified in wound care. Findings suggested that staff nurses need additional education on pressure ulcer staging and wound identification. A follow-up study was conducted by Bergquist-Beringer et al. to establish the reliability of pressure ulcer staging from bedside evaluation of the wounds. In this study, a team of nurses rounded together to visually assess patient pressure ulcers. Each member of the team independently staged each ulcer. Analysis revealed that teams of nurses led by certified wound care nurses had higher reliability in pressure ulcer staging than teams led by staff nurses not certified in wound care. Findings again suggested the need for additional training in pressure ulcer staging for nurses not certified in wound care.

### Pressure Ulcer Knowledge in Nursing

Review of the literature revealed that staff nurses often score poorly on tests measuring knowledge of pressure ulcer identification, staging, and prevention. In a recent study of 295 nurses not certified in wound care or another related specialty area, only 34% of the nurses scored high-

er than 79% on a pressure ulcer test that included questions to assess staging knowledge (Zulkowski et al., 2007). Less than 63% had attended a lecture, read information about pressure ulcers, or used the Internet to obtain information about pressure ulcers within the previous year. A 2005 survey found that just 62% of hospital nurses felt confident in their ability to stage pressure ulcers (Ayello et al., 2005). Almost 1 in 3 hospital nurses (32%) only sometimes felt confident in their ability to stage pressure ulcers. Confidence improved with age and experience. Less than 50% of new nurses believed they could consistently stage pressure ulcers.

Education on pressure ulcers in undergraduate nursing programs is often inadequate. A 1993 review of nursing textbooks revealed that content on pressure ulcers was frequently sparse, incomplete, sometimes inaccurate, and often inconsistent (Vogelpohl & Dougherty, 1993). One decade later, there was still wide variation in the quality and amount of information devoted to pressure ulcers in nursing textbooks (Ayello & Meaney, 2003). Most practicing nurses consider their basic wound education to be insufficient (Ayello et al., 2005).

Although pressure ulcer education improves knowledge, studies also indicate that regular educational updates are needed to maintain or improve pressure ulcer knowledge and practice standards (Pieper & Mattern, 1997; Sinclair et al., 2004). Importantly, studies suggest that improved identification of pressure ulcers and knowledge of prevention of pressure ulcers are associated with a reduction in the rate of hospital-acquired pressure ulcers (Finlay, Smith, & Abrams, 2004; Young, Evans, & Davis, 2003). Nursing education on pressure ulcer identification and staging was clearly warranted.

## DEVELOPMENT OF THE NDNQI PRESSURE ULCER TRAINING PROGRAM

A pressure ulcer training program was developed by NDNQI staff in 2006 to educate nurses on pressure ulcer identification and staging and the accurate collection of data for NDNQI pressure ulcer surveys. The training program included four modules. Module I, titled Pressure Ulcers and Staging, defined pressure ulcers, covered usual pressure ulcer locations, and defined each pressure ulcer stage (Stage I to IV pressure ulcers, unstageable pressure ulcers, and suspected deep tissue injury). High-quality digital photographs of the pressure ulcer stage followed each staging definition. A short narrative description of the wound accompanied most photographs to apply the staging definition to the photograph and to provide contextual information about the wound ordinarily available through direct observation.

Module II, titled Other Wound Types and Skin Inju-

ries, covered wound types and skin injuries often misclassified as pressure ulcers. Information on arterial, venous, and diabetic ulcers, skin tears, and perineal dermatitis was included. Photographs of each wound type were included in the discussion. Module III, titled Prevalence Study Protocol, covered content related to conducting an NDNQI pressure ulcer survey; suggested training on pressure ulcer identification and staging for survey team members; and provided information on pressure ulcer risk assessment and prevention. Module IV, titled Community vs Hospital/Unit-Acquired Pressure Ulcers, addressed the difference among community-, hospital-, and unit-acquired pressure ulcers.

