

**THYME CU-specific annotation guidelines:
Entity mentions, indicator classes, attributes and normalization, and FAQ
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1 Semantic (entity) types

Entities are the “things” of UMLS annotation. They are often nouns, but may also be any number of other grammatical types, including entire phrases. You should try to capture the most information possible specific to each annotation. For example, if you have the phrase “renal cell carcinoma,” you should annotate the following:

[renal cell]: Anatomical site

[renal cell carcinoma]: Disease/Disorder

cTAKES will often preannotate entities with annotations that we would not use. You may delete these annotations. However, if you are unsure about a preannotation, either leave it or ask your supervisor about it.

1.1 Anatomical_site

- A normal or pathological part of the anatomy or structural organization of an organism.
- **Examples:** lower extremity artery, arm, skin graft, red blood cell

1.2 Clinical_attribute

- An observable or measurable property or state of an organism of clinical interest.
- **Examples:** pulse 73, weight 184 lb., bp 130/86, no apparent distress, alert and oriented x3

1.3 Devices

- A manufactured object used primarily in the diagnosis, treatment, or prevention of physiologic or anatomic disorders.
- **Examples:** stethoscope, seat belt, catheter, stent, syringe

1.4 Disease_Disorder

- A condition which alters or interferes with a normal process, state, or activity of an organism. It is usually characterized by the abnormal functioning of one or more of the host's systems, parts, or organs. Included here is a complex of symptoms descriptive of a disorder.
- **Examples:** heart disease, degenerative changes, stenosis, peripheral artery disease, COPD, lower extremity edema

1.5 Lab

- A procedure, method, or technique used to determine the composition, quantity, or concentration of a specimen, and which is carried out in a clinical laboratory. Included here are procedures which measure the times and rates of reactions.
- **Examples:** biopsy, lipid panel, metabolic rate test, red blood cell count

1.6 Medications/Drugs

- Compounds or substances of definite molecular composition.
- **Examples:** iodine, carbohydrate, adrenaline, serotonin, phenylephrine, amoxicillin

1.7 Person

- A specific, nameable person.
- **Examples:** Dr. Johnson, patient, pt., Mrs. Smith

1.8 Phenomena

- A broad type for grouping entities and processes that occur naturally or because of humans.
- **Examples:** pregnancy, aerobic metabolism, playing hockey, climbing stairs, bone growth, air pollution

1.9 Procedure

- A broad type for grouping clinical activities.
- **Examples:** bariatric surgery, MRI, palpitation, auscultation, CT, reconstruction, valve replacement

1.10 Sign_symptom

- An observable manifestation of a disease or condition based on clinical judgment, or a manifestation of a disease or condition which is experienced by the patient and reported as a subjective observation.
- **Examples:** chest pain, fever, arterial narrowing, headache, nausea, muscle cramping, redness, non-productive cough, difficulty swallowing

2 Indicator classes

These annotations are not actually a part of the UMLS schema, and fall outside of both the entities and relations categories. They serve to add additional information to UMLS annotations, and are closely linked to attributes, which are discussed in the next section. There are many indicator classes, but we will only be using the following:

2.1 conditional_indicator_class

- Indicates that a particular entity is the subject of a condition.
- **Examples:** if, in the eventuality, in the case that

2.2 generic_class

- Indicates that a particular entity is not being mentioned as being present in the patient *nor* is it being stated that it is not in the patient. It is used for more general mentions of particular entities.
- **Examples:** discussed, thought about, section, department, wing

CAUTION: You should not assume that every instance of these trigger words is indicating a generic_class. For example, note the difference between “We discussed the side-effects of chemotherapy” (generic) and “We discussed her cancer” (non-generic). Be cautious!

2.3 *historyOf_indicator_class*

- Indicates that an entity has been present in the past (gives no indication to whether it is present at the time of the note).
- **Examples:** hx of, history of, three years ago had, has had

2.4 *negation_indicator_class*

- Indicates that an entity is not present.
- **Examples:** no evidence of, without, lacking, missing, none, no

2.5 *uncertainty_class*

- Indicates that there is uncertainty as to whether an entity is present.
- **Examples:** unsure, might be, could be, not sure, evidence of, possible

3 **Attributes and Normalization**

As with indicator classes, attributes are not a part of the UMLS schema per se. They are used in conjunction with indicator classes to add additional detail to UMLS annotations. Most of the attributes, like the indicator classes, are handled outside of CU. We will only be using the following:

3.1 *Conditional*

Definition: Conditional use of a medical concept. This is used primarily to indicate the existence of a conditional phrase (see examples below).

