

Using SNOMED CT language sets to create structured radiological reports that can be read in multiple languages

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INTRODUCTION



Topic

- Creating radiological report templates based on SNOMED CT concepts
- Automatic translation of reports from clinician's native language to multiple languages supported by SNOMED CT
- Structuring reports that are not supported by SNOMED CT terminology

Abstract

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In a world of increased cooperation between specialists from different countries, it is no longer a necessity for a clinician to be present physically next to the patient. No matter who creates medical documentation and which language they use natively, the final receiver of the documentation -- patient is expected to be informed about their condition in a way they fully understand. This implicitly imposes the assumption that the documentation should be presented to the patient in a language they know best. Precision in the terminology used to encode the state of a patient is crucial for the interpretation of the clinician who has to plan treatment according to what they read. SNOMED CT is a mature and widely recognized terminology that is a work of hundreds of professionals from different specialities and disciplines. It allows to encode the state of a patient using terms that are precisely defined.

Unfortunately, SNOMED CT is still not fully available in Polish language. We managed to use it as a source of medical terminology in a structured reporting system called upmedic. The system allows to create structured medical documentation using templates that contain most frequently used phrases to describe contents of medical imagery for such types of examinations as: computed tomography, ultrasonography, magnetic resonance, etc. Reports are created in Polish, but we wanted to use SNOMED CT as source of truth for the terminology, so we created a custom mapping for a subset of SNOMED CT concepts that have equivalents in our templates. While creating a report, a radiologist is guided through a list of topics that should be described in a well-organized document and they pick from lists of concepts ones that describe best what they see in the images.

This simple solution allowed clinicians from a network of medical facilities in Poland to create radiological reports three times faster while improving overall reception of the documents by readers. We want to present a learning curve of a typical user that indicates that although initially reports require more time to complete, eventually clinicians get to know the software and how it helps them save time.

Main benefit from this approach was to make reports created in one language available in other languages. As phrases used in our system have their SNOMED CT equivalents, the resulting report can be read by patients using any language that has reference sets for SNOMED CT.

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METHODS

Problem

Translate reports from unsupported language by SNOMED CT to other languages supported by SNOMED CT.

