

Effective Medical Writing

Pointers to getting your article published

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Preparing effective illustrations. Part 2: photographs, images and diagrams

ABSTRACT

In part two of "Preparing effective illustrations", the other three categories, viz. photographs, radiological images and diagrams, are discussed. Illustrations provide visual information to supplement the results in a scientific paper, and create a visual impact that can improve the readability of a paper. This article provides some basic guidelines to assist authors in preparing effective photographs, radiological images and diagrams.

Keywords: diagrams, illustrations, radiological images, medical writing, photographs, scientific paper

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INTRODUCTION

Illustrations provide visual information in a scientific paper and are often the best way to communicate research findings, particularly non-textual information, in a way that attracts the readers' attention. In this article, guidance will be provided on preparing effective illustrations (also known as figures) for three categories: photographs, radiological images and diagrams. The most important consideration is the value of the illustrations to the paper to be submitted. In many fields such as pathology, cell biology and microbiology, the importance of the paper (especially its findings) lies in the photographs used, such as electron micrographs. In the past, figures had to be either professionally drawn and photographed, or submitted as photographic-quality digital prints. Today, these methods have largely been replaced by digital photography and graphic software. However, the goal of high-quality illustrations remains essential.

GENERAL GUIDELINES FOR PREPARING PHOTOGRAPHS

Photographs and micrographs

Photographs are used when it is important to show the actual

appearance of the object being discussed, such as a biopsy sample, pathology specimen, endoscopic image, patient or patient part. High quality photographs are essential for their reproduction in print as well as electronic versions. As with graphs, the size of the photographs in relation to the column and page width of the journal is very important. Authors are advised to ensure that the photographs fit the column/page width of the chosen journal. Too much size reduction during the publication process may affect the quality of the photographs. In today's digital age, authors are able to take advantage of the imaging software to manipulate the photographs, before submitting the cropped and framed versions highlighting the relevant parts to the journal. The most important factor to consider is whether the details will be preserved after size reduction to suit the journal width/page.

For photomicrographs and electron micrographs, an internal scale marker may be inserted directly onto the micrograph. Thus, regardless of the resizing in the publication process, the magnification factor is indicated. Alternatively, the magnification should be provided in the accompanying legend. Symbols, arrows or letters used in photomicrographs should contrast with the background. Information on the method of staining in photomicrographs, e.g. haematoxylin and eosin, should also be provided in the legend.

Colour photographs are useful for illustrating certain interesting features and are sometimes necessary to highlight specific results. However, colour photographs are seldom printed due to their high production costs. Authors are often required to pay for part or all of the printing cost.

Patient confidentiality

If photographs of persons are used, the patients or subjects must not be identifiable. A common practice to hide the identity of the patient is to mask the eyes. If disclosure of identity is unavoidable, then written, informed consent should be obtained from the patient (or guardian) prior to taking the photograph and a copy of the consent letter should be sent to the journal together with the manuscript

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submission. All figure parts relating to one patient should have the same figure number.

GENERAL GUIDELINES FOR PREPARING RADIOLOGICAL IMAGES

Images include reproductions of medical images obtained from modalities such as radiography, computed tomography (CT), magnetic resonance (MR) imaging, ultrasonography and nuclear medicine (radionuclide imaging). When several images of a given type are being shown, they should be reproduced at the same magnification. Prints should correspond in appearance to the tonal relations of the original radiograph (i.e. showing the bones white on a dark background, with the patient's right to the observer's left; CT and MR images should employ the "view from the feet"). The image should be cropped to show just the relevant area (i.e. no more than is necessary to illustrate the points made by the author while retaining sufficient anatomical details and marks). The amount of blank space around the illustration should be kept to a minimum.

GENERAL GUIDELINES FOR PREPARING DIAGRAMS

Diagrams are essentially drawings that consist of basic lines, shapes and text which are used to convey an idea. Some examples are line drawings, flow charts, algorithms, schematics and chemical structures. In some areas such as anatomy, line drawings are more useful than photographs in illustrating details. Algorithms are used to present processes, sequences or systems in an organised way; specifically, they are useful in illustrating the decisions and steps involved in solving a clinical problem or reaching a particular endpoint.

PREPARING ILLUSTRATIONS

When symbols, arrows, numbers or letters are used to identify parts of illustrations, each one should be identified and explained clearly in the legend. They should not only be clear and consistent throughout, but large enough to remain legible when the figure is eventually reduced in size for publication. Irrelevant portions of figures should be cropped to focus attention on the object of interest.

All illustrations should be referenced in the text of the article. They should be numbered consecutively according to the order in which they have been cited in the text. If an illustration has been manipulated or enhanced electronically, the alterations must be stated and an original image submitted to the editor, along with the enhanced one.

