

# Clinical Photography in the Dermatology Practice

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Photography has been accepted for decades as a standard means for documenting dermatologic conditions and as an adjunct to their treatment, in both medical practice and research. The emergence of low-cost easy-to-use digital imaging systems has made good-quality photography more accessible to practitioners, while providing improved functionality in the clinical environment. Primary concerns are controlling lighting and positioning to provide a clear record of the patients skin condition and maintaining consistency over time to assure meaningful comparison of clinical end points.

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## Clinical Photography Overview

A particular characteristic of dermatology is that the patient's condition, and the result of any treatment, is typically apparent to any observer. It is the visual nature of these conditions that makes photography so useful in the dermatology practice. For decades, photography has been accepted as the standard documentation tool for cutaneous diseases and injuries. With the development of today's advanced digital imaging systems, it has evolved into a uniquely valuable adjunct to their treatment.

Photography plays an important role in professional communications, practice development, and medicolegal issues. These various applications of clinical photography can be summarized as follows:

### Documenting Conditions and Treatments

The accepted standard in medical research, serial photography, provides significant benefit to the clinical practice. Photography provides a unique opportunity to document the patient's initial presentation and serves as a baseline to how the condition progresses with treatment. Photographs taken

over time, or at specific end points, provide a medical record that could not be acquired in any other way. This enables clear communications with patients regarding their progress and provides practitioners with permanent documentation of the efficacy of their treatments.

### Monitoring At-Risk Patients

For patients at risk for melanoma, total body photography, also known as whole-body integumentary photography, provides the means of establishing a baseline against which to evaluate changes in the patient's presentation.<sup>1</sup> The basis for this type of photography is a multisection template that divides the body into discrete anatomical areas. This template defines a standardized series of photographs that comprise a "Body Map," consisting of 25-30 photographs. The body map defines both the area of the anatomy to be photographed and the positioning, or pose, of the subject for each picture (Fig. 1).

### Professional and Business Development

An archive of clinical images documenting your work can be a valuable asset for your practice. For professional publications or presentations, photography is indispensable. If your practice includes esthetic procedures, clinical photography demonstrating the results can be used in marketing and promotional materials, or simply arranged in a binder to show prospective patients.

