Semantics in Radiology

Definition
Generally, semantics is he study of meaning. Related to radiology, semantics denotes the study of the content or meaning of radiology reports, or – in a larger sense – of the content and meaning of images used in radiology.

Motivation
An image is worth a thousand words is often said and even more true is the phrase that an image can be described in a thousand different ways. Even in radiology where many things including the image creation are fairly standardized there are many ways for describing the content of an image, including synonyms, various levels of description and a focus of different persons on varying details. This is not necessarily a problem when single images are regarded for single patients. With the exploding amount of images being created and information overload in many fields of radiology it will become essential to have automated decision support in the future and have tools to sort content and prepare structured reporting as much as possible in an automated way [2] to increase efficiency in radiology and assure quality across different persons making sure that each one understands the reports of other persons.

Steps towards concrete use of semantics
In radiology RadLex [1] has been created to standardize annotation of images and thus reuse. One example of RadLex use is structured reporting where templates for many domains and types of observations exist and reusing the templates can significantly increase efficiency.
Another are of RadLex use is information retrieval, where semantic knowledge of cases can make it much easier to find a specific case with a particular visual observation or a specific disease, again taking into account synonyms and also sub categories of a disease or a specific imaging modality. The Render Project [3] the Radmining Project [4] and the Medico Project [5] have shown the feasibility of semantic image search in medicine. Also the Radiology search engine Goldminer [6] has been able to map images onto RadLex terms for better search.
Imaging modality can be determined also in the biomedical scientific literature using semantic terms and this allows to link the literature for example with specific cases of clinical routine as is one of the goals of the Khresmoi project [7]. medicine

Conclusions
Semantics have started to become usable in many domains such as for the semantic web to allow machines to automatically process and understand digital content.
In Radiology a semantic terminology exists, created mainly for writing radiology reports but also useful in making several parts of the radiologic workflow more effective and more efficient, such as semi-automatically preparing structured reporting templates and allowing access to relevant cases or to cases similar to a currently observed abnormality.

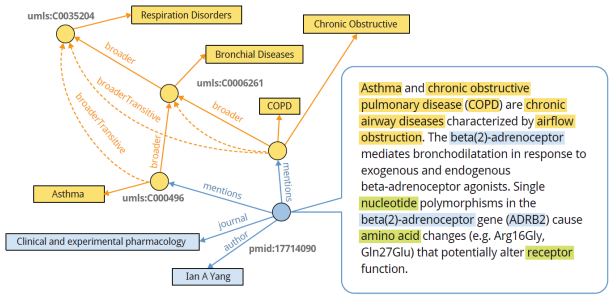

Figure 1: Overview of semantic links between entities automatically extracted form a report.

References
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Authors and contact:
Elmar Kotter, Henning Müller
Contact:
elmar.kotter@uniklinik-freiburg.de