Illustrations must not be excessive and should be limited to those referred to in the text. If a figure has been published previously, the original source should be

acknowledged and written permission from the copyright holder to reproduce the figure must be submitted. Permission is required, irrespective of authorship or publisher, except for documents in the public domain.

Almost all journals require the submission of electronic files of illustrations in a format that will produce high quality images. Authors should consult the targeted journal's "Instructions to Authors" for its requirements for figures submitted in electronic formats. Box 1 lists some general technical requirements for illustrations:

Box 1. General technical requirements:

• File formats

Files should be saved in either TIFF or EPS formats. Other image file formats, e.g. JPG, GIF, BMP, and Microsoft PowerPoint slides, are compressed and many details may be lost. If the image cannot be saved in TIFF or EPS, it may be saved in JPG at the highest resolution; but this should be considered only as the last resort. It is suggested that TIFF be used for halftone figures, i.e. medical images such as radiographs and MR images, etc; and EPS for drawn artwork, i.e. line drawings and graphs.

• Image resolution

Files should be saved at the appropriate dpi (dots per inch) for the type of image. Lower resolutions will not be usable. It is recommended that the minimum resolution for halftone and colour work is 300 dpi, and that for line drawings and scanned images is 600 dpi.

• File delivery

All figure parts should be sent as separate images (and not combined); as figure arrays will be done by the journal. Figures should also be loaded as separate files, particularly for manuscripts with a large number of figures. In addition, it is recommended that for multi-part figures, one file is created for each figure, with all parts included in the same file.

• Additional requirements

If a graph or illustration was created in Microsoft Excel or Word format, it is recommended that the original file be submitted in the native format (.xls for Excel, .doc for Word), which can then be rendered as high-resolution images by the publisher.

A movie is a new type of illustration that may be submitted as a supplementary file to those journals that accept them. Movie files may be encoded in different formats, depending on the required technology to view them. Common formats include MOV, MP4, and AVI. The specific journal's "Instruction to Authors" should be consulted before deciding which format the movie should be encoded in.

PROVIDING LEGENDS

A clear, descriptive legend must be provided for each illustration (whether it is a photograph, radiological image or diagram). Each legend should concisely convey as much information as possible about what the illustration tells the readers. It should be understood by readers without them having to read the results section, i.e. it must be able to stand-alone and be interpretable.

Examples of figure legends that appeared in recent issues of the Singapore Medical Journal are:

1. Clinical photographs show (a) erosions and crusting on face and oral mucosa; and (b) desloughing of the detached epidermis on the trunk.
2. Photograph of the excised bicuspid aortic valves shows the large vegetations.
3. Photomicrograph shows the vacuolar change in the basal layer of epidermis with early separation of the basal layer from the papillary dermis. Apoptosis of individual keratinocytes is noted (arrows) (Haematoxylin & eosin, $\times 20$).
4. Supine radiograph of the abdomen of a patient with intestinal pseudo-obstruction shows a dilated large bowel. It resolved after insertion of a rectal tube.
5. Rheumatoid arthritis. (a) Longitudinal and (b) transverse US images of the extensor tendons (dashed arrows) at the wrist show hypertrophic echogenic synovium (solid arrows) and fluid distension of the tendon sheath.
6. Flow chart shows the standard operating procedure of the expected steps in medication administration.

Box 2. Common errors:

- Photographs show much more than the relevant parts, i.e. extraneous material.
- Patients or subjects can be clearly identified in the photographs and images.
- Authors' names and affiliations appear on the images.
- Photographic/halftone figure scans are embedded in a Microsoft Word document, causing significant pixel resolution to be lost.
- Annotations on the figures are too small or are illegible.

SUMMARY

Illustrations such as photographs, radiological images and diagrams are useful tools for improving the readability of a scientific paper as they make a visual impact. Authors should pay attention to the guidelines of specific journals when preparing effective illustrations.

Box 3. Take home points:

1. Illustrations provide visual information.
2. Effective illustrations improve the readability of a scientific paper as they make a visual impact.
3. Prepare legends and label illustrations clearly so that they are easy to understand.
4. Submit illustrations in a format that will provide high-quality reproduction.

Appendix I. Common illustration types.


