Annotation Guidelines for Temporal Information in E3C

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Contents

1 Introduction

This document presents the guidelines for the annotation of E3C, the European Clinical Case Corpus. Clinical cases are narratives written at the time of the medical visit that contain the description of the case, previous medical information of the patient and the procedures and treatments carried out. As can be seen from the sample clinical case in Figure 1, a clinical case contains a description of the patient's condition at the moment of the visit (and previous clinically relevant events, if useful to the understanding of the current situation) as well as the tests and procedures conducted to identify them and treat the patient.

E3C is a multilingual corpus consisting of documents in five different languages (Italian, English, French, Spanish, and Basque) and hence, the annotation guidelines presented in this document are based on language-independent semantic criteria.

In these guidelines we present the decisions for temporal information annotation.

Within the E3C project, annotation has been performed using the WebAnno[1] annotation tool; in Appendix A we present the annotation schema as we have implemented it in WebAnno.

A 61-year-old woman was referred to the Department of Coloproctology and Septic Surgery due to recurrent hematochezia and lower abdominal pain. Her medical history included surgery for a bleeding duodenal ulcer, in addition to diarrhea, melena, weight loss and fatigue, all of which dated a year prior to this hospitalization.

The surgical approach to the ulcer included a suture and pyloroplasty, followed by conservative therapy with spasmolytics, fluid resuscitation, and medications for the anemic syndrome. As a result, the patient's health status had improved for one year before a hemorrhage from the lower gastrointestinal tract manifested. She was hospitalized at another hospital where colonoscopy was performed, which revealed colonic polyposis.

Two months later, a surgical intervention at our hospital was undertaken due to the persisting hematochezia. Preoperatively, laboratory findings indicated anemia, high erythrocyte sedimentation rate, and abdominal ultrasound revealed splenomegaly. A total colectomy was performed and the gastrointestinal passage was recovered through an ileo-recto anastomosis using a stapler.

The resected material underwent histological examination. Microscopically, serrated polyps were found as well as homogeneous eosinophilic material located in the walls of the submucosal blood vessels and in the smooth muscle cells of the intestinal wall. Congo red staining confirmed that the depositions were amyloid. These findings were relevant to intestinal amyloidosis. Sub-typing of the amyloid deposits was not performed. Following the histological examination, laboratory tests of urine indicated Bence-Jones proteins, which supported the diagnosis of primary systemic amyloidosis.

The patient was redirected to a hematological department for additional laboratory tests and treatment of the disease.

Figure 1: A sample clinical case

[1] https://webanno.github.io/webanno/

2 Temporal information annotation

Annotation of temporal information in E3C is performed following largely the THYME annotation guidelines[2] (Styler et al. 2014). Temporal information refers to the events narrated in a text as well as to chronological references and relations existing between events. In this section, we limit ourselves to present a summary of the THYME guidelines and invite the reader to refer to the THYME annotation guidelines for a more thorough description of the THYME annotation schema and its theoretical foundations.

In this section we also explicitly describe all the E3C annotation choices that differ from those of the THYME project and, finally, we report the indications that in some cases were necessary to make the THYME guidelines more specific.

In order to complement the information in this section, the appendices of this document offer the following:

- APPENDIX A: full annotation schema with the list of tags and attributes
- APPENDIX B: list of the more specific changes to the original THYME guidelines
- APPENDIX C: answers to the to the typical questions in annotation

2.1 Tags and notation format

For the annotation of temporal information, we have adopted two tags from THYME, i.e. EVENT and TIMEX3, and three new tags have been added, i.e. RML (for results and measurements), ACTOR and BODYPART. Annotations for all five tags are performed at token level; this means that the minimum span is one token and that annotation of sub-parts of a token is not allowed. From THYME we have also adopted aspectual (ALINK) and temporal relations (TLINK).

Each tag is illustrated with some representative examples extracted from the clinical case in Figure 1 as well as from other documents in our corpus, the THYME guidelines and other clinical sources (e.g. online news). For the sake of clarity, only the tags that are being discussed in each (sub-)section will be marked in the examples of that (sub-)section.

In our examples, the word(s) belonging to the extent of annotated tags are shown between square brackets []. For instance, in the time expression section (Section 2.3), examples will be represented as in (1).

> (1) [Last month], a surgical intervention at our hospital was undertaken due to the persisting hematochezia.

Relations to be marked in a sentence are represented in our examples as additional lines below the example itself (listed by letters) in the form [source] RELATION TYPE [target], as in (2).

> (2) The patient's health status had [improved] for [one year].
>
> a. [Improved] OVERLAP [one year]

[2] http://clear.colorado.edu/compsem/documents/THYME_guidelines.pdf

2.2 Events (EVENT tag)

Any events or states relevant to the patient's clinical timeline are annotated through the EVENT tag. In the following examples (3-6), the events are marked between square brackets.

> (3) We [discovered] a second [tumor], which was morphologically [different] from the surrounding high grade [dysplasia].
>
> (4) [Examination] [shows] decreased bilateral peripheral [pulses].
>
> (5) He is [willing] to [meet] with our Pauahi Wing Queens Hospital.
>
> (6) The patient underwent [surgery] for cyst excision in 1999.

Note that conjugated verbs are all marked as events except for copular verbs (such as *be* or *seem*) and semantically light predications (such es *experience*, *undergo*, and, in certain contexts, *perform*, *develop*, etc.). However, events can also be expressed by untensed verbs, noun phrases and adjectives. In the following lines, we specify what should be annotated as an event.

Following THYME, we only mark the syntactic head of an event (only ONE token is annotated), which can be either a noun, a verb or an adjective. More specifically, in the case of verbs and adjectives, we consider that their scope only covers, respectively, the verb form or the adjective (for compound verbs we annotate the main verb, not the auxiliary). In the case of nouns, the full span of the event, as opposed to the annotated span, i.e. the syntactic head, is the whole noun phrase and we annotate only its head as an event[3].

In (7), for instance, we have the events “was referred”, “recurrent hematochezia’, and “lower abdominal pain”, but we respectively mark “referred”, “hematochezia”, and “pain” (i.e., their syntactic heads). In the examples (8-22) we present some other typical events in clinical cases.

> (7) A 61-year-old woman was [referred] to the Department of Coloproctology and Septic Surgery due to recurrent [hematochezia] and lower abdominal [pain].[4]
>
> (8) [Excision] of the arm swelling
>
> (9) We [discovered] a second [tumor], which was morphologically [different] from the surrounding high grade [dysplasia].
>
> (10) The patient was [unable] to [raise] her left arm[5].
>
> (11) [Examination] [shows] decreased bilateral peripheral [pulses].
>
> (12) and the right hilar [lesions] were not [reported] as being [prominent]

[3] Subordinate clauses to an event, both finite and non finite, are considered outside the full span of the event, see (9).
[4] We consider that due to introduces a non finite dependent clause.
[5] This differs from the THYME guidelines.

(13) He [denies] any chest [pains], chest [pressures], [shortness] of breath, or exertional [symptoms].

(14) He is [willing] to [meet] with our team in the Pauahi Wing Queens Hospital.

(15) As a long-time [smoker], the patient presented respiratory symptoms.

(16) The patient had been a [smoker] for 33 years.

(17) [Meropenem] 2g q8h

(18) [Meropenem] was discontinued after a heart attack

(19) The patient was [treated] with Meropenem

(20) The [administration] of paracetamol was [discontinued]

(21) The bronchial [nodule] was [stable] in size.

(22) The [surgery], which consisted of laparotomy and resection of the necrosis

In addition, it is important to remark that we do not admit events nested within other events. This means that once we have marked as an event the syntactic head of a noun phrase, there can not be other events within the full span of the noun phrase.

In the examples below (23-27), for instance, *surgery* (23), *securing* (24), and *extraction* (25) are not marked as events because they belong to the noun phrases “evaluation for possible surgery”, “difficulties securing his way” and “surgery for the extraction of the mass”, whose syntactic head is marked as event.

(23) He was undergoing [evaluation] for possible surgery.

(24) There were no [difficulties] securing his airway.

(25) [surgery] for the extraction of the mass.

(26) The patient’s [insistence] on full investigation of the persistent epigastric pain

(27) [resolution] of her symptoms and signs of hypercortisolemia.