## Selecting a Photographic System

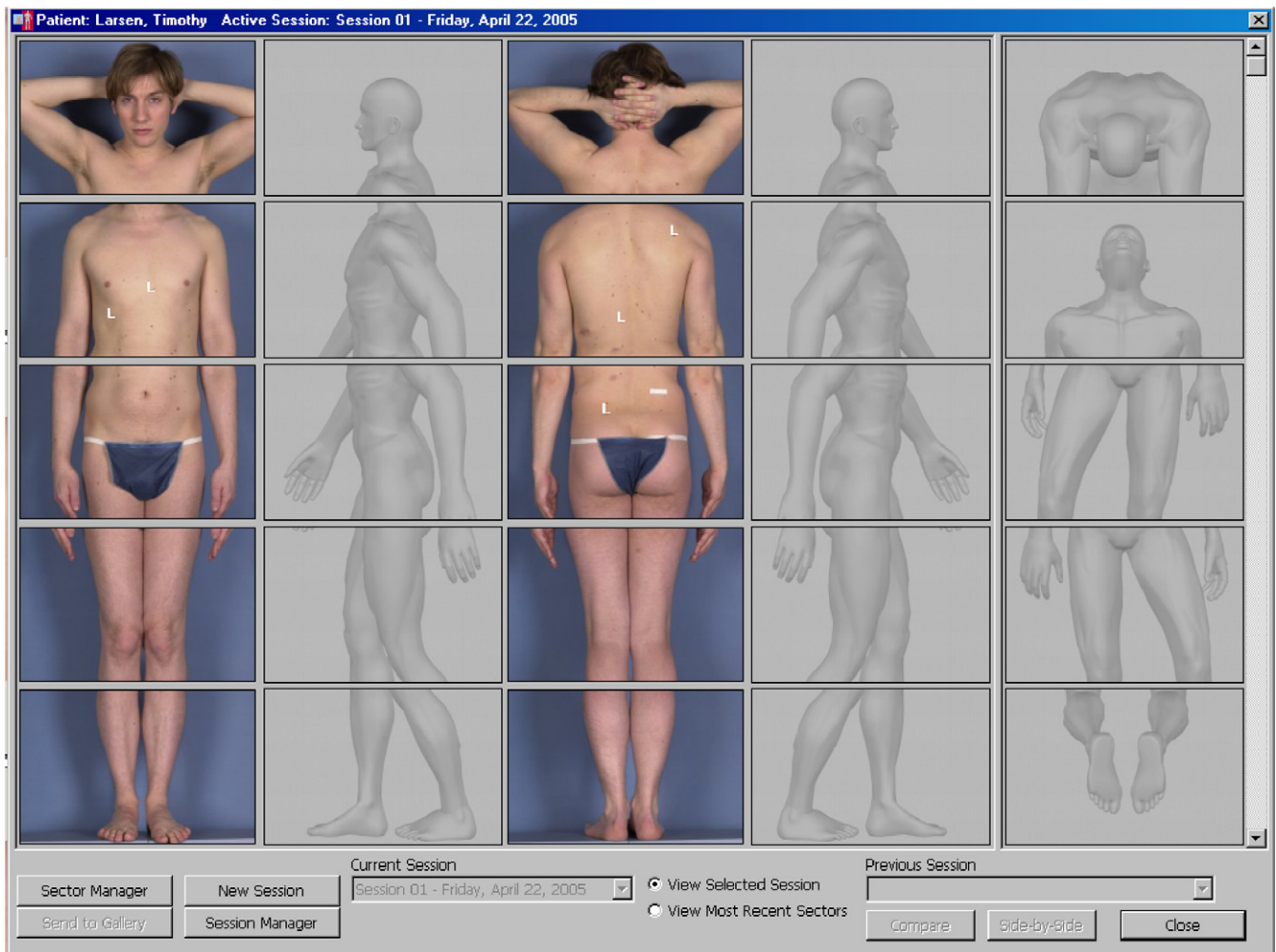
If you are installing an entirely new photographic system or planning an upgrade, there are a number of factors to consider.

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**Figure 1** The body map defines the anatomical area and subject positioning for each photograph. (Color version of figure is available online.)

## Camera Selection

The most basic decision in selecting a camera is whether to choose a single-lens reflex (SLR) camera or a point-and-shoot (PAS) camera. As a rule, you will get better quality and greater versatility from an SLR. This type of camera uses an interchangeable lens that can be optimized for the type of photography that best suits your needs. They all accept a wide range of accessories and most importantly, synchronize with external flash systems, features that are available only on high-end PAS cameras. However, SLR cameras can seem complicated to the inexperienced user and cost somewhat more than PAS models.

PAS cameras, as the name implies, are extremely easy to use and are typically used in "Full Automatic" mode. In this mode, the camera makes all the decisions regarding focus, exposure, color balance, and the use of flash. For routine documentation of gross conditions, even the most inexperienced user will get acceptable results from these systems. However, the settings selected by a camera in automatic mode can be influenced by any number of variables, such as ambient lighting or subject position. Therefore, this mode of operation may not provide the consistency needed when the

application requires critical imaging or lighting. This is particularly true for serial photography where consistency of imaging is required for meaningful visualization of the clinical progress and end points.

## Location

An important first decision is the physical location where your photography will take place. A dedicated room is the ideal choice, as this provides the most control of the environment. To prevent outside lighting from influencing the color or brightness of your subject, try to find a location away from windows. If that is not an option, install opaque fabric "black-out" drapes over the windows for use during photo sessions.

Unless space is extremely limited, it's best to avoid the situation where your photography setup needs to be dismantled when not in use. A key element of quality clinical photography is consistency, and this will be difficult to maintain if the physical configuration of your equipment keeps changing. For most uses, a modest amount of space is adequate. Even a full-body photography studio can be installed in about 50 sq ft of floor space.



