USAMP-II to RIM 092 mapping

2.3.1

All people, things and locations involved in a Service (or for scheduling purposes "all resources of an activity") are associated with the Service as either actors or targets. Actors are mostly professional provider personnel, but also the patient (for self-administered services,) or a proxy (e.g. next of kin.)

Actors can participate in an action in different ways. For example, primary surgeon, assistant surgeon, sterile nurse, and nurse assistant are all actors in a surgical procedure, who are more or less immediately involved in the action. However, payers, supervisors, provider organizations (e.g., "MicroLab") and their delegates may be actors too, even though they might not be individual persons who have their "hands on" the action. The patient himself is a performing actor in self-care procedures (e.g. fingerstick blood glucose, insulin injection, etc.)

The Stakeholders, people and organizations that can be actors and targets of a service action are capable of and accountable for their independent decisions. Capability of independent decision and accountable usually applies only to persons under the law, including both organizations and natural (human) persons. This "legal person" as a subject of legal rights and obligations is a very obvious interpretation of the RIM Stakeholder construct (it is a well-known legal notion.)

The notion of multiple actors with specific functions touches and partially overlaps on two "sides" with related concepts of the RIM, and understanding the distinctions is important to use the RIM constructs correctly. On the one "side" actor functions look similar to Stakeholder roles (e.g., healthcare practitioner, guarantor, contact-person,) and capability and certification (e.g., certified surgeon vs. resident, certified nurse midwife vs. other midwife practitioner, registered nurse vs. other nurse practitioner.) The professional credentials of a person may be quite different from what a person actually does. The most common example is interns and residents performing anesthesia or surgeries under (more or less) supervision of attending specialists. The opposite example is people who are both medical doctors and registered nurses and who perform the function of a nurse. Thus, roles and certification refer to the static capabilities of a person (person-related) while actors and Actor.type_cd refer to the particular function an actor played in the service (activity-related.)

On the other "side" the actor concept interferes with sub-activities. Whenever multiple actors are involved in a service, each actor performs a different task (with the extremely rare exception of such symmetrical activities as two people pulling a rope from either end.) Thus, the presence of multiple actors could be equally well modeled as a service consisting of sub-services (through the Service_relationship class,) where each service would have only one performing actor

For example, a record of a surgical service may include the actors of type: (a) consenter, (b) primary surgeon, and (c) anesthesist. These three actors really perform different tasks, which can be represented as three related services: (a) the consent, (b) the surgery proper, and (c) the anesthesia service in parallel to the surgery. If we used the sub-services, the consenter, surgeon and anesthesist could simply be of actor type "performer." Thus the more sub-services we use, the fewer different actor types need to be distinguished, and the fewer sub-services we use, the more distinct actor types we need.

Note that the perception of a task as "atomic" or "composite" (of sub-tasks) depends on local business rules and may differ from department to department. In principle, every task can be thought of as being a composite of sub-tasks. We thus say that actions are "fractal." The paradigmatic example of the fractal nature of activities is a "robotic arm" doing some simple action as reaching for a tool in front of it. The seemingly simple activity of the robotic arm decomposes into complex control and coordination procedures and movements, action of separate motors and switches, etc. (We sometimes use the key-phrase "robotic arm discussion" to recall the fractal nature of actions, since this example has been brought up over and over again, independently by different people.)

As a rule of thumb, sub-tasks should be considered instead of multiple actors when each sub-task requires special scheduling, or billing, or if overall responsibilities for the sub-tasks are different. In most cases, however, human resources are scheduled by teams (instead of individuals,) billing tends to lump many sub-tasks together into one position, and overall responsibility often rests with one attending physician, chief nurse, or head of department. This model allows both the multi-actor and the muli-service approach to represent the business reality, with a slight bias towards "lumping" minor sub-activities into the overall service.

Active_participation	clearly mapped
Goal.management_discipline_cd	mapped
Healthcare_service_provider :: participates_as(0..n) :: Producer_of_master_service ::	mapped
Producer_of_master_service	clearly mapped
Resource_request :: generalizes(1..1) :: Individual_healthcare_practitioner_request ::	mapped
Service_intent_or_order.clarification_phon	mapped
Service_intent_or_order.escort_required_ind	mapped
Service_intent_or_order.report_results_to_phon	mapped with issues

Service_intent_or_order.transport_arrangement_responsibility_cd	mapped
Treatment_intent_or_order_revision.needs_human_review_ind	mapped
Treatment_service_dispense.needs_human_review_ind	mapped with issues
Treatment_service_give.needs_human_review_ind	mapped with issues

Actor :: for(1..1) :: Service :: has(0..*) C04-R091.03.02

Active_participation :: participates_in(0..1) :: Service_event :: has_as_active_participant(0..n)	clearly mapped
Active_participation :: participates_in(0..1) :: Service_intent_or_order :: has_as_participant(0..n)	clearly mapped
Producer_of_master_service :: produces(1..1) :: Master_service :: is_produced_by(0..n)	clearly mapped

Actor :: participation_of(1..1) :: Stakeholder :: participates_as(0..*) C04-R091.03.03

Active_participation :: has_as_participant(1..1) :: Stakeholder :: participates_in(0..n)	clearly mapped

Actor.note_txt C04-R091.03.13

2.3.1.3   ED

An actor can make a comment about this service item in the note attribute.

Treatment_service_administration.administrators_notes_cd	mapped
Treatment_service_administration.substance_refusal_reason_cd	mapped

Actor.tmr C04-R091.03.12

2.3.1.2   IVL<TS>

This attribute can specify the time range during which the associated person was an actor of the specified Actor.type_cd in the associated service. This may be needed when the actor's involvement spans only part of the service, and if this fact is worth mentioning. The Actor.tmr does not need to be used in cases where this detail is irrelevant.

Active_participation.tmr	clearly mapped
Service_event.attestation_dttm	mapped

Actor.type_cd C04-R091.03.11

2.3.1.1   SET<CV>

Identifies a particular function or a set of functions that a person performs in the Service.

Note that the Actor.type_cd designates the actual function performed in the service. This is quite different from a role associated with a person or a profession- or specialty-code, although, some of the Actor.type_cd values may suggest that they are the same. While a person's role, a profession code, or a specialty code may signify a general capability and authority of that person, an Actor.type_cd rather represents a part or sub-task of the associated Service activity.

Most notably the role "performing surgeon" is not necessarily played by a certified surgeon, but in many cases by a resident (in which case an attending surgeon is designated as the "responsible" actor.) The same is true for the "anesthesist" which doesn't have to be an "anesthesiologist" and will in most cases be a resident or sometimes even a nurse.

An actor can do multiple of such functions identified by the Actor.type_cd at the same time. This can be represented in two ways: either the same Actor instance can be used with multiple Actor.type_cd values (hence, it's a set of code values). Alternatively, one can use multiple Actor-instances with just one Actor.type_cd value relating to the same Stakeholder. A mixture of both approaches is also possible. The rationale when to use just one or the other approach can be, e.g., an actor playing three roles two of which are closely related whereas the third role may have a different time range. A more concrete ruling on a standardized use may follow in the future.

Active_participation.participation_type_cd   clearly mapped

Condition_node C04-R091.10.00

2.6.4

The condition node service type is used to represent problems (medical conditions.) The primary purpose of the condition node is to arrange other services of the patient record into a longitudinal thread that represents the patient's condition. Condition nodes are lined up along the time axis through links of type updates condition. Thus, a Condition node instance is not a condition or problem in itself, the condition is the entire thread or network of chain-linked condition nodes.

Each condition node represents a revision of the problem in the form of added evidence, or changing of the "name" assigned to the problem. A "name" is assigned to a problem thread by a condition node that binds another observations (diagnosis) to the thread. Consequently, conditions may change their "names" over time to represent the progression of disease, and the changing of knowledge about the disease.

A condition thread may have more than one current name. Consequently, conditions may accumulate names over time as different practitioners develop opinions or descriptions of the condition. It will not be unusual that these names may be in conflict with one another, such as when two clinicians disagree about the nature of a condition. In addition, these names may also change over time to represent the progression of disease or the changing of knowledge about the disease.

Condition_node   clearly mapped

Condition_node :: defines(0..1) :: Episode_of_condition :: C04-R091.10.02

This association binds an episode of condition to a condition thread that defines that episode.

Condition_node :: defines_episode(0..1) :: Episode_of_condition :: links_condition(1..1)   clearly mapped

2.6.5

The Consent class represents informed consents and all slimilar medico-legal transactions between the patient (or his legal guardian) and the provider. Examples are informed consent for surgical procedures, for clinical trials, advanced beneficiary notice, against medical advice decline from service, release of information agreement, etc.