Accepted arguments: conditional_indicator_class

Normalization values: true, false (default)

Example

The patient should come back to the ED **if** any rash occurs.

“if” is annotated as a conditional_indicator_class, and added as an argument to the Conditional attribute of “rash” with the normalization value “true.” (Note: although syntactically it may seem to make more sense that “if any rash occurs” should be the conditional_indicator_class added to “come back to the ED,” this is not the case. “come back to the ED” is not annotated under THYME, as it does not fit any of the semantic types.)

Example

The patient **should return** to the ED immediately for any numbness.

“should return,” the conditional_indicator_class, is the argument of the Conditional attribute of “numbness” (normalization value “true”).

Future events are also annotated with a Conditional modifier:

Example

Patient **is scheduled** for colonoscopy

The mention “colonoscopy” has in its Conditional attribute the conditional_indicator_class “is scheduled,” with the normalization value “true.”

3.2 *Generic*

Definition: generic use of a medical concept i.e., the mention is not related to the instance of a disorder, sign/symptom, etc.

Accepted arguments: `generic_class`

Normalization values: `true`, `false` (default)

Example

The patient was referred to the Lupus clinic.

Because this sentence does not specify whether the patient has Lupus (remember, we're doing intra-sentential annotations only, and not using any extra-textual information), "clinic" is annotated as a `generic_class` and added as the argument to the Conditional attribute of "Lupus."

Example

Unenhanced and enhanced aortic dissection protocol

Again, this sentence makes no indication that the aortic dissection took place. Therefore, "protocol" is annotated as a `generic_class` and added to the Conditional attributes of "unenhanced and enhanced aortic dissection." The normalization value is "true."

Example

We discussed increased risk of breast cancer

"discussed" is annotated as a `generic_class` and added to the Conditional attribute of "breast cancer" (normalization "true").

Example

We discussed possible increased risk of recurrence locally without radiation.

In this sentence, both "recurrence" and "radiation" are being discussed, and there is no indication that either has taken place; because of this, they both have the `generic_class` "discussed" added to their Conditional attributes with the normalization values set to "true."

Example

We also discussed pros and cons of tamoxifen which could reduce her risk of recurrence

The `generic_class` "discuss" is added to the Conditional attribute of both "tamoxifen" and "recurrence," with normalization values set to "true."

3.3 *historyOf*

Definition: An indication of explicit mentioning of a past history. The indicator captures only very explicit mentions of historicity, such as "history of cancer" "past medical history: cancer," "hx of," "past," &c. These are historicity indicators not expressed through TLINKs.

Accepted arguments: `historyOf_indicator_class`

Normalization values: `historyOf_present`, `historyOf_absent` (default)

Example

PMH: HYPERLIPIDEMIA

The initialism PMH stands for “past medical history,” indicating that hyperlipidemia has been present in the past. “PMH” gets annotated as a historyOf_indicator_class, added to the historyOf attribute of “hyperlipidemia,” and receives the normalization value “historyOf_present.”

Example:

No significant history of cancer

“history of,” being an obvious historical indicator, gets annotated as a historyOf_indicator_class and added to the historyOf attribute of “cancer” (normalization value set to historyOf_present). (Note: “No” in this sentence is a negation_indicator_class, and is added to the Negation Indicator attribute of “cancer.”)

3.4 Negation Indicator

Definition: Used to indicate that a procedure, assertion, or other entity did not occur or does not exist. This modifier refers to whether the presence of a disorder, sign/symptom, &c. was negated. (Note: this can be confusing. Remember that if a negation is present, the entity in question is *not* present.)

Accepted arguments: negation_class_indicator

Values: negation_present, negation_absent (default)

Example

She had no fever yesterday.

The disorder “fever” has its Negation Indicator attribute filled with the negation_indicator_class “no,” which is normalized to “negation_present.”

Example

Patient denies fever.

“denies” is annotated as a negation_indicator_class and added to the Negation Indicator attribute of “fever” (it also receives the normalization value “negation_present”).

Example

The patient has not noticed any numbness.

“not noticed any” is annotated as a negation_class_indicator and used to fill the Negation Indicator attribute of “numbness” (again, normalized to “negation_present”).