**Figure 2** A multipurpose camera accessory for epiluminescent or standard close-up photography.

## Special-Purpose Imaging Systems

For many practices, a special-purpose imaging system will provide the best solution. If your practice is highly specialized, such a system may in fact be all you need. If you are involved in research or clinical trials, the system requirements will be considerably more rigorous than for the typical medical practice. In such a case, it may be necessary to use a custom-designed system. The systems described later are available “off the shelf” and are routinely used in dermatology practices.

## Dermatoscopic Systems

An excellent solution for photographing individual lesions is a device that optically couples the camera to the subject. With built-in illumination, these combine the functionality of a dermatoscope with a digital camera. A cone-shaped attachment with removable contact glass enables repeatable epiluminescent photography at a fixed reproduction ratio. With the cone removed, the device can be used for general-purpose flash photography (Fig. 2).

Attachments are also now available for smart phones that use their built-in cameras and displays to provide a type of digital dermatoscope. Using companion software “apps,” these systems are able to view and capture highly-magnified images of individual lesions or areas of interest. The images can be stored in the smart phone’s memory, exported to an external database, or telecommunicated to remote locations. These systems also provide a more comfortable examination

for both patient and clinician, particularly when the lesion is in a location that is personal or awkward to access (Fig. 3).

## Facial Devices

For practices that specialize in facial treatments, a dedicated facial imaging device offers significant benefits. These devices typically use a chin cup at a fixed distance from the camera to assure optimal, and repeatable, facial positioning. Likewise, lighting units are fixed in relation to the face. A number of these devices are available, usually with a dedicated software application to control image capture and database management. The more sophisticated models provide multiple lighting modes, such as ultraviolet (UV) and cross-polarized illumination, multipoint subject registration systems, and advanced software, to perform image processing and analysis (Fig. 4).

## 3-Dimensional (3-D) Systems

Traditionally embraced by plastic and reconstructive surgeons, 3-D imaging has proven to be valuable in documenting a wide range of dermatologic procedures as well. With true volumetric imaging, 3-D systems can quantify changes in morphology over time or resulting from treatment. Pre- and postprocedure images can be registered and overlaid to provide a visual comparison as well. In melanoma research, an innovative 3-D system is being used to monitor hundreds of school children in the Framingham, Massachusetts school district. Sponsored by the National Institutes of Health, the Study of Nevi in Children, is the first school-led study of its kind that intends to learn how moles on the skin change over time with the goal of preventing skin cancer.<sup>2</sup>

## Lighting Systems

The choice of lighting systems should be guided by the anatomical area and skin condition that you need to photograph.



**Figure 3** The Canfield DermScope (Canfield Imaging Systems, Fairfield, NJ) turns a smartphone into a digital imaging dermatoscope.





**Figure 4** A specialized facial imaging system with multiple lighting modes and image analysis software.

Convenient as it is, a camera's built-in flash is seldom the best light source for clinical photography. Following is a summary of lighting systems and their uses.

**Camera-Mounted Flash Systems.** Particularly useful for close-up photography, a variety of twin-light and externally-mounted flash units are available from the major camera manufacturers and third-party suppliers. A ring-light configuration is well suited for intraoral applications, whereas the point-flash systems provide better illumination for skin surfaces and texture. A useful feature in these systems is the ability to integrate with the through-the-lens metering system of compatible SLR cameras (Fig. 5).

**Studio Lighting Systems.** Whenever space permits, external studio lighting offers the best solution. These lights can be positioned exactly as needed and offer variable power settings for complete control over the lighting situation. For a simpler solution, consider an integrated studio lighting system that combines lighting and camera positioning in a single movable device. Systems such as this produce excellent clinical photographs, and when used with distancing systems, such as ranging lights, and patient-posing mats, allow for highly repeatable serial imaging (Fig. 6).