The details of consents vary. Often an institution has a number of different consent forms for various kinds of purposes, that remind the physician about the topics to mention. Such forms also contain patient education material. In electronic medical record communication consents thus are information entities on their own and need to be managed similar to medical activities. Thus, consents are modeled as a special class of Services.

The "signatures" to the consent document are represented electronically through Actor instances to the consent object. Typically an informed consent has actors of type performer (the physician informing the patient, and consenter, the patient or legal guardian. Some consents may associate a witness or a notary public (e.g., living wills, advanced directives.) In consents where a physician is not required (e.g. living will,) the performer may be the patient himself or a notary public.

Some consents have a minimal required delay between the consent and the service, so as to allow the patient to rethink his decisions. This minimal delay can be expressed in the service definition by the service_relationship.pause_qty attribute that delays the service until the pause time has elapsed after the consent has been completed.

Advance_directive   mapped

Consent   clearly mapped

Consent is specialization of Service   C04-R091.12.01

Service_event :: generalizes(1..1) :: Consent :: specializes(1..1)   clearly mapped

Container.capacity_qty   C04-R091.24.11

2.8.2.1   PQ   ~ 1 cm

From NCCLS, a geometric property of the container.

Master_specimen_requirement.container_volume_qty   clearly mapped

Device   C04-R091.27.00

2.8.4

A device is anything used in an activity without being substantially changed through that activity. This includes durable (reuseable) medical equipment as well as disposable equipment.

There are a few device concepts defined by HL7 version 2.3 which are suggested for use in HL7 v2.3 as Material.type_cd values if the material is a device of one of the defined kinds and if it is not otherwise specified. See USAMP documentation, Table 38.

Table 38: Devices commonly used to administer medication (from HL7 v2.3 table 0164)

Value	Description	Value	Description
AP	Applicator	IVS	IV Soluset
BT	Buretrol	MI	Metered Inhaler
HL	Heparin Lock	NEB	Nebulizer
IPPB	IPPB	PCA	PCA Pump
IVP	IV Pump		

Durable_medical_equipment   mapped

Device.portable_ind   C04-R091.27.11

   BL

Indicates wheter the device can be moved to a location of service or whether the other targets of service must come to the location of the device.

 Master_service.portable_device_ind   mapped with issues

Device.slot_size_increment_qty   C04-R091.27.12

        ~ 1 min

Duration for a single schedulable unit in a schedule for a resource.

 Durable_medical_equipment.slot_size_increment_qty   clearly mapped

Diet   C04-R091.09.00

 2.6.8

Diet services are very much like supply services, with some aspects resembling Medication services: the detail of the diet is given as a description of the Material associated as a target of type product. Medically relevant diet types may be communicated in the Diet.type_cd, however, the detail of the food supplied and the various combinations of dishes should be communicated as Material instances.

 Dietary_intent_or_order   clearly mapped

Diet is specialization of Supply   C04-R091.09.01

 Service_intent_or_order :: generalizes(1..1) :: Dietary_intent_or_order :: specializes(1..1)   mapped

List_item   C04-R091.31.00

A list item represents one service on a service list. It holds sequence and priority numbers to establish the list-specific ordering of the service.

 Condition_node.management_discipline_cd   mapped

 Durable_medical_equipment_slot   mapped with issues

 Resource_slot :: generalizes(1..1) :: Durable_medical_equipment_slot :: specializes(1..1)   mapped

 Patient_service_location_slot :: is_scheduleable_unit_for(1..1) :: Master_patient_service_location ::   mapped

 Patient :: is_scheduled_by(0..n) :: Patient_slot :: is_a_scheduleable_unit_for(1..1)   mapped

List_item.priority_nmb   C04-R091.31.12

 2.9.2.2 REAL

Items in the list can be ranked by priority. This is used to help deciding which item to address next when the items are not sequenced.

 Goal.goal_list_priority_nbr   mapped

 Procedure.priority_nbr   mapped

 Service_event.billing_priority_nbr   mapped

List_item.sequence_nmb C04-R091.31.11

2.9.2.1 REAL 1

The items of the list can be sequenced using this attribute. It is a real number in order to allow dynamic insertion without having to renumber all the items every time an insertion or deletion is made.

Condition_node.ranking_nbr mapped

Master_patient_service_location :: is_a_role_of(1..1) :: Material :: C04-R091.29.01

2.8.6

Master_patient_service_location untouched

Material C04-R091.20.00

2.7

The Material class represents all physical and physiological things that are used, assessed, and acted upon in a service action.   This includes pharmaceutical substances or disposeable supplies as well as durable medical equipment, prosteses, implantable devices, accesses, drains, literally everything.

Notably the material class includes facilities, such as immovable service locations or ambulances.

Durable_medical_equipment_group mapped

Master_specimen_requirement mapped

Patient_service_location_group mapped

Treatment_intent_or_order_revision.PTcomp mapped

Treatment_service_event.PTcomp mapped

Material.danger_cd C04-R091.20.19

2.7.1.9 CD

A code signaling whether there are certain dangers or hazards associated with this material.

Concept	Implies	Code	Definition
tissue		TIS	The normal dangers associated with normal human or animal tissue. I.e. potential risk of unknown infections. Routine blood or excretions of humans and animals.
infectious		INF	Material known to be infectious with human pathogenic microorganisms. Those who handle this material must take precautions for their protection.
biohazard	infectious	BHZ	Material contains microorganisms that is an environmental hazard. Must be handled with special care.
radioactive		RAD	Material is a source for ionizing radiation and must be handled with special care to avoid injury of those who handle it and to avoid environmental hazards.
poison		POI	Material is poisonous to humans. Special care must be taken to avoid incorporation, even of small amounts.
acid		ACI	Material is acid and may cause severe injury to human skin and eyes. Avoid any unprotected contact.
inflammable		IFL	Material is highly inflammable and in certain mixtures (with air) may lead to explosions. Keep away from fire, sparks and excessive heat.
explosive	inflammable	EXP	Material is an explosive mixture. Keep away from fire, sparks, and heat.

Collected_specimen_sample.danger_cd clearly mapped

Observation_intent_or_order.patient_hazard_cd mapped with issues

Material.descr C04-R091.20.14

2.7.1.4 ED

A free text description of the material. May contain multimedia, such as a drawing or image depicting the material.

Master_patient_service_location.desc mapped

Master_specimen_requirement.container_desc clearly mapped

Material.extent_tmr C04-R091.20.16

2.7.1.6 IVL<TS>

The time interval a certain material is in existence. The high boundary of this interval is the expiration date if it is defined for the material.

Expiration dates does not always have a "day" component; therefore, such a date may be transmitted as YYYYMM.

Master_specimen_requirement.retention_time_qty mapped

Treatment_service_event.substance_expiration_dttm mapped

Material.form_cd C04-R091.20.13

2.7.1.3 CV

This is a classifier describing the form of the material. This includes the typical state of matter (solid, liquid, gas) and, for therapeutic substances, the dose form.

Master_treatment_service.medication_form_cd clearly mapped

Material.handling_cd C04-R091.20.18

2.7.1.8 CD

A code to describe how the material needs to be handled to avoid damage.

Concept	Implies	Code	Definition
room temperature		RMT	Keep at room temperature, about 20 ?C
body temperature		BDT	Keep at body temperature, about 36 to 37 ?C
cool		COO	Keep cool at about 5 to 8 ?C
frozen		FRZ	Keep frozen below 0 ?C
deep frozen		DFR	Keep deep frozen, below – 16 ?C
nitrogen		NTR	Keep in liquid nitrogen
dry	DRY		Keep in a dry environment
dark		DRK	Protect against light
no shock		PSO	Protect against shock
upright		UPR	Keep upright, do not turn upside down
no shake		PSA	Do not shake
… more …			

Collected_specimen_sample.handling_cd clearly mapped

Master_specimen_requirement.special_handling_desc clearly mapped

Material.id C04-R091.20.11

2.7.1.1 SET<II>

As a substantive class reflecting physical entities, material has instance identifiers. Note that an instance identifier is a pure identifier and not a classifier. That means, this identifier is not used to store information about what kind or type of material this is. Ideally each entity will have only one identifier assigned to it, however, since different systems will maintain different material data bases, there may be different instance identifiers assigned by different systems.

Note that for serial numbers assigned by specific manufacturers, catalog numbers of specific distributors, or for inventory numbers issued by owners, the attribute Responsibility.material_id : SET<II> can also be used. This allows to more clearly express the fact that such a code is assigned by a specific party associated with that material. In any case, all values of Responsibility.material_id may occur in Material.id just as well.

