TECHNICAL REQUIREMENTS FOR FIGURES

For the best reproduction quality, follow the technical requirements outlined below for figures in submitted and accepted manuscripts. A glossary of terms is provided at the end.

REQUIREMENTS AT SUBMISSION

For initial manuscript submissions, figures must be of sufficient digital quality for editorial assessment and peer review. Please note, however, if the manuscript is accepted, authors will be asked to provide figures that meet the Requirements at Acceptance (see below).

Acceptable Figure File Size. To reduce the time that it takes to upload files to the submission site and for reviewers to download files from the site, we recommend that the file size of figures be compressed before uploading them. This can be done by using compression software or by decreasing the resolution of individual files. Each file should be no larger than 1 MB.

Acceptable Figure File Formats. At submission, the following file formats are acceptable: AI, BMP, DOC, EMF, EPS, JPG, PDF, PPT, PSD, TIF, WMF, or XLS. Figures may be embedded at the end of the manuscript text file or loaded as separate files for submission purposes.

Figure Legends (Captions). Include a legend for each figure at the end of the manuscript (maximum length, 40 words). For photomicrographs, include the type of specimen, original magnification or a scale bar, and staining technique. For gross pathology specimens, label any rulers with unit of measure. Figures may have multiple parts and will be referred to with alphabetic designators in the legends.

Number of Figures. Refer to Categories of Articles as there may be a limit on the number of figures for the type of manuscript.

Video. Video file formats acceptable at submission are MOV, AVI, MPEG, RM, and WM, and the file size should not exceed 5 MB with a maximum dimension of 800 pixels wide and/or 600 pixels deep.

REQUIREMENTS AT ACCEPTANCE

Print reproduction of an accepted manuscript requires all figures to be submitted at a higher level of quality than figures reproduced for electronic media. Figures may be represented on a variety of materials: digital files, glossy high-resolution prints, positive or negative film, or laser prints. The minimum print reproduction standard for each method varies according to the type of figure. Follow the material standards listed for each type of figure to ensure good print reproduction (they are listed from best to poorest for each type of figure). All graphs, charts, diagrams, labels, and indicators will be edited and typeset according to *JAMA-Archives* style and standards prior to publication.

Statistical Graphs, Charts, and Simple Diagrams

Digital Files. Files created by vector programs are best for accurately plotting and maintaining data points. Although we are unable to use file formats native to statistical software applications to prepare figures for publication, many of these applications allow users to save or export files in digital vector formats that we can use. Copies of graphs, charts, and diagrams may be imported into applications such as Word or PowerPoint for the addition of labels and indicators; however, these must be accompanied by the original file used to generate the figure saved in one of the preferred vector formats (AI, EMF, EPS, PDF, WMF, or XLS) and submitted on diskette, CD, or DVD media.

Laser and Glossy Prints. Submit 2 prints of each figure. The print will be scanned and used as a template to create a digital vector file.

Photographic Images and Illustrations

Digital Files

Image Size: Minimum electronic image width of 5 in (depth is not important) at a minimum resolution of 350 ppi.

Resolution: Minimal resolution: at least 350 ppi at 5 in wide. Adequate resolution of an appropriately sized image is essential to producing an excellent image in print. Each component of a composite image must meet the minimum resolution requirement. Digital photographs and illustrations are most frequently unsuitable for print publication because of inadequate resolution. **Figure 1** shows the printed difference between 72-ppi and 350-ppi resolutions (images seen on internet sites are 72 ppi). Images created digitally (as with a digital camera or illustrations created electronically) must meet the minimum resolution requirement at the time of creation. Digital files created from prints or slides (images that were originally non-digital) may be acceptable if scanned at a resolution of 600 ppi, but generally it is better to send glossy prints or film since most desktop scanners cannot capture enough detail. Electronically increasing the resolution of an image after creation causes a breakdown of detail and will result in a poor-quality image. Labels and indicators should be added to electronic images *only* on a separate layer or by importing into applications such as Word, PowerPoint, or Illustrator; however, original image files **must** also be submitted. Digital alteration of photographic images must be clearly identified in the legend as electronically enhanced or manipulated.