**Special-Purpose Systems.** For certain skin features, special-purpose lighting systems are available. UV systems are useful for imaging subsurface pigmentation (melanin) or features, such as porphyrins, which fluoresce under this type of illumination. Digital cameras are largely insensitive to the UV illumination itself, but the visible fluorescence of collagen and the UV absorption of melanin enable the camera to image pigment clusters, lesions, and the like. Another type of special-purpose system works by positioning cross-polarized filters over the light source and camera lens, respectively. This virtually eliminates surface

reflections, and therefore texture, from the skin which allows for a clearer rendering of subsurface vascularity (Fig. 7).

#### **Patient-Positioning Systems**

Together with lighting, patient positioning, or posing, is one of the key elements of success in clinical photography. Al-



**Figure 5** The Canfield TwinFlash (Canfield Imaging Systems, Fairfield, NJ) integrates with a camera's through-the-lens metering system.



**Figure 6** An integrated studio system provides consistent lighting and camera positioning.

though we are accustomed to simply framing the subject in the camera's viewfinder, there are considerable limitations to this approach when applied to clinical photography.

First, keep in mind that the patient's position itself can influence the appearance of the feature being photographed. An obvious example would be facial wrinkles or skin laxity. The severity of these features can change dramatically with the position of the patient's head and neck, as well as the facial expression. Similar effects can be seen in most parts of the anatomy. As a rule, a natural relaxed position is desirable because that more closely represents the typical appearance of your patient.

Second, you may need to critically align pre- and posttreatment photographs. For many procedures, the visual improvement can be lost if there is a mismatch in positioning of the before and after pictures. This is particularly important for those treatments in which the change to physical appearance is subtle. Positioning tools and other techniques for ensuring repeatability are discussed further on.

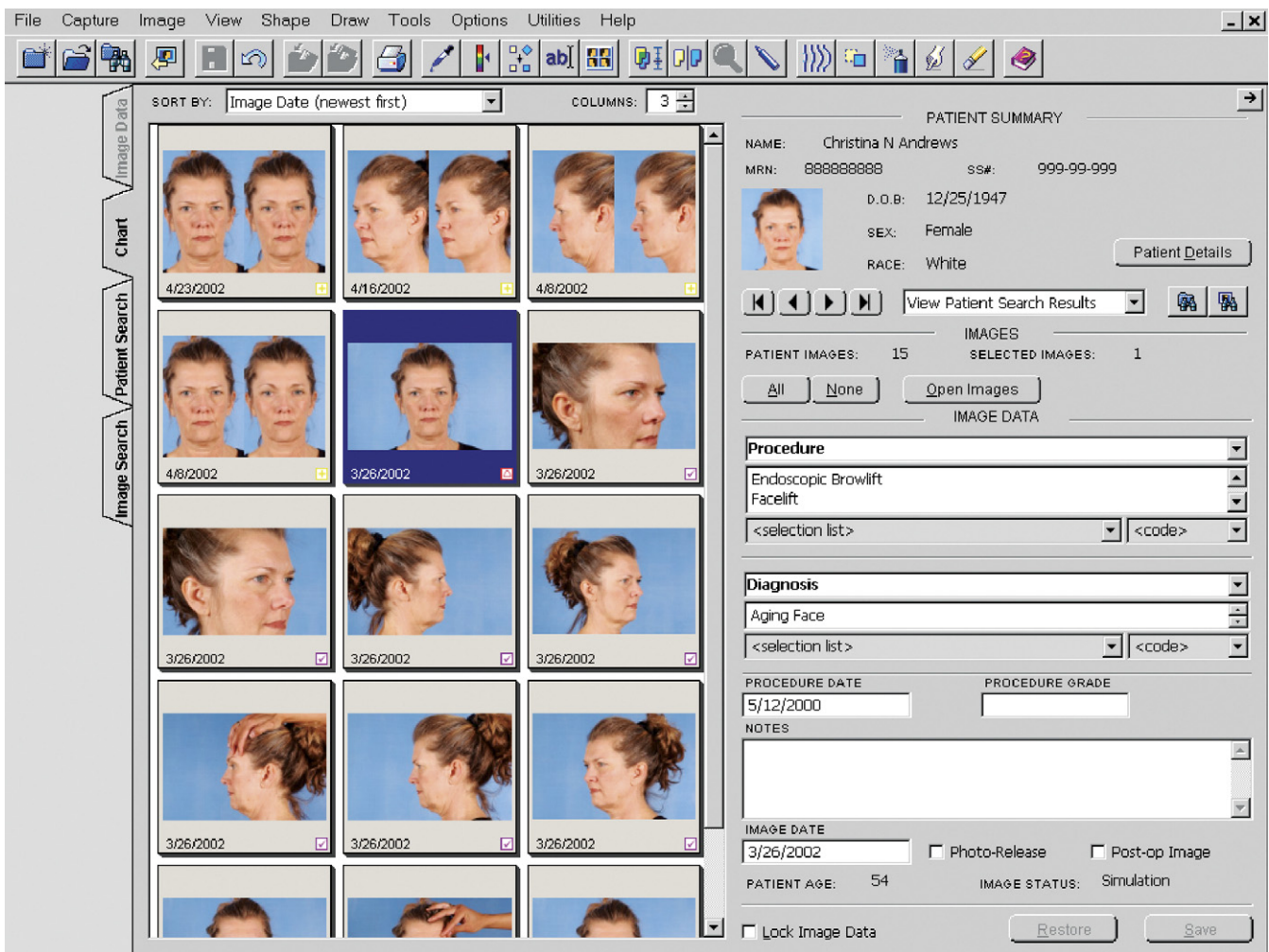
Although not strictly a positioning issue, you also need to be mindful of the background that will appear in your photographs. The short answer is that it must be plain and simple. Distracting backgrounds not only look bad but they can have a negative effect on the clarity of your clinical image. One of the best backgrounds to use is a medium-blue felt material, as this provides a pleasing contrast with skin tones and resists wrinkling. Other excellent choices would be rolled paper background systems, available from photographic supply shops, or to cover a wall with flat medium blue paint.