Collected_specimen_sample.id clearly mapped

Durable_medical_equipment.id mapped

Durable_medical_equipment.type_cd	clearly mapped
Durable_medical_equipment_group.id	clearly mapped
Master_patient_service_location.id	clearly mapped
Master_patient_service_location.nm	mapped with issues
Patient_service_location_group.id	clearly mapped

Material.lot_nmb C04-R091.20.17

2.7.1.7   ST

The lot number is the number printed on the label attached to the container holding the substance and on the packaging which houses the container. A "lot" is a collection of products produced in one cycle. This means, for instance, if one bottle of a lot is spoiled, chances are high that the entire lot is spoiled. Conversely, product defects that occur in routine production are likely to be contained in one lot.

Note that a lot number is not meant to be a unique identifier, but is meaningful only when the product kind is identified.

Treatment_service_event.substance_lot_number_txt	mapped

Material.qty C04-R091.20.20

2.7.1.10   SET<PQ>   {1}

For many materials, the individual thing has no relevance. Especially continuously divisible forms come only in "amounts" rather than as individuals. There is a specific class of physical quantities that can be used for amounts, count (number), amount of substance, mass, and volume. This class of physical quantities is called "extensive" quantities. A quantity is called extensive if it can be added up (if it is additive.) For example, if you have 1 gallon of water and you add another gallon of water, you wave two gallons of water, since volume is an additive quantity. By contrast, if you have one gallon of Glucose 5% and add to it another gallon of Glucose 5% you still have Glucose 5%, thus, mass fraction is not an additive (extensive) kind of quantity.

Only extensive quantities are permitted as elements of the Material.qty set. Typically the kinds of quantities shown in Table 34 will occur. Extensive quantities are simpler to deal with than intensive quantities. Extensive quantities are never fractions or ratios, no denominator can cancel out the units of a numerator, and therefore, with extensive quantities we can conclude the kind of quantity from the unit of measure.

Table 34: Kinds of quantities for amounts of material

Kind of quantity	Typical Unit	Forms	Examples
Number	1	solid	Material that is large enough that is can be counted ("eaches")
Mass	1 g	liquid, solid	Tissue, chemical substances, food.
Amount of substance	1 mol	all	Chemical substances, small particles.
Volume	1 L	liquid, gas	Chemical substances in liquid and gas state. Amorphic tissue.
Length	1 m	solid	Long material measured in length, e.g., tape, pipes, hose, etc.
Area	1 m2	solid	Flat material measured in area, e.g., covers, foils, etc.
Energy	1 J, 1 kcal	solid, liquid	Chemical substances, especially food.
Catalytic amount	1 kat, 1 U, 1 i.U.	all	Enzymes and other chemical substances having catalytic activity.
Radioactivity	1 Bq, 1 Cu	all	Radioactive substances.
Reaction equivalent	1 Eq	all	Ionized chemical substances measured through titration. Deprecated, use proper amount of substance instead.

The Material.qty attribute permits to convey a collection of physical quantities. This collection feature must be used in the following way. When the set contains more than one quantity, the quantities must have different units. Furthermore, all quantities in the set must denote an equivalent amount. For example, for the material Glucose, we may specify an amount as the mass of 1 g. If we also want to specify the amount in amount of substance (moles) we must specify the equivalent of 1 g Glucose in mole, which is 5.556 mmol. For another example, if we specify the amount of a material Water as 1 L, and we want to provide a mass, the mass must be the mass of 1 L water, which is 1 kg.

Collected_specimen_sample.collection_volume_qty	clearly mapped
Collected_specimen_sample.number_of_sample_containers_qty	mapped
Durable_medical_equipment_request.quantity_amt	clearly mapped
Master_specimen_requirement.minimum_collection_volume_qty	mapped
Master_specimen_requirement.normal_collection_volume_qty	mapped

Material.type_cd

2.7.1.2   CD

This code describes what kind of material this is. It is an arbitrarily precise classification. We do not expect any single terminology to provide all concepts that are types of material, since it is simply too broad a domain. Instead of limiting the Material.type_cd to a single domain, we allow various code systems to be used, and thus, the actual domain of Material.type_cd becomes the union of all the possible code systems for material.

For example, specimen types (e.g., whole blood, serum, urine) can be used in this attribute. For chemicals, IUPAC codes might be used here. For arbitrary products one can use the Universal Product Code (UPC) code or a particular manufacturer's serial number. For pharmacological substances yet another coding system may be applicable such as the U.S. National Drug Code (NDC.) The concept descriptor data type allows for multiple codes used as synonyms for each other, thus, one can specify an UPC code next to an NDC code and an IUPAC code.

Collected_specimen_sample.source_cd	clearly mapped
Collected_specimen_sample.type_cd	clearly mapped
Master_patient_service_location.type_cd	mapped
Master_specimen_requirement.type_cd	clearly mapped

Material_relationship

2.7.2

Material relates to other material largely in some kind of whole-part or containment relationship. The special functioning of the material relationship depends on the nature and role of material, i.e. whether the material is a discrete thing, a homogenous amorphic substance, a container, a facility, etc.

Analogous to the service relationship, the material relationship is a directed link between material entities. This means, the relationship is like an arrow with a butt and a point. The entity at the side of the butt is called the source, and the entity at the point is called the target of the relationship.

Collected_specimen_sample.additive_desc	mapped
Dietary_intent_or_order.tray_type_cd	mapped with issues
Durable_medical_equipment :: belongs_to(0..n) :: Durable_medical_equipment_group ::	mapped
Master_patient_service_location :: belongs_to(0..n) :: Patient_service_location_group ::	mapped
Master_patient_service_location :: includes(0..n) :: Master_patient_service_location ::	mapped
Master_patient_service_location.equipment_type_cd	mapped
Master_specimen_requirement.additive_cd	mapped
Master_specimen_requirement.derived_specimen_cd	mapped

Material_relationship.qty

2.7.2.5   PQ

This attribute specifies how much of the target material is contained in the source material of a relationship. For example, if a box contains 10 eggs, the box is the relationship source is the box and the relationship target is the egg, where the relationship quantity is 10.   For mixtures with multiple ingredients, the relationship quantities specify the relative amounts of the ingredients in the mixture (proportion.)

The quantity must be a quantity that specifies an "amount" (refer to Table 34 in Section 2.7.1.10). The amounts specified as the proportion quantity for each ingredient are taken to be numerators over the same denominator. For example, D5W is a mixture consisting Water (H_2O) and 5% (= 50 g/L) Glucose (Glc.) The proportions can be either of the following pairs: H_2O:1 g + Glc:50 mg; H_2O:1 L + Glc:50 g; H_2O:500 mL + Glc:25 g; or any combination that amounts to the same concentration of Glucose in Water.

Note that the value of the proportion quantity does not matter as long as the proportion between the ingredients of a substance is kept invariant. If, for example, we specify D5W as having ingredients 500 mL of H_2O and 25 g of Glucose this does not mean that D5W could only be dispensed in multiples of 500 mL.

Treatment_intent_or_order_revision.dispense_package_size_qty mapped

Treatment_service_dispense.dispense_package_size_qty mapped

Medication

2.6.3

Medication is an indirect care-intervention using a material substance as a therapeutic agent. The effect of the therapeutic substance is typically established on a biochemical basis, however, that is not a requirement. For example, radiotherapy can largely be described in the same way, especially if it is a systemic therapy such as radio-iodine. Whether or not radiotherapy will be covered by a separate class is open.

Medication as a service indicates the administration of a generic class of medication to a patient. The administration of a particular preparation (in the U.S. typically represented by NDC code) requires the association of the material class with the Medication service. The material information is usually added to the order by the pharmacist when the prescription is filled as a revision or substitution to the original order.

Because medication deploys material substances, a number of attributes arguably pertain to the material rather than the medication action. Therefore, some information may be representable in two ways: as attributes of the medication service or as attributes of the material. This is especially obvious with the kind of substance applied. For example, an Amoxicillin treatment is usually described as Medication.type_cd = Amoxicillin; however, it could also be described as Medication.type_cd = administer with an associated Material target of type Amoxicillin. At this point naming the Service Action after the generic administered substance is the preferred strategy.

This design allow simple medications to be described without having to use the Material class. Only if such actions as dispensing, or such information as the manufacturer are relevant, or if a recipe prescription is written, should one have to deploy the Material class.

