Standardized Medical Photographic Imaging of Patients: A Proposed Guideline

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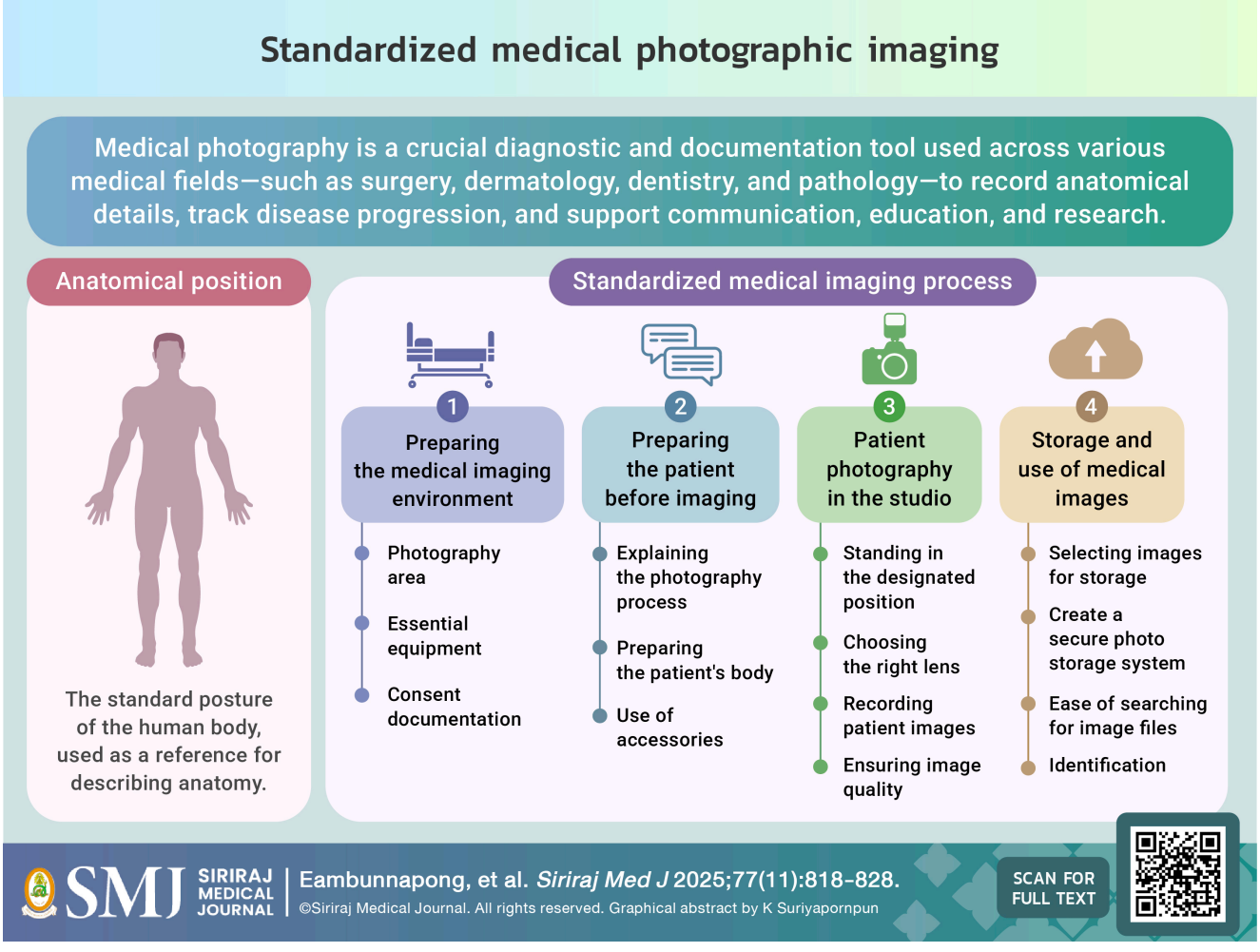

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ABSTRACT

Medical photographic imaging plays an essential role in the diagnosis, treatment planning, and follow-up care of patients. Medical photographic imaging also plays a vital role in supporting academic/instructional and research documentation and materials. Therefore, to ensure high-quality, reliable, and consistent medical photographic imaging, standardized guidelines for photographing medical patients are needed. Based on a synthesis of relevant published documents, we hypothesized that medical photographic imaging standards can be divided into the following three key domains: 1) characteristics of; 2) essential elements of; and, 3) standardized process of producing good medical photographic imaging. Establishing and consolidating these standards into a medical photographic imaging guideline for medical clinicians, researchers, and educators will improve the usefulness and consistency of photographic communication of medical patient information. Accordingly, the aim of this study was to establish a medical photographic imaging guideline for use by any subset involved in human patient healthcare, including clinicians, medical imaging specialists, researchers, teachers/students, human healthcare manufacturers/publishers, and government health policy organizations. Moreover, acceptance and establishment of the proposed medical photographic imaging guideline will facilitate and promote improved communication of medical information internationally, making comparisons of treatment and research outcomes more accurate, consistent, and systematic. The proposed medical photographic imaging guideline represents an important advancement in medical knowledge, including how medical photographic imaging is learned, used, and communicated in clinical practice.