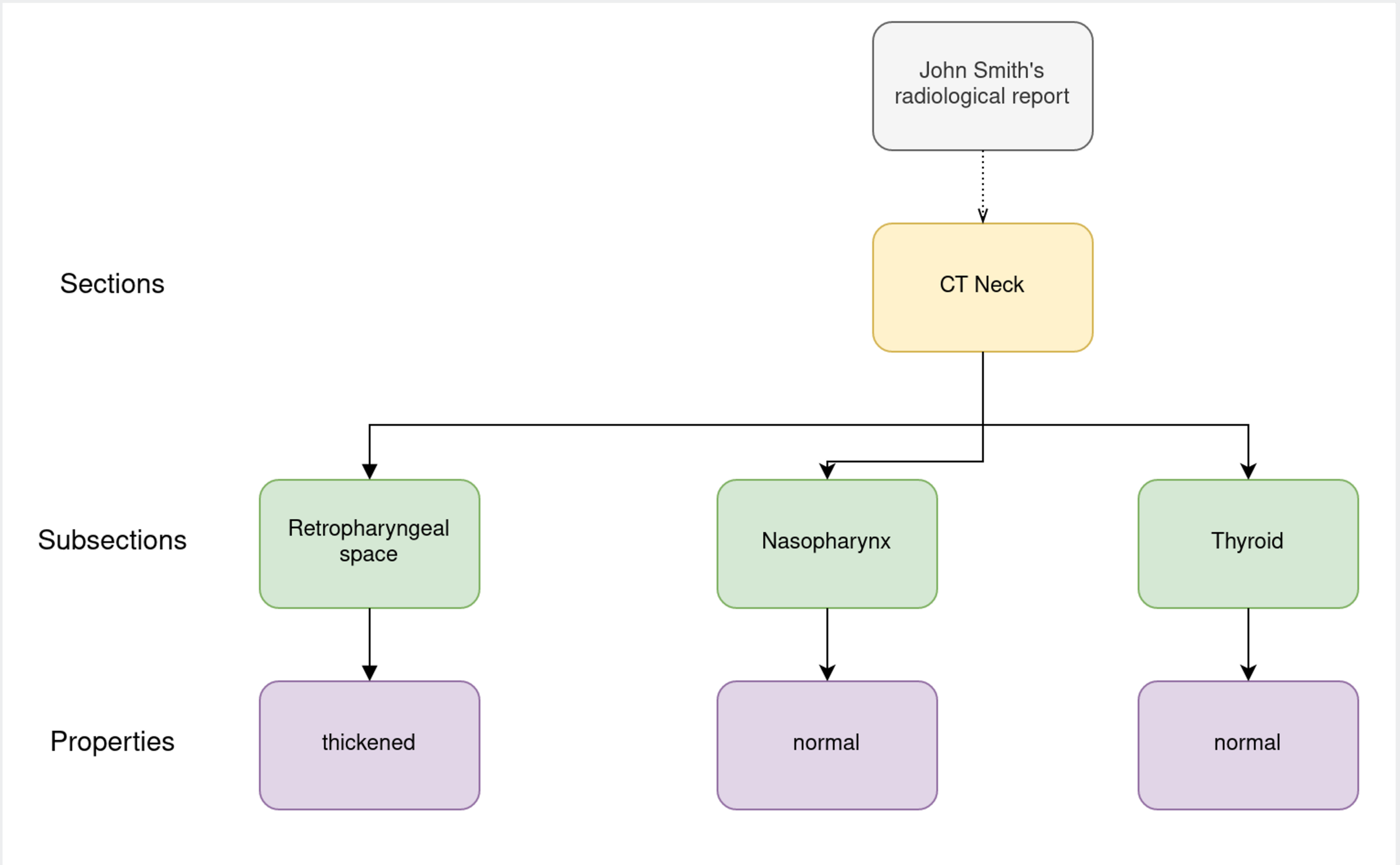
Reports created using upmedic are template driven. Most of reports are created in Polish which is not supported by SNOMED CT terminology. Translating them requires certified translators. We wanted to make the translation process automatic.

Background

upmedic was developed to be a text editor that enables creation of structured radiological reports based on templates. Templates define steps which clinician has to follow to create a report.

Templates consist of nodes which form a tree. There are several types of nodes: Sections, Subsections and Properties. Sections define name of an examination which was performed. Subsections are organs which were examined. Properties are observations related to an organ.

Below is a simple structure of a report based on template (Computed tomography of Neck):

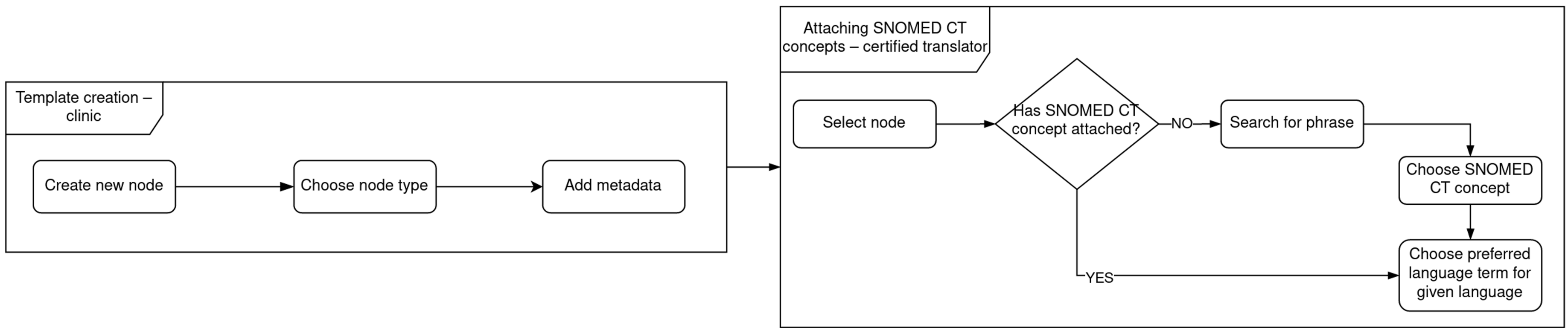


Solution

Our goal was to enrich Polish templates with SNOMED CT concepts by pairing template nodes with SNOMED CT equivalents or slightly adjust templates to SNOMED CT terminology. Fully completed templates that have been paired with SNOMED CT concepts and language reference sets can only be edited by clinic in order to prevent from accidentally editing SNOMED CT concepts.