There is only one exception to the “no nested events” rule, in the case of evidential/aspectual events (see below in this section for the definition of evidential and aspectual events): we annotate the evidential/aspectual event (the head of the noun phrase), but also another event (i.e. the “evidenced” event) contained in the full span of the event (28-31).
Unlike THYME[6], we do not admit any other exceptions.

(28) This diagnosis coincides with the [identification] of ovarian [enlargement] in ultrasound testing.

(29) In the follow-up there were no [signs] of [recurrence].

(30) The final examination [showed] no [evidence] of tumour [recurrence].

(31) At the [beginning] of the [therapy], the patient suffered from severe nausea.

[6] p. 12 of the THYME guidelines

On the other hand, there are some cases in which (i) the head of a (somehow complex) noun phrase is not to be marked as event, while (ii) a modifier or the syntactic head of a dependent noun phrase is to be marked as event.

In particular, we have identified three specific cases: *risk of [event]*, *episode(s) of [event]*, and *diagnose of [event]*. In these cases the head of the noun phrase is not eventive.

In the following example (32) (translated from Italian), the syntactic head *episodes* is not marked as an event because it is not so important for the clinical timeline as it is for defining the contextual aspect, the event *fever* as intermittent.

> (32) The patient presented to the emergency service as experiencing repeated episodes of [fever].

Similarly, *risk* is not marked as an event because it is not so important for the clinical timeline as it is for defining the factuality of the event *recurrence* as hypothetical (33-35).

> (33) She has significant risk for tumor [recurrence].
>
> (34) The patient was discharged as no risk of [recurrence] was foreseen.
>
> (35) Ignoring the risk of additional [acquisition] of drug resistance.

Similarly, *diagnosis* in *diagnosis of EVENT* is not marked as an event because what we are interested in is the diagnosis itself (i.e. the disorder event, with all its attributes), not so much the fact that it was diagnosed (36-38).

> (36) The final diagnosis was periodontal [disease] associated with a proliferative non-neoplastic lesion.
>
> (37) These immunohistochemical findings were fundamental for the final diagnosis of [LCH]
>
> (38) With the diagnosis of presumption of vesical [leiomioma], a transuretral [resection] of the tumoration was performed
>
> Note that in many other cases diagnosis is actually marked as an event (39)!
>
> (39) The final [diagnosis] was periodontal [disease].

The EVENT tag takes the attributes and values described below.

DocTimeRel

DocTimeRel is short for "Document (Creation) Time Relation" and represents the temporal relation between an event and the time when the medical record in question was created (the "document time"). We consider that the document was written at the time of the visit to the doctor's. All the events in a text are assigned a DocTimeRel value, and the possible values are:

BEFORE: BEFORE is used where the event ended before the patient was seen and the document was written (40).

(40) Her medical history included [surgery] for a bleeding duodenal [ulcer], which dated a year prior to this hospitalization.

AFTER: AFTER is used for events that are scheduled or planned to begin following the document time (41).

(41) The patient was redirected to a hematological department for additional laboratory [tests] and [treatment] of the disease.

CONTAINS: is used to mark events that completely contain the document creation time (42).

(42) We report the case of a 19-year-old female who [has] no consanguineous parents.

IS-CONTAINED: is used to mark events that happen entirely during the date expressed (natural day) by the document creation time (43).

(43) At the three-years [follow-up], the patient has no [complaints].

OVERLAP: OVERLAP is used for events or states which are happening or true at the time when the patient was seen and the document was written (44), but are less specific than CONTAINS or IS-CONTAINED.

(44) Her medical history included surgery for a bleeding duodenal ulcer, which dated a year prior to this [hospitalization].

All GENERIC events[7], take DocTimeRel value OVERLAP.

Type

Three different event values are considered for the Type attribute:

ASPECTUAL: is used to indicate an event whose function is to emphasize or code the aspect of a later event (45-48)[8].

(45) This pain [began] without any known trigger.

(46) The patient [remains] symptom free

(47) The rash has not [reappeared] and we will monitor closely
(48) At the [beginning] of the [therapy], the patient suffered from severe nausea.

EVIDENTIAL: is used for events that provide information about how doctors came to identify and learn about other events. They are generally verbs of showing, demonstration, evidence, confirmation or revelation, and in the clinical domain, they are very commonly associated with tests, imaging, and human observation. In short, an event should be

[7] See further down in this section for the definition of the contextual modality attribute; GENERIC is one of its possible values.
[8] More on this is found in Section 2.5, which focuses on aspectual relations (ALINK).

marked EVIDENTIAL only if it serves as the link between a source of knowledge (e.g. a test or a person) or observation and a piece of knowledge gained from it (49-52).

> (49) The CT of the orbits [noted] abnormal, wispy attenuation of the intraorbital retrobulbar or intraconal fat.
>
> (50) The result of histologic examination and rheumatologic valuation has [excluded] this hypothesis.
>
> (51) The patient [complained] of severe [headaches].
>
> (52) The patient presented with [complaints] of severe [headaches]

N/A: is assigned to the events that do not fit in the previous categories (this is the most frequently used value) (53).

> (53) A 61-year-old woman was [referred] to the Department of Coloproctology and Septic Surgery due to recurrent [hematochezia] and lower abdominal [pain].

Polarity

Polarity refers to both syntactic and lexical polarity and is determined by the presence of an element (adverb, verb, etc.) that affirms or negates the event. It may take these two values:

POS: for events with positive polarity, that is to say, for events that are not negated (i.e. the majority of the events in a text) (54).

> (54) A 61-year-old woman was [referred] to the Department of Coloproctology and Septic Surgery due to recurrent [hematochezia] and lower abdominal [pain].

NEG: for events that didn't take place or have an otherwise negative polarity (55-56).

> (55) [Sub-typing] of the amyloid deposits was not performed.
>
> (56) The patient remains [symptom] free

Degree

Degree is used to make explicit the degree of completion of the action the event refers to. MOST and LITTLE values will only be assigned if the completion phase of the event is explicit in text.

MOST: to be used when the event is almost completed/is present in large quantity (57).

> (57) Abdominal tenderness has *nearly* [disappeared].

LITTLE: to be used when the event is lightly present (58)

> (58) *Slight* enanthematous antral endoscopic [gastritis].

N/A: to be used for all other events (the majority of events), which do not take any of the other two values (59).

(59) A 61-year-old woman was [referred] to the Department of Coloproctology and Septic Surgery due to recurrent [hematochezia] and lower abdominal [pain].

Contextual modality

The contextual modality attribute refers to the event modality, understood as the speaker's idea/knowledge of the truth value of the event. For this attribute, we use the following values:

ACTUAL: for events that have already happened (60) or are scheduled (61) and for events that have not happened or will not happen (62).

(60) A 61-year-old woman was [referred] to the Department of Coloproctology and Septic Surgery due to recurrent [hematochezia] and lower abdominal [pain].

(61) The patient was referred to the cardiology service to [start] the [therapy].

(62) [Sub-typing] of the amyloid deposits was not performed.

HEDGED: for events mentioned with any sort of hedging. This hedging can be lexical ("seems", "likely", "suspicious", "possible", "consistent with"), or phrasal ("I suspect that...", "It would seem likely that..."). These EVENTs are strongly implied, but, for safety, liability, or due to lack of comprehensive evidence, are not stated as fact by the doctor. In (63) the word "suspicion" triggers the hedged nature of "colitis". In (64) "consistent with" is the hedging cue for "metastases".

(63) The ED physician agreed to admit and to treat him with antibiotics due to the *suspicion* of infectious [colitis] that could lead to a CNS shunt infection.

(64) Further workup of the patient demonstrated multiple radiologic lesions consistent with [metastases].

HYPOTHETICAL: for hypothetical events, theories, hypothetical diagnoses, etc.

- **HYPOTHETICAL-IF-STAT**: for events in if statements, both in the condition and in the main clause (65).

  (65) If she experiences a [fever], we'll [treat] it on an outpatient basis.

- **HYPOTHETICAL-OTHER-COND**: for events in other sorts of conditionals (66).

  (66) We may [recommend] [continuing] with the [treatment].

GENERIC: for EVENTs which occur in a text, but are only mentioned in a general sense, and do not appear on the patient's timeline of treatment (67).

(67) Small bowel [volvulus] is a rare clinical entity which presents as recurrent intermittent abdominal [pain] after [consumption] of food.