Example

She denies any symptoms of aseptic meningitis including vomiting and headache. In this case, “denies” applies to several other entities. “denies” is annotated as a negation_class indicator and added to the Negation Indicator attributes of “symptoms of aseptic meningitis,” “vomiting,” and “headache.” All three receive normalization values of “negation_present.”

3.5 Subject

Definition: The person a particular entity affects, is seen in, or is related to. This modifier refers to the entity experiencing the disorder.

Accepted arguments: Person (Note: this is the only attribute that takes an argument other than an indicator class.)

Normalization values: Patient, Family_Member, Donor_Family_Member, Donor_Other, Other.

Example

The **patient** has a fever.

The Subject attribute belonging to “fever” is filled with the Person argument “patient,” which is normalized to “Patient.”

Example

The **patient’s son** has schizophrenia.

Both “patient’s” and “patient’s son” are annotated as a Person, and “patient’s son” is added to the Subject attribute of “schizophrenia.” The normalization value is set to “Family_Member,” because the entity being annotated, schizophrenia, is present in a family member of the primary patient.

“Patient” (besides the obvious) includes the recipient of something like a transplant

- Pt** received allogeneic transplant. (span = “Pt,” normalization value = “Patient)

“Family_Member” value may be used for general references to family

- Family** history of hyperlipidemia (span = “Family,” normalization value = “Family_Member”)

“Donor_Family_Member” should be clearly marked as a donor and as relative of the patient

- Her brother John** donated bone marrow for her transplant. (span = “Her brother John,” normalization value = “Family_Member_Donor”)

“Donor_Other” is a donor that is not a relative of (or has unclear relationship to) the patient

- Mrs. Smith** donated bone marrow for her transplant. (span = “Mrs. Smith,” normalization value = “Donor_Other”)

“Other” value for references to non-immediate or unclear family relationships

- Family History: ... **Other Mother** Comment: A Fib. , divertics (span = “Other Mother,” normalization value = “Other”)

“Other” can also be used for departments or specialists

- Cardiology** was consulted (span = “Cardiology,” normalization value = “Other”)

3.6 *Uncertainty Indicator*

Definition: An introduction of a measure of doubt into a statement. This modifier refers to the uncertainty associated with the mention. It only refers to explicit mentions of uncertainty, and does not involve any pragmatics-level reasoning. Note: many physicians hedge a large amount of their statements to decrease liability issues. You may see a lot of these annotations, so be on the lookout for them.

Accepted arguments: `uncertainty_indicator_class`

Values: `indicator_present`, `indicator_absent` (default)

Example

The patient presents for the **evaluation of MI**.

(Note: in this case, the evaluation is used to determine whether an MI took place, not to evaluate a definite MI.) “evaluation of” receives an `uncertainty_indicator_class` annotation, and is used to fill the Uncertainty Indicator of “MI,” with the normalization value “`indicator_present`.”

Example

The symptoms are **not inconsistent with** renal failure

“not inconsistent with” is annotated as an `uncertainty_indicator_class` added to the Uncertainty Indicator field of “renal failure,” and normalized to “`indicator_present`.”

4 Frequently Asked Questions

4.1 *How do I indicate family history?*

In the MiPACQ project, we indicated family history by using an attribute that could accept a value of “`Family_HistoryOf`.” In THYME, we’ll be using a combination of two attributes: `Subject` and `HistoryOf`. For example, if you have the following sentence:

Family history of hypertension.

you would annotate “Family” as a `Person` with a normalization value of “`Family_Member`,” annotate “history” as a `historyOf_indicator_class`, and add both of them to “hypertension.” If you see a sentence like this one:

Mother had adrenals removed.

you would annotate “Mother” as a `Person` (normalization value of “`Family_Member`”), “had” as a `historyOf_indicator_class`, and add them both to “adrenals removed.”

4.2 *Should I annotate population groups as Persons?*

Although we annotated population groups in MiPACQ, we will not be doing that in THYME. So phrases like “males under the age of 40,” “those who suffer from diabetes,” and “all patients at the hospital” would remain unannotated.

4.3 Should I create overlapping annotations?

Because of the objectives of THYME and the method of creating CEM template annotations, we will be using overlapping annotations in this project. In order to create the most specific annotations of a particular semantic type, you may be using fairly long spans, but it's important to create some smaller spans within the longer ones. Take this sentence for example:

Right lower leg swelling caused by edema.

