New concept proposal

Interpretation

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Project	General importance	**Contact**	DCC
Dataset release	2024.1	**Consulted expert**	

1 Rationale

When results are produced in a study or investigation, they are often interpreted to make sense of that outcome. We can think of different kinds of interpretations such as statistical interpretations to make sense of values obtained in a data analysis (e.g. p-value), comparative interpretation which would make sense of a value in comparison to defined standards, etc. Interpretation of medical results is quite widespread and would represent valuable information for researchers to analyze the data.

2 Comparison to other standards/data models

2.1 FHIR

FHIR defines in the Observation an interpretation as “a categorical assessment of an observation value. For example, high, low, normal.”.

2.2 NCIT

NCIT defines the term “interpretation” as “An act or process of elucidation, explication, or explanation of the meaning of an event or thing.”.
The extended CDISC definition for “interpretation” is “An act or process of elucidation; explication, or explanation of the meaning of the event or thing via the assignment of objects from the domain to the constants of a formal language, truth-values to the proposition symbols, truth-functions to the connectives, other functions to the function symbols, and extensions to the predicates, if any. The assignments are result of human logic application and are not native to the symbols of the formal language.”

2.3 SNOMED CT

SNOMED CT features the code 243814003 | Interpretation of findings (observable entity) | as child of 363787002 | Observable entity (observable entity) |. It has 17 descendants and covers various types of interpretation, for example biopsy interpretations (271935000), prognoses and outlook (170967006), or test interpretations (277034006).

3 Concept information

3.1 Proposal A (Interpretation of single input)

Concept or concept compositions or inherited	General concept name	General description	Contextualized concept name	Contextualized description	Type	Standard	Value set or subset	Meaning binding	cardinality for composedOf
concept	Interpretation	process of making sense of a result to derive meaningful conclusions	Interpretation	process of making sense of a result to derive meaningful conclusions					
composedOf	input result	input result associated to the concept	Input result	the result that is interpreted	Result				1:1
composedOf	output result	output result associated to the concept	interpretation result	the actual interpretation	Result				1:1
composedOf	standard guideline	reference to a standard document associated to the concept	standard guideline	standard document or publication used for interpreting the input result	string				0:1

3.2 Proposal B (Interpretation of multiple inputs)

Concept or concept compositions or inherited	General concept name	General description	Contextualized concept name	Contextualized description	Type	Standard	Value set or subset	Meaning binding	cardinality for composedOf
concept	Interpretation Process	process of making sense of a result to derive meaningful conclusions	Interpretation	process of making sense of a result to derive meaningful conclusions				SNOMED CT: 363109007 | Evaluation of test results (procedure) |	
composedOf	result input	input result associated to the concept	result input	the result that is interpreted	Result				0:n
composedOf	diagnosis input	input diagnosis associated to the concept	diagnosis input	the diagnosis that is interpreted	Diagnosis				0:n
composedOf	data file input	input data file associated to the concept	data file input	the data file that is interpreted	Data File				0:n
composedOf	interpretation	interpretation associated to the concept	interpretation result	the actual interpretation	Interpretation				1:1
composedOf	datetime	datetime of the concept	interpretation datetime	datetime when the conclusion, i.e., the interpretation, was drawn	temporal				0:1
composedOf	standard guideline	reference to a standard document associated to the concept	standard guideline	standard document or publication used for interpreting the input components	string				0:n

Concept or concept compositions or inherited	General concept name	General description	Contextualized concept name	Contextualized description	Type	Standard	Value set or subset	Meaning binding	cardinality for composed Of
concept	Interpretation	meaningful conclusions derived from input	Interpretation	meaningful conclusions derived from input				SNOMED CT: 243814003 |Interpretation of findings (observable entity)|	
composedOf	result	result associated to the concept	result output	the result representing the outcome of the interpretation	Result				0:n
composedOf	diagnosis	diagnosis associated to the concept	diagnosis output	the diagnosis representing the outcome of the interpretation	Diagnosis				0:n

3.3 Proposal C (Interpretation of multiple inputs; generic concept)

Proposal C represents a generic concept which can be used as a blueprint for more specialized concepts.