Note that if an event is both hypothetical and generic, we mark it as HYPOTHETICAL (68).

(68) If you [drink] alcohol, you get [drunk].

Contextual aspect

This attribute is not related to the grammatical aspect; it is used instead to mark additional aspectual information (about how events happen in time) that is not coded either by aspectual links (see Section 2.5) or by the “ASPECTUAL” value of the “type” attribute. More precisely, through this attribute it is expected that the novelty or the intermittency of an event will be coded. It should be noted that explicit intermittency (e.g. episodes, intermittent) and novelty (e.g. new, novel) triggers should be present in text to annotate them.

It takes the following values:

INTERMITTENT: is used in situations where there may be a series of smaller events within a single EVENT, rather than a single, constant event. Those events are usually marked with words like "intermittently" or "occasionally". Intermittent events may also be typically expressed by constructions such as “episodes of EVENT” (see “hematochezia” in (69) and “vomiting” in (70)).

> (69) A 61-year-old woman was [referred] to the Department of Coloproctology and Septic Surgery due to *recurrent* [hematochezia] and lower abdominal [pain].
>
> (70) Repeated episodes of [vomiting].

NOVEL: NOVEL, as suggested by its name, indicates novelty and is used for events that appear for the first time and for which it is relevant to mention their novelty. It is generally associated with predicate adjectives like "new" (71-74).

> (71) The patient’s new [tumor] is 3.5 cm from the epiglottis.
>
> (72) We [re-explored] the treatment options
>
> (73) Repeated [imaging] of her pituitary gland
>
> (74) The [rush] reoccurred after quitting the antibiotics

N/A: for the events that are neither INTERMITTENT nor NOVEL, i.e. the majority of the events occurring in a document (see “pain” and “referred” in (75) and “reoccurred” and “quitting” in (76)).

> (75) A 61-year-old woman was [referred] to the Department of Coloproctology and Septic Surgery due to *recurrent* [hematochezia] and lower abdominal [pain].
>
> (76) The rush [reoccurred] after [quitting] the antibiotics.

Permanence

In THYME, the permanence attribute relates to whether a given condition or disease is FINITE (it might go away with treatment, like pneumonia or different cancers) or is PERMANENT (and the patients will have them for the rest of their lives). Multiple Sclerosis or Diabetes will thus be marked as PERMANENT as they are unlikely to be completely

cured given the state of medicine at the time of writing. Permanence is thus defined as a property of the event itself. As such, this is medical-domain specific knowledge and, in THYME, annotators should not mark it (they are instructed to leave the default value UNDETERMINED) unless specifically instructed.

In E3C, on the other hand, the annotation of the Permanence attribute is defined for all events (i.e. not only for conditions and diseases) and is OPTIONAL.

Possible values of this attribute in E3C are defined as follows:

PERMANENT. It is used for diseases and conditions with no known cure (as in THYME) and other events known to last at least until the patient's death (77-78).

> (77) The findings were relevant to intestinal [amyloidosis].
>
> (78) The patient was diagnosed with [ALS] two months ago, and started intravenous feeding last week.

FINITE. It is used for events that can finish or be resolved eventually. Diseases and conditions with a known cure or that are naturally resolved within some days are finite and so are other events that are likely to have a bounded duration or can be terminated (79).

> (79) In October 2017, a 40-years-old woman was [admitted] to our Autoimmune Disease Unit because of the presence of [arthralgia] and diffuse [paraesthesia].

2.3 Time expressions (TIMEX3 tag)

We annotate time expressions according to the indications provided by ISO-TimeML (Pustejovsky et al., 2010), just as in THYME. The TIMEX3 tag is therefore not assigned to a single word (the syntactic head), but to a noun phrase, an adjective phrase or an adverbial phrase, following TimeML syntactic chunks. Any prepositions preceding or following a time expression are outside the span of the TIMEX3 tag, whereas post-expressions adverbs (like "ago" or "later") are inside.[9]

For the annotation of time expressions, we recommend visiting the TimeML guidelines for each language as they contain much more in-depth descriptions of time expressions and the ways to annotate them. Nonetheless, we here offer a brief explanation of the time expression annotations in E3C. Time expressions take the attributes and values explained below.

timex3Class

As in THYME, we use this attribute to classify time expressions by their type:

DATE: for points in time with a granularity equal to or larger than a day (80-81).

> (80) In [October 2017], a 40-years-old woman was admitted to our Autoimmune Disease Unit because of the presence of arthralgia and diffuse paraesthesia.

[9] For language specific issues see Section 2.9

(81) [Six months later], the patient presented the same symptoms again.

TIME: for points in time with a granularity shorter than a day (82).

(82) The patient was admitted to the ER at [17.40].

DURATION: for time expressions that express a span or an interval of time (83-88)

(83) The patient's health status had improved for [one year].

(84) A 63-years-old male patient was referred to the emergency room after [2 days] of acute onset headache.

(85) [Three year] after removal, the patient did not show any complications.

(86) [Six months] after the surgery, the patient presented no symptoms.

(87) In the [two months postoperatively] follow-up, the patient seemed completely recovered.

(88) The patient refers to an acute headache for [the last three days].

QUANTIFIER: applies to the expressions that refer to the number of occurrences of an EVENT (89).

(89) The patient has undergone knee surgery [twice].

SET: for time expressions that combine a quantifier (*twice*, *8 times*) and an interval (*weekly*, *per day*) (90-92).

(90) For most, this should occur [twice weekly] during the first month of therapy and then [monthly].

(91) The initial prescribed dose of d-penicillamine was 250 mg orally [twice daily].

(92) Meropenem 2g [q8h]

Note that we have no time expressions in this example (93); “hr” is part of a complex measure, i.e. mcg/kg/hr.

(93) Midazolam 30 mcg/kg/hr

PREPOSTEXP: for text strings that express pre-, post- or intra- parts of an event (94).

(94) [Preoperatively], laboratory findings indicated anemia, high erythrocyte sedimentation rate, and abdominal ultrasound revealed splenomegaly.

Value

This attribute is not part of the THYME annotation schema. In E3C, on the other hand, we follow other annotation efforts based on TimeML and add this attribute to assign a normalised value to the time expressions; in fact, we consider that it is relevant to correctly anchor events in a timeline. The value of this attribute is an ISO 8601 standard[10] value. For a summary, yet still complete, description of the ISO values, refer to the ISO 8601 Wikipedia page[11].

[10] https://www.iso.org/iso-8601-date-and-time-format.html
[11] https://en.wikipedia.org/wiki/ISO_8601

All TIMEX3 classes are assigned a normalised ISO 8601 value with the only exception of PREPOSTEXP and QUANTIFIERS, which receive the pseudo value “NO_VALUE” (102) and (103).

TIMEX3s expressing a point in time are assigned a value based on the annotated text span (95) and on the Document creation time in the case of relative time expressions (96). The normalised values assigned to TIMEX3s expressing durations and sets, on the other hand, are based on intervals such as “day”, “year”, etc. (97-103).

(95) In [October 2017], a 40-years-old woman was admitted to our Autoimmune Disease Unit because of the presence of arthralgia and diffuse paraesthesia.

a. class = DATE value = 2017-10

(96) The patient was admitted to the ER today. (DCT = 2020-09-01)

a. class = DATE value = 2020-09-01

(97) The patient's health had improved for [one year].

a. class = DURATION value = P1Y

(98) A 63-years-old male patient was referred to the emergency room after [2 days] of acute onset headache.

a. class = DURATION value = P2D

(99) A 63-years-old male patient was referred to the emergency room after [2 hours] of acute onset headache.

b. class = DURATION value = PT2H

(100) The initial prescribed dose of d-penicillamine was 250 mg orally [twice daily].

a. class = SET value = P1D

(101) The initial prescribed dose of d-penicillamine was 250 mg orally [daily].

b. class = SET value = P1D

(102) The patient has undergone knee surgery [twice].

a. class = QUANTIFIER value = NO_VALUE

(103) [Preoperatively], laboratory findings indicated anemia, high erythrocyte sedimentation rate, and abdominal ultrasound revealed splenomegaly.

a. class = PREPOSTEXP value = NO_VALUE

Function in document (functionInDocument)

Some time expressions play a special role in text as they mark explicitly the time in which the text (or a portion of the text) was written. Those time expressions help to assign the value of the rest of the time expressions in text.
In E3C this is a (non-THYME) optional attribute and we have the following possible values:

DOCTIME: for the time expressions explicit in text that express the time the document was created.
SECTIONTIME: for the time expressions explicit in text that express the time in which a section of the document was created.
NONE: for all the other time expressions (the great majority), normally time expressions inside the narratives.