## Medical Imaging Software

Most digital cameras are shipped with software that allows the user to transfer photos from the camera to a computer, organize them on a hard drive and usually adjust, modify, and print pictures as desired. The better applications are very intuitive and provide an easy experience for users without a high level of digital photography or computer expertise. However, for the medical practice, they are not likely to provide the best solution. For this environment, special-purpose



**Figure 7** Cross-polarized lighting allows clear visualization of subsurface vasculature.



**Figure 8** Medical imaging software combines a searchable database with image management tools.

software is available that is optimized for the medical practice workflow. Most importantly, the software should enable network data sharing, as well as Health Level 7 (HL7) integration with practice management/electronic medical records software in a The Health Insurance Portability and Accountability Act compliant environment.<sup>3</sup>

Beyond maintaining your image archive, it could be useful to have a software application that allows you to tether the camera to the computer. With this arrangement, you can use the computer to control the camera and capture images directly into the patient's chart. A useful feature to look for here is the ability to superimpose live preview from the camera over a patient photograph from a previous session. This "live image overlay" is invaluable in matching subject positioning for before and after pictures.

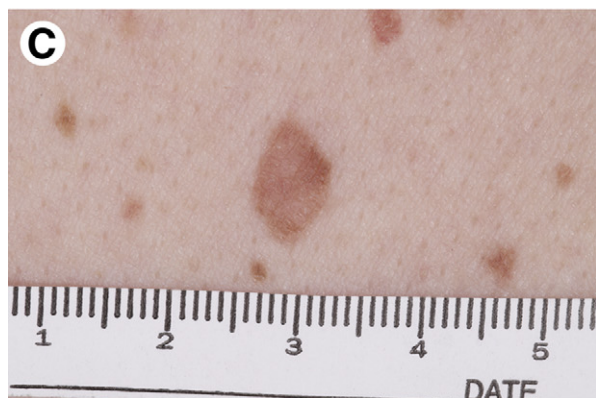
Other features to look for in medical imaging software include presentation tools, pan and zoom controls for close examination of clinical features, and printing templates. The ability to position 2 pictures side by side, or to overlay them, is particularly useful for comparing before and after image captures. Along with measurement and annotation tools, this will be useful in consultations, or if you plan on creating professional publications. Of course, be sure to obtain suitable photographic consent forms from patients for any such use (Fig. 8).