Color Mode Profiles: Color is highly subjective to each viewer. Factors such as ambient lighting in the room, paper color, and monitor brand can cause images to appear to have unwanted colors. The RGB colors viewed on screen are very different from the CMYK colors needed to print. Successful remapping of color to a printable gamut requires extensive expertise in color management. **Figure 2** shows the difference between original RGB

Figure 1.

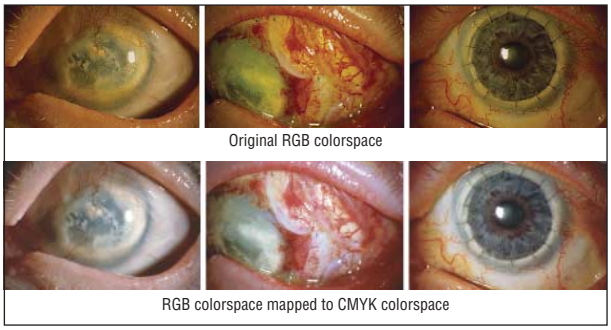

Figure 2.

color space and RGB color correctly mapped to the CMYK color space used for print reproduction. The safest way for an author to be assured that color will be clinically correct when reproduced (as in photomicrographs) is to provide the image printed on glossy photographic stock with color you have approved in addition to the digital file. If this is not possible, the image will be reproduced according to color densities mapped to printable CMYK only. Color photographs should be submitted in RGB mode using profiles such as Adobe RGB (1998), CIE RGB, or Colormatch RGB. Digital cameras capture images in RGB. Do not change any color settings once the file is on the computer (sRGB, e-sRGB, or Wide Gamut RGB color modes adversely affect reproduced colors). *Caution:* default setting of viewing software may be sRGB. Check preference settings before opening images. Black-and-white photographs such as radiographs, ultrasound images, CT [computed tomographic] scans, MRI [magnetic resonance imaging] scans, and electron micrographs can be submitted in either RGB or grayscale modes.

File Formats:

• Preferred file formats (raster files): EPS, JPG (highest quality, least compression), PSD, and TIF (no compression enabled) and submitted on CD or DVD media.

• Unacceptable file formats (not of reproducible quality): BMP, GIF, PCT, and PNG. Photographic images imported into programs such as Word or PowerPoint are not acceptable.

Glossy Prints. Submit 2 5 × 7-in glossy photographic prints of each figure (if a figure has multiple parts, glossy prints of each part). *Caution:* While most laser printers can output onto glossy photographic stock, the resolution can still be grainy and contain streaks of uneven ink coverage that does not reproduce well. It is best to use a service bureau with high-resolution output capabilities for glossy photographic prints with color you have approved. Labels and indicators should be applied to duplicate prints or photocopies.

Film. Submit positive or negative film, ranging from 35-mm size to 8 x 14-in size. Submit glossy prints as well if color reproduction is critical (as in photomicrographs). It is best to use a service bureau with high-resolution output capabilities for glossy photographic prints output with color you have approved.

Laser Prints. Laser prints are not suitable for reproduction of photographic images. Only laser prints indicating labels, indicators, and layouts for photographic images are acceptable.

Video

Provide the video file(s) in a format listed below and a still image representative of the video content to use on the associated navigational web page. Author assistance will be requested during preparation (editing; optimization) of the final video. A raw version of video content without labels and transition sequences may be requested.

• Preferred File Formats: MOV (QuickTime), MPEG. No or minimal compression.

• Video Dimension: 800 pixels wide and/or 600 pixels deep (minimum). Larger dimension is preferable.

• File Size: 200 MB (maximum).