Keywords: Standardized medical photographic imaging; medical patients; proposed guideline (Siriraj Med J 2025; 77: 818-828)

INTRODUCTION

Photography is characterized as the art and science of capturing light to create an image that captures the essence of a moment using both technical tools and the creative expression of the photographer.[1] Photography originated in ancient times, but was first used in medicine in 1852.[1,2] With the advancement of imaging technology, photography has become an essential diagnostic tool for medical doctors across various specialties and subspecialties.[1,3-12] In addition, medical photography is being increasingly applied in medical education.[5,7,9-11,13,14] Medical photographs, whether taken in a medical or accident/crime setting, capture specific patient characteristics that have helped to shape clinical standards of practice.[15] Medical photographs also help to document a patient's journey from admission to recovery.[10,11,16] However, a significant challenge is the limited availability of professional medical photographers.[17] It is, therefore, necessary to provide healthcare personnel with knowledge/training in standard medical photographic imaging techniques so they can produce higher quality medical photographic images, which, as shown by related research, yield significant benefits for both medical personnel and patients.

Medical photographic imaging

Medical photography is an important diagnostic tool that provides detailed anatomical information for physicians to perceive and analyze.[1,3-5,7,9,11,15,17-20] It is widely applied across various fields for documenting anatomical abnormalities and tracking disease progression. Examples include dentistry.[4,8] plastic and cosmetic surgery[2,5,18,21-23], plastic surgery[1,2,11,15,24-27], veterinary medicine[8], dermatology for skin lesions[2,3,6,8,10,16,24,28-33], emergency care such as open fractures[17], forensic medicine[11,13], anatomy, pathology, osteopathology[2,7,24] and in patients with cleft lip and palate.[18] Medical photography also enhances communication between doctors[1,15,17,24,34], serves as a valuable tool in medical education[7,17-20,34], and plays an important role in academic presentations and publications.[5]

Characteristics of good medical photographic imaging

The essential characteristics of high-quality medical photography include: 1. Clarity & Resolution: Images must be sharp and detailed to minimize misinterpretation[1,3,15,17,21,35]; 2. Correct Scale & Magnification: Standardized magnification allows accurate comparisons before and after treatment, ensuring consistency across cases[15,21,32]; 3. Consistency & Reproducibility: The camera must always be held at the same distance from the object to facilitate comparison of data or results[5,15,21,29,35]; 4. Proper Lighting & Exposure: Uniform and appropriate lighting must be maintained[5,21,29,32,35]; 5. Correct Positioning & Framing: Patients and anatomical structures should be consistently positioned[21,32,35]; 6. Minimizing Artifacts: Non-medical elements must be excluded.[5,15,36] This includes covering the patient's eyes with black bars to conceal their identity[7,33] and avoiding

jewelry, glasses, cosmetics, clothes, accessories, or unkempt hair[5,18,35]; and 7. Compliance with International Standards: Medical photography must be done after obtaining written informed consent.[1,5-7,9,11,23,24,29,35-37] (Fig 1)

Important elements in medical photographic imaging

The key components of medical photography include: 1. Medical photographer[4,11,18,35], 2. Imaging environment[11,18,21,22,28,35,38], 3. Equipment for image recording[4,5,7,8,10,11,17,18,21,22,24,26-29,31,33,35,38] 4. Standardized angles and image techniques[2,11,15,18,21,25,28,35,38,39] 5. Standardized lighting[4,5,10,11,13, 15,21,22,26-28,35], 6. Patient preparation and positioning[4,11,21,28,35], 7. Software[6,8,10,11,24,29,31,33,38], 8. Imaging phase[11,13,18], 9. Stance[18,27,35], 10. Background[2,10,11,18,19,25,26,28,35,38], 11. Accessories[4,11,28,35], 12. Patient Consent[1,5-7,11,19,23,24,28-30,32-37,39], and 13. Dissemination of medical photographs[6,10,19,23] (Fig 2).