## Photographic Techniques for the Medical Practice

The 2 attributes most important to good clinical photography are clarity and consistency. Clarity requires that the feature of interest is distinctly and correctly represented in the photography. It results from adherence to the photographic principles of focus, exposure, lighting and framing, and assures that the viewer's attention is drawn to the area of clinical interest. Consistency, or repeatability, means that in any series of photographs, there are no variations introduced by the photographic process itself. This assures that any differences observed between photographs at different time points, or among different patients, truly represent differences in the subject or procedural outcomes.

Regrettably, even a casual survey of work published in professional journals will show that these principles are frequently overlooked. This is particularly unfortunate in that most clinical photographers have available everything necessary to produce a far superior result. It really comes down to being mindful of a few critical factors.





**Figure 9** (A-C) Multiple views at varying distances clearly show the location of a lesion on the patient's body.

## Patient Preparation

The extent of patient preparation necessary will depend on the area of interest for your photography. As a rule, you want to eliminate the influences of clothing, jewelry, makeup, and hair style. By eliminating distracting elements in the photograph, the viewer's attention can be focused on the clinical presentation itself. Besides being a distraction, some external elements can have a negative influence on the photograph. Brightly colored clothing can impart a color cast to adjacent skin, and any extraneous element can cast shadows or influence subject positioning.

For facial photography, makeup will certainly degrade the photographic record. Washing the subject's face before photography has the added benefit of reducing the shininess caused by oily skin. This assures accurate documentation of the skin condition. Keep in mind that a temporary erythema caused by the cleansing process itself can influence the skin's appearance. Because of this, it's good practice to wait a few minutes before taking the photograph. To prevent a patient's hair from obscuring part of the face, use a black headband to keep it pulled back and out of the way. Males should be clean-shaven whenever possible. In facial photography, it's important that the patient maintain a neutral relaxed expression, particularly if there is the need to monitor the progression of a treatment over time.

For most types of body photography, it may be desirable for the patients to remove their clothing or cover it with a neutral drape or surgical gown. In any event, do not allow the clothing to appear in the photograph, particularly if your procedures will require follow-up photo sessions. For full- or half-body photography, you can make the patient more comfortable by providing disposable modesty garments.

## Composition and Distance

The best way to avoid unwanted elements in your photographs is to keep them entirely out of the picture in the first place. Careful framing, creative draping, and the use of a solid-color background are easy ways to improve any clinical photograph. Moving the camera close to the area of interest provides several obvious benefits. It effectively isolates the area from its surroundings while providing a more detailed picture.

Experienced clinical photographers typically work at a limited number of camera-to-subject distances. Each of these distances has associated with it a specific subject framing, camera setting, and lighting configuration. This assures that the photographic results of serial photography will be the same. The range of these distances is dictated by the type of condition that is being documented. It is increasingly common to use a zoom lens, with a single camera-to-subject distance for all views. In this case, achieving repeatable magnification in the mid range of the zoom can be challenging. A good solution is to select a 3× or 5× zoom lens that can be used at the extreme ends of the zoom range.

There are several easy and reliable methods of assuring consistent camera-to-subject distance. Index marks on the floor, typically made with adhesive tape, are useful when the space is dedicated to photography. Some purpose-built sys-

tems use ranging lights, which converge to a point on the subject at a predetermined distance. This is particularly useful in that it provides a clear visual indicator of the correct distance and offers a reliable distance standard in situations where the shooting location is not permanent.

It is also possible to index the lens-focusing ring of an SLR camera at various points that correspond to the desired distances. When photographing a subject, the focus ring is set to the desired index point, and the camera is moved forward and back until the subject is sharply focused in the viewfinder. This technique, known as “body focusing” would not be normally used in conventional photography, but provides a simple method of achieving repeatable results in a clinical environment.