Thanks to pairing template nodes with SNOMED CT terminology, report can be created in clinician's native language and then automatically translated to every language that is supported by SNOMED CT. Certified translators are given access to created template after completing this template by a clinic. They try to match SNOMED CT concept with existing nodes and then select the term which should be used for automatic translation from language reference sets. This requires to hire a certified translator only to completed templates by the clinic rather than to every single report that is created.

Picture below presents the process of creating a template by the clinic and granting access to a certified translator to attach SNOMED CT concepts.



Attaching SNOMED CT terminology is simply adding SNOMED CT Concept ID to every template node. Attaching language to a given node is basically adding descriptionId which is available for every SNOMED CT Concept node. This enables automatic translation to every language that is supported by SNOMED CT.

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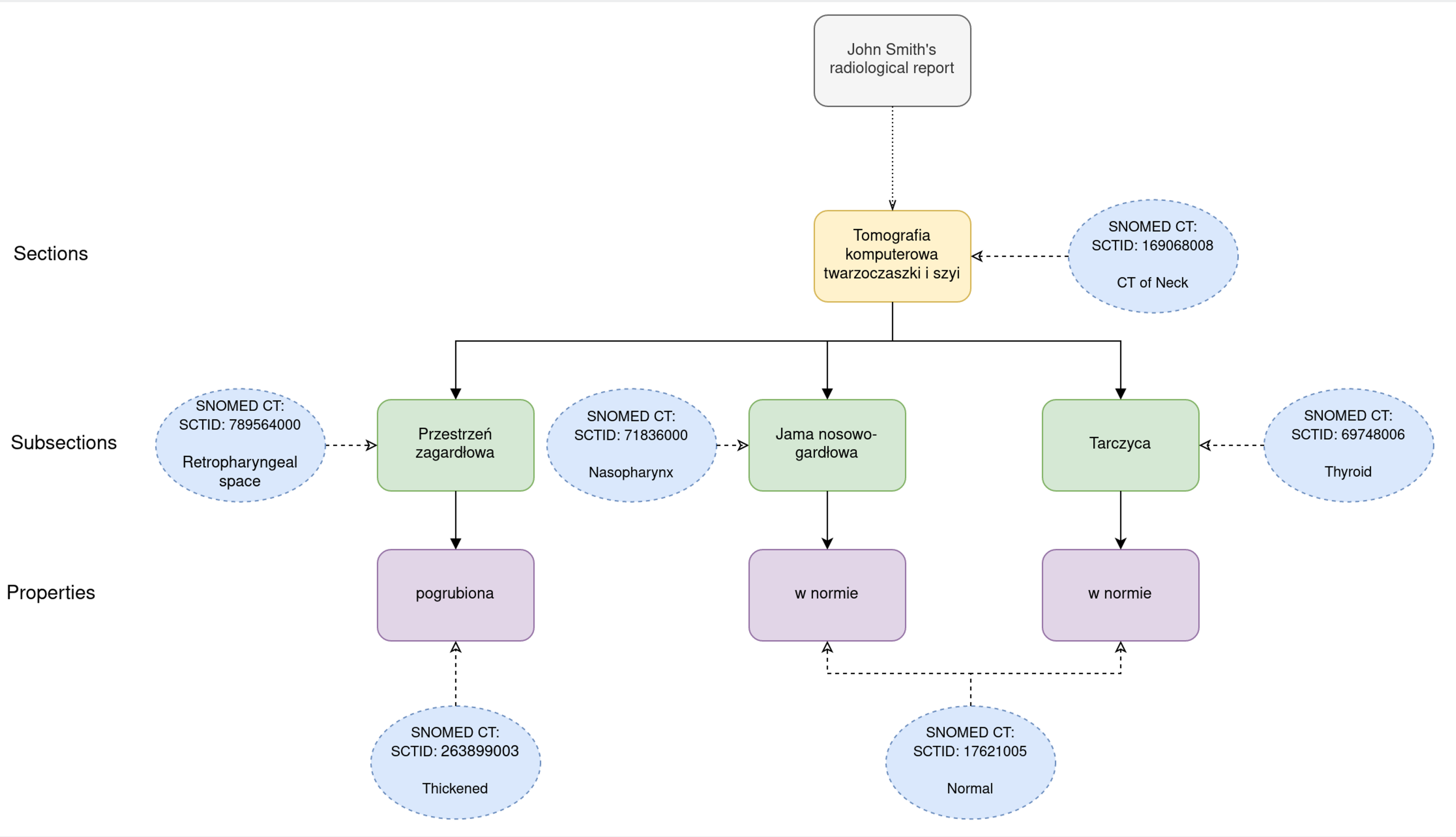
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Template structure with SNOMED CT terminology