Master_treatment_service mapped

Treatment_intent_or_order mapped

Treatment_intent_or_order_revision mapped

Treatment_service_administration mapped

Treatment_service_event mapped

Treatment_service_give mapped

Medication is specialization of Service

Master_service :: generalizes(1..1) :: Master_treatment_service :: specializes(1..1) mapped

Service_intent_or_order :: generalizes(1..1) :: Treatment_intent_or_order :: specializes(1..1) mapped

Care_event :: generalizes(1..1) :: Treatment_service_event :: specializes(1..1) mapped

Medication.dose_check_qty C04-R091.06.16

2.6.3.6   PQ

This attribute should not generally be used, it is only provided for a special purpose. In some countries, especially Japan, there is a regulatory requirement to note the total daily dose on the prescription and associated documentation. The purpose of this requirement obviously is to encourage and facilitate reviewing the total dose prescribed to avoid over- (or under-) dosage. Rather than to define a "total daily dose" attribute as HL7 v2.3 did, we define this general purpose dose_check_qty attribute that can be used in various ways as required by local business rules or regulations. For example, in Japan one would use this field as a total daily dose by calculating the "real" dose as noted above and then adjusting the denominator to 1 d. For example, with Erythromycin 250 mg 1 tablet 3 times a day one can calculate the total daily dose as

dosis_check_qty = dosis_qty (1) * strength_qty (250 mg) * frequency (3 /d) = 750 mg/d.

For the i.v. example above this term would be

dosis_check_qty = dosis_qty (100 ml) * strength_qty (1) / rate_qty (1 h) = 100 mL/h

which can be calculated on a daily basis as

dosis_check_qty = 100 mL/h * 24 h/d = 2400 mL/d = 2.4 L/d.

So, in Japan, the denominator of the dosis_check_qty unit must always be 1 /d. In other countries the constraints on the dosis_check_qty may be different or, most likely, the attribute would not be used at all. In any case this dosis_check_qty attribute must not be used to carry any functional information.

Treatment_intent_or_order_revision.total_daily_dose_qty   mapped with issues

Treatment_service_dispense.total_daily_dose_qty   mapped

Medication.dose_qty   C04-R091.06.13

2.6.3.3   PQ

The dose is the amount of the therapeutic agent given at one administration event. This attribute can be used all by itself, or in combination with a strength. In theory, a physician's prescription could suffice with just the dose specification. For example, if Azythromycin is to be given at 80 mg once a day for three days, there is no need to specify a strength. The pharmacist can figure out the right preparation given what is available in stock or on the marketplace. When the pharmacist dispenses a particular preparation with a particular strength and packet size from a particular manufacturer, etc., this detail should be communicated using the Material class.

Treatment_intent_or_order_revision.max_give_qty   mapped

Treatment_intent_or_order_revision.min_give_qty   mapped

Treatment_service_event.amount_qty   mapped

Medication.form_cd   C04-R091.06.11

2.6.3.1   CD

The dose form of the therapeutic substance. Examples are tablet, capsule, suppository, etc.

Treatment_service_event.dosage_form_cd   mapped

Medication.rate_qty   C04-R091.06.15

2.6.3.5   PQ   ~ 1s

With continuously divisible dose forms (e.g., liquids, gases) a dose rate can be specified. The Medication.rate_qty is specified as a physical quantity in time (a duration.) Hence, the rate_qty is really the denominator of the dose rate. For example, if an Ringer solution is to be given at 100 mL/h i.v., the dosis_qty would be 100 mL and the rate_qty would be 1 h. Note that there is no difference in the actual values of dosis_qty and rate_qty as long as the quotient of both has the same value. In this example, we could just as well specify dosis_qty as 50 mL and rate_qty as 30 min, or 200 mL and 2 h or any other combination where the quotient equals 100 mL/h.

Note that in principle one could again suffice with just the dosis_qty attribute specifying the rate right in that one attribute (e.g., dosis_qty = 100 mL/h.) However this practice is not allowed. Systems that implement the semantics of units according to the Unified Code for Units of Measure would have no problem noting the fact that a dose_qty is really a rate. Other system however will have difficulties to tell an at-once dose from a dose rate from just looking at the units. If a system wishes to deal only with a single quantity describing the dosage, it can always calculate such a quantity as

real_dosis_qty = dosis_qty x strength_qty / rate_qty.

Treatment_intent_or_order_revision.give_per_timeunit_cd	clearly mapped
Treatment_intent_or_order_revision.give_rate_qty	mapped with issues
Treatment_service_administration.administered_per_timeunit_cd	mapped
Treatment_service_administration.administered_rate_qty	mapped
Treatment_service_give.give_per_timeunit_cd	mapped
Treatment_service_give.give_rate_qty	mapped

Medication.route_cd   C04-R091.06.12

2.6.3.2   CD

The route of the medication. Medication route is similar to an anatomic body site through which the therapeutic agent is incorporated or otherwise applied to the body. It is an open issue whether a specialized route_cd could be replaced by a general anatomic site code. The typical routes are per os (PO), sublingual (SL), rectal (PR), per inhalationem (IH), ophtalmic (OP), nasal (NS), otic (OT), vaginal (VG) , intra-dermal (ID), subcutaneous (SC), intra-venous (IV), and intra-cardial (IC).

However, as the table below suggests there are other routes and there are many variations as to how to access a specific route. For instance, an oral administration with the patient swallowing will usually have the same effect as if the same substance is given through a gastric tube. A more systematic approach to analyze the route into components such as site of primary entry (e.g. oral, nasal), site/system of substance uptake (e.g. gastrointestinal, bronchial, nasal mucosa), method (e.g., swallow, inhale), and device (e.g., gastric tube, tracheal tube) should be considered. At this point the version 2.x code table is used.

Master_treatment_service.route_cd	clearly mapped
Treatment_intent_or_order_revision.PTrout	mapped
Treatment_service_event.PTrout	mapped
Treatment_service_event.route_cd	mapped

Medication.strength_qty   C04-R091.06.14

2.6.3.4   PQ   1

The strength of a medication is the amount of therapeutic agent per each unit of administration (entitic mass, amount of substance, etc.) If the dose form is continuously divisible (e.g., liquid, gas), the strength is a concentration (volumic mass, amount of substance, etc.)

We generally discourage using this attribute, because in theory, a physician's prescription could suffice with just the dose specification. For example, if Azythromycin is to be given at 80 mg once a day for three days, there is no need to specify a strength. The pharmacist can figure out the right preparation given what is available in stock or on the marketplace. When the pharmacist dispenses a particular preparation with a particular strength and packet size from a particular manufacturer, etc., this detail should be communicated using the Material class.

Treatment_intent_or_order.requested_give_strength_qty	clearly mapped

Treatment_service_event.strength_qty   mapped

Observation

2.6.1

Observations are actions performed in order to determine an answer or result value. Observation result values are specific information about the observed object. The type and constraints of result values depend on the kind of action performed.

The observation action and observation result are modeled as being the two aspects of the same concept, just like the two faces of a coin are not separable from each other. Most other published healthcare models, including earlier HL7 RIM versions, separate the activity of observing and the observation result into different classes. These models label the kind of action in one class and the kind of observation result in the other. In most cases, however, the test name is a label for both activity and observation result. So, in merging action with the result, the two codes are now only one.

Clinical_observation   clearly mapped

Goal   mapped

Master_numeric_range   mapped

Observation_intent_or_order   mapped

Observation is specialization of Service   C04-R091.05.01

Assessment :: generalizes(1..1) :: Clinical_observation :: specializes(1..1)   mapped

Assessment :: generalizes(1..1) :: Goal :: specializes(1..1)   mapped

Master_service :: generalizes(1..1) :: Master_observation_service :: specializes(1..1)   clearly mapped

Service_intent_or_order :: generalizes(1..1) :: Observation_intent_or_order :: specializes(1..1)   mapped

Observation.derivation_expr   C04-R091.05.12

2.6.1.2   ST

Derived observations can be defined through association with other observations using relationships of derivation type (Service_relationship.type_cd = derivation.) For example, to define a derived observation for Mean Corpuscular Hemoglobin (MCH) one will associate the MCH observation with an Hemoglobin (HGB) observation (Service_relationship.sequence_nmb = 1) and a Red Blood cell Count (RBC) observation (Service_relationship.sequence_nmb = 2) Since MCH = HGB / RBC, the value of the derivation expression would be "$1 / $2".

The derivation expression is a character string with a simple syntax similar to that of the UNIX "expr" utility, or the expression subset of the PERL or TCL language.   All observations that are cited in the formula must be associated with the derived observation through links of type derivation with a unique Service_relationship.sequence_nmb. Such observation values are referred to by that sequence number preceded by a dollar sign ($).

Defined operators are addition (+), subtraction (?), multiplication (*) and division (/). Parentheses can be used to overcome the usual precedence (left to right, multiplication before addition.) In addition to the basic arithmetic operations the usual mathematical functions are defined.

Master_observation_service.derivation_rule_desc   mapped

Observation.property_cd   C04-R091.05.13

2.6.1.3   CV

This attribute describes the scientific property of the observation value. For quantitative observations, this is the kind of quantity. The code table to be used will represent all the concepts defined in the IUPAC Compendium of Terminology and Nomenclature of Properties in Clinical Laboratory Sciences ("Silver Book".) This concept has a large intersection with the LOINC "Kind of Property" table, which is also featured by HL7 v2.3.1 as Table 0254.