Because photographs of an individual lesion or small rash are always taken close-up, it will be useful to take additional views to establish the location and configuration of the affected area. Where there are multiple lesions, a medium view should be used to document any spatial relationships, such as linearity or annularity. In any case, a longer view is always useful to show the actual location on the patient’s body. This view should also include corresponding but unaffected parts of the body, such as the other leg or arm<sup>4</sup> (Fig. 9A-C).

### Camera-To-Patient Registration

An important element in serial photography is repeatable patient positioning in relation to the camera. Consistent camera-to-patient registration assures that the photographs always represent exactly the same view of the subject. For critical facial or other close-up photography, special fixtures or devices are sometimes employed to lock down the camera/subject geometry.

A number of devices are available to aid in camera-to-patient registration and image capture. For small-field photography, close-up scales are available that can be attached to a variety of cameras. Because of the simplicity of these devices, high-quality imaging can be achieved by users with even modest skill levels. In addition to assuring consistent camera positioning, an indexed measurement scale is included in the image for reference (Fig. 10).

A more flexible solution, which produces excellent results as well, uses the previously noted “live image overlay” feature available in some medical imaging software. This method allows the user to very closely duplicate the positioning of almost any photographic subject. Though not as simple as a mechanical fixture, it is a reliable and cost-effective means of achieving consistent before and after photography in a wide range of clinical applications, including those in which a zoom lens is used in the middle of the range.

### Lighting

The importance of lighting in clinical photography cannot be overstated, as it largely determines how clinical features will be rendered in the photograph.<sup>5</sup> This is particularly important when there is a need to document subtle changes in form or surface texture. Light striking the skin at an angle, or obliquely, will reveal contour, creases and texture far better than direct head-on, or axial, illumina-



**Figure 10** A close-up accessory assures consistent camera position and includes a measurement scale.

tion (Fig. 11A, B). This is one reason, as noted previously, that a camera’s built-in flash unit is usually not the best choice for lighting.

Relatively small changes in lighting position can dramatically influence, for better or worse, the photographic record of a treatment. The result can be the appearance of improvement in the patient’s condition when none has occurred, or conversely, mask the results of successful treatment. Even a small change in lighting alone can dramatically alter the appearance of patient’s features (Fig. 12).

### Camera Settings

The controls on modern digital cameras can seem bewildering, even to experienced photographers. This confusion can be compounded by the cryptic assortment of symbols and icons that camera manufacturers use. Of course, for everyday picture taking, there is usually an “Auto” mode that overrides all the other controls. In many applications, this will produce entirely acceptable photographs. However, in clinical photography, the rigorous requirements of clarity and consistency require a higher level of control, and “Auto” mode is generally not the best choice. Although camera controls vary among models, the following is a guide to those that are most important to clinical quality photography.

**Exposure.** Cameras control exposure through a combination of lens aperture and shutter speed. Shutter speed is important to minimize the effect of subject movement, while aperture controls depth of field. In a clinical environment, the subject is normally stationary but depth of field is important. Therefore, set the exposure control to “Aperture Priority” or “Manual” and set a higher aperture number. This will assure maximum sharpness in your photographs.

The use of flash changes the exposure calculation, in that shutter speed becomes almost irrelevant. In this case, flash duration determines exposure time and at a few milliseconds is fast enough to freeze any subject motion. Advanced flash systems allow some control over light output, but for the



most part, it is a combination of lens aperture and flash-to-subject distance that determines exposure. SLR cameras also have through-the-lens metering systems that can control flash output based on actual subject illumination.

**Focus.** Most autofocus systems work quite well, and all other things being equal, will provide consistent results. Autofocus systems typically identify a target area in the subject and set the focus to that distance. With a PAS camera, this area is identified with an illuminated box on the camera's display. Always be sure this box covers the clinical feature you want to photograph. To assure proper focus, depress the shutter release halfway and wait for the focus confirmation before taking the picture.

**White Balance.** Digital cameras achieve natural-looking color rendition by adjusting to the external light source illuminating the subject. This adjustment, called "White Balance," can be set automatically or by selecting from a menu of lighting options (eg, Flash, Sunlight, Fluorescent, Incandescent). Most cameras also provide the ability to lock in a custom, or preset, white balance that matches your shooting environment. This option assures the greatest color accuracy and consistency over time, and it is well worth the one-time effort of setting it up in your camera.