The following entities should be annotated:

[Right lower leg swelling] Sign/Symptom
[Right lower leg] Anatomical_site
[leg swelling] Sign/Symptom
[edema] Disease/Disorder

(The purpose for creating both [Right lower leg] and [leg swelling] will become more clear during relation annotation.) Remember that we can always programmatically remove shorter annotations while maintaining longer ones (or vice versa), so make sure that you capture as much information as possible. Fortunately, cTAKES usually preannotates a very large number of semi-redundant spans, so creating overlapping annotations shouldn't add a great deal of work for annotators.

For more information on overlapping spans and how they are used, see the relation guidelines below.

THYME CU Specific annotation guidelines: UMLS relations, attributes, and FAQs

1 General guidelines

The initial UMLS relations guidelines were developed under the MiPACQ. The difference between the MiPACQ and THYME relation annotations is that we are limiting the relations to only a subset. Relations not included in the subset are not to be annotated.

All relations should be contained within the same sentence. **Note: we are not annotating inferred annotations for this project. Do not annotate any inferred relations unless specifically authorized to do so.** Inference is defined as any conclusion that you reach based on your domain or world background knowledge and that you cannot deduce solely from the structure of the sentence, e.g. the arguments to a verb, trigger words, &c.

The arguments of the UMLS relations are gold standard named entity mentions. You are to annotate relations ONLY between the existing entity mentions (see the annotation flow document for more details). You are not allowed to change, remove, add to, or modify in any way the provided entity mentions.

1.1 Terms

- argument
 - In an English sentence, the word or phrase to the left of the UMLS relation title is considered the argument. So, “amoxicillin” in “Amoxicillin treats bacterial disease” is an argument.
- related_to
 - In an English sentence, the word or phrase to the right of the UMLS relation title fills the related_to slot. So, “bacterial disease” in “Amoxicillin treats bacterial disease” fills the related_to slot of the relation.

2 Types of UMLS relations

2.1 affects

Definition: Produces a direct effect on. Implied here is the altering or influencing of an existing condition, state, situation or entity.

Example: Drug X sedates a child with Downs Syndrome
[Drug X] *affects* [a child with Downs Syndrome]

Example: Significant caffeine intake has raised her blood pressure.
[Significant caffeine intake] *affects* [blood pressure]

2.2 *causes/brings_about*

Definition: Brings about a condition or an effect. Implied here is that an agent, such as, for example, a pharmacologic substance or an organism, has brought about the effect. This includes "induces," "effects," "evokes," and "etiology." Acts on or influences an entity. Brings forth, generates or creates. This includes "yields," "secretes," "emits," "biosynthesizes," "generates," "releases," "discharges," and "creates."

Canonically, the UMLS has a three way distinction between *brings_about*, *causes*, and *produces*, but the difference between them is very slight, even using the UMLS guidelines. So, for these projects, we've merged those three subcategories into *causes/brings_about*. This relation is used to express any flavor of causation you can think of.

Example: Also, lidocaine products reportedly give her an altered mental status.

[lidocaine] *causes/brings_about* [altered mental status]

2.3 *complicates/disrupts*

Definition: Causes to become more severe or complex or results in adverse effects. Alters or influences an already existing condition, state or situation. Produces a negative effect on.

Once again, these concepts are canonically separated in the UMLS, but there was little to differentiate the two in most cases, so, in this annotation schema, anything falling under the bounds of either will be marked with one relation type, "*complicates/disrupts*".

Example: Cystoscopy was complicated by moderate hematuria.

[hematuria] *complicates/disrupts* [cystoscopy]

Example: We were unable to complete the angiogram because of arterial blockage.

[arterial blockage] *complicates/disrupts* [angiogram]

2.4 *Contraindicates*

Definition: To make something inadvisable or to negate the benefits of a possible treatment. If the presence of A makes B inadvisable, A contraindicates B.

This relation was created for our instance of the schema because there was no other good way to express this relation. Note that it is *not* the same as "does not indicate" (which would be represented by a negated "indicates" relation).

Example: Ondansetron Oral Solution, USP is contraindicated for patients known to have hypersensitivity to the drug.

[hypersensitivity to the drug] *contraindicates* [Ondansetron Oral Solution, USP]

Example: Women who are pregnant or may become pregnant may not take these medications.