Type	Usage	Example
Patient or specimen photograph	Clinical, intraoperative, endoscopic laparoscopic, enteroscopic photographs	

Fig. 1 Photograph shows the facial features with microtia, supra-auricular skin tag and skin pit, and micrognathia. (Reproduced from Singapore Med J 2008; 49(12):e372-e374)

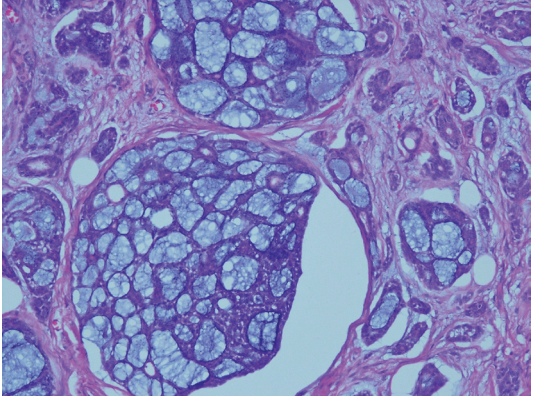
Micrograph (also known as photomicrograph)	Light (optical) micrograph, electron micrograph	
--------------------------------------------	-------------------------------------------------	-------------------------------------------------------------------------------------

Fig. 2 Photomicrograph of the specimen obtained from an ultrasound-guided core biopsy shows adenoid cystic carcinoma composed of cribriform islands of cells with dark nuclei and luminal spaces containing pale mucinous secretions on light microscopy. Several irregular tubules are also noted (Haematoxylin and eosin, $\times 200$). (Reproduced from Singapore Med J 2009; 50(1):e8-e11)

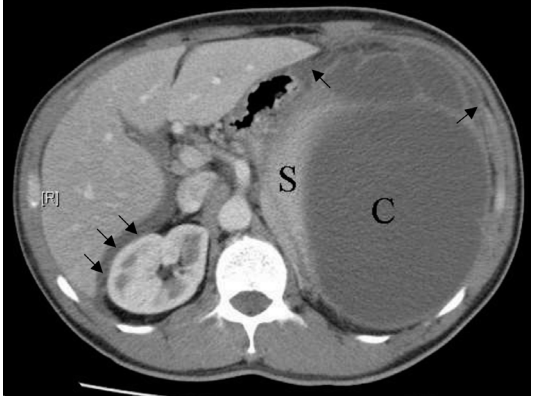
Radiological image	Radiograph, computed tomography, magnetic resonance imaging, ultrasound, angiogram, radionuclide imaging	
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Fig. 3 A 54-year-old man with sudden onset of severe abdominal pain. Contrast-enhanced axial CT image of the upper abdomen shows a 16.7 cm \times 14.9 cm septated cyst (C) with compression of the adjacent splenic parenchyma (S) medially, resulting in the appearance of a "claw sign", suggesting splenic origin. Free perihepatic and perisplenic fluid are noted (arrows), which may be simple reactive or malignant ascites, or even cyst rupture. (Reproduced from Singapore Med J 2009; 50(3):e91-e93)

Physiological signal tracing

Electrocardiogram, electroencephalogram, echocardiogram



Fig. 4 ECG, after correction of hypercalcaemia (Ca^{2+} 8.2 mg/dL), shows normal QTc and no J-waves.
(Reproduced from Singapore Med J 2008; 49(2):160-164)

Laboratory graph

Chromatogram, karyogram, electropherogram

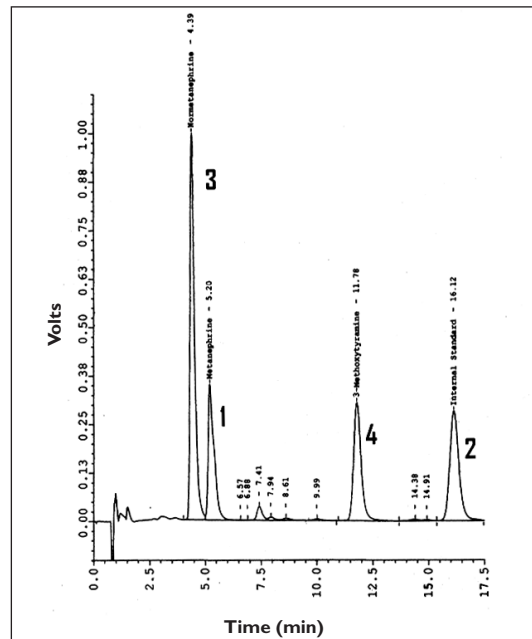


Fig. 5 Representative chromatogram of injection shows Bio-Rad abnormal urine control. Peaks indicate: 1: metanephrine; 2: internal standard; 3: normetanephrine; and 4: methoxytyramine. Unlabelled peaks are extraneous.
(Reproduced from Singapore Med J 2008; 49(6):454-457)