**Resolution.** Resolution is the number of pixels that a camera uses to create the image. Usually, this is controlled



**Figure 12** A small change in lighting can result in the appearance of clinical improvement.

by a "Quality" or "Image size" setting on the camera. To use the full resolution of a camera, be sure this is set to the highest quality or largest image size available. This will assure the greatest possible detail in your photographs. If you need to resize or alter a photograph later on, be sure to keep your original image file and save the modified image under a different file name.

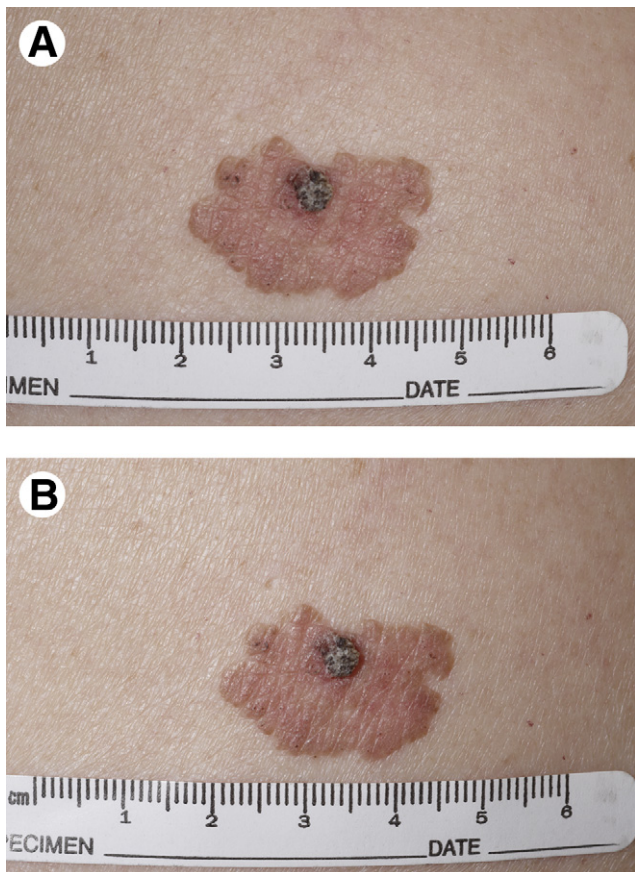
## Conclusions

Because the outcomes of dermatology treatments typically result in a visible change to the patient's appearance, photography is a natural adjunct to these procedures. For almost any procedure, you will want pictures before the treatment to establish a baseline, during the treatment to monitor progress and at completion to document the results. Over time, these photographs will comprise a valuable professional resource.

Good-quality clinical photographs will form an important part of your patient records, enable clear evidence-based communications, and provide valuable support for your practice. To achieve this, you need only apply the few basic considerations discussed in this chapter. Being mindful of these, and with some basic equipment, any practice can produce consistently high-quality medical photographs.

## References

1. Halpern AC: The use of whole body photography in a pigmented lesion clinic. *Dermatol Surg* 26:1175-1180, 2000
2. Oliveria SA, Satagopan JM, Geller AC, et al: Study of Nevi in Children (SONIC): Baseline findings and predictors of nevus count. *Am J Epidemiol* 169:41-53, 2009
3. Rigel DS, Robinson JK, Ross MI, et al: Cancer of the Skin, in Kirkwood JM (editor) 2nd ed. England, UK, Elsevier Health Sciences, 2011, pp 657-661
4. Pak HS: Basic Guide to Dermatologic Photography. Walter Reed Army Medical Center, 1999
5. DiBernardo B, Pozner J, Codner MA: Techniques in Aesthetic Plastic Surgery Series: Lasers and Non-Surgical Rejuvenation. England, UK, Elsevier Health Sciences, 2009, pp 155-165



**Figure 11** Oblique lighting on this seborrheic keratosis (B) reveals skin markings and focal crusting not visible with axial illumination (A).