Three tests were included in the NDNQI Pressure Ulcer Training Program. The Pressure Ulcer Staging Test consisted of 12 questions and followed review of Module I. The learner was provided with 12 randomly selected pictures of pressure ulcers and asked to stage each ulcer. A short narrative description accompanied most photographs. The Wound Type Identification Test consisted of 8 questions and followed review of Module II. The learner was provided with 8 pictures of wounds and asked to identify wound type. A short narrative description accompanied most photographs. The Case Scenarios Test consisted of 12 questions and followed review of Module IV. Nine scenarios were presented, several of which had two or more parts. Participants were asked to determine whether the source (origin) of the pressure ulcer in the scenario was community-, hospital-, or hospital and unit-acquired.

Program content could be perused in any order or completed for 1.5 contact hours of continuing education (CE) without cost. Sequential review of all four modules and successful, sequential completion of all three tests (29 of 32 correct) were required for display of a hyperlink to ANA Online CE and certificate of CE award. Participants were asked to evaluate the training program during the CE award process.

Content on pressure ulcer identification and staging was reviewed during development by five experts in pressure ulcer research or practice and revised as needed based on their feedback. The training program was rigorously tested on completion by NDNQI staff and beta tested by hospitals participating in NDNQI. After minor revisions, the NDNQI Pressure Ulcer Training Program (version 1) was released in November 2006 for free and open online access. CD copies of the training program also were distributed to hospitals participating in NDNQI for individual computer use. Computer requirements for both modalities were Windows 2000 or newer and Internet Explorer 6.0 or higher.

Estimated total cost for development of the NDNQI

Pressure Ulcer Training Program was \$25,500. Budget items included CD mailing, staff salaries, software programming (\$6,900), and indirect costs. Not included in the development costs were the hours of extra staff time and university resources donated to the project or ANA-donated CE credit. Considerable expense also was saved by not having to purchase or take pressure ulcer and other wound pictures. Although costly, program development was crucial to the overall reliability of NDNQI pressure ulcer data and the accuracy of comparisons between participating hospitals.

## METHODOLOGY

By April 2007, 5,200 individuals had completed and evaluated the NDNQI Pressure Ulcer Training Program for CE credit. Of these, 937 reviewers (18%) provided written evaluation comments that were de-identified and sent to NDNQI by ANA Online CE. Reviewer comments were analyzed to determine learner experiences and guide future module revisions. Institutional Review Board approval was provided by the University of Kansas Medical Center.

The written evaluation comments were analyzed using content analysis techniques and the results represented by their frequency and the content of the text (Graneheim & Lundman, 2003). Because reviewers often provided more than one evaluation comment, the individual comment was selected as the unit of analysis. Evaluation comments were read and re-read to obtain a sense of the whole. Individual comments were then coded to designate data that contained similar material. Individual comments and assigned codes were organized into categories and subcategories. Themes were developed to link the underlying meaning within categories. Masters' students trained in content analysis, statistics, and research participated in the project. These students and the primary author independently conducted the analysis and compared results to establish the inter-rater reliability of coding and category and subcategory placement. Differences were resolved by consensus. Categories and subcategories were refined as needed.

## RESULTS

The 937 reviewers provided 1,069 individual evaluation comments. Major themes that emerged from these evaluation comments included pressure ulcer and other wound pictures, accuracy and clarity of content, program design and technology, and the educational/informational experience. The Table lists the four themes and the frequency of positive and negative reviewer comments by theme and category.

## Pressure Ulcer and Other Wound Pictures

Many reviewers praised the photographs of the pressure ulcers and other wounds. Most said that the photographs were of high quality and made staging and wound differentiation easier. Some reviewers appreciated the multiple examples of pressure ulcer stage that followed each staging definition. Others thought that the short narrative descriptions next to the pressure ulcer and other wound pictures helped with differentiating the stages of pressure ulcers and other kinds of wounds. One reviewer stated, "I really enjoyed the photos for wound staging . . . that is honestly the most realistic approach for training someone for wound staging." Several reviewers intended to use the pressure ulcer pictures to train new and current staff nurses on pressure ulcer staging. Comments included "this program is excellent as a resource to all staff members, not only for hospitals but also for long term care," "the pictures well describe the difference in all four stages of pressure ulcers and are helpful to the new nurses during their orientation period," and "this will surely be useful as a skin integrity resource in my unit."