2.4 Narrative containers and temporal relations (TLINK)

In the THYME framework, temporal relations are strictly related to the idea of narrative containers, which can be understood as “scenes” of the narration.

2.4.1 Narrative containers

Narrative containers are document level information structures (Pustejovsky and Stubbs, 2011) that help to organise chronologically the information in text. More precisely, narrative containers are salient temporal intervals that contain a set of events in text. Narrative containers can be time expressions (104) but can also be expressed by means of event expressions (105).

(104) [Two months later], a surgical [intervention] at our hospital was undertaken.

a. [Two months later] CONTAINS [intervention]

(105) She was [hospitalized] at another hospital where [colonoscopy] was performed.

a. [hospitalized] CONTAINS [colonoscopy]

Following THYME in the attempt to reconstruct the timeline of a document, our annotation is based on the identification of narrative containers in a text. The idea behind that is that identifying and filling narrative containers contributes to reduce the amount of temporal relations between events and time expressions that have to be created to obtain a complete representation of the temporal information in text and to organise the timeline of the events in text (see pp. 29-30 of the THYME Annotation Guidelines). In Figure 2 we have marked the temporal information of the text in Figure 1 using a representation of narrative containers where each container and the events it contains are highlighted with the same shade of colour. Time expressions are additionally marked in bold.

A 61-year-old woman was referred to the Department of Coloproctology and Septic Surgery due to recurrent hematochezia and lower abdominal pain. Her medical history included surgery for a bleeding duodenal ulcer, in addition to diarrhea, melena, weight loss and fatigue, all of which dated **a year** prior to this hospitalization.

The surgical approach to the ulcer included a suture and pyloroplasty, followed by conservative therapy with spasmolytics, fluid resuscitation, and medications for the anemic syndrome. As a result, the patient’s health status had improved for **one year** before a hemorrhage from the lower gastrointestinal tract manifested. She was hospitalized at another hospital where colonoscopy was performed, which revealed

colonic polyposis.

Two months later, a surgical intervention at our hospital was undertaken due to the persisting hematochezia. **Preoperatively**, laboratory findings indicated anemia, high erythrocyte sedimentation rate, and abdominal ultrasound revealed splenomegaly. A total colectomy was performed and the gastrointestinal passage was recovered through an ileo-recto anastomosis using a stapler.

The resected material underwent histological examination. Microscopically, serrated polyps were found as well as homogeneous eosinophilic material located in the walls of the submucosal blood vessels and in the smooth muscle cells of the intestinal wall. Congo red staining confirmed that the depositions were amyloid. These findings were relevant to intestinal amyloidosis. Sub-typing of the amyloid deposits was not performed. Following the histological examination, laboratory tests of urine indicated Bence-Jones proteins, which supported the diagnosis of primary systemic amyloidosis.

The patient was redirected to a hematological department for additional laboratory tests and treatment of the disease.

Figure 2: The sample clinical case of Figure 1 annotated with temporal information

Temporal containers, hence, contribute to the ordering of the events in text. To create the full temporal graph, we rely on temporal relations (TLINK). These are directioned relations by the means of which one can express the chronological ordering between a pair of events and/or time expressions. We will create TLINKS between pairs of temporal containers to organise them along the chronological axis and we will also link the events inside a temporal container to the temporal container itself to get in-container ordering of events.

2.4.2 Temporal relations (TLINK)

As just mentioned, a TLINK can hold between two events, between two time expressions or between an event and a time expression[12]. The different types of relations are expressed through the relType attribute and its possible values.

RelType

BEFORE: chronologically orders one event (or time expression) before the other (106-107).

(106) A 34-year-old male who was [diagnosed] with SLE [presented] to our clinic for therapy.

a. [diagnosed] BEFORE [presented]

(107) The surgical approach to the ulcer included a suture and pyloroplasty, followed by conservative therapy with spasmolytics.

a. [approach] BEFORE [therapy]

BEGINS-ON: BEGINS-ON signals that an event or TIMEX3 (the source) begins on the target event or TIMEX3 (108-111).

(108) She has had abdominal [cramping] since [January].

[12] For practical reasons depending on the annotation tool, temporal relations in E3C are named in two different ways: if the source of the relation is an EVENT we have a TLINK; if the source of the relation is a time expression we have a timexLink instead.

a. [cramping] BEGINS-ON [January]

(109) He reports intermittent chest [pain] since his prior [MI].

a. [pain] BEGINS-ON [MI]

(110) The boy remains in perfect health now, [five years] after the initial [operation]

a. [five years] BEGINS-ON [operation]

(111) She [lost] her contact lens [7 months] prior to her first visit.

a. [7 months] BEGINS-ON [lost]

ENDS-ON: ENDS-ON signals that the source event ends on the (target) event or TIMEX3 it is related to (112-113).

(112) The patient's health status had [improved] for one year before a [hemorrhage] from the lower gastrointestinal tract manifested.

a. [improved] ENDS-ON [hemorrhage]

(113) She lost her contact lens [7 months] prior to her first [visit].

a. [7 months] ENDS-ON [visit]

CONTAINS: CONTAINS signals that an event is completely contained within the span of the event or TIMEX3 it is related to (114-119).

(114) The surgical [approach] to the ulcer included a [suture] and [pyloroplasty].

a. [approach] CONTAINS [suture]

b. [approach] CONTAINS [pyloroplasty]

(115) The patient was referred for [postpartum] [hemorrhage].

a. [postpartum] CONTAINS [hemorrhage]

(116) The patient received parenteral [nutrition] for [2 years].

a. [2 years] CONTAINS [nutrition]

(117) The CT [scan] revealed a severe [pneumonia].

a. [pneumonia] CONTAINS [scan][13]

(118) [Eversion] of the upper eyelid revealed a firm subconjunctival [mass].

a. [mass] CONTAINS [eversion]

(119) The [tumour] was [resected].

a. [tumour] CONTAINS [resected]

OVERLAP: This can refer to two events that share a certain interval of time, an event that occurs during another, larger event or time reference (but where containment is not entirely sure), or any other sense in which two events are occurring in the same timeframe (120).

(120) Her medical history included surgery for a bleeding duodenal [ulcer], in addition to [diarrhea], [melena], weight [loss] and [fatigue].

[13] The pneumonia existed prior to the CT scan and most likely continues after the scan containing it completely.

a. [ulcer] OVERLAP [diarrhea]

b. [ulcer] OVERLAP [melena]

c. [ulcer] OVERLAP [loss]

d. [ulcer] OVERLAP [fatigue]

SIMULTANEOUS: This link is used when two events and/or time expressions happen at the same time and share the begin and end points (121).

(121) In the MRI a second [tumor] was found, which was morphologically [different]

a. [tumor] SIMULTANEOUS [different]

TLINK creation

In E3C we follow the THYME guidelines for TLINK creation (Sections 6.2 to 6.4 in the THYME guidelines). Here we offer a summary of those guidelines and we make some additional clarifications and explanations. In order to help annotators create all relevant TLINKs while not overgenerating TLINKs, we have devised the following procedure.

1. Start from the first sentence in text and identify the event or timex that is the narrative container for the sentence.
    a. How to choose the narrative container
        i. If in a sentence there is a date or a time, it most likely is a good candidate for becoming the narrative container of the sentence (122).
            (122) [Two months later], a surgical intervention at our hospital was undertaken.
        ii. If there is a temporal prepositional clause, the main event in it most likely is a good candidate for becoming the narrative container of the sentence (123).
            (123) During the [surgery], we curetted the cyst and we sutured the wound.
        iii. If none of the previous is present in the sentence, the main verb of the sentence most likely is a good candidate for becoming the narrative container of it (124).
            (124) A 61-year-old woman was [referred] to the Department of Coloproctology and Septic Surgery due to recurrent hematochezia and lower abdominal pain.
    b. There might be more than one narrative container in a single sentence.
        i. choose the most expressive one as the main narrative container in the sentence
        ii. link the other narrative containers in sentence to the most prominent one (if possible and relevant)
2. Link the events (or timexes) to the narrative container of the sentence (125-127).
    (125) [Two months later], a surgical intervention at our hospital was undertaken.
        a. Two months later CONTAINS intervention

(126) During the [intervention], we curetted the cyst and we sutured the wound.

b. intervention CONTAINS curetted
c. cyst CONTAINS intervention
d. intervention CONTAINS sutured
e. intervention OVERLAPS wound

(127) A 61-year-old woman was [referred] to the Department of Coloproctology and Septic Surgery due to recurrent hematochezia and lower abdominal pain.

f. hematochezia CONTAINS referred
g. pain CONTAINS referred

3. Once all the TLINKs inside the first sentence have been done, repeat the process in the second one.
4. Create a TLINK between the main narrative containers of the first and second sentence (128).

