Impact of Bar-Code Labeling of Clinical Photographs on Patient Care and Practice Workflow

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D ermatologists rely on clinical photographs to observe lesions over time and to identify surgical sites. Studies have shown that without photographs at the time of surgery, patients could not identify 17% to 29% of biopsy sites, and surgeons could not identify 5% to 12% of biopsy sites. With photographs, all biopsy sites were identified.1,2

Accurate labeling and secure storage of clinical photographs is a universal problem within dermatology. From 2008 through 2011, our department used prints of clinical photographs stored in the patients’ physical medical charts. Photographs were sometimes missing or unavailable at the various clinic sites, so we stored digital images on a secure server. Authorized users could access and print images at any site (2011). These methods were time intensive, error prone, and had less security than our online medical record.

Our practice uses demographic labels with a Code-39 bar code to identify patient specimens. Bar codes are a validated tool for error reduction in many areas of health care.3 We developed software (in C# for Windows Desktop) that uses photographs of these Code-39 bar-code labels to identify and upload clinical photographs into the patient’s online medical record, enabling all providers to view these images. To format images for this software, we photograph the patient’s demographic label prior to photographing the patient (the label with identifiers are not in the clinical photograph) (Figure).

M ethods. At our academic medical center, for two 1-month periods, before (January 2010) and after (January 2012) implementation of the bar-code system, we assessed the proportion of Mohs surgery referrals with a photograph present in the medical record. To quantify the effort required under both our prior systems and the current bar-code system, we measured time for associated activities. We measured the time to log and process clinical photographs using our bar-code software to calculate the total administrative time per photograph. We compared this time to 2 prior systems that our practice used: (1) printing (Epson Photolab Personal) and labeling 2 copies of the digital photograph (for the medical chart and dermatologic surgeons); and (2) manually moving digital photographs onto a secure drive.

To determine the electronic readability of Code-39 bar-code images obtained in our practice, we examined the demographic data extracted from 200 sequentially bar-code images obtained during clinic visits. The Fischer exact test was used to determine P values for 2×2 frequency tables; the t test was used to compare group means. Institutional review board approval was waived.

R esults. With our bar-code system, the percentage of patients with photographs available at the time of surgery increased from 84% (54 of 64) to 95% (73 of 77) (P = .049). Under the bar-code system, an average of 20 seconds of administrative time was required per clinical photograph, significantly faster than the 50 seconds per photograph needed...
to manually upload the photographs or the 77 seconds for printing the photographs (Table) \( (P \leq .001 \text{ for both}) \). The software automatically determined the correct identifier from 85% of bar-code images (170 of 200). The mean (SD) processing time was 0.18 (0.09) seconds per image.

Comment. Use of the bar-code system to process digital images significantly increased availability of photographs at the time of surgery and decreased the amount of administrative time required to archive and access photographs. Prior studies\(^1,2\) have demonstrated that photographs improve surgical site identification and patient care. Our software integrates photographs into the online medical record, which ensures the security of the clinical image and improves communication within a patient’s health care team.

Our software requires no new hardware and automates the labeling and processing of most photographs acquired (85%). In 15% of cases, because of poor lighting or focus, the software was unable to process the bar-code image, but no cases of partial or erroneous labeling were found. When a bar code is not read automatically, the data are entered manually. Use of 2-dimensional bar codes or a laser scanner would increase the accuracy of a bar-code system but would require substantial capital investment.

Incorrect identification of photographs is a medical error. To minimize this risk, a written log is kept with each camera. The log has the demographic label, body part photographed, and number of photographs taken. This takes 7 seconds per clinical photograph (11 seconds per patient with an average of 1.6 photographs per patient). This log is submitted with the memory cards to an administrator who uses the bar-code software to confirm the identity and process the photographs, which takes 13 seconds per clinical photograph.

Many dermatology practices use bar codes in labeling pathologic and laboratory specimens. Software that uses bar-code data to process photographs into a pdf report is a generalizable solution to a universal practice problem in dermatology.

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COMMENTS AND OPINIONS

Interleukin 12/23 Agents and Major Adverse Cardiovascular Events

The JAMA article by Ryan et al1 on the association between biological therapies for psoriasis and cardiovascular events and the commentary by Bigby2 have generated significant controversy in the community of psoriasis researchers. By drawing attention to a potential increase in cardiovascular events in patients treated with interleukin (IL)-12/23 antagonists, the article and commentary provide a service to dermatologists and our patients.

The association between major adverse cardiovascular events and the use of IL-12/23 antagonists is unclear. The manufacturers of those drugs will never be able to escape the data in their pivotal trials: there were more adverse cardiovascular events in the treatment arms than in the placebo arms during the first 12 weeks of therapy.1 Was that a coincidence or is there a true risk of heart attack, arrhythmia, or stroke? Other trials do not confirm the association. In the phase 2 psoriatic arthritis trial of ustekinumab,3 there was a single myocardial infarction in the placebo arm but none in the group of subjects treated with ustekinumab,4 which is not consistent and investigator for all of the companies currently making approved biological agents for psoriasis. Ustekinumab is the only IL-12/23 antagonist approved for psoriasis. At my request, the amount that I am paid for each consultation I do for Janssen Biotech, the maker of ustekinumab, is limited to $1 to avoid the appearance of a conflict of interest for our most expensive psoriasis drug, one that is unaffordable to many patients who need it. The funds received from clinical trials are paid to my employer and do not affect my personal income.

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