Negative comments included "pictures not helpful," "pictures not as discernible as real life, needed more assessment facts," "some of the pictures were hard to see," and "wish the pictures were bigger." Many reviewers thought that more photographs of each pressure ulcer stage should be displayed and narrative descriptions added to photographs missing them.

## Accuracy and Clarity of Content

Reviewers frequently commented on the accuracy and clarity of program content. A few thought that the content of Module I, Pressure Ulcers and Staging, and Module II, Other Wound Types and Skin Injuries, was clear, relevant, and informative. Others thought that one or more of the pressure ulcer pictures were inaccurately staged or too ambiguous for determination. Comments included "picture of shallow ulcer is not a Stage II pressure ulcer," "the stage III ulcer looks like a Stage II ulcer," and "the pictures are too subjective regarding their stage." Evaluation comments also reflected reviewer misunderstanding of the appropriate classification for a pressure ulcer extending through muscle and bone so deeply that the base of the wound could not be seen. A surprising number of reviewers thought that example and test photographs of skin tears, perineal dermatitis, and arterial and diabetic ulcers were incorrect representations of the wound type. Comments included "the heel ulcer is . . . not an arterial ulcer," "disagree that wound on lateral heel is a diabetic ulcer," and "the picture of perineal dermatitis appears to be more of a fungal rash."

TABLE  
FREQUENCY OF REVIEWER COMMENTS ON THE  
NATIONAL DATABASE OF NURSING QUALITY  
INDICATORS PRESSURE ULCER TRAINING  
PROGRAM (N = 1,069)

|                                                               | Number of<br>Positive<br>Comments | Number of<br>Negative<br>Comments |
|---------------------------------------------------------------|-----------------------------------|-----------------------------------|
| Pressure ulcer and other wound pictures                       | 140                               | 36                                |
| Accuracy and clarity of content                               |                                   |                                   |
| Module I—Pressure Ulcers and Staging                          | 1                                 | 4                                 |
| Module II—Other Wound Types and Skin Injuries                 | 4                                 | 33                                |
| Module III—Prevalence Study Protocol                          | 1                                 | 9                                 |
| Module IV—Community vs Hospital/Unit-Acquired Pressure Ulcers | 4                                 | 187                               |
| Program design and technology                                 | 17                                | 246                               |
| Educational/informational experience                          | 333                               | -                                 |
| Miscellaneous other                                           | -                                 | 26                                |
| Total                                                         | 500                               | 541                               |

Note. Neutral comments = 28.

The focus of many comments was Module IV, Community vs Hospital/Unit-Acquired Pressure Ulcers. A few reviewers thought the information was "clear" and "well written," but many thought the content was confusing. Comments included "need more information on the differentiation between community- and hospital-acquired pressure ulcers" and "hospital-acquired versus unit-acquired needs to be explained better."

These comments reflected the newness of the content to reviewers of this training program. In particular, nurses had received little previous education on unit-acquired pressure ulcers. Module content was developed to train NDNQI pressure ulcer survey team members before scheduled data collection on unit-acquired pressure ulcers began among hospitals participating in NDNQI. Case studies to test nurses' knowledge of community-, hospital-, and unit-acquired pressure ulcers also were the target of reviewer comments. Comments included "case study questions were difficult to understand, needed more information" and "I did not agree with the answers to two of the case scenarios." Other comments, such as "using previous screen's scenarios is confusing," reflected reviewer distress in answering case scenario questions with two or more parts when pertinent information was

located on a prior screen. Reviewers expressed frustration in determining whether the pressure ulcer was community or hospital and unit acquired from case scenarios in which the patient was transferred between units. However, transfer of patients between units is common in most hospitals. Comments such as “the question involving transfer of a patient from acute care to the rehab unit was confusing and tricky” also reflected lack of reviewer knowledge about Medicare admission and discharge rules when transferring patients to within-hospital rehabilitation units.