Line drawing

Flow chart, algorithm, schematic diagram, chemical structure

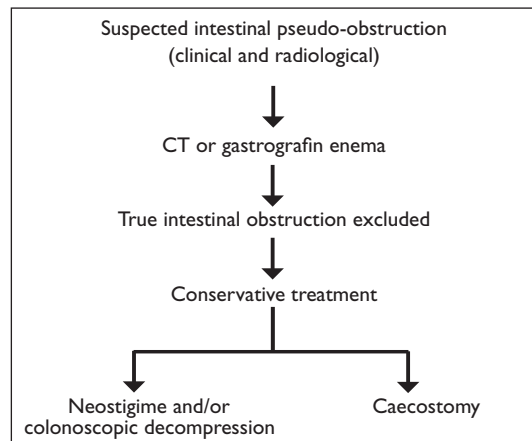
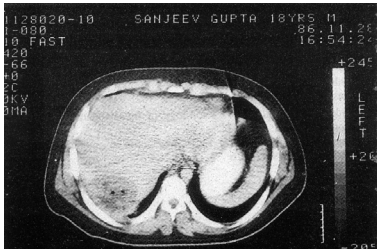


Fig. 6 Flow chart shows the suggested plan of managing a suspected case of intestinal pseudo-obstruction.
(Reproduced from Singapore Med J 2009; 50(3):237-244)

SINGAPORE MEDICAL COUNCIL CATEGORY 3B CME PROGRAMME
Multiple Choice Questions (Code SMJ 200904A)

- | | True | False |
|---------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|--------------------------|
| Question 1. In the general guidelines for preparing illustrations, the following statements are true: | | |
| (a) When symbols, arrows, numbers or letters are used to identify parts of the illustration, identify and explain each one clearly in the legend. | <input type="checkbox"/> | <input type="checkbox"/> |
| (b) The illustration should be cropped to show just the relevant area. | <input type="checkbox"/> | <input type="checkbox"/> |
| (c) The illustration should be submitted in a format that will provide high-quality images. | <input type="checkbox"/> | <input type="checkbox"/> |
| (d) All illustrations should be referenced in the text of the article. | <input type="checkbox"/> | <input type="checkbox"/> |

Question 2. Based on this image, answer the following questions:



- | | | |
|-----------------------------------------------------------------|--------------------------|--------------------------|
| (a) No legend is required. | <input type="checkbox"/> | <input type="checkbox"/> |
| (b) The patient's right is to the reader's left. | <input type="checkbox"/> | <input type="checkbox"/> |
| (c) Cropping is required for this image. | <input type="checkbox"/> | <input type="checkbox"/> |
| (d) Details of the patient's identity (as shown) are necessary. | <input type="checkbox"/> | <input type="checkbox"/> |

Question 3. The following are common types of illustrations:

- | | | |
|--------------------------------------|--------------------------|--------------------------|
| (a) Radiological images. | <input type="checkbox"/> | <input type="checkbox"/> |
| (b) Patient or specimen photographs. | <input type="checkbox"/> | <input type="checkbox"/> |
| (c) Tables. | <input type="checkbox"/> | <input type="checkbox"/> |
| (d) Line drawings. | <input type="checkbox"/> | <input type="checkbox"/> |

Question 4. When preparing photograph legends:

- | | | |
|----------------------------------------------------------------------------------|--------------------------|--------------------------|
| (a) They should be placed below the photographs. | <input type="checkbox"/> | <input type="checkbox"/> |
| (b) They should provide as much detail as possible. | <input type="checkbox"/> | <input type="checkbox"/> |
| (c) They should be interpretable without having to refer to the results section. | <input type="checkbox"/> | <input type="checkbox"/> |
| (d) They should identify the patient's name, age and location. | <input type="checkbox"/> | <input type="checkbox"/> |

Question 5. The following statements are true:

- | | | |
|------------------------------------------------------------------------------------------------------|--------------------------|--------------------------|
| (a) Annotations should be used to explain every detail in the photograph or micrograph. | <input type="checkbox"/> | <input type="checkbox"/> |
| (b) Radiological images should ideally be sent embedded in a Microsoft Word document. | <input type="checkbox"/> | <input type="checkbox"/> |
| (c) Illustration files should not be saved at resolutions lower than 72 dpi. | <input type="checkbox"/> | <input type="checkbox"/> |
| (d) Each legend should convey as much information as possible about what the image tells the reader. | <input type="checkbox"/> | <input type="checkbox"/> |

Doctor's particulars:

Name in full: _____

MCR number: _____ Specialty: _____

Email address: _____

SUBMISSION INSTRUCTIONS:

(1) Log on at the SMJ website: <http://www.sma.org.sg/cme/smj> and select the appropriate set of questions. (2) Select your answers and provide your name, email address and MCR number. Click on "Submit answers" to submit.

RESULTS:

(1) Answers will be published in the SMJ June 2009 issue. (2) The MCR numbers of successful candidates will be posted online at www.sma.org.sg/cme/smj by 20 June 2009. (3) All online submissions will receive an automatic email acknowledgment. (4) Passing mark is 60%. No mark will be deducted for incorrect answers. (5) The SMJ editorial office will submit the list of successful candidates to the Singapore Medical Council.

Deadline for submission: (April 2009 SMJ 3B CME programme): 12 noon, 15 June 2009.