Master_service.kind_of_quantity_observed_cd   clearly mapped

Observation.value   C04-R091.05.11

2.6.1.1   ANY

The result value of an observation action. As was true with HL7 v2, this value can be of any data type. However, there are clearly more or less reasonable choices of data types as indicated in the table below.

Kind of observation   Data type Notes
Quantitative measurements   PQ   Physical quantity (real number with unit.) This is the most usual choice. Note that numeric values must not
be communicated as a simple character string (ST.)
Titer (e.g., 1:64) and other ratios (e.g. 1 out of 1000)   RTO   A ratio of two integer numbers (e.g., 1:128.) Sometimes by local conventions titers are reported as just the denominator (e.g., 32 instead of 1/32) Such conventions are confusing and should not be followed in HL7 messages.
Index (number without unit)   REAL   When a quantity does not have a proper unit, one can just send the number as a real number. Alternatively one can use a PQ with a dimensionless unit (e.g., 1 or %). An integer number should only be sent when the measurement is by definition an integer, which is an extremely rare case and then is most likely an ordinal (see below.)
Ranges (e.g., < 3; 12-20)   IVL<PQ> Interval of physical quantity. Note that sometimes such intervals are used to report the uncertainty of measurement value. For uncertainty there are dedicated data type extensions available.
Ordinals (e.g., stage "IIa")   CV, INT   At this point, ordinals should be reported either as code values, (e.g., +, ++, +++; or I, IIa, IIb, III, IV) or as
integers. In the future ordinals may be addressed by a separate data type.
Nominal results, "taxons" (e.g. organism type.)   CD   The Concept Descriptor (CD) is the most common data type to use for categorical results
 (e.g., diagnosis, complaint, color.) Such qualitative results are rarely simple Code Values (CV) if there is a tightly defined code system which everyone uses.
Image (still, movie)   ED   The encapsulated data type allows one to send an image (e.g., chest X-ray) or a movie (e.g., coronary angiography,
cardiac echo.)
Waveform   Waveforms can be sent using the waveform template developed by the Automated Data SIG for version 2.3. A mapping onto
version 3 is shown farther below. In addition one can use the Encapsulated Data (ED) type to send waveforms in other formats.
Formalized expressions   ST   The character string data type may exceptionally be used to convey formalized expressions that do not fit in
any of the existing data types. However, use of the string data type is not allowed if the meaning can be represented by one of the existing data types. Note that many of the data types do have character string literal expressions too, so the field in the message can be formatted using character string literals and still have a distinct data type.
Bulk text reports   ED   A detailed procedure report should normally be sent in the attribute Service.descr. The Observation.value should be
reserved for computer interpretable or automatically generated information. Note that the Encapsulated Data type (ED) can accommodate formatted text in such common formats as HTML, PDF, or Word Processor formats. The ED data type can also carry dictation that is not yet transcribed. We strongly discourage to send formatted text as result values. At the very least, the formatted text should be broken down into sections, one per sub-service object.

Clinical_observation.nature_of_abnormal_testing_cd   mapped

Clinical_observation.references_range_val   mapped

Clinical_observation.val   clearly mapped

Clinical_observation.value_datatype_cd   mapped

Goal.goal_value_cd   clearly mapped

Master_numeric_range.age_qty   mapped

Master_numeric_range.condition_desc   mapped

Master_numeric_range.gestation_age_qty   mapped

Master_numeric_range.race_subspecies_txt   mapped

Master_numeric_range.species_txt   mapped

Master_numeric_range.value_qty   mapped

Master_observation_service.permitted_data_type_cd   mapped

Master_qualitative_observation.abnormal_result_cd   mapped with issues

Master_qualitative_observation.critical_result_cd   mapped with issues

Master_qualitative_observation.normal_result_cd   mapped

Master_qualitative_observation.preferred_coding_system_cd   mapped

Master_qualitative_observation.valid_answer_cd   mapped

Master_quantitative_observation.display_length_and_decimal_precision_cd   mapped

Master_quantitative_observation.unit_of_measure_cd   mapped

Procedure   C04-R091.07.00

2.6.2

The term "procedure" typically stands for surgical procedures. But the Procedure class covers all direct care activities, whether performed by physicians, nurses, physiotherapy providers, etc.

Procedure   clearly mapped

Procedure is specialization of Service   C04-R091.07.01

Care_event :: generalizes(1..1) :: Procedure :: specializes(1..1)   mapped

Responsibility   C04-R091.22.00

2.7.3

Material can have many kinds of relationships with Stakeholders. We subsume all the relationships between material and stakeholders under the notion of Responsibility. The reason being that responsibility for the existence of material, any specific property of material, or performance of functional material (devices) is with some stakeholder. The underlying reason for stakeholder associations to material is that the material is somehow acted upon by the stakeholders. In that sense, one could subsume the Responsibility association under the Service action class. However, just as we chose to represent minor sub-activities around Services as Actors with various actor types, we allow the responsibilities that come from actions of stakeholders to be persistently "coined" on the material.

For example, manufacturing is certainly an activity (Service) with the manufacturer (Organization) as an Actor and the material as a Target of type product. However, in many cases we are not interested in the activity of manufacturing the material, when it took place and what its circumstances were, but what we are interested in is just: who made it? This interest in the manufacturer is chiefly one of responsibility and liability: if the material is different than expected, does not perform well, or does harm, one would probably consider holding the manufacturer liable. Responsibility and liability are concepts that form the very basis of a society based on the law, and emphasis on those terms should by no means imply an undue "legalization" of relationships.

Other relationship types between Material and Stakeholder are: owner, distributor, custodian/holder. All those relationships can be considered to be characterized by responsibilities. This even goes so far as if a human fetus would be considered Material, motherhood (and fatherhood!) would be a type of Responsibility between a Stakeholder (Person) and that fetus. This example shows that responsibility has two aspects: responsibility is not only being held liable by others for malfunctioning, disappointment, and harm caused by the material; responsibility also means an ethical responsibility towards the "material" and even to the extent of being held liable by society for neglect of one's responsibility towards that "material." This latter kind of responsibility is clearly present between fetus and parent, but also between animal and owner or custodian.

Treatment_service_event.substance_manufacturer_cd   mapped

2.2

A service is an intentional action in the business domain of HL7. Healthcare (and any profession or business) is consitituted of intentional actions. A Service instance is a record of such an intentional action. The terms service, action, activity, and service action are all used interchangeably, but service has been selected as the principle name of this class.

Any intentional action can exist in different "moods." The mood of an action tells whether the action represents a fact (event) an order, a plan (intent), a goal, a risk, a potential (definition) or the like. A service instance represents an action in one and only one such mood. Thus, service definitions (master), orders, plans, and performance records (events) are all represented by an instance of class Service.

Any instance of a Service assumes one and only one mood and will not change its mood along its life cycle. The moods definition, intent, order, event, etc. seem to specify a life cycle of an activity and thus seem like state changes. However, the actors of these different moods are different, and so is the data different. It is important to keep track of those differences (variances) in business processes. Therefore, the mood of a service instance is static and not part of the state, not part of the life cycle. The progression of the idea of a service towards actualization (i.e., the progression from defined, through planned and ordered to being performed) is called "business cycle" to distinguish it from the "life cycle" of a single service instance.
Related service instances that form such a "business cycle" are linked through the Service_relationship class.

Examples for services in health care are: a clinical test, an assessment of health condition (such as problems and diagnoses), the setting of healthcare goals, the performance of treatment services (such as medication, surgery, physical and psychological therapy,) assisting, monitoring or attending, training and education services to patients and their next of kins, notary services, such as advanced directives or living will.

Services have actors and targets. Examples for actors are nurses, doctors, family members, notary publics, and service organizations -- every entity that is capable of independent decisions and can thus be responsible (and liable) for the actions performed.

Target participants may include, the patient, the patient's spouse, family, or community, a specimen drawn from the patient or from any object of interest. As patients do play active roles in their own healthcare, the patient can be both an active participant and a target participant at the same time (self-administered or reflexive services.)

A service_event can have multiple active participants and multiple target participants, their specific role is distinguished in the "type_cd" of the respective instance of the participation class. In particular, a service event involving coordination of care may involve two or more active participants -- playing different roles -- who interact on behalf of a patient, family, or aggregate in the role of target participant. For example, a nurse (active participant) calls Meals on Wheels (active participant) on behalf of the patient (target participant).