(128) [Two months later], a surgical intervention at our hospital was undertaken. During the [intervention], we curetted the cyst and we sutured the wound.

1. [Two months later] CONTAINS [intervention]

5. Continue creating the links inside the third sentence.
6. Create the link between the narrative container in sentence 3 and the relevant one in a previous sentence.
   a. In most of the cases, links between narrative containers are done between the narrative containers in consecutive sentences
   b. Only in a very few cases, it may be necessary to create TLINKS between narrative containers between non consecutive sentences.

These are some additional specifications that should guide the annotators.

- When creating the links, only create relevant relations and avoid every redundant information.
  a. Example: If we have three events A, B and C that happen one after the other, it is enough to create the relations “A before B and “B before C”, as “A before C” is entailed and does not add any new information.

- Always try to create a TLINK between events that are related through an ALINK (129-130).

(129) This [pain] [began] without any known trigger.

a. ALINK: [began] INITIATES [pain]
b. TLINK: [pain] BEGINS-ON [began]

(130) The [rash] has not [reappeared] and we will monitor closely

a. ALINK: [reappeared] REINITIATES [rash]
b. TLINK: [rash] BEGINS-ON [reappeared]

- Try to be as specific as possible, prefer TLINKS of the type CONTAINS or SIMULTANEOUS to the more generic OVERLAPS.

- Always create a T-LINK (which will most often be of type CONTAINS) between a test and its result, if it is an event (58-59). Note that the evidential events ("indicates" and "perceived") do not take part in the TLINKS (when there is a TEST-EVIDENTIAL-RESULT (event) structure) (131-134).

  (131) The [CBC] [indicates] [thrombocytopenia].

  a. [Thrombocytopenia] CONTAINS [CBC]

  (132) In [auscultation], a whistling [sound] was [perceived].

  a. [auscultation] OVERLAP [sound]

  (133) Dagli [esami] abbiamo visto che le [piastrine] sono al 20% (From the exams we have seen that platelets are at a 20%)

  a. [esami] CONTAINS [piastrine]

  (134) [analisi]: [emoglobina] 9 mg/dl (analysis: hemoglobin 9 mg/dl)

  a. [analisi] CONTAINS [emoglobina]

- The type of link between an event expressing the act of diagnosis and the diagnosis should be CONTAINS, unless it is referred to a clearly past and overcome disorder (135).

  (135) An 80-year-old male was [diagnosed] with [diabetes] mellitus type 2.

  - diabetes CONTAINS diagnosed
- Hypothetical and generic events should not be part of the TLINKs (as stated in THYME guidelines).
- Include negated events in TLINKs although it is sometimes difficult to place them in time (136).

  (136) nella [radiografia] non si oggettiva nessuna [massa] (In the radiography no mass was identified.)

  - [massa] CONTAINS [radiografia]
- For durations try to create BEGINS-ON and ENDS-ON links (in addition to the links created between events) (137).

  (137) The patient was [dismissed] [ten days] after the [surgery].

  - [ten days] BEGINS-ON [surgery]
  - [ten days] ENDS-ON [dismissed]
- Try to predilect the narrative container as the source/target of the TLINKS when different and equally acceptable options are available
  - predilect this (138):

    (138) Among the [antecedents], [diabetes] mellitus and [hypertension] are the most relevant.

    - [antecedents] CONTAINS [diabetes]

- [antecedents] CONTAINS [hypertension]

- to this (139):

(139) Among the [antecedents], [diabetes] mellitus and [hypertension] are the most relevant.

- [antecedents] CONTAINS [diabetes]
- [diabetes] OVERLAP [hypertension]

2.5 Aspectual relations (ALINK)

ALINKs are created between an aspectual event (the source of the relation) and its subordinated non-aspectual event (the target of the relation). We adopt the THYME relation types for ALINK, as follows:

relType

CONTINUES: CONTINUES is used when an aspectual event shows the continuation of another event (140).

(140) She [continued] to [live] with these unexplained, recurrent episodes of numbness and tingling.

a. [continued] CONTINUES [live]

INITIATES: INITIATES is used when an aspectual event indicates the start or initiation of another event (141).

(141) This [pain] [began] without any known trigger.

a. [began] INITIATES [pain]

REINITIATES: REINITIATES is used when an aspectual event indicates the re-start or re-initiation of another event (142-143).

(142) [Chemotherapy] will [restart] on Friday.

a. [restart] REINITIATES [chemotherapy]

(143) The [rash] has not [reappeared] and we will monitor closely

a. reappeared REINITIATES rash

TERMINATES: TERMINATES is used when an aspectual event indicates the ending of another event (144).

(144) At 3 days after surgery, there were no abnormal seizure-like movements, so [clonazepam] was also [discontinued].

a. [discontinued] TERMINATES [clonazepam]

2.6 Results, measurements and lab test results (RML)

We have created the RML tag to mark lab test and analytics' results, formulaic measurements and measurement values, which are not marked in THYME. According to the THYME annotation guidelines, in fact, results of laboratory analysis (e.g. *9 mg/dL* in (145)), test results (e.g. *normal* in (146) and *positive* in (149)), and the value of measurements, both formulaic (e.g. *178.60 cm* in (147)) and not (e.g. *59 kg* in (148)) are not to be marked, as they will be captured in a later step with other annotations that link tests and results[14].

In E3C, on the other hand, annotators will mark them through the RML tag. Unlike with events, the RML tag is not assigned to a single word (the syntactic head), but to a syntactic chunk. Any prepositions preceding or following a RML are outside the span of the RML tag[15].

(145) Her BUN is [9 mg/dL]. (Note that "BUN" is marked as an event)

(146) The CT scan was [normal]. (Note that "scan" is marked as an event)

(147) Height=[178.60 cm]. (Note that "Height" is marked as an event)

(148) The patient weighs [59 kg].

(149) Molecular studies demonstrated that the melanoma was [positive] for the X mutation of the BRAF gene.

Note that RMLs in the examples are linked to the events they pertain to. Also weight, index, score and level in similar contexts are marked as events. Note that in case of scores we mark the name, note the word "score" (150).

(150) The patient had a GCS score of [7].

In addition, we follow the THYME framework as far as measure phrases (e.g two liters of fluid in the example below) are concerned. Although the unit of measure would be the syntactic head of the event, it is not marked; instead we mark the thing being measured (151)[16].

(151) He <EVENT>drunk</EVENT> 2 liters of <EVENT>fluid</EVENT>

PERTAINS-TO relation

The PERTAINS-TO relation links the result of a test analysis or a measurement (source) to the test/measurement event (target) (RML PERTAINS-TO EVENT) (152-155).

(152) Her BUN is 9 mg/dL. (Note that "BUN" is marked as an event)

a. [9 mg/dL] PERTAINS-TO [BUN]

(153) The CT scan was [normal]. (Note that "scan" is marked as an event)

a. [normal] PERTAINS-TO [scan]

[14] P. 11
[15] For language specific issues see Section 2.9
[16] It is not marked as an RML either, as it is a quantity rather than the result of a measurement.

(154) Height= 178.60 cm. (Note that “Height” is marked as an event)

a. [178.60 cm] PERTAINS-TO [Height]

(155) Molecular studies demonstrated that the melanoma was [positive] for the X mutation of the BRAF gene.

a. [positive] PERTAINS-TO [mutation]

2.7 Actors (ACTOR)

We have created the ACTOR tag in order to mark people (or animals) mentioned in the text as nouns or pronouns (according to well established practices in entity recognition).