Contact Information

For additional questions regarding figure quality, please contact Chris Meyer at (312) 464-4826 (chris.meyer@ama-assn.org).

GLOSSARY

• **AI:** Native file format of Illustrator (Adobe).

• **BMP:** Windows bitmap, the file format built into Windows and native to Microsoft Paint; supports 1- to 24-bit depth and index color.

• **Compression:** Minimizing the size in bytes of a graphics file without degrading the quality of the image. See also *lossy*, *non-lossy*, and *LZW compression*.

• **Color mode profiles:** Reference files for software programs mathematically designating colorspace values. Profiles such Adobe RGB (1998), CIE RGB, or Colormatch RGB consist of a broader spectrum of visible colors and are best for print reproduction. Profiles such as sRGB, e-sRGB, and Wide Gamut RGB have less colors defined, are used for electronic media only, and are not suitable for print reproduction.

• **CMYK:** A subtractive color model based on cyan (C), magenta (M), yellow (Y), and black (K) inks; CMYK is used for print reproduction; mixing equal amounts of cyan, magenta, yellow and black inks will produce a dark color.

• **dpi/ppi:** dpi stands for dots per inch; it refers to a measurement of output device resolution (printers, imagesetters, etc.); ppi stands for pixels per inch, it refers to units of measurement for digital images. The terms *dpi* and *ppi* are often used interchangeably.

• **EMF:** Enhanced MetaFile, 32-bit file format created by Microsoft.

• **EPS:** Encapsulated postscript, the file format created by Adobe with vector (line art data only; therefore, it can be scaled with no loss of quality) and raster (bitmap data that cannot be scaled or edited) options; EPS files normally include a low-resolution screen preview used in other programs (for faster processing speeds) then substituted with the high-resolution file at output.

• **GIF:** Graphics Interchange Format, a lossy compression algorithm, supports 1- to 8-bit depth; suitable primarily for electronic images with 256 colors or less.

• **Glossy prints:** Any image output on photographic stock at high resolution. *Caution:* While most laser printers can output onto photographic stock, the resolution can still be grainy and contain streaks of uneven ink coverage that does not reproduce well. It is best to use a service bureau with high-resolution output capabilities for glossy photographic prints.

• **Grayscale:** A continuous tone image comprising black, white, and gray data only.

• **JPG (or JPEG):** Joint Photographic Expert Group, a lossy compression algorithm that allows you to adjust the amount of loss, trading between compression and quality.

• **Lossy:** Image compression that functions by removing minor tonal and/or color variations, causing visible loss of detail at high compression ratios.

• **Non-lossy:** Image compression without loss of quality.

• **LZW compression:** Lempel-Ziv-Welch (not a file format): Non-lossy compression algorithm that allows for compression of image data without loss of quality.

• **MOV:** QuickTime video file format.
• **MPEG:** Moving Pictures Expert Group, a digital video file format.
• **PCT (or PICT):** Mac graphics file format most commonly used for bitmap images.
• **PDF:** Portable Document Format, the file format of Adobe's Acrobat specification.
• **PNG:** Portable (Public) Network Graphic file format.
• **PSD:** Photoshop (Adobe) file format.
• **Raster:** A digitized image that is mapped into a grid of pixels; therefore, the image is resolution dependent; the color of each pixel is defined by a specific number of bits.
• **RGB:** An additive color model based on red (R), green (G), and blue (B) light; RGB is used by computers, televisions, and film recorders to display colors; mixing equal amounts of red, green, and blue light will produce white light.
• **TIFF (or TIF):** Tagged Image File Format, a common and portable file format for saving bitmap scans; does not compress data but offers LZW compression option; useful for moving files between Macintosh and PC platforms.
• **Vector:** Resolution-independent graphic image that can be defined by mathematical equations and scaled with no loss of quality.
• **WMF:** Windows MetaFile, a file format created by Microsoft Windows.
• **XLS:** Microsoft Excel file format.