



Digital Dermoscopy Monitoring: Is it Time to Define a Quality Standard?

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Dermoscopy monitoring is useful in detecting melanoma in patients with multiple atypical naevi (1). Thus, sequential dermoscopy imaging (SDI) has shifted from an academic, investigational practice to a commonly provided service. In the past, SDI was provided only through costly dedicated digital epiluminescence systems available from only a few manufacturers; however, improvements in digital camera and smartphone technology have recently enabled a notable increase in routine SDI. Diagnosis using the SDI process essentially relies on comparing pictures acquired by various means. We discuss here some of the difficulties dermatologists may face in performing SDI.

At present, a dermatologist can perform SDI of suspicious naevi through:

- a polarized or non-polarized handheld dermatoscope or stereomicroscope coupled with specific compact digital cameras, single-lens reflex camera, smartphone, or tablet;
- a dedicated point-and-shoot dermoscopy camera (DermLite Cam, 3Gen Inc., San Juan Capistrano, CA, USA);
- USB digital microscopes (Dino-Lite DermaScope, Dino-Lite, Naarden, Holland);
- a dedicated lens coupled to a digital single-lens reflex camera (DermLite Foto II Pro and DermLite Foto II Pro Plus, 3Gen Inc.; VEOS SLR Canfield Scientific, Parsippany, NJ, USA).

Image storage and retrieval requires a custom software database. Also, handheld dermatoscope manufacturers provide smartphone applications, such as the DermLite app, Handyscope and Handyscope 2 (FotoFinder Systems GmbH, Bad Birnbach, Germany), and the VEOS app (Canfield Scientific), allowing the capture of dermoscopy images and localizing lesions on a mannequin directly from within the applications. Since these solutions are readily available to every dermatologist, requiring no more than a smartphone and a handheld dermatoscope, the choice of using a smartphone over a digital camera is greatly encouraged. It should be noted that as the performance of smartphones and digital cameras improves significantly each year, it is expected that, over time, a given patient will receive SDI via different devices, thus increasing picture heterogeneity, even within a single dermatological facility.

A major drawback of such solutions is that it is somewhat demanding to comply with full mole mapping and subsequent follow-up, and this will require a significant amount of time for patients with many moles.

Instead of smartphones and handheld dermatoscopes, large facilities or tertiary referral centres use costly (usually not less than €15,000) digital epiluminescence systems or videodermatoscopes (e.g. Vidix Skin Imaging Group, Las Vegas, NV, USA; FotoFinder Systems; Molemax Derma Medical Systems, Vienna, Austria; VideoCap DS Medica, Milan, Italy). This choice is largely based on the need to rapidly map many moles per patient (which is possible with these systems) rather than on the quality of the pictures produced.

When using such methods, dermatologists must deal with the following consequences:

- there are currently many dermatologists compiling a huge number of patient databases with potentially ill-conceived images in terms of colour accuracy and consistency;
- poor-quality pictures could result in misdiagnosis;
- transferring patient's SDI results between different facilities is currently difficult, thus preventing the establishment of a reliable dermatology network;
- at present, digital dermoscopy monitoring is a highly operator-dependent technique, although there are recommendations to minimize this issue (2).

An outdated proposal for standardizing reports of dermoscopic evaluations of skin tumours recommends including information related to the imaging equipment (brand name, manufacturer, type of illumination, and spectral band) and magnifications (3). However, the guidelines offered are only professional recommendations and are not binding as "standards." A more recent teledermatology standards guideline from Primary Care Commissioning in the UK has posed more complete recommendations, but it refers to standard photography (4).

Such carelessness regarding SDI is of concern. The adequacy of these images for clinical use is not a subjective aesthetic judgement. In cases of a life-threatening disease, such as melanoma, we feel that sometimes even a hard-to-detect hue difference could make a great difference in diagnosis. This is especially important, as this group of patients is generally at greater risk. To avoid misdiagnosis, it seems advisable for dermatologists to

have a minimum set of requirements for accomplishing SDI (spatial and colour resolution, post-acquisition image processing, such as high dynamic range (5), using conventional or polarized light dermoscopy (6), colour calibration and image compression) (7).

Another concern regarding SDI relates to the quality of patient care. In the most common clinical scenario, a patient moves to the care of another dermatologist, wishing to continue the SDI of suspicious naevi. The patient sometimes provides printed pictures or a CD of previous SDI results. Although of some use, the pictures are rarely comparable because of an unacceptably large variation in colour. At present, not even a costly digital videodermatoscope enables record interchangeability, since they use proprietary file formats to exchange records only within the same brand systems. This fact also prevents dermatologists from switching to other videodermatoscope brands for fear of losing all their patients' SDI records.

On the other hand, radiologists have adopted Digital Imaging and Communications in Medicine (DICOM) as a standard for handling, storing, printing, and transmitting information in medical imaging. DICOM enables the integration of medical imaging devices, such as scanners and printers from multiple manufacturers. This allows the easy sharing of magnetic resonance imaging and computerized tomography scans on low-cost compact disks, which can be burned automatically by an assistant, freeing up the physician's time. Radiologists can confidently use images in a calibrated display to solve a clinical dilemma (e.g. to check if a pulmonary nodule, which was formerly present, has changed). Images can also be easily displayed on any computer with a stand-alone DICOM viewer application, avoiding the need for costly prints.

We believe that setting a minimum imaging standard would provide many benefits, such as:

- compelling digital videodermatoscope or dermoscopy camera producers to provide real high-end, calibrated, standard equipment that justifies their cost. Although, for example, DICOM supports advanced colour

capabilities through embedded International Colour Consortium profiles, no actual products have the capacity to provide a DICOM file of the whole SDI record that can be displayed easily through commonly available DICOM viewers;

- having the potential to eliminate the proliferation of non-standard (and therefore barely comparable) SDI follow-up; because of the logarithmic increase in SDI diffusion and SDI equipment, it seems reasonable to assume that it would be much more difficult to resolve this issue later;
- allowing easy and, most importantly, effective sharing of patient data in referral cases through a dermatological network.

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