Unlike with events, the ACTOR tag may cover more than a single word (the syntactic head), but to a noun phrase or a personal pronoun (not relative pronouns). Any prepositions preceding or following an actor are outside the span of the actor tag (156-162)[17].

(156) [A 61-year-old woman] was referred to the Department of Coloproctology and Septic Surgery.

(157) [She] was hospitalized at another hospital where colonoscopy was performed.

(158) [I] talked to [the patient] about it.

(159) [A 65 year old male] diagnosed with dyslipidemia reached the emergency service.

(160) [The patient] was a 56 year old teacher.

(161) Phisical examination on admission revealed [a middle aged woman] who was clinically obese.

(162) [A male patient], 63 years old, reached the emergency service late this morning.

See that in example (162) “63 years old” is not part of the actor as it is an aside.

We highlight the role and the age of the actor in our annotation.

Role

The role attribute gets one of the following three values:

PATIENT: the patient is the person to whom the clinical narrative refers and that is being treated by a health professional

H-PROFESSIONAL: health professionals are the professionals present in the clinical narratives that take care of the patient and interact with her or him. These are normally doctors, nurses, emergency department paramedicals, etc.

OTHER: the other category represents the actors that are neither the patient or any health professional present in text. These can be animals (mainly if the animal affects (or may affect) the health conditions of the patient), family and acquaintances of the patient, lawyers, generic mentions, etc.

[17] For language specific issues see Section 2.9

Age

If explicit in text, we mark the age of the actor (commonly the patient) with a normalised value: numerical value + letter for unit (163). The values for the units are taken from the ISO 8601 specification. The most plausible age units and examples for them are represented in Table 1.

Table 1: Examples and normalised values of ages of actors

Unit	ISO	Example	Age value
year	Y	A 61-year-old woman	61Y
month	M	18-month-old toddler	18M
week	W	2-week-old female patient	2W
day	D	3-day-old male	3D

(163) <ACTOR role='PATIENT' age='61Y'>A 61-year-old woman</ACTOR> was referred to the Department of Coloproctology due to recurrent hematochezia.

(164) [A male patient], 63 years old, reached the emergency service late this morning.

In example (164), no age is marked for the actor as the age information is outside the scope of the actor tag span.

2.8 Body parts

Body parts are not annotated in THYME, but we consider they provide relevant information, mainly for the localisation of events. For their annotation in E3C we have created the BODYPART tag.

Unlike with events, the BODYPART tag is not assigned to a single word (the syntactic head), but to a noun or a noun phrase. Any prepositions preceding or following a body part are outside the span of the actor tag[18] (165-166).

(165) Our patient's [pituitary gland].

(166) Abdominal ultrasonography showed [a mildly enlarged liver] and [spleen].

eventiveValue

Sometimes a body part may express an event, while in most of the cases, they simply refer to a part of the body as an entity. To mark this distinction, we have created the evntiveValue attribute, which takes the the following values:

EVENT: for body parts that express events (167-169). There is something wrong with the body part.

[18] For language specific issues see Section 2.9

(167) The patient has [a swollen eye].
a. eventiveValue = EVENT

(168) A 20-year-old female arrived at the emergency room with [a broken arm].

(169) Under the microscope, we could observe [quickly degenerating epithelial cells].

N/A: for body parts that do not express any event (170). When bodyparts refer to parts/cells/liquids that are normally in a healthy body.

(170) The patient reports [his leg] hurting for two weeks.
a. eventiveValue = N/A

2.9 Language specific decisions

The E3C annotation guidelines aim at being language-independent. However, the morphosyntactic features of each language and some syntactic criteria applied in the annotation guidelines make necessary the definition of some language-specific indications.

Basque

Basque is a highly agglutinative non-indoeuropean language that has specific features that make it differ largely from the neighbouring languages.

Postposition annotation in Basque

The information expressed by prepositions in the other languages of the project is expressed by postpositions in Basque. Most of the postpositions appear attached to the noun, verb, adjective etc. they follow. In these cases, as the E3C annotation is based on token level, the whole token (e.g. event+postposition) is assigned a E3C tag as in example (171).

(171) [Larriagotzeetan] sintoma psikiatrikoekin lotuta; gainera infekzio estreptokozikoa izana zuen.

In the case of free postpositions, these remain out of the scope of the tag as can be seen in example (172).

(172) Tik motoreak zeuzkan, [bizpahiru urtez] **geroztik**, bilakaera irregularrarekin.

Adverbs expressing events

In Basque events can be expressed by adverbs (173).

(173) Pazienteak mina sentitzen du [korrika] egitean.

Italian

As most other Romance languages, Italian is characterised by relatively free word order, the use of prepositions and low agglutination.

Contractions of prepositions and definite articles

In the general annotation guidelines of RML, actors, body parts, and time expressions, prepositions are excluded from the extent while articles are included (e.g. to [the patient], in [the next months]). This is problematic for Italian, Spanish and French, which, unlike English, have contractions of simple prepositions and definite articles. This phenomenon is common to many prepositions in Italian (e.g. *di*, *a*, *da*, *in*, *su*), and includes both singular and plural (e.g. *al* vs. *agli*) and both masculine and feminine (e.g. *al* vs. *alla*).

As annotation in E3C is always performed at token-level annotation, the whole contraction (e.g. *degli*) is included in the extent of the tag as in the following example (174):

(174) Presenta una posizione obbligata [degli arti superiori].

Spanish

As most other Romance languages, Spanish is characterised by relatively free word order, the use of prepositions and low agglutination.

Contractions of prepositions and definite articles

See the Italian section for a more detailed description. The contractions of simple prepositions and definite articles in Spanish are restricted to two contractions, *al* and *del*, in which the prepositions *a* or *de* respectively merge with the masculine singular definite article *el*.

As for Italian, the whole contraction (e.g. *al*) is included in the extent of the tag as in the following example (175):

(175) [Al octavo día postoperatorio], se realizó una segunda laparotomía.

French

As most other Romance languages, French is characterised by relatively free word order, the use of prepositions and low agglutination.

Contractions of prepositions and definite articles

See the Italian section for a more detailed description. The contractions of simple prepositions and definite articles in French are restricted to the contractions *au* and *du*, in which the prepositions *à* and *de* respectively merge with the masculine singular definite article *le*. In addition, in the case of *aux* and *des*, the prepositions *à* and *de* respectively merge with the masculine plural definite article *les*.

As for Italian, the whole contraction (e.g. *aux*) is included in the extent of the tag as in the following example (176):

(176) Le développement de la biopsie liquide est importante afin d'éviter [aux patients] le recours aux biopsies répétées.

APPENDIX A: Annotation Schema implemented in WebAnno

Blue is used for optional “features”, black for required “features”. Default values are in bold. Following the terminology and the implementation of the WebAnno annotation tool, “L” stands for layer.

L1:EVENT

docTimeRel:
- BEFORE
- OVERLAP
- AFTER
- CONTAINS
- IS-CONTAINED

eventType
- N/A
- ASPECTUAL
- EVIDENTIAL

polarity
- POS
- NEG

degree
- N/A
- MOST
- LITTLE

contextualModality
- ACTUAL
- HYPOTHETICAL-IF
- HYPOTHETICAL-OTHER
- HEDGED
- GENERIC

contextualAspect
- N/A
- NOVEL
- INTERMITTENT

permanence
- FINITE
- PERMANENT

TLINK (EVENT source, EVENT or TIMEX3 target)
- BEFORE
- OVERLAP
- **CONTAINS**
- BEGINS-ON
- ENDS-ON
- SIMULTANEOUS

ALINK (Link between two events)

- CONTINUES
- **INITIATES**
- REINITIATES
- TERMINATES

L2:TIMEX3

timex3Class
- DATE
- TIME
- DURATION
- QUANTIFIER
- PREPOSTEXP
- SET

value
- (free text slot)

functionInDocument
- NONE
- DOCTIME
- SECTIONTIME

timexLink (TIMEX3 source, EVENT or TIMEX3 target)
- BEFORE
- OVERLAP
- CONTAINS
- BEGINS-ON
- ENDS-ON
- SIMULTANEOUS

L3:RML

PERTAINS-TO (link between RML-source and EVENT-target)
PERTAINS-TO -> PERTAINS-TO values
- **PERTAINS**

L4:ACTOR

role -> role values
- PATIENT
- H-PROFESSIONAL
- OTHER (for relatives of the patient or animals)

age
- (free text slot) TIMEX3 duration value, but P is omitted, e.g. 27Y, 36M

L5:BODYPART

eventiveValue -> eventiveValue values
- EVENT
- N/A

L6:CLINENTITY[19]

entityID
- (free text)

L7: METADATA

docAuthor
- (free text)

docLanguage
- (free text)

docLicense
- (free text)

docName
- (free text)

docSource
- (free text)

docTime
- (free text)

docUrl
- (free text)

note
- (free text)

[19] The guidelines for the annotation of the clinical entities have been described separately in Speranza, Magnini and Altuna (2021). *Annotation Guidelines for Clinical Entities in E3C*. Technical Report.