Concept or concept compositions or inherited	General concept name	General description	Contextualized concept name	Contextualized description	Type	Standard	Value set or subset	Meaning binding	cardinality for composed Of
concept	Interpretation	process of making sense of an outcome to derive meaningful conclusions	Interpretation	process of making sense of an outcome to derive meaningful conclusions				SNOMED CT: 363109007 |Evaluation of test results (procedure)|	
composedOf	input	input associated to the concept	information input	the input information that is interpreted	SPHNConcept				0:n
composedOf	output	output associated to the concept	interpretation result	the actual interpretation of the information input	SPHNConcept				1:n
composedOf	datetime	datetime of the concept	interpretation datetime	datetime when the conclusion was drawn, i.e., the interpretation made	temporal				0:1
composedOf	standard guideline	standard document associated to the concept	standard guideline	standard document or publication used for interpreting the input components	string				0:n

General concept name	Cardinality for concept to Administrative Case	Cardinality for concept to Data Provider	Cardinality for concept to Subject Pseudo Identifier	Cardinality for concept to Source System
Interpretation		1:1		1:1

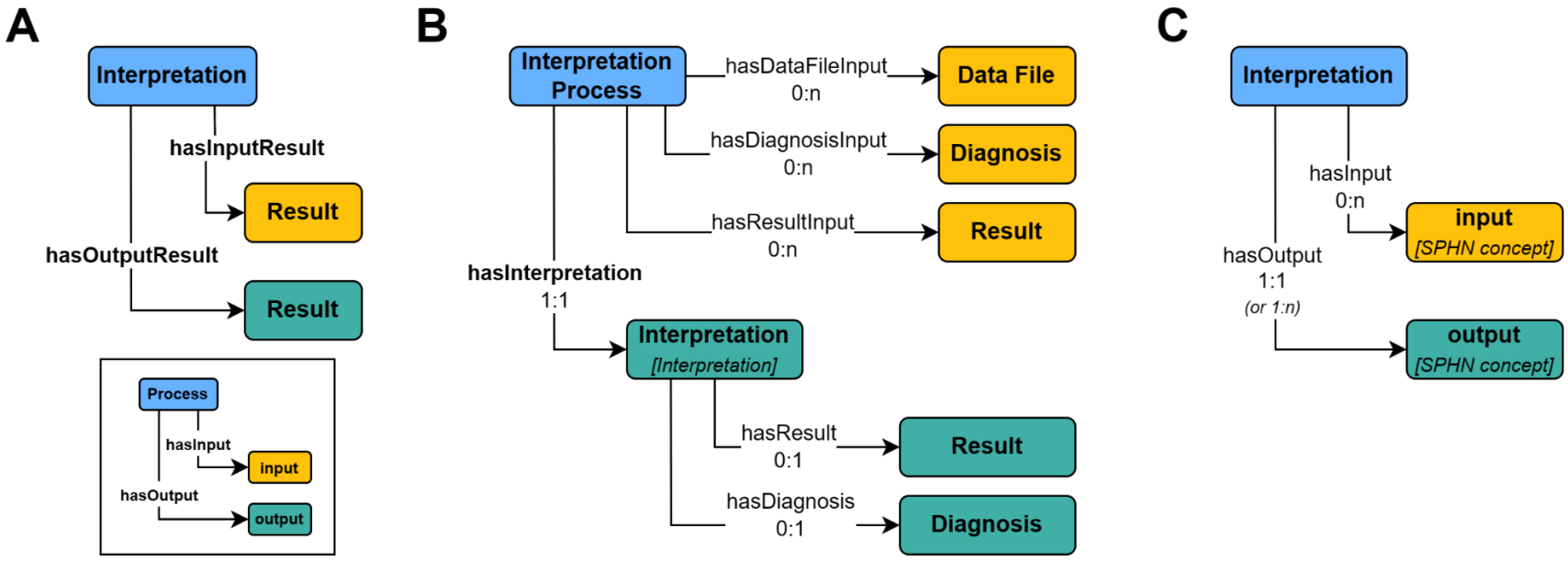

Figure 1: Interpretation Process and Interpretation

(A) Interpretation (process) with a single input and output result (Proposal A). Inset: Process-oriented concept design.
(B) The process of interpreting multiple potential inputs of specific type to a single output (Interpretation) of type Result or Diagnosis (Proposal B).
(C) The input and output are flexible: The only constraint is that they are of type “SPHN concept” (Proposal C). This generic concept can be used as a blueprint for more specialized concepts.

4 Impact on the SPHN Dataset

All proposals do not have a major impact on the SPHN Dataset (release 2023.2) since the concepts presented here are new concepts and will be reusing other existing and newly defined concepts.

