New concept proposal

Organ Support

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1 Rationale

Organ support procedures are important measures to keep patients alive in intensive care units and other wards of a hospital. Such procedures either support or even replace the function of an organ for a limited period of time. Procedures exist for lung (ventilation, extracorporeal membrane oxygenation (ECMO)), heart (ECMO, Impella, LVA, Ventricular Assist Device), liver or kidney (dialysis). Some of these procedures, in particular dialysis, are also important for patients treated in the outpatient setting.

Organ failure, and therefore the need for organ support, is an important endpoint/outcome in many scientific studies. Furthermore, information on organ support procedures is required to calculate the SOFA score. This score is used to assess the degree of organ dysfunction and thereby the mortality risk of a patient in the intensive care unit.

2 Comparison to other standards/data models

2.1 Concept Organ Support

No explicit standard for Organ Support was found, neither in FIHR nor OpenEHR. In the MIMIC database, a freely-available database comprising de-identified health-related data associated with over forty thousand patients who stayed in critical care units of the Beth Israel Deaconess Medical, organ support is modelled as a procedure. We assume that most standards would adopt the same strategy and use procedure to represent Organ Support. The proposed concept Organ Support also inherits from SPHN Procedure; hence we adopted the same strategy but modelled it explicitly as an additional concept instead of using SPHN Procedure directly. **A suitable meaning binding could not be found.**

2.2 Value set of OrganSupport::hasCode (inherited from SPHN:Procedure::hasCode)

The information whether a patient had ECMO or was ventilated is part of the MDSI, the Minimal Dataset of the Swiss Society for Intensive Care Medicine. The information is encoded as a binary value only, hence whether a patient was ventilated yes/no, ECMO yes/no. No further details regarding the ventilation mode or type of ECMO are included.

2.3 Billing, DRG data set

Organ support is encoded as CHOP codes for billing (part of DRG codes). The focus there is more on the implementation of an organ support procedure than on the observation that organ support is present over a period of time. Also, details of the organ support mode are missing.

2.4 SNOMED-CT

Proposed value set for the new concept to indicate the type of organ support (OrganSupport::hasCode)

3 Concept information

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	**Organ Support**	type and time period when patient was supported by organ support procedures	**Organ Support**	type and time period when patient was support by organ support procedures like dialysis, ECMO, cardiac support like IAPB, Heart Pump, Impella, Left ventricular assist device (LVAD), respiratory support	**Medical Procedure**				
inherited	code	coded information specifying the concept	organ support code	code/mode of the organ support method	Code	SNOMED CT	descendant of: 232957001 | Cardiac support procedure (procedure) |; descendant of: 108241001 | Dialysis procedure (procedure) |; descendant of: 233573008 | Extracorporeal membrane oxygenation (procedure) |; descendant of: 1222606000 | Continuous mandatory ventilation (regime/therapy) |; descendant of: 1149092001 | Positive pressure airway ventilation (regime/therapy) |		1:1

inherited	body site	anatomical site or structure associated to the concept	organ support body site	body site of the organ support	Body Site	SNOMED CT	code restricted to: descendant of: 39607008 |Lung structure (body structure)|; descendant of: 80891009 |Heart structure (body structure)|; descendant of: 10200004 |Liver structure (body structure)|; descendant of: 64033007 |Kidney structure (body structure)|		0:n
inherited	start datetime	datetime at which the concept started	organ support start datetime	start datetime of organ support	temporal				1:1
inherited	end datetime	datetime at which the concept ended	organ support end datetime	end datetime of organ support	temporal				0:1
inherited	intent	intention for the concept	organ support intent	intention of the organ support	Intent		code restricted to: 399707004 | Supportive - procedure intent (qualifier value) |		0:1

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
Organ Support	0:1	1:1	1:1	1:1

4 Impact on the SPHN Dataset

Following feedback from the Semantic Working Group (11.10.2023), the cardinality for the composedOf “body site” should be 0:n as organ support can affect more than one body site. The cardinality 0:1 inherited from Procedure (as of release 2023.2) is therefore not suitable. The cardinality for the body site-attribute of Procedure will be adapted accordingly in release 2024.1.

Note: In previous releases, the concept Procedure had the composedOf ‘coding datetime’.The introduction of the concept ‘Semantic Mapping’ in release 2024.1 makes this composedOf obsolete. It has therefore been removed from Procedure and in consequence from inheriting concepts.

5 Discussion

The decision to model organ support procedures as a separate concept, explicitly captured as "Organ Support," stems from the need for a clear and distinct representation of these critical interventions. Defining organ support as a separate entity allows for better organization, analysis, and identification of patients who have received such interventions across different datasets and standards.

“body site” should not be instantiated for ECMO as support of the whole body. For other support types there can be multiple body sites. The cardinality of the composedOf 'body site' was initially suggested as 1:1, but has been changed to 0:n following recommendations of the Semantic Working Group (11.10.2023). As this attribute is inherited from ‘Procedure’ the cardinality of composedOf 'body site' of 'Procedure' needs to be adjusted to 0:n accordingly (change implemented in release 2024.1 where ‘Procedure’ is moreover renamed to ‘Medical Procedure’).

It would have been an option to use CHOP codes instead of or in addition to SNOMED-CT codes. The advantage of CHOP codes is that they are established at hospitals for billing. However, CHOP codes are not available at all university hospital ICUs. Furthermore, CHOP is not used internationally.

6 Example

Organ Support

code:
- identifier: 232957001
- name: Cardiac support procedure (procedure)
- coding system and version: SNOMED-CT-2022-12-31

body site:
- identifier: 80891009
- name: Heart structure (body structure)
- coding system and version: SNOMED-CT-2022-12-31

start datetime: 2020-10-22T10:00:00+02:00
end datetime: 2020-12-12T10:00:00+01:00
coding datetime: -

intent:

identifier: 399707004
name: Supportive - procedure intent (qualifier value)
coding system and version: SNOMED-CT-2022-12-31