APPENDIX B: Changes to the original THYME guidelines

Even if the original THYME annotation guidelines have been followed quite narrowly while creating the E3C guidelines, a series of changes had to be done so as to overcome some incoherence issues and to adequate the proposed guidelines to the needs in the E3C project. In addition, some annotations decisions that were postponed in THYME have been resolved in the E3C annotation guidelines.

The most important changes have already been addressed throughout this document. However, in this appendix, we list the little changes and nuances we have added to some minor issues in the THYME guidelines[20]. We present them grouped according to the sections in the THYME guidelines and ordered by page.

Changes in Section 3 EVENT Annotation. Pages are the ones in the original THYME guidelines.

- P8, “swollen spleen” is not an event as stated in P14 (it is marked as BODYPART)
- P8 (before 3.2.2), do not annotate age as an event (nor as a time expression)
- P9 (before examples 18-24), nouns can also be annotated as events
- P11, test results, measurements and labs are annotated in E3C as RML (see section 2.6)
- P12 (complex predications), we annotate [risk] of [x]
- P12 (complex predications), Intraoperatively is wrongly marked as an event as it is a PREPOSTEXP time expression
- P16, we do not used the BEFORE-OVERLAP DocTimeRel. In addition we add the CONTAINS and IS-CONTAINED relations (see section 2.2)

Changes in Section 4 TIMEX3 Annotation

- P26 (ex 155), “tomorrow morning” should be annotated as a TIME according to the TIMEX3 guidelines
- P27 (ex 173, 175, 176), the time expressions in these examples are DATEs

Changes in Section 6 TLINK Annotation

- P36 (last paragraph), the rule is cancelled
- P37 (ex 219), it is a CONTAINS relation
- P40 (section 6.2.6), durations can be linked to times and dates to mark their begin and end points

[20] We have used this version of the THYME guidelines: http://clear.colorado.edu/compsem/documents/THYME_guidelines.pdf

APPENDIX C: Answers to typical questions in annotation

In this appendix, we present some illustrative examples of the most complex or hard annotations. Examples are classified according to the elements or relations they are focused on.

R = resolved
? = to be discussed

Event

1. R Her [height] was 1.29 m, which is 4.71 standard deviations below the median for normal girls her age
2. Medicaments as events. When should they be annotated?
    a. R He was [treated] with prednisolone and propranolol
        i. If there is a verb, annotate the verb
    b. R [Prednisolone] was discontinued
    c. R [started] [anticoagulation] with MEDICINE
        i. Do not annotate the medicine
    d. R The dose of [MEDICINE] was decreased
        i. Annotate de medicine
3. Patient's complaints are to be marked as events
    a. R The patient [complained] of severe [headaches]
        i. Complained is evidential
    b. R The patient [presented] with [complaints] of severe [headaches]
        i. Complaints is evidential and thus headaches is also annotated
4. Nested events. If a nominal event is marked, all its subordinated events are not, as they are part of the same noun phrase (check the guidelines for exceptions)
    a. R The patient's [insistence] on full investigation of the persistent epigastric pain
        i. The rule of the head covers all the levels of the noun phrase
    b. R [resolution] of her symptoms and signs of hypercortisolemia
        i. Do not annotate signs even if it is evidential as it is a subordinate of resolution
5. A nominal event can appear as a modifier of a non-eventive noun
    a. R Areas of [necrosis]
    b. Levels of [fever]
    c. No restriction in the syntactic role of the event mentions
6. Free of [event]
    a. R the patient [remains] [symptom] free
    b. R The patient [remains] free of [symptoms]
        i. Remains is aspectual
        ii. We do not mark "free" as an event as it does not have a strong eventive value, its main function being to make the other event negative
7. Evidential events are to be annotated, as well as the "evidenced" event.

    a. R the final [examination] [showed] no [evidence] of tumour [recurrence]
        i. Evidence = sign and is annotated equally? YES
8. Mass and similar anomalies are annotated as events even when the context refers more to an “object” than an event? YES
    a. R we identified a large [sac]
    b. R we removed the large [sac]
        i. Annotate both as events
    c. R the bronchial [nodule] was stable in size
9. In these specific contexts, results and findings are not annotated as events
    a. R the CT [scan] findings revealed a talus fracture
    b. R arthritis of the ankle was suspected despite the results of the CT [scan] Otherwise they are annotated
    c. R Los [datos] del laboratorio iniciales incluyeron: HDL 123 mg/l
    d. R The [results] [confirmed] the initial [diagnosis]
10. Intermittent attribute
    a. R Madame Z.O opérée **à deux reprises** pour kystes hydatiques du foie (il y a respectivement 6 ans et 3 ans). (Mrs. Z.O. operated **twice** for hydatid cysts of the liver (respectively 6 and 3 years ago).) = does “operated” have the attribute INTERMITTENT?
        i. It is NOT intermittent
    b. R same example : “twice” is a quantifier
        i. YES and it should be annotated as a timex-quantifier
11. Degree attribute
    a. R La NFS notait anémie **sévère** à 4,5g/dl. (The CBC showed **severe** anemia at 4.5 g/dl.) = The degree attribute does not have the value MOST
        i. We CAN’T assign “most” in this case
        ii. Mild and severe only get degree values in cases like “mild fever = a bit of fever”
12. Acronyms. Are they annotated as events? YES, if relevant
    a. R Pour une [insuffisance] rénale ([IR])
    b. R Magnetic resonance [imaging] ([MRI])
13. Light verbs (common traditional light verbs and periphrases)
    a. R tenía como objetivo <u>dar [soporte]</u> (it had the objective of <u>giving [support]</u>)
        i. Dar or soporte? soporte
        ii. If there is a single verb that means the same thing, opt for the noun
    b. R se emitió el diagnóstico de carcinoma (diagnosis of [carcinoma] was [emitted])
        i. Annotate emitió? NO
14. Relative pronouns DO NOT ANNOTATE PRONOUNS AS EVENTS
    a. R The [biopsy] , which was performed with X technique…
        i. “Which” is not annotated as an event
15. Past participle. Annotate it if it is the head of a implicit relative phrase
    a. R La [lésion] [révélée] par l’[IRM] ... (The lesion revealed by an MRI scan)
        i. In this case, do not annotate [révélée]
16. Metonymy and similar figures
    a. x-ray film revealed: event or object?
        i. It is an event in this case
        ii. Similar to “lab results, test data...”
17. Medicine

   a. R We [suggested] that it was a side [effect] of MEDICINE so its [administration] was temporary [interrupted]
      i. There is no reason to annotate MEDICINE here as an event as it is subordinated to [effect] which is a nominal event
18. Failed. Annotate as event? Or is it only a “negation” trigger?
   a. R The MRI failed to demonstrate the presence of a tumor.
      i. Do NOT annotate it, it is a “negation trigger”
19. Hedging
   a. R In mutated SERPINC1 protein a new N-linked [glycosylation] site is [formed], however, it is *unclear* if the [glycosylation] at 219-221 site is *possible*.
      i. Glycosylation is HEDGED
20. Aspectual: Should we annotate both the nominal aspectual event and his modifier? **YES**
   a. R Le [début] de la [maladie] remonte à 2 mois [...] (The [beginning] of the [disease] goes back 2 months …)

Timex3

1. TIMEX3 annotation guidelines for SPANISH: https://catalog.ldc.upenn.edu/docs/LDC2012T12/annotationGuidelines_timex3_SP.pdf
2. SET inside a dosage/unit **NO**
   a. R Un traitement à base de Cabergoline (1 mg/semaine) a été instauré …
      i. “Semaine” does not get a TIMEX tag