A service includes the "results," "answers" or informational "procedure products" gained during the service. In this model, "results" do not exist without a service, and every clinical result, including those results gained accidentally, are service events. In other moods, such as definition, goal, and criterion, the results are the possible results, the expected or aimed-for results, or the tested-for results.

Durable_medical_equipment_request	mapped
Master_observation_service	mapped
Master_patient_service_location :: is_requested_by(0..n) :: Patient_service_location_request ::	mapped
Master_service	mapped
Master_service_relationship.reflex_testing_trigger_rules_desc	mapped
Service_event	mapped
Service_intent_or_order	mapped
Service_intent_or_order_relationship.reflex_testing_trigger_rules_desc	mapped
Service_scheduling_request	mapped

Service :: is_assigned_to(0..1) :: Patient_encounter :: C04-R091.01.02

Services are delivered in the context of encounters, this association establishes the relationship between a service to an encounter. Services can be mentioned independent from an Encounter, which is why Encounter is optional.

Service_event :: is_assigned_to(0..1) :: Patient_encounter :: has_assigned_to_it(0..n)	mapped

Service :: is_associated_with(0..*) :: Financial_transaction :: pertains_to   C04-R091.01.03

This asociation links a Service with financial transactions that represent the billing for this service. This association is primarily used for the Service in event mood, i.e., the Service that did actually happen and is now billed for.

Service_event :: is_associated_with(0..n) :: Financial_transaction :: pertains_to(1..1)   clearly mapped

Service :: is_charged_to(0..1) :: Patient_billing_account ::   C04-R091.01.04

This association links a Service with a billing account. It may specify the account to which a service is billed, before the service is even executed. For example, an order might select a specific billing account.

Patient_billing_account :: has_charges_for(0..n) :: Service_event :: is_charged_to(0..1)   clearly mapped

Patient_billing_account :: is_billed_from(0..n) :: Service_intent_or_order :: is_billed_to(0..1)   mapped

Service :: is_covered_by(0..*) :: Coverage_item ::   C04-R091.01.06

Describes the coverage of a service under a healthcare benefit product. The service is usually in defnition mood, as coverage item describes whether a certain kind of service is covered.

Master_service :: is_covered_by(0..n) :: Coverage_item :: provides_coverage_for(1..n)   mapped

Service :: is_documented_by(0..*) :: Clinical_document_header ::   C04-R091.01.05

This association stands for any documentation of Services in clinical documents.

Service_event :: is_documented_by(0..n) :: Clinical_document_header :: documents(0..n)   clearly mapped

Service_intent_or_order :: is_referred_to_in(0..n) :: Clinical_document_header :: is_related_to(0..1)   mapped with issues

Service.body_site_cd   C04-R091.01.19

2.2.1.9   CD

Most health care services have a focus on a particular anatomic structure of the patient (the "target" of service.) This information is found in body_site_cd. The coding system to be used for anatomic site is not specified in detail. Anatomic sites, body parts, and functional body systems are huge and highly complex domains that require a very sophisticated terminology system. Candidates are Galen, SNOMED, or Read codes. Alternatively, a simple local coding system can be used to identify exactly the common body sites used.

Some body sites can also be "pre-coordinated" in the Service definition, so that there is never an option to select different body sites. The same information structure can handle both the pre-coordinated and the post-coordinated approach.

For administrative body sites (i.e. where medications are administered) HL7 used to define a table (0163) that must be used as defined in Table 4 below.

Master_service.target_anatomic_site_cd   clearly mapped

Service_intent_or_order.service_body_site_cd   clearly mapped

Service_intent_or_order.service_body_site_modifier_cd   mapped

Treatment_service_event.body_site_cd   mapped

2.2.1.11 SET<CV>

This is a code that limits the disclosure of information about this service. The codes refer to confidentiality policies as listed in the normative table [see USAMP-II document]

Confidentiality policies may vary from institution to institution and not all systems are capable of abiding by all details of the confidentiality policies suggested in the above table. However, these are the items that are being used in some institutions and which implementers may want to consider supporting.

It is important to note that good confidentiality of the medical record can not be achieved through confidentiality codes only to filter out individual record items to certain types of users. There are two important problems with per-item confidentiality: one is inference and the other is the danger of holding back information that may be critical in a certain care situation. Inference means that filtered sensitive information can still be assumed given the other information not filtered. The simplest form of inference is that even the existence of a test order for an HIV Western Blot test or a T4/T8 lymphocyte count is a strong indication for an existing HIV infection, even if the results are not known. Very often, diagnoses can be inferred from medication, such as Zidovudin for treatment of HIV infections. The problem of hiding individual items becomes especially difficult with current medications, since the continuing administration of the medication must be assured.

A similar confidentiality code attribute is therefore required in the Patient class to cover the entire patient record. But this is outside the scope of the present proposal.

The flags HIV, PSY, ETH, and SDV may only be used on service items that are not patient related. Typically, they are used in the service definition object ("master" service) to indicate a generic disclosure policy of any actual service item of that type.

Aggregations of data should assume the privacy level of the most private action in the aggregation.

Advance_directive.disclosure_level_cd	clearly mapped
Clinical_observation.user_defined_access_check_cd	mapped with issues
Master_service.confidentiality_cd	clearly mapped
Service_event.confidential_ind	clearly mapped
Service_event.patient_sensitivity_cd	mapped

Service.critical_time C04-R091.01.17

2.2.1.7 GTS

This is the "biologically relevant" time of an action. The concept is best understood with observations, where the time of the observation action may be much later than the time of the observed feature. For instance, in a Blood Gas Analysis (BGA), a result will always come up several minutes after the specimen was taken, meanwhile the patient's physiological state may have changed significantly. Even more so in history taking, when the doctor records an episode of Hepatitis A under which the patient suffered last year for several weeks. For surgical procedures the time between first cut and last suture is taken as the critical time of the procedure. For transport and supply services the critical time is the time en route or time of delivery respectively. Critical time and total time of a service may often be related in a certain way, which will be discussed in USAMP-II Part A, Figure 10.

Advance_directive.notarization_dttm	mapped with issues
Clinical_observation.clinically_relevant_tmr	mapped
Goal.expected_achievement_dttm	clearly mapped
Goal.review_interval_cd	mapped
Procedure.incision_open_tmr	clearly mapped
Service_event.specimen_received_dttm	mapped with issues
Treatment_intent_or_order_revision.qt	mapped

2.2.1.4   ED

The description of a service is a piece of free text or multimedia data that describes the service in all necessary detail. There is no restriction on length or content imposed on the description attribute. However, the content of the description is not considered part of the functional information communicated between systems. Descriptions are meant to be shown to specially interested human individuals. All information relevant for automated functions must be communicated using the proper attributes and associated objects.
Note that the description attribute is not a service "name." All names of the service can be communicated in the Service.type_cd attribute as codes together with readable print-names.

As with any attribute of class Service, the meaning of the description attribute is subject to the Service.mood_cd. For service definitions, the description can contain textbook like information about that service. For service orders, the description will contain particular instructions pertaining only to that order. Filler order systems must show the description field to a performing provider.

For Service records of actual services (Service.mood_cd = actual,) the description is an important part of the documentation. The description will contain textual reports on the service. This is true for any service, in particular for surgical procedures, where the description attribute is the place to put the entire surgery report. If the surgical procedure is reported as multiple interrelated Service instances, each instance may contain the part of the report pertinent to that step of the procedure. However, there is no need to break a service report apart into sub-services only to break the textual report apart into multiple sections. The Encapsulated Data type is capable of handling formatted textual reports in HTML, PDF, or word processor formats. In addition, the HL7 PRA working group defines standards to use XML as a markup language for report documents.
Note that textual reports should always be sent in the Service.descr; this includes reports of observation services. The Observation.value field is reserved for information that is processed automatically and that is accessible to automated processes. Human authored free text reports are not easily accessible to automated processing, which is why they should be communicated in the Service description attribute. Of course, free text documents can be analyzed by natural language parsers and similar tools. We encourage that any output of such natural language parsers be communicated in the Observation.value attribute in the form of structured machine accessible data. Since narrative text and observation value are in different attributes, they can be communicated together, without interfering with each other.

Advance_directive.life_quality_desc	mapped with issues
Advance_directive.mortuary_preference_nm	mapped with issues
Collected_specimen_sample.collection_method_desc	mapped
Collected_specimen_sample.collectors_comment_cd	mapped
Dietary_intent_or_order.instruction_desc	mapped
Master_service.desc	clearly mapped
Master_service.factors_that_may_affect_observation_desc	mapped
Master_service.interpretation_considerations_desc	mapped
Procedure.delay_reason_txt	mapped
Service_event.service_desc	clearly mapped
Service_reason.reason_txt	mapped
Treatment_intent_or_order.ordering_providers_instruction_txt	mapped
Treatment_intent_or_order_revision.treatment_suppliers_instruction_cd	mapped
Treatment_service_dispense.suppliers_special_dispensing_instruction_cd	mapped

Service.id   C04-R091.01.11

2.2.1.1   SET<II>

This is an instance identifier of a particular Service object. For example, whenever a service is carried out, there is a new service object instantiated with an identifier that uniquely distinguishes this service object from every other service object.