Medical photographer

In many countries, medical photographs are taken by professionals skilled in positioning patients with various medical conditions to capture the most accurate images. The characteristics of good medical photography therefore depends largely on the skill of the photographer.[11,17] Anonymous photographs must be taken without compromising image quality.[1] Key characteristics of a good medical photographer include: 1. Medical Knowledge: A basic understanding of human anatomy, medical photography perspectives, medical terminology, and image documentation to communicate the meaning correctly; 2. Specialized Photography Skills: Proficiency in controlling light, shadow and composition, and the ability to produce images suitable for clinical analysis; 3. Technological Proficiency: Skilled use of cameras, accessories, image-editing software, and database management systems. Training in proper patient imaging and secure data storage is essential; 4. Ethics: Ability to respect patient privacy and maintain confidentiality, ensuring that images are not altered in ways that misrepresent medical information. In some sensitive medical conditions requiring patients to remove clothing, their privacy must be respected and concerns acknowledged; 5. Communication Skills: Effective collaboration with physicians, nurses, researchers, and patients, translating medical needs into clear and easy-to-understand images; 6. Creativity: Ability to compose and present images in a visually effective and meaningful way; and 7. Time Management: Capacity to work under tight timelines and plan photoshoots both in the studio and at various hospitals.[1,8,11,17] Since technology evolves rapidly, medical photographers must be able to continually update their skills and knowledge.

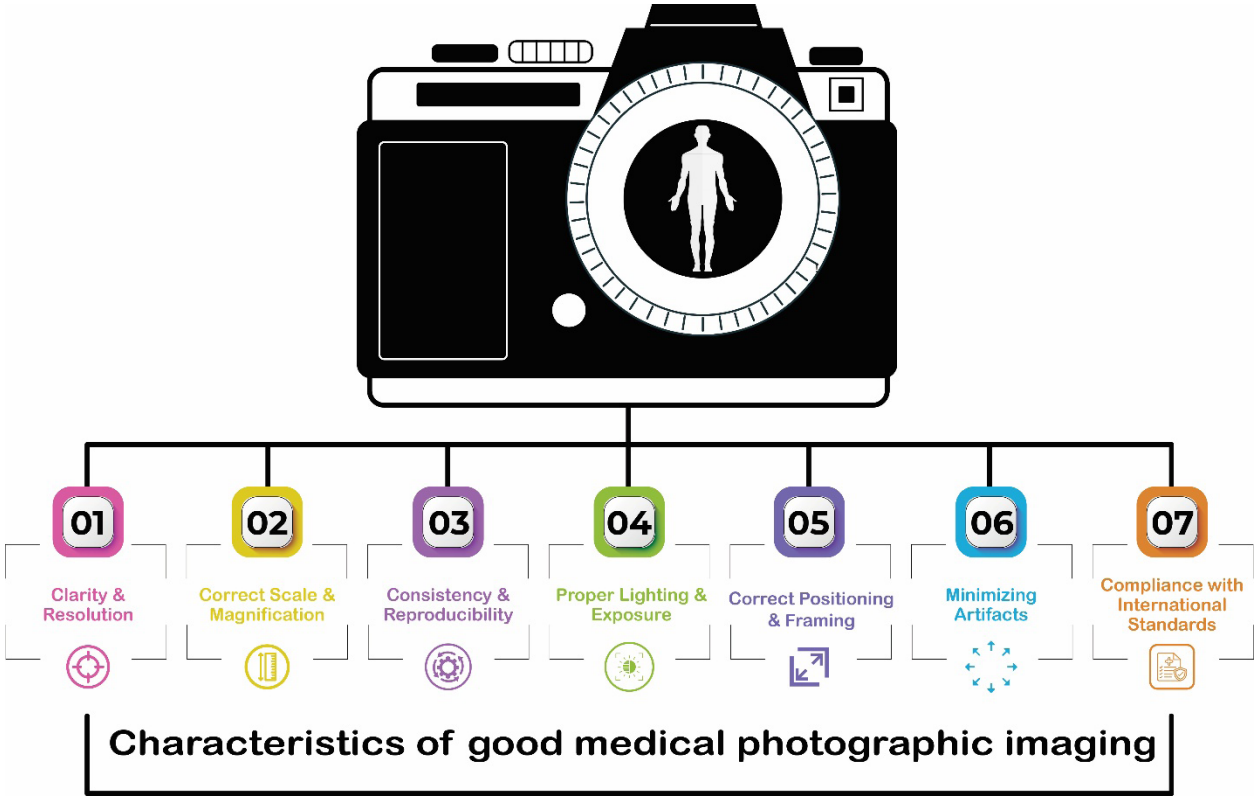

Fig 1. Characteristics of good medical photographic imaging.