Actor

1. Which is the right extent of an actor tag?
   a. R [55 year-old patient] who presents at the emergency service
   b. R [Paciente femenina de 85 años] diagnosticada de hipotiroidismo
   c. R [Mujer], de 18 años de edad, se presenta…
   d. R [Our patient] was [an 87-year-old African-American woman] who was a nursing home resident, with a history of diabetes mellitus type 2 and subarachnoid hemorrhage leading to aphasia, hemiplegia, seizures and dysphagia requiring percutaneous gastric feeds.
   e. R A new genetic variant c.662G > C (p.W221S) in the SERPINC1 gene was detected in proband and affected [father] but was absent in [healthy sister]
   f. R L'enquête familiale faite aux urgences révèle [une mère porteuse d'une double mutation génétique au niveau du gène HERG et du gène KCNQ1]. (Family investigation in the emergency room revealed [a mother with a double genetic mutation in the HERG gene and the KCNQ1 gene].)
2. Are “mentions” in attributive position to be annotated?
   a. R Por la edad de [la paciente], se consideró una candidata adecuada
      i. Because the age of [the patient], (she) was considered an adequate candidate
3. Are entities like “the oncology service” to be annotated as actors? **NO**
   a. R Había sido valorada en ginecología
      i. She was assessed in gynecology
   b. R El servicio de oncología

        i. The oncology service
    c. R In the oncology service, [they] did tests
4. R Her height was 1.29 m, which is 4.71 standard deviations below the median for normal girls her age. **NO**
    a. “Normal girls her age” is not an actor
5. Predicative complements. SUBJECT (potentially actor) + COPULA + PREDICATIVE COMPLEMENT
    a. R Hijo mediano de tres hermanos ([He] was the middle son (event) of 3 siblings)
    b. R [He] had been a smoker (event) for 25 years
6. Fetus
    a. Is it an actor? YES (e.g. if the fetus needs intrauterine surgery, there is a malformity...)
    b. And embryo? Most likely NO
    c. How do we mark the age? DO NOT MARK AGE
        i. A 24 week fetus
7. Combination of years and months for patient age
    a. Varón de 1 año y 5 meses de edad
        i. 1Y5M
    b. un mes y medio de vida (one month and a half)
        i. 1.5M
    c. paciente de 5 años y 7 meses de edad
        i. 5Y7M
    d. Recién nacida hembra means 0Y? NO
        i. Guidelines say: add age only if it is explicit in text
            1. As in 4 month old, 2 days old etc.
8. Is the ending or clitic an indicator for actors? NO
    a. Verbal ending: describi**mos** (the doctors)
        i. DO NOT ANNOTATE
    b. DO NOT ANNOTATE CLITICS
        i. R Sugerirle
        ii. R Visitarci, visitarla
        iii. Other pronouns: R [Je] [la] visite
            1. [Io] [la] visito
            2. [Yo] [la] visito
9. In this case should I tag the patient's age (notice the comma punctuation)? NO
    a. R [paciente], 58años

Body part

1. Which should be the extent of a body part?
    a. R Our patient’s [pituitary gland]
    b. R Examination revealed [acutely swollen, tender thyroid gland]
    c. R Ultrasonography showed a loop of [herniated small bowel] and an [undescended testis] on the right
    d. R [Un utérus de taille normale] (74x31mm) avec … ([A uterus of normal size] (74x31mm) with)

   e. R avec [endomètre fin], mesurant 6mm d'épaisseur et … (with [a thin endometrium], measuring 6mm thick and …)
   f. R [four small caliber coronary arteries in right and left coronary systems] including [right posterior descending, posterolateral, obtuse marginal and septal arteries].
   g. R [il terzo quadrante]
   h. R [il terzo quadrante della schiena]
2. Is there any limit to consider a body element as a body part? Everything as big as a cell or bigger can be a body part, effusions and bodily secretions included
   a. R [the synovium of anterior femur]
   b. R [the body] and [tail of pancreas]
   c. R [the end of the pancreas]
      i. In certain contexts
   d. R a fibrous pseudo-capsule was noted around the tumour
      i. "A fibrous pseudo-capsule" should maybe be an event
   e. R [her left inferobasal lung segment]
3. How to annotate conjoint body parts?
   a. R [the body] and [tail of pancreas]
4. Are hormones to be annotated as body parts? **NO**
   a. R her serum growth hormone levels were high
5. Are cells to be annotated as body parts? **YES**
   a. R The patient had seroconverted for anti-dengue IgM antibodies
      i. They are proteins
   b. R Mild elevation of liver enzymes was found
      i. Smaller than cells
   c. R islands and tuberculae of regular cells with variable amounts of eosinophilic cytoplasm
      i. Smaller than cells
6. Are genes to be annotated as body parts? NO
   a. R The growth hormone receptor gene
7. Are "holes" to be annotated as body parts? **YES**
   a. R [a large hernia sac] was identified
   b. R allowing access to [a cavity]
8. Are "fuzzy" body parts to be annotated? **YES**
   a. R [the anatomical site] was not clearly delineated
   b. R no abdominal wall defect could be palpated at [that area]
   c. R the anatomical site of the excess hormone secretion was not identified
   d. R [soft tissue] swelling around the ankle joint
9. Are pee and poop (and similars) to be annotated as body parts? YES
   a. R Las pruebas de laboratorio aportaron una elevación de X en [orina] (lab tests offered an elevation of X in [urine])
10. Are administration modes to be annotated? Mostly NOT
   a. R by oral route
   b. R par intraveineuse (by intravenous)
11. When is a body part eventive?
   a. R The ipsilateral testis lying in a high iliac crest position
      i. This body part is not eventive
   b. R Reported as having a non specific appearance of a small granuloma or [lymph node]
   c. R Examination revealed [acutely swollen, tender thyroid gland]

   d. R The biopsy specimen revealed tumor cells that showed monotonous proliferation
      i. This should be annotated as an EVENT as they are not normal body parts of a healthy body
12. Linked to the previous, where is the limit between eventive body parts and events?
   a. The threshold should be between body parts that are normally in a healthy body (BODYPART) and parts that are not normally in a healthy bodies (EVENT)
   b. R Reported as having a non specific appearance of a small granuloma or [lymph node]
      i. Eventive body part
   c. R the bronchial [nodule] was stable in size
      i. Event
13. Should we annotate body parts in a prenominal position? **YES** (this only happens in English and Basque)
   a. R Increased metabolic activity in the [lung] lesion
   b. R The defect was packed with cancellous [bone] graft
14. Material for biopsy or similar are body parts? **NO**
   a. R to remove the cystic material
   b. R The biopsy specimen revealed tumor cells that showed monotonous proliferation

RML

1. In which form can RML appear?
   a. R The patient was [strongly positive] for adrenocorticotropic hormone
   b. ? Thyroid profile showed [increased T3 and T4 and low TSH]
   c. R Synaptophysin was [strongly positive]
2. Are size/ weight mentions always RML? **YES**
   a. R A tumor that was [7 mm in diameter]
   b. R The CT scan showed a large tumor ([6 cm in diameter])
   c. R careful isolation of the sac at a length of 3 cm
      i. no measurement of a body part, cell count, etc...
   d. R the presence of a [7 mm] lesion
3. Which is the extent of a RML?
   a. ? A tumor that was [7 mm in diameter] or ? A tumor that was [7 mm] in diameter
   b. R Staining was [positive] for chronogranin A
      i. Chronogranin should be annotated as event
   c. R Ki-67 was [less than 2% positive]
   d. R the mitotic count was [between 2-20 per 10 hpf]
   e. R La fonction rénale s'est stabilisée [autour de [265 µmol/l] (Renal function stabilized around [265 µmol/l]).
   f. R The antithrombin level in our patient was [low],[44-48%] (AT deficiency type I).
4. R Clinical examinations at the time were unrevealing
   a. It is an EVENT
5. is "normal" a result (RML) linked with the "parto" event?
   a. “Con embarazo y parto normales” 01_ES100143
      i. NO RML, normal is a feature of embarazo and parto
      ii. Like unrevealing above
6. What if normal goes with bodyparts?
   a. The duodenal bulb and the second part of the duodenum were normal

i. It is an event

References

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