Master_service.alternate_id	mapped with issues
Service_event.filler_id	mapped

Service_intent_or_order.filler_order_id	clearly mapped
Service_intent_or_order.order_id	clearly mapped
Service_intent_or_order.placer_order_id	mapped
Service_intent_or_order.secondary_identification_txt	mapped
Treatment_intent_or_order_revision.prescription_id	mapped
Treatment_service_event.prescription_id	mapped

Service.interpretation_cd   C04-R091.01.20

2.2.1.10   SET<CV>

This attribute allows for a very rough interpretation of the course or outcome of a service action. This is sometimes called "abnormal flags", however, the judgement of normalcy is just one of the common rough interpretations, and is often not relevant. For example, for the observation of a pathologic condition, it doesn't make sense to state the normalcy, since pathologic conditions are never considered "normal."

| Clinical_observation.abnormal_result_cd | clearly mapped |

Service.max_repeat_nmb   C04-R091.01.22

2.2.1.12   INT   1

This is the maximum number of repetitions of a service. Typical values are 1, some other finite number, and the infinity (a specific null value for numbers.) See the discussion on service plans in the USAMP-II specification, part A, on how specifically this is used.

| Treatment_intent_or_order_revision.refills_allowed_nbr | mapped |

Service.method_cd   C04-R091.01.18

2.2.1.8   CD

For any service there may be several different methods to achieve by and large the same result, but may be important to know when interpreting a report more thorroughly (e.g., blood pressure method: arterial puncture vs. Riva-Rocci, sitting vs. supine position, etc.)

Method concepts can be "pre-coordinated" in the Service definition, so that there is never an option to select different methods. Pre-coordinating methods into the service code (type_cd) avoids having to standardize on method codes. There are so many possible methods which all depend heavily on certain kinds of services, so that defining a vocabulary domain of all methods is close to impossible. The pre-coordinated approach avoids relying on the impossible to be done.

However, a code system might be designed such that it specifies a set of available methods for each defined service concept. Thus, a user ordering a service could select one of several variances of the service by means of the method code. Available method variances may also be defined in a master service catalog for each defined service. In service definition records (Service.mood_cd = DEF) the method_cd attribute is a set of all available method codes that a user may select while ordering, or expect while receiving results.

Although the authors of this proposal believe that the pre-coordinated approach to methods goes a long way and should be followed as far as possible, the same information structure can handle both the pre-coordinated and the post-coordinated approach.

Clinical_observation.method_cd	clearly mapped
Collected_specimen_sample.collection_method_modifier_cd	mapped
Master_service.method_cd	clearly mapped
Treatment_intent_or_order_revision.dispense_package_method_cd	mapped with issues
Treatment_service_dispense.dispense_package_method_cd	mapped with issues

Service.mood_cd   C04-R091.01.12

2.2.1.2   SET<CV>

Webster's dictionary defines mood as a "distinction of form […] of a verb to express whether the action or state it denotes is conceived as
fact or in some other manner (as command, possibility, or wish)" This definition of mood can be directly applied to the USAMP-II model, where
 the service action (corresponding to a verb in natural language) may be conceived as an event that happened (fact), an ordered service
(command), a possible service (master), and a goal (wish) of health care. The mood code is critical to the design of this model. Without the
mood_cd, the model above would be at least three times as big, in order to distinguish service events, from orders, schedules, goals, and
master service items.

One of the "infinitive" moods is used for describing potential services that can have actual services associated with them. Common use of
the infinitive mood is for dictionary entries (so called "master service") and all "knowledge" links (e.g., possible reason, cause, manifestation,
etc.) Other special infinitives are goal and trigger mood. A goal describes a wish for a certain outcome (typically an observation) to be
achieved in the future. An observation in goal mood is not actually made, thus is an infinitive. Goals are evaluated later. Triggers are service
descriptions that can match actual services (like a query.) When a trigger matches, it enables, suggests, or demands the associated action
to be performed. Triggers are most often used to fully describe PRN medication orders, but can serve to build reminder systems too.

Service_intent_or_order.intent_or_order_cd   mapped

Service.orderable_ind   C04-R091.01.26

2.2.1.16   BL   true

This attribute indicates whether this service can be requested independently from other services. Some services can only occur as
subordinate to a super-service; others are abstractions of services or service groups that should not be ordered in one piece. Since in
principle everything that can be done can potentially be requested, this attribute is true by default. It is usually only used for master file
definitions.

Master_service.orderable_service_ind   clearly mapped

Service.priority_cd   C04-R091.01.25

2.2.1.15   SET<CV>   {R}

This attribute encodes the urgency under which the service is to be scheduled and performed, or was performed. This attribute is used in
orders to indicate the ordered priority. It is also used in the service event documentation to indicate the actual priority used to perform the
service, which is used to determine the charge. In master service definitions it indicates the available priorities.

Master_service.allowable_processing_priority_cd   clearly mapped

Master_service.allowable_reporting_priority_cd   mapped

Master_specimen_requirement.priority_cd   mapped

Service_intent_or_order.reporting_priority_cd   mapped

Service.status_cd   C04-R091.01.15

2.2.1.5   CV

The state of the action (e.g., newly ordered, in process, completed.) The state is communicated in coded form. The codes are strictly
defined by the state-transition model of a service class. No alternative coding system can be used for the status_cd attribute (CNE, coded no
 exceptions.)

Clinical_observation.status_cd   clearly mapped

Clinical_observation.status_dttm   mapped

Condition_node.life_cycle_start_dttm   mapped

Condition_node.lifecycle_status_cd   clearly mapped

Master_service.effective_tmr   mapped with issues

Master_service.last_update_dttm   mapped with issues

Resource_request.status_cd   clearly mapped

Service_event.filler_order_status_dttm   mapped

Service_event.status_cd   clearly mapped

Service_event.status_reason_cd   mapped with issues

Service_intent_or_order.order_placed_dttm   mapped with issues

Service_intent_or_order.status_cd   clearly mapped

Service_intent_or_order.status_dttm   mapped with issues

Service_intent_or_order.status_reason_cd   mapped with issues

Service_intent_or_order.transport_arranged_ind   mapped

Service_scheduling_request.status_cd   clearly mapped

Treatment_service_administration.completion_status_cd   clearly mapped

Service.substitution_cd   C04-R091.01.24

2.2.1.14   CV   N

Indicates whether an ordered or intended service may be or has been substituted for a different service. The fact that the actual service differs from the planned or ordered service, and the details of the variance can be seen by comparing the service as planned or ordered from the service as performed. Both service records should be sent in a message where this difference is important. The Service.substitution_cd attribute is mainly used in an order, to specify whether an ordered service may be substituted and in what way it

Resource_request.allowable_substitutions_cd   mapped

Service_scheduling_request.allowable_substitutions_cd   clearly mapped

Treatment_intent_or_order.substitution_allowed_ind   clearly mapped

Treatment_intent_or_order_revision.substitution_status_cd   mapped

Treatment_service_event.substitution_cd   mapped

Service.total_time   C04-R091.01.16

2.2.1.6   GTS

This is the time when the action happened, is ordered or scheduled to happen, or when it can possibly happen (depending on the mood of the Service object.) The timing of actions is a very important concept that is explained in greater detail in USAMP-II part A, Section 2.5.3.

Advance_directive.assessment_dttm   mapped with issues

Collected_specimen_sample.collection_scheduled_dttm   mapped

Collected_specimen_sample.collection_tmr   mapped

Master_observation_service.processing_time_qty   mapped

Master_observation_service.typical_turnaround_time_qty   mapped

Master_service.performance_schedule_cd   mapped

Master_service.standard_time_to_perform_qty   mapped with issues

Procedure.procedure_tmr   mapped

Resource_request.duration_qty   mapped

Resource_request.start_dttm	mapped
Service_event.scheduled_start_dttm	mapped with issues
Service_event.tmr	clearly mapped
Service_intent_or_order.expected_performance_time_qty	mapped
Service_scheduling_request.duration_qty	mapped
Service_scheduling_request.start_dttm	mapped
Treatment_intent_or_order_revision.last_refilled_dttm	mapped

Service.type_cd   C04-R091.01.13

2.2.1.3   CD

A code for the kind of action (e.g., physical examination, serum potassium, etc.), used to be called "universal service identifier". The Service.type_cd specifies the service conceptually by using a code from a code system. We often refer to the Service.type_cd as the "name" of the Service. In any case, the type_cd or "name" is a handle on the concept of the action, not on the individual action instance.