5 Discussion

The Interpretation gives additional insights for making sense of a result based on external knowledge enabling for this inference. The Reference Interpretation concept is a specific interpretation that allows to infer knowledge based on both a Lab Result which contains the actual result information and a Reference Range or Reference Value (see new Reference Interpretation concept here).

The Interpretation differs from the Assessment in the sense that the assessment aims at collecting data based on an objective measurement or score, which often leads to a quantitative or qualitative result, while the interpretation is a subjective analysis of a result, for example the classification of a sepsis type, or even the assignment of a diagnosis.

The Interpretation concept is currently limited to include basic information, but can easily be extended by additional attributes of interest, for example information on the performer of the interpretation.

The Semantic Working Group (meeting 25.10.2023) has discussed the different proposals:

- Proposal A is not flexible enough to cover the use cases where the interpretation is not made on Results. Therefore, this proposal is not considered.
- Proposal B is an approach that appears to be excessively and unnecessarily complex to convey the knowledge about an interpretation and may still miss requirements of specific use cases. In addition, the “generic” concept of Interpretation is already specifying use case specific composedOfs and would be difficult to extend for other use cases without lengthening the amount of composedOfs.
- Proposal C is flexible enough to enable the definition of different use cases such as the Reference Interpretation by keeping the semantics correct between the generic concept and the specialized ones.
  Note that the cardinality of 0:n is crucial for the ‘input’-composedOf as source input is often not traceable.

The Semantic Working Group has favored proposal C. It will be included in the 2024.1 release of the SPHN Dataset.

6 Example

6.1 Proposal A (Interpretation of single input)

Interpretation

input result:
quantity:

value: 10.1
unit: g/dL
code: -
string value: -
output result:
quantity: -
code: 271737000 |Anemia (disorder) |
string value: -
standard guideline: -

6.2 Proposal B (Interpretation of multiple inputs)

Interpretation Process

result input:
result [Microorganism Identification Result]:
code: 52101004 |Present (qualifier value)|
time to positivity [Quantity]:
value: 72
unit :h
organism:
code: 112283007 |Escherichia coli (organism) |
diagnosis input:
code: P77 |Necrotizing enterocolitis of newborn|
record datetime: 2023-08-05 10:22:15
coding datetime: 2023-08-04 16:53:45
subject age:
quantity:
value: 22
unit: wk
determination datetime: 2023-08-03 10:42:05
data file input:
name: PatID_12309378_ 2023-08-03_07:32:15
uniform resource identifier: file://ukbb35/icu2/PatID_12309378_ 2023-08-03_07:32:15
format code: EDAM:format_3548 |DICOM format|
interpretation:
result: -
diagnosis:
code: 206379003 |Sepsis of newborn caused by Escherichia coli (disorder)|
record datetime: 2023-08-05 10:25:25
coding datetime: 2023-08-05 10:25:25
subject age:
quantity:
value: 22
unit: wk
determination datetime: 2023-08-03 10:42:05
datetime: 2023-08-05 10:25:25
standard guideline: PMID: 3081865

6.3 Proposal C

Interpretation example 1: Interpretation of a microorganism identification result, a known diagnosis, and a data file, e.g., an X-ray image, to conclude the kind of sepsis a patient presents with.

Interpretation

input:
microorganism identification result:
code: 52101004 |Present (qualifier value)|
time to positivity:
value [double]: 72
unit: h
organism]: 112283007 |Escherichia coli (organism) |
input:
diagnosis:
code: P77 | Necrotizing enterocolitis of newborn|
record datetime: 2023-08-05 10:22:15
coding datetime: 2023-08-04 16:53:45
subject age:
quantity
value: 22
unit: wk
determination datetime: 2023-08-03 10:42:05
input:
data file:
name: PatID_12309378_ 2023-08-03_07:32:15
uniform resource identifier: file://ukbb35/icu2/PatID_12309378_ 2023-08-03_07:32:15
format code: EDAM:format_3548 |DICOM format|
output:
diagnosis:
code: 206379003 |Sepsis of newborn caused by Escherichia coli (disorder)|
record datetime: 2023-08-05 10:25:25
coding datetime: 2023-08-05 10:25:25
subject age:
quantity:
value: 22
unit: wk
determination datetime: 2023-08-03 10:42:05
datetime: 2023-08-05 10:25:25
standard guideline: PMID:3081865