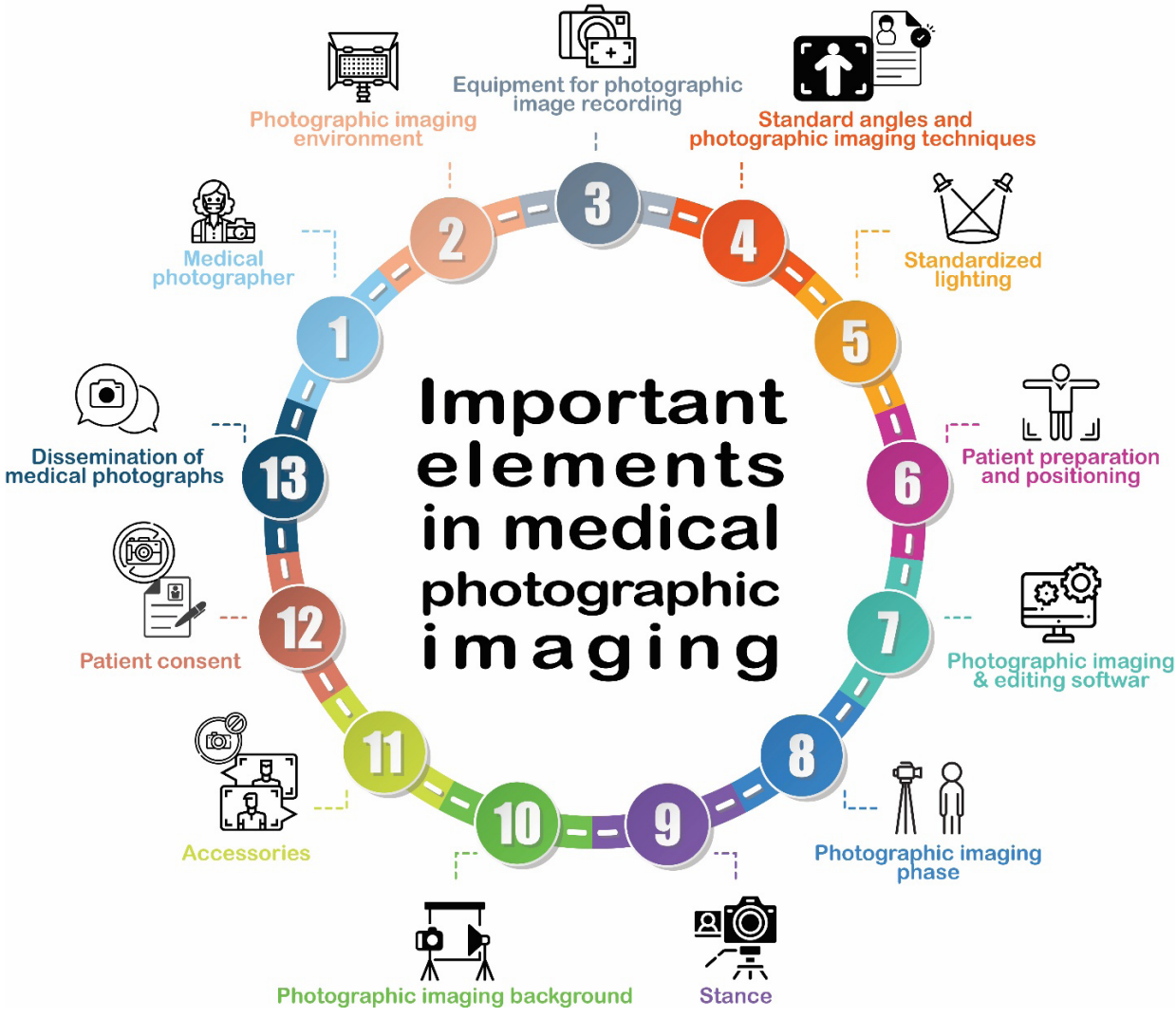

Fig 2. Important elements in medical photographic imaging.

Photographic imaging environment

Medical photography should be conducted in a dedicated, quiet area that ensures privacy and comfort, so that the angle and direction of photographs can be adjusted.[18,26] Ideally, the area should be divided into three sections: Image Display Area: For immediate access and reviews; Dressing Room: To provide patient comfort and privacy; and Photography Studio: A sufficiently large space equipped with controlled studio lighting.[11] Having a fixed location for medical photography with the same background helps maintain image consistency.[2,21,32] If windows are present, curtains should be drawn to block external light.[11] Establishing a permanent and well-equipped photography environment enhances is therefore an important part of achieving high-quality results and minimizing required time to achieve acceptable results.

Equipment for photographic image recording

The equipment used to record medical images must be reliable since there is only one opportunity to record a lesion. When patients undergo intraoperative procedures, images cannot be retaken because lesions will change, making pre-treatment and intraoperative images critical for documenting progression and treatment outcomes.[8,10,13] Equipment selection should emphasize ease of use.[40] Based on a review of relevant literature, the equipment used for recording medical images includes the following:

Camera

Digital single-lens reflex cameras are the most widely used by professional photographers in medical imaging due to their ability to review, store, upload, or delete images as they are taken.[4,9-11,13,18,22,26, 27,32,35,40] Cameras equipped with overhead flash reduce glare and reflection.[28] A good understanding of lens aperture and shutter speed is necessary to adjust image quality and troubleshoot errors when something goes wrong.[21] Image quality depends on the quality of the camera device.[17] Essential features of medical cameras include the ability to

change lenses and adjust settings that control aperture size and shutter speed, through-the-lens focusing, metering system, exposure settings, and compatibility with external flashes.[13,32] The amount of detail a camera can capture is called its resolution and measured in pixels. Most modern digital cameras feature higher resolutions and allow for large, detailed images without loss of clarity.[28] In wound photography, high-resolution cameras provide precise visualization of wound margins and enable enlargement while maintaining clarity.[40]

Lens

The lens is one of the most important components of medical photography equipment.[8,9,11,18,27] A high-resolution lens with an appropriate focal length for the area being photographed is essential. A high depth of field is recommended to ensure that the entire area of interest, or larger anatomical structures, remain in focus. Variable focal length (zoom) lenses should be avoided, as they make it difficult to standardize clinical photography.[11,13] Lens selection is therefore critical in clinical documentation.[8,9,11,22,26] The focal length should always match the clinical application and the size of the area being photographed.[11] For consistency and accurate comparison, it is important to use the same lens when capturing the same view.

Memory card

All digital cameras store images on memory cards, which are available in various types. The specific type of memory card is less important than ensuring sufficient storage capacity and keeping multiple spare cards available.[8]

Battery

At least one or two fully charged rechargeable battery packs should always be available along with a reliable charger.[8]

Tripod

A tripod is a valuable accessory in medical photography.[8,28] It allows precise control of camera angles[2,22,35], reduces image blur when photographing without flash[28,35], and helps maintain consistency in serial image documentation, such as pre- and post-surgical comparisons.[22,35] With the growing use of mobile phones in medical photography, additional accessories such as memory cards, batteries, and tripods, are also recommended to ensure image quality and consistency.

Standardized angles and photographic imaging techniques

Accurate patient positioning is essential for clear comparison between preoperative and postoperative images.[18] Anatomical landmarks should be aligned in standardized positions to record patient symptoms in a reproducible manner.[2,5,15,21] Six standard views are commonly used in medical imaging (Fig 3): 1) frontal and posterior views, 2) right and left oblique views, and 3) right and left side angles.[9,26] These standardized views must be applied consistently before and after surgery. Postoperative photographs are typically taken about one year following surgery once healing has occurred and lesions have diminished. Maintaining the same preoperative standards is essential to achieve the best possible results.

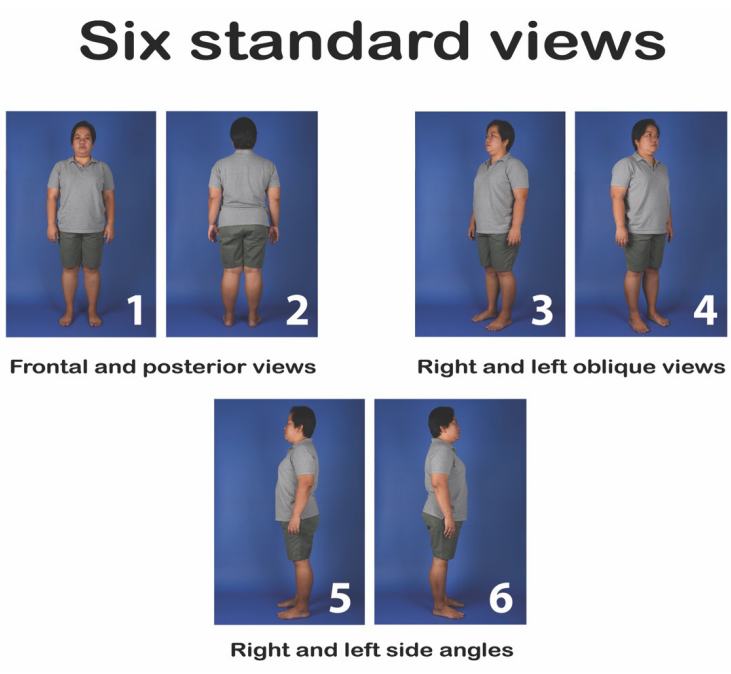

Fig 3. Six standard views are commonly used in medical imaging.

Standard lighting

Natural light is unsuitable for medical photography because it varies by time of day and weather conditions. Instead, controlled artificial lighting should be used.[9-11] The aim is to capture clinical symptoms, not cosmetic images, so accessories such as taillights or reflectors are unnecessary.[18,28] Therefore, standardized lighting is essential to minimize shadows, provide adequate depth of field[9,11,13,35], and ensure consistent image quality.[5,9,11,21,35] The light source should never be placed behind the subject.[28] For portraits, illumination from the same direction allows reliable comparison of features, expressions, and treatment outcomes.[5,9,15,35] The recommended setup involves two electronic light sources positioned 1 to 1.5 meters from the patient at 45-degree angles. Once established, lighting should not be altered, as changes lead to inconsistencies in image quality.