### Program Design and Technology

A few reviewers expressed appreciation for program design and technology. Evaluation comments included “immediate feedback was very helpful” and “I like the online learning environment.” Numerous other reviewers were frustrated by program design and difficulties encountered during completion of the Pressure Ulcer Training Program. Specifically, reviewers were frustrated by required sequential module review and test completion for CE credit. Those who disrupted the forward sequence by return to previous materials had to repeat the entire training program. Comments included “module difficult because unable to go back to re-read previous information,” “frustrating CE program—miss one click and then forced to start over,” “wasted a lot of time re-testing when the program said I was out of order,” and “should not have to do sequentially . . . having to click through each slide upon retaking exam was unnecessary.” Reviewers wanted flexibility in reviewing module content or completing tests and the ability to return to module content while taking tests. Comments included “would have been helpful to review weak areas,” “should be able to take the test in any order one desires,” and “would like to recheck pictures for the test.” Reviewers also wanted multiple paths for completing the training program. Comments included “would be nice to have the option to take each module and test individually rather than having to do the whole program at one time” and “nurses with wound care knowledge should be able to take tests only.”

Several reviewers reported difficulty linking to ANA Online CE after successful completion of the NDNQI Pressure Ulcer Training Program. Other reviewers experienced technological difficulties with their hospital computer while completing the training program. Comments included “my computer screen would freeze up during the review,” “pages loaded too slowly,” “on dial-up computers, the pictures can be hard to see,” and “I had to take the program over again because I was unable to print the certificate from my computer.” The train-

ing program was formatted for use with Windows 2000 or newer and Internet Explorer 6.0 or higher, which are compatible with a wide range of computer systems. Nevertheless, NDNQI staff provided many hours of technical support to facilitate use of the training program when hospital Internet browser settings or fire walls blocked online access, computer systems used different browsers, or nurses had restricted Internet time.

### Educational/Informational Experience

An overwhelming number of positive comments were received about the learning experience. Numerous comments were congratulatory. Other comments identified what the reviewer learned, such as “I gained information to assess pressure ulcer staging” and “learned to differentiate types of ulcers.” Many reviewers compared the training program to previous educational experiences. Comments included “one of the best online training courses in a long time, to the point and informative,” “very helpful and more educational than the workshops I attended,” “best education on skin care that I have seen,” and “one of the best in-services I have had in years.” Importantly, reviewers identified how they hoped to use this information in the future. Comments included “the pressure ulcer training adds to my credibility as a valid resource,” “I look forward to sharing this educational offering with members of my skin integrity team,” “we will be using the module for mandatory training of all our nursing staff,” and “will recommend the training module to other members of the health care team.”

### DISCUSSION

The 5,200 individuals who completed and evaluated the NDNQI Pressure Ulcer Training Program between November 2006 and April 2007 for CE credit indicates high penetration of the educational materials to nurses. Of these, 937 reviewers (18%) provided 1,069 written evaluation comments, the content of which likely reflects the perception of those who completed the NDNQI Pressure Ulcer Training Program within the first 5 months after release. The 937 reviewers most often commented on their positive learning experience. These enthusiastic comments provide strong evidence for the effectiveness of the training program in educating nurses on pressure ulcer identification and staging. Appreciation was often expressed for the multiple pictures of pressure ulcers at each stage and pictures of other wound types. Reviewers also commented positively on the wound descriptions. The studies by Hart et al. (2006) and Bergquist-Beringer et al. (2006) revealed that the inter-rater reliability of pressure ulcer staging improved when a description of the wound accompanied the picture.

Reviewer comments such as “far superior to prior pressure ulcer training programs” suggest limitations in previous educational programs to train staff nurses on pressure ulcer identification and staging. Findings are consistent with those from a 2005 search for pressure ulcer staging educational materials that revealed that few materials were publicly available and most contained only one picture or a graphic representation of each pressure ulcer stage (Lehmann & Bergquist, 2005). Wound descriptions were generally not included. Reviewer evaluation of the NDNQI Pressure Ulcer Training Program provides support for the use of multiple pictures of pressure ulcers by stage and other wounds in educational materials regarding pressure ulcer identification and staging. Interestingly, critique of the training program included the need for even more pressure ulcer and other wound pictures, but reviewers strongly suggested that the pictures be unambiguous and clearly represent the ulcer stage or wound type.