[pregnant] contraindicates [these medications]

2.5 *degree_of*

Definition: The relative intensity of a process or the relative intensity or amount of a quality or attribute. *degree_of* should be used primarily when entities are graded on a scale or in a quantitative-like manner. This includes "mild," "severe," "moderate," "increased," "decreased," "normal," and other such words. Note: the arguments used for *degree_of* relations will almost always be an indicator class, such as "severity_indicator_class."

Example: Patient stated decreased neuropathic pain

[decreased] *degree_of* [neuropathic pain]

Example: Kidney function is normal

[normal] *degree_of* [kidney function]

2.6 *diagnoses*

Definition: Distinguishes or identifies the nature or characteristics of. This is different from the *indicates* relation in that it provides a definitive diagnosis, while *indicates* is used for relations which have a lower degree of certainty. Also, *indicates* can be used with a wider variety of entities; *diagnoses* will almost always be used with disorders in the related_to slot.

Example: An abdominal CT revealed a 2 cm solid enhancing mass , most certainly a renal cell carcinoma, new since CT done in 8/11.

[abdominal CT] diagnoses [renal cell carcinoma]

2.7 *indicates*

Definition: Gives evidence for the presence at some time of an entity or process.

Example: Labs demonstrate normal electrolytes and creatinine.

[labs] indicate [normal electrolytes and creatinine]

Example: Skin rash most characteristic of a dermatitis and asteatitis.

[skin rash] indicates [dermatitis]

[skin rash] indicates [asteatitis]

2.8 *is_indicated_for*

Definition: To suggest a course of action, diagnostic or treatment. This is often used in the context of a clinical best practice or of prudent treatment, and is usually annotated between a treatment or medication and a disorder. Stating that a treatment is indicated for

a disorder states that not only might the treatment be effective, but it's a known clinical best practice for it to be used for that disorder. This relation can also be used with diagnostic procedures and symptoms, as seen below (example 2).

Example: Antibiotics are indicated for bacterial infections.
[antibiotics] *is_indicated_for* [bacterial infections]

Example: Because she suffered a concussion, a CT scan of the head is prudent.
[CT scan] *is_indicated_for* [concussion]

2.9 *location_of*

Definition: The position, site or region of an entity or the site of a process. Note: this relation will often result in some semantic redundancy when used correctly for THYME, as we are relating entities that are maximally specific whenever possible. See examples 2 and 3 below. Also, note that an entity may have multiple *location_of* relations based on the amount of information present in the sentence (see example 4).

Example: The patient has gout in the olecranon bursa
[olecranon bursa] *location_of* [gout]

Example: He was admitted with right leg swelling.
[right leg] *location_of* [leg swelling]

Example: She was diagnosed with breast cancer.
[breast] *location_of* [breast cancer]

Example: The patient had a skin tumor removed from behind his left ear.
[skin] *location_of* [skin tumor]
[behind his left ear] *location_of* [skin tumor]

2.10 *manages/treats*

Definition: Is applied as a remedy with the object of affecting a cure or managing a condition. Once again here, two relations from the UMLS ("manages" and "treats") were collapsed due to their closeness of meaning.

Example: Milk of Magnesia 30 cc p.o. q.h.s. p.r.n. constipation
[Milk of Magnesia] *manages_treats* [constipation]

Example: Endoscopy showed an angiodysplasia of the duodenum; applied bipolar electrocoagulation
[bipolar electrocoagulation] *manages_treats* [angiodysplasia]

2.11 *manifestation_of*

Definition: The part of a phenomenon which is directly observable or concretely or visibly expressed or which gives evidence to the underlying process. This includes expression of, display of and exhibition of.

Example: CT revealed a 2 cm solid enhancing mass, most certainly a renal cell carcinoma
[2 cm solid enhancing mass] *manifestation_of*[renal cell carcinoma]

Example: Patient is worried because swelling is a symptom of tendinosis.
[swelling] *manifestation_of*[tendinosis]

2.12 *prevents*

Definition: Stops, hinders or eliminates an action or condition.

Example: Post excision of her tumor (with negative margins) the patient elected to undergo hysterectomy to prevent any recurrence of her uterine cancer.
[hysterectomy] *prevents* [recurrence . . . uterine cancer]

2.13 *result_of*

Definition: Results in a value, as in the case of a laboratory test.

Example: Rheumatoid factor at 300 + units
[300+ units] *result_of*[rheumatoid factor]

Note: Although it require an inference to induce that there was a rheumatoid factor test to determine this relationship, it's a very minor one and acceptable.

