Representing Clinical Information in an Internal Medicine Teaching Image Database

Jason A. Lyman, MD, MS, William Hersh, MD, Kent Spackman, MD, PhD
Division of Medical Informatics and Outcomes Research,
Oregon Health Sciences University, Portland, OR

INTRODUCTION

Digital image collections are becoming increasingly pervasive in medicine, and offer significant potential advantages to their analog counterparts. These include the potential for distributed simultaneous access by several users, reduced risk of image loss, and more powerful indexing to aid in image retrieval[1]. Important factors in optimizing retrieval of images in such a collection include the selection of an appropriate data model and the use of a standard terminology to unambiguously represent clinical concepts.

A World-Wide-Web (WWW)-based internal medicine teaching image database was designed and developed with particular attention to the data model. A SAPHIRE-based term-matching algorithm was used to map terms to the SNOMED 3.5 vocabulary to represent the users' clinical terms. A preliminary evaluation assessed both the data model and the feasibility of using SNOMED for this purpose.

APPLICATION DEVELOPMENT

The data model includes three general categories of information. Clinical information includes multiple fields for diagnoses, findings, and allows the user to specify the anatomic location involved. Patient information contains consent-related information as well as demographic data such as age and gender. Procedural information includes the photographer name, date, image quality for teaching, department, etc.

SNOMED 3.5 has been favorably compared to other classifications in terms of content coverage, comprehensiveness, and hierarchical representation[2, 3]. In addition, an informal investigation of the representation of concepts originally used to describe the images in the collection found that 95% of the concepts were covered by SNOMED. For these reasons, it was chosen as a terminology for use in the database. A multi-step term-matching algorithm using SAPHIRE was developed and integrated into the indexing process. Each clinical term is processed through the algorithm, resulting in a list of potential matching SNOMED terms.

EVALUATION METHODS

Eight study participants, faculty and housestaff of the Oregon Health Sciences University Department of Medicine, were given sets of 6-7 images to submit into the database. A combination paper/Web-based survey was developed to evaluate the usability and comprehensiveness of the data model, as well as the usability and success of the term-matching algorithm in identifying SNOMED terms that matched the user's intending meaning.

RESULTS

Users were generally satisfied with the attributes used to store image information. The indexing process was not seen as overly cumbersome or time-consuming. Participants felt that the data model allowed representation of the most important image-related information, although they indicated a general desire for the ability to include more clinical data, such as clinical presentation and abnormal lab values.

Participants felt that the term-matching algorithm was well integrated into the indexing process, and that the potential benefits were worth the additional steps required. In 80% of all images indexed, the clinical terms used to describe image content matched appropriately to SNOMED, in the opinion of the participants.

REFERENCES

1. Bidgood WD, Jr., Bray B, Brown N, Mori AR, Spackman KA, Golichowski A, et al. Image acquisition context: procedure description attributes for clinically relevant indexing and selective retrieval of biomedical images. JAMIA 1999;6(1):61-75.

2. Chute CG, Cohn SP, Campbell KE, Oliver DE, Campbell JR. The content coverage of clinical classifications. JAMIA 1996;3(3):224-33.

3. Campbell JR, Carpenter P, Sneiderman C, Cohn S, Chute CG, Warren J. Phase II evaluation of clinical coding schemes: completeness, taxonomy, mapping, definitions, and clarity. JAMIA 1997;4(3):238-51.

1067—5027/00/$5.00