Program design and technological problems were barriers to reviewer satisfaction with the NDNQI Pressure Ulcer Training Program and a challenge to program development. Goals during development were to track the number of questions answered correctly on module tests and to offer the program online and on CD. To accomplish these goals, sequential review of all four modules, which included the sequential review of content within each module, and sequential completion of all three tests were required. Interruption in the sequential review caused the program to lose count of the accumulated test score, prevented display of the hyperlink to ANA Online CE, and forced the reviewer to retake the entire training program for CE credit. The many negative comments about program design and technology suggested the need for program revision. As identified by Sweeney, Saarmann, Flagg, and Seidman (2008), those who offer online continuing education programs must ensure there are no problems because nurses who encounter difficulties may not give the system a second chance. The 187 negative comments about Module IV also suggested the need for clarification of information on community-versus hospital- and unit-acquired pressure ulcers and reformatting of the Module IV test.

Numerous revisions have been made to the NDNQI Pressure Ulcer Training Program based on reviewer evaluation comments. The training program was redesigned for exclusive online use. Sequential review of the NDNQI Pressure Ulcer Training Program is no longer required. Learners can return to a previous module or re-read module content when taking a test without loss of test score. The training program also now offers multiple paths to completion. Learners can review module

## key points

### Pressure Ulcers

Bergquist-Beringer, S., Davidson, J., Agosto, C., Linde, N. K., Abel, M., Spurling, K., Dunton, N., Christopher, A. (2009). **Evaluation of the National Database of Nursing Quality Indicators (NDNQI) Training Program on Pressure Ulcers.** *The Journal of Continuing Education in Nursing*, 40(6), 252-258.

- 1 Accurate identification of pressure ulcers and determination of tissue damage from pressure is important for treatment, comparison of pressure ulcer rates across health care facilities, and evaluation of quality improvement programs to prevent pressure ulcers.
- 2 The NDNQI Pressure Ulcer Training Program was developed to improve nursing accuracy and reliability in identifying and staging pressure ulcers and differentiating hospital- and unit-acquired from community-acquired pressure ulcers.
- 3 Content analysis of reviewer evaluation comments suggests that the NDNQI Pressure Ulcer Training Program was effective for educating nurses on pressure ulcer identification and staging.
- 4 Reviewer dissatisfaction with content clarity, program design, and technology problems provided direction for revisions to the training program.

content and take all module tests in one sitting, review module content and take module tests at their own pace in separate sittings, or tailor review of module content to their learning needs.

Case scenarios were clarified and test questions reduced to one per scenario. Information to remedy reviewer confusion about community- versus hospital- and unit-acquired pressure ulcers was added to module content. Confusion about hospital- versus unit-acquired pressure ulcers also declined after hospitals participating in NDNQI began collecting data on unit-acquired pressure ulcers.

More pictures of pressure ulcers and other wound types were added to Module I, Pressure Ulcers and Staging, and Module II, Other Wound Types and Skin Injuries. Delineating unambiguous pictures of pressure ulcer stages and other wound types is a challenge to the development and enhancement of educational programs on pressure ulcer identification and staging. For example, a pressure ulcer may be Stage II when assessed at the bedside, but may look like Stage III in a two-dimensional picture. Similarly, poor picture quality and shadowing can suggest deep tissue injury rather than a Stage I pres-

sure ulcer. Ambiguous pictures were replaced with new pictures or the wound description was modified to better represent the intended stage or wound type. Wound descriptions were added to all pictures previously missing the information. Future educational programs may benefit from case studies to teach pressure ulcer identification and differentiation between wound types.

## CONCLUSION

The NDNQI Pressure Ulcer Training Program was developed to educate nurses on pressure ulcer identification, staging, and source for the purposes of improving the accuracy of data collection on hospital-acquired pressure ulcers and allowing meaningful comparison of nursing care performance. Findings from the analysis of reviewer evaluation comments suggest that the NDNQI Pressure Ulcer Training Program was effective for educating nurses on pressure ulcer identification and staging. Flexibility and ease of use are also important to reviewer satisfaction. The training program should be reviewed regularly to maintain or improve pressure ulcer knowledge.

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