Example: RBC 3.83
[3.83] *result_of*[RBC]

3 Attributes

For information on indicator classes, see the entity guidelines document. The use of indicator classes in relation attributes is detailed below.

3.1 *Conditional*

Definition: Conditional use of a medical concept. . It signals hypothetical relations that are within a hypothetical or conditional construction, wherein the reality of the relation is conditional on something else happening. Hypothetical relations will often follow “if” statements (“If X happens, then we’ll use Y to treat Z”) or other sorts of conditionals (“Depending on the patient’s response, we might treat A with B or with C”). This also includes relations that are scheduled, planned, or predicted to occur in the future. Note: if you are familiar with the MiPACQ relation guidelines, the Conditional attribute is very similar to the Reality (actual, hypothetical, hedged, future) attribute.

Arguments accepted: conditional_class_indicator
Normalization values: True, False (default)

Example: If the patient's tumor returns, we can continue treating it with Oxaliplatin.
[Oxaliplatin] *manages/treats* [tumor]
(conditional_indicator_class span = "if," normalization = "True")

Example: Hopefully, the tumor will shrink with the FOLFOX, and this will not be an issue.
[FOLFOX] *interacts_with* [tumor]
(conditional_indicator_class span = "will shrink," normalization = "True")

Example: Depending on the response, we could either consider radiation with 5-FU, continuation of FOLFOX, or possible surgery depending on tumor response.

[radiation with 5-FU] *manages/treats* [tumor]
(conditional_class_indicator span = "consider," normalization = "True")

[FOLFOX] *manages/treats* [tumor]
(conditional_class_indicator span = "consider," normalization = "True")

[surgery] *manages/treats* [tumor]
(conditional_class_indicator span = "consider," normalization = "True")

Example: He does have some concerns that the rectal mass may grow and cause obstructive symptoms.

[rectal mass] *causes/brings_about* [obstructive symptoms]
(conditional_class_indicator span = "concerns," normalization = "True")

Example: We will plan to proceed with surgery next week to remove the tumor.

[surgery] *manages/treats* [tumor]
(conditional_class_indicator span = "will plan," normalization = "True")

Example: The plan is to treat the mass with this regimen for two months which would be a total of four cycles and reassess with a CT scan at that time.

[regimen] *manages/treats* [tumor]
(conditional_indicator_class span = "The plan," normalization = "True")

Example: Once the patient is cleared by her cardiologist, we will treat the tumor with oxaliplatin at 85 mg/m2.

[Oxaliplatin] *manages/treats* [tumor]
(conditional_indicator_class span = "will treat," normalization = "True")

3.1.1 Negation

Definition: Used to indicate that a procedure or assertion did not occur or does not exist. It is an indicator, so valid values are `negation_absent` and `negation_present`. `negation_present` means the relation is explicitly negated.

Arguments accepted: `negation_class_indicator`

Values: `negation_absent` (default), `negation_present`

Example: Vitamin supplements do not interact with orthotricyclin.

[vitamin supplements] *interacts_with* (*negated*) [orthotricyclin]

3.1.2 Uncertainty

Definition: An introduction of a measure of doubt into a statement. This modifier refers to the uncertainty associated with a relation. It only refers to explicit mentions of uncertainty, and does not involve any pragmatics-level reasoning.

Accepted arguments: `uncertainty_class_indicator`

Values: `indicator_present`, `indicator_absent` (default)

Relations are marked as `Uncertainty_indicator_present` which fills the `Uncertainty_indicator` attribute when the doctor mentions a given relation alongside 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 relations are often strongly implied, but, for safety, liability, or due to lack of comprehensive evidence, are not stated as fact by the doctor.

Examples: The patient does have some baseline thrombocytopenia which I suspect is due to his underlying liver cirrhosis.

[liver cirrhosis] *causes/brings_about* [thrombocytopenia]
(`uncertainty_class_indicator` span = “I suspect,” normalization = “indicator_present”)

Example: Ultrasound findings were felt to be consistent with a T3, N1 rectal tumor.

[ultrasound findings] *indicates* [T3, N1 rectal tumor]
(`uncertainty_class_indicator` span = “to be consistent,” normalization = “indicator_present”)

Example: He is also aware of the two pulmonary nodules as well as the lesion in the liver which do have increased uptake on a PET scan, and he understands that this is concerning for metastatic disease.

[lesion in the liver] *indicates* [metastatic disease]

(uncertainty_indicator_class span = "this is concerning for," normalization
= "indicator_present)