Patient preparation and positioning

Informed consent must be obtained before any formal photography, particularly if the images will be published or displayed. The purpose of the photograph must be clearly explained to the patient.[5,9,11,18,32] Patients should remove all distracting elements, such as visible rings, watches, and bracelets, when arms or legs are photographed.[2,5,21,22] Female patients with long hair should tie it back so the face, forehead and both ears are visible, using accessories such as headbands, clips, or elastic hair bands.[5,9,11,32] Glasses, visible earrings, and nose bridges should be avoided. Simple makeup is acceptable, but lipstick and foundation on the nose or lips should be avoided, as they may conceal scars or relevant features.[5,11,18,30] In dermatology, makeup should be avoided altogether to reveal skin irregularities and blemishes that inform diagnosis and treatment.[9,11,22,32] When photographing the scalp, excess oil may cause glare, so the hair should be wiped with tissue to reduce shine before imaging.[28] Proper patient positioning is crucial for standardization across different views, though it is often difficult to control and a common cause of non-standardized images.[9]

Photographic imaging & editing software

Image editing software is an important tool in medical photography, as it enhances image quality to support clarity and allows for more precise medical analysis. The key aspects are as follows:

Image editing

When photographing patients, if the face is visible, black bars should be placed over the eyes. Tattoos, birthmarks, and other unique features that may reveal a patient's identity should be avoided or edited out.[8,30,33] The face is the most identifiable anatomical feature; scars, melanocytic nevi, other birthmarks, and tattoos may still allow recognition by acquaintances. Image editing helps preserve patient privacy, and identifiable features should be removed as necessary.[6,37] Automatic camera corrections, such as red-eye removal, blemish correction, or cosmetic filters, may obscure clinical findings and must be disabled in medical photography.[10]

Image file format

With the increased use of digital cameras, image file sizes have grown dramatically.[8,10] Each file format has different properties relevant to accuracy and usage: JPEG (Joint Photographic Experts Group): Small file size, suitable for web use and sharing on social media, TIF (Tagged Image File Format): Large file size, high quality, suitable for professional printing, and RAW: Unprocessed files from which brightness, white balance, and sharpness can be adjusted later without loss of quality.[10] The choice of format depends on the medical photographer's expertise and the institution's imaging system.

Access to image data

Storage of patient images must comply with strict security standards to prevent unauthorized access.[1,29,35] Each image should contain information such as patient name, date of photography, patient status, and clinical status (preoperative, intraoperative, or postoperative). For follow-up, postoperative photographs should be taken during routine visits to ensure consistency comparability.[11,35,40]

Storage area

Adequate and secure storage is essential for data retrieval and security.[11,26,29,40] Identifiable tattoos or body art should be separated from clinical records whenever possible.[11,26] Proper storage allows longitudinal tracking of wound healing and disease progression.[17,40] File format guidelines are as follows: For hospital archival, original images should be stored in TIFF or RAW, while JPEG copies may be generated for general use, such as for sending images to doctors.

Photographic imaging phase

A constant distance between the camera and the patient is critical. Images of the same anatomical region should always be captured from the same distance.[11,13,18] Pre-set distances provide consistency which improves readability. Patients should be positioned at least one foot away from the background as an appropriate distance

between the object and background reduces shadows.[9,11,32] Pre- and postoperative images must be taken from equal distances; otherwise, lesions may be missed or inconsistencies introduced.[11,21] If excessive background shadow occurs, increasing the distance slightly beyond 1 foot or more usually resolves it. This principle applies to both full-body and partial body photography.

Stance

Consistent patient positioning is one of the one of the most challenging but essential aspects of clinical photography and requires consistent practice.[18,21] Specific body parts should be framed to emphasize anonymity.[15] Precise patient positioning is essential for professional photographs.[11] Standard positioning is important because it facilitates recognition of abnormal conditions, and annotating the patient's position t on the image can aid in future reference.[10]

Photographic imaging background

The purpose of the background is to isolate the subject.[9,11,13] The ideal background for medical photography is smooth, non-reflective, and sky-blue, which complements skin tones and is easy on the eyes.[2,9,11,13,18,22,25,26,32,35,38] When printed in grayscale, blue appears as neutral gray, preserving detail.[11,35] It also allows for greater depth of field and adjusts shadows without overexposing objects.[9,11] The background color should also be consistent with appropriate contrast.[2,11,26,28] Also, patient clothing and background should remain consistent across sessions.[11,21] In addition to the background, the walls and ceiling should be off-white.[11] Once chosen, background color should not be altered.