In METHODS section we have shown what template looked like before attaching SNOMED CT terminology. Picture below presents template in Polish with SNOMED CT terminology attached to every template node.



Structure of a template node

Structure of template nodes before attaching SNOMED CT concept:

```
{  
  "nodeType": "subsection",  
  "data": {  
    "text": "Nerka"  
  }  
}
```

Structure of template nodes after attaching SNOMED CT:

```
{  
  "nodeType": "subsection",  
  "data": {  
    "text": "Nerka"  
  },  
  "snomed": {  
    "SCTID": 64033007,  
    "languages": {  
      "en": {  
        "descriptionId": 106434018,  
        "language": "en",  
        "term": "Kidney",  
        "acceptability": "acceptable"  
      }  
    }  
  }  
}
```

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Conclusions

Attaching SNOMED CT concepts and language reference sets to template nodes enables automatic translations from languages that are not yet supported by SNOMED CT. This solution reduces the need to engage certified translators in translating every radiological report. The described process to attach SNOMED CT concept to every template node with selecting preferred term may seem as a time consuming process. However, this process is performed only once, during the template creation. After completing a template with attached SNOMED CT, radiologists only have to follow and select nodes that represent state of patient's health. Using this setup, translation is simply substituting equivalent phrases in different languages.

This is crucial in situation when a patient from a foreign country needs to be diagnosed immediately. Usually, there are two options. First one is simply creating the report in clinician's native language and after that a translation needs to be performed by a certified translator. Second option is to create the report in patient's native language. This option may be the fastest one, however, it requires a clinician that is fluent in patient's native language and to be available.

Future Directions

- Creating automatic reasoning that finds conflicts within selected nodes. This may prevent creating reports that have multiple statements that are pairwise incompatible.
- Adding SNOMED CT to ICD-10 codes mapping to enable automatic billing of created reports. This may reduce the number of cases when radiologists select different ICD-10 codes from the ones that should be selected. The codes mismatch may result in different prices for the same medical service.
- Making the process of mapping existing templates to SNOMED CT concepts automatic using solution presented during the lecture "Entity tagging for SNOMED CT concepts in text-based telemedical solutions"

References

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2. SNOMED International, "5.8. Language Reference Set - Reference Sets Practical Guide - SNOMED Confluence", Online: <https://confluence.ihtsdotools.org/display/DOCRFSPG/5.8.+Language+Reference+Set>
3. SNOMED International, "5.9. Human-Readable Reference Set - Reference Sets Practical Guide - SNOMED Confluence", Online: <https://confluence.ihtsdotools.org/display/DOCRFSPG/5.9.+Human-Readable+Reference+Set>
4. Paczuski, P. (2020), "Entity tagging for SNOMED CT concepts in text-based telemedical solutions"

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