Accessories

Useful accessories include measuring tapes and a marker.[28] Additional positioning aids may be employed to help patients maintain consistent posture across multiple views.[35]

Patient consent

The consent process should always be clearly authorized and agreed upon by the patient. Patient privacy and dignity must be never be violated, and patients retain the right to withdraw consent at any time.[1,7,9,11,19,23,24,28,30,32-36,39] Written consent should be obtained prior to any photography, as this provides legal and ethical protection for health professionals and researchers.[6,7,9,11,19,23,28-30,35,39] Compliance with data protection laws and privacy regulations is essential to ensure that healthcare data are collected, stored, and used securely and lawfully.[17] Images may include a hospital card, tag or patient number to facilitate later identification.[28] Personal information in electronic form must be safeguarded by appropriate security measures to prevent unauthorized access. Respect for human autonomy and privacy is a fundamental principle of medical ethics.[1,30,36,39,41] Patients must be informed that photographs are a tool for treatment planning. If photographs are used for educational, academic, exhibition, or publication purposes, additional statements regarding patient confidentiality are required.[6,7,9,35] If photographs are to be used for non-medical purposes, such as marketing, a separate consent form describing the intended use must be provided.[11,35] Patient consent should clearly specify the purpose of the photographs, and patients should have the option to decide how their images may be used.

Dissemination of medical photographs

The dissemination of medical photographs across platforms including print, websites, personal devices, television, and social media must always protect patient privacy and rights. Written informed consent remains the practice.[23,28-30] Consent forms must explicitly address issues related to patient identity, as public disclosure requires particular care.[23] Therefore, protecting patient data is of utmost importance.[17] The increasing availability of the internet and digital publishing has contributed to an increase in the number of photographs in circulation, underscoring the need for careful ethical consideration in the dissemination of medical photographs.[19]

Standardized medical imaging process

The creation of standardized medical photographs requires adherence to strict tools, technologies, and protocols to ensure high-quality images. The process can be divided into four main steps. (Fig 4)

1. Preparing the medical imaging environment

The imaging environment consists of:

1.1 Photography area – The area should be large enough to accommodate all photographic equipment. If patients must undress, a fully enclosed dressing room should be available. A display area should also be provided so patients can review their images.

1.2 Essential equipment – Includes camera, lens, memory card, battery, studio light, backdrop and tripod, all of which should be prepared in advance.

1.3 Consent documentation – Patients must sign informed consent forms to protect their rights and privacy. Establishing a permanent medical photography environment reduces workflow time and improves

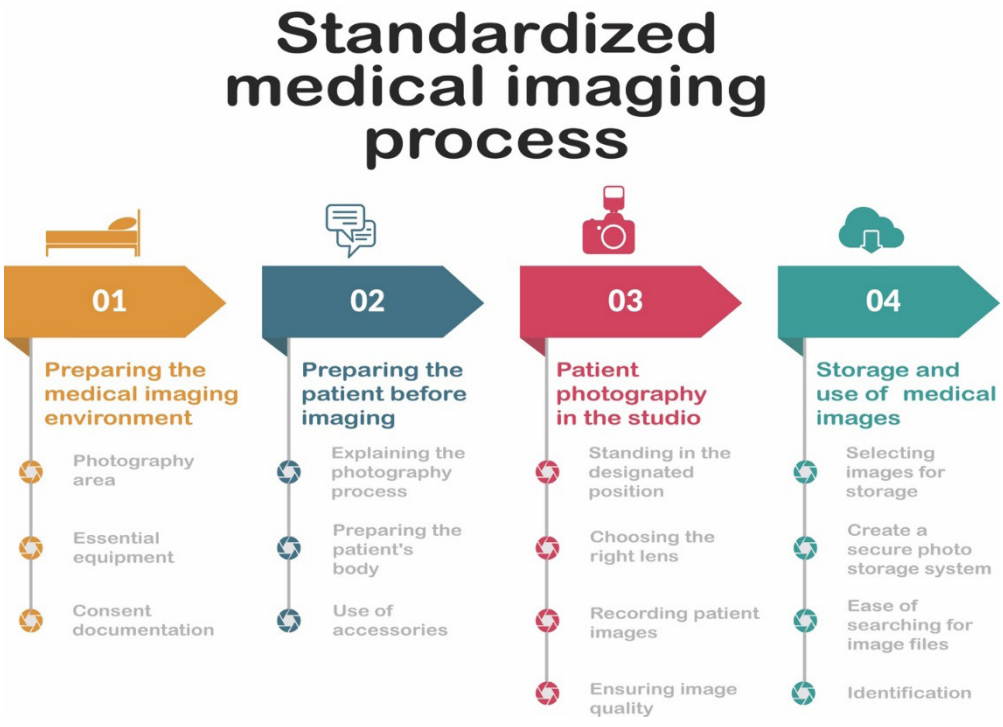

Fig 4. Standardized medical imaging process.

consistency. Importantly, patients retain the right to withdraw consent at any time.

2. Preparing the patient before imaging

Patient preparation is a critical step before beginning any imaging procedure. The preparation process includes the following steps:

2.1 Explaining the photography process: Medical photographers should carefully review and understand the doctor's request for photography r to ensure accuracy. If the patient agrees to being photographed, they must sign a consent form to protect their rights and privacy before any imaging begins.

2.2 Preparing the patient's body: Preparation varies depending on the type of disease being documented. Some procedures may require the patient to remove certain clothing items or all clothing. The photographers should clearly explain the purpose of the images, demonstrate the required poses and angles, and assess the patient's readiness beforehand. Careful planning is essential, as clinical images are cannot be taken again.

2.3 Use of accessories: Preparation for female patients often takes longer than male patients. For example, distracting jewelry must be removed, and long hair should be adjusted if it obscures the neck or ears, particularly when photographing the face. Photographers must always keep extra equipment available. After the session, the medical photographer should review the images to ensure they meet professional standards.

3. Patient photography in the studio

For every patient photoshoot conducted in a studio, a relative or an assistant photographer should remain nearby to help prevent accidents. If the patient experiences any adverse symptoms, assistance can be provided immediately assisted. The patient photoshoot process is as follows:

3.1 Standing in the designated position: The patient should be positioned exactly as instructed by the photographer. All necessary equipment must be prepared in advance. For example, a seated photo may be taken first, followed by a standing full-length image. Any repositioning, such as moving a chair to take a full-length standing photo, should be handled by the photographer's assistant. A tripod is essential to maintain consistent positioning and to reproduce image accurately. Standardized anatomical positioning must be followed: the patient should stand upright with the head and eyes facing forward, arms resting close to the body with palms facing forward, and feet slightly apart to distribute body weight evenly.

3.2 Choosing the right lens: The same lens type should be used across different angles to maintain consistency in distance and perspective. This ensures comparability of images when monitoring disease progression.

3.3 Recording patient images: Clinical photoshoots are not intended just for aesthetics; their primary purpose is to document conditions clearly and realistically. Lighting must remain consistent in direction and intensity. Patient

positioning should follow the doctor's instructions and safety must always be the main concern.

3.4 Ensuring image quality: Image quality depends heavily on the skill on the medical photographer's skill. Clinical photographs must be realistic, not distorted, and show signs of disease, such as skin color, shallow or deep wounds. Most importantly, the images must be sharp to help doctors make accurate diagnoses.

4. Storage and use of medical images

After recording, images should be carefully selected and stored in a secure, standardized, and easily accessible system. When editing is necessary, identifying features should be removed as necessary. Each photo should include key information such as the patient's name, doctor's name, date of imaging, and patient status before, during, or after surgery. For patients requiring follow-up, postoperative photographs should be taken in coordination with scheduled visits to ensure consistency and comparability. Access to medical photographs must be restricted to physicians or authorized personnel only. Properly organized and secure image storage not only safeguards patient data but also enhances efficiency in patient care and reduces risk of data loss.

CONCLUSION

Medical imaging plays a vital role in diagnosis, treatment planning, treatment follow-up, and in academic or research papers. To achieve high-quality accurate, and reliable images, clear and standardized guidelines are essential. From the synthesis of related documents, standardized medical photography can be summarized into three key components: 1. Characteristics of high-quality medical imaging: This includes clarity and resolution, correct scale and magnification, consistency and reproducibility, proper lighting and exposure, accurate positioning and framing, minimization of artifacts, and compliance with medical guidelines. 2. Essential elements of medical photography: These encompass the role of trained medical photographers, the imaging environment, recording equipment, standardized angles and techniques, standardized lighting, patient preparation and positioning, supporting software, imaging phases and stance, background, use of accessories, patient consent, and appropriate dissemination of images. 3. Standardized Medical Imaging Process: This involves preparing the imaging environment, preparing the patient before imaging, following a structured studio photography process, and ensuring secure and systematic storage and use of medical image files. By integrating these three elements, medical imaging can achieve the highest standards of quality. This not only enhances diagnostic accuracy and treatment effectiveness but also provides a strong foundation for developing reliable medical image databases in line with international standards in the digital age.

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Conflict of Interest

The authors declare that they have no conflicts of interest.

Registration number of clinical trial

This is an academic article with no human trials.

Author Contributions

Conceptualization and methodology, K.E, W.S., and P.N. ; Investigation, K.E, W.S., and P.N. ; Formal analysis, K.E, W.S., and P.N. ; Visualization and writing – original draft, K.E, W.S., and P.N. ; Writing – review and editing, K.E, W.S., and P.N. ; Supervision, K.E, W.S., and P.N. All authors have read and agreed to the final version of the manuscript.

Use of Artificial Intelligence

The authors declare no use of artificial intelligence.

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