Different code systems cover different kinds of services, which is why there is not one single code system to be used for the Servcie.type_cd. Furthermore, the data type Concept Descriptor (CD) allows the action to be named by multiple code systems at the same time, whereby each term from a coding system is assumed to be a synonym. For example, a Thrombectomy service may be named "34001" using the CPT-4 code, "P1-30322" in SNOMED, or "38.00" in ICD-10-PCS.

Advance_directive.directive_cd	clearly mapped
Clinical_observation.confirmation_status_cd	mapped with issues
Clinical_observation.universal_service_identifier_suffix_txt	mapped with issues
Dietary_intent_or_order.diet_type_cd	clearly mapped
Dietary_intent_or_order.service_period_cd	mapped with issues
Master_numeric_range.type_cd	mapped
Master_service.alternate_name_use_cd	mapped with issues
Master_service.alternate_nm	mapped with issues
Master_service.imaging_measurement_modality_cd	mapped with issues
Master_service.observation_id_suffix_txt	mapped with issues
Master_service.primary_nm	mapped with issues
Master_service.universal_service_id	clearly mapped
Procedure.functional_type_cd	mapped with issues
Procedure.modifier_cd	mapped
Service_event.consent_cd	mapped
Service_intent_or_order.transport_mode_cd	mapped

Service_list :: is_about(0..1) :: Material :: is_subject_of(0..*)

Each service list is about something specific, e.g. the schedule for operating room 12a is about a facility (Material) and the worklist for CAT scan machine 123 is about that machine (also a Material.)

This relationship and the relationship Service_list :: is_about(0..1) :: Person :: is_subject_of(0..*) are mutually exclusive. But one of them must be present. The 0..1 multiplicity is thus not a true optionality.

Durable_medical_equipment_slot :: is_scheduleable_unit_for(1..1) :: Durable_medical_equipment   mapped

Service_relationship   C04-R091.02.00

2.4

The Service relationship class is a recursive associative class with two associations to the Service class, one named "source" the other named "target". Consider every Service_relationship instance an arrow with a point (headed to the target) and a butt (coming from the source.) For each relationship type the functions (or roles) of source and target Service are different as specified in Table 13 below.

In principle the assignment of functions (roles) to each side of the relationship "arrow" is completely arbitrary. However since a service is the core element of a medical record, proper attribution of the medical record items is an important issue. The relationships associated with a Service are considered properties of the source service object. That means, that the originator of the information reported in a service object is not only responsible for the attribute values of that object, but also for all its outgoing relationships.

The rule of attribution is that all service relationships are attributed to the responsible actor of the Service at the source of the Service_relationship (the "source service".)

With this recursive service relationship one can group actions into "batteries," e.g. LYTES, CHEM12, or CBC, where multiple routine laboratory tests are ordered as a group. Some groupings, such as CHEM12, appear more arbitrary; others, such as blood pressure, seem to naturally consist of systolic and diastolic pressure.

Actions may also be grouped longitudinal, in a sequence of sub-actions to for temporal and conditional (non-temporal) action paths (e.g., care plan, critical path, clinical trials, drug treatment protocols).

Actions may be explicitly timed, and may be conditioned on the status or outcome of previous actions. Concurrent collections of actions allow expressing logical branches as well as parallel tasks (tasks carried out at the same time.) These constructs can be organized in multiple layers of nesting, to fully support workflow management.

The relationship class is not only used to construct action plans but also to represent clinical reasoning or judgements about action relationships. Prior actions can be linked as the reasons for more recent actions. Supporting evidence can be linked with current clinical hypotheses. Problem lists and other networks of related judgements about clinical events are represented by the service relationship link too.

The Service_relationship.type_cd identifies the meaning and purpose of every service relationship instance.

Clinical_observation.last_observed_normal_values_dttm   mapped

Clinical_observation.observation_sub_id   clearly mapped

Conditional_link   mapped

Goal :: is_measured_by(1..1) :: Master_observation_service :: measures(1..n)   mapped

Judgement_link   mapped

Master_numeric_range :: applies_to(1..1) :: Master_quantitative_observation :: conforms_to(0..n)   mapped

Master_observation_service :: has_as_basis(0..n) :: Master_observation_service ::   mapped

Master_service.challenge_information_txt   mapped

Master_service.consent_required_cd   mapped

Master_service.contraindication_desc   mapped

Master_service.patient_preparation_desc   mapped

Master_service.qt   mapped with issues

Master_service.report_display_order_txt	mapped with issues
Master_service_relationship	clearly mapped
Master_service_relationship.constraint_txt	mapped
Master_treatment_service :: is_ordered_on(0..n) :: Treatment_intent_or_order_revision ::	mapped
Observation_intent_or_order.relevant_clinical_information_txt	mapped with issues
Procedure.anesthesia_cd	mapped with issues
Procedure.anesthesia_tmr	mapped with issues
Rule_link	mapped
Master_service :: is_delivered_during(0..n) :: Service_event :: delivers(1..1)	mapped
Service_intent_or_order :: is_fulfilled_by(0..n) :: Service_event :: fulfills(0..1)	mapped
Service_event_relationship	clearly mapped
Service_intent_or_order :: is_an_instance_of(1..1) :: Master_service :: is_instantiated_as(0..n)	mapped
Service_intent_or_order_relationship	mapped
Service_intent_or_order_relationship.constraint_txt	mapped
Service_reason	mapped
Master_service :: is_requested_by(0..n) :: Service_scheduling_request :: requests(1..1)	mapped
Treatment_intent_or_order :: has_parts(1..n) :: Treatment_intent_or_order_revision ::	mapped
Treatment_intent_or_order.indication_id	mapped with issues
Treatment_intent_or_order_revision.give_indication_id	mapped
Treatment_service_event.indication_id	mapped

Service_relationship :: has_source(1..1) :: Service :: is_source_for(0..*)   C04-R091.02.02

A service relationship is like an arrow with a butt (source) and a point (target). A Service instance is on each side. This association is the source (butt) of the arrow. The service relationship is -- without exception -- attributed to the originator of this source service.

For example, if the service relationship type is called "has_plan_component" then the source service represents the plan of which the target is a component. Note that the service_relationship.inversion_ind attribute can invert the meaning of the relationship. However, the rule of attribution does never change, i.e., it is always the originator of the source service who is responsible for the relationship.

Master_service :: is_source(0..n) :: Master_service_relationship :: has_source(1..1)	clearly mapped
Service_event :: is_source_for(0..n) :: Service_event_relationship :: has_as_source(1..1)	clearly mapped
Service_intent_or_order :: is_source_for(0..n) :: Service_intent_or_order_relationship ::	clearly mapped
Service_reason :: is_reason_for(0..1) :: Service_event :: has_as_reason(0..n)	mapped
Service_reason :: is_reason_for(0..1) :: Service_intent_or_order :: has_as_reason(0..n)	mapped

Service_relationship :: has_target(1..1) :: Service :: is_target_for(0..*)   C04-R091.02.03

A service relationship is like an arrow with a butt (source) and a point (target). A Service instance is on each side. This association is the target (point) of the arrow.

For example, if the service relationship type is called "has_plan_component" then the target service is that plan component, while the source would represent the plan of which the target is a component. Note that the service_relationship.inversion_ind attribute can invert the meaning of the relationship.

Master_service :: is_target(0..n) :: Master_service_relationship :: has_target(1..1)   clearly mapped

Service_event :: is_target_for(0..n) :: Service_event_relationship :: has_as_target(1..1)   clearly mapped

Service_intent_or_order :: is_target_for(0..n) :: Service_intent_or_order_relationship ::   clearly mapped

Service_reason :: has_as_evidence(0..1) :: Service_event :: is_evidence_for(0..n)   mapped

Service_relationship.join_cd   C04-R091.02.18

2.4.1.8   CV   W

In a parallel branch construct the join code indicates how the concurrent activities are resynchronized.

Concept	Code	Definition
wait	W	Wait for this branch to terminate.
kill K		When all other concurrent branches are terminated, interrupt and discontinue this branch.
exclusive wait	X	Wait for any one of the branches in the set of exclusive wait branches to terminate, then discontinue all the other exclusive wait branches.
detached	D	Detach this branch from the other branches so it will not be resynchronized with the other branches.

A kill branch will only be executed if there is at least one active wait (or exclusive wait) branch. If there is no other wait branch active, a kill branch is not started at all (rather than being discontinued shortly after it is started.) A detached branch will be unrelated to all other branches, thus a kill branch will be discontinued no matter whether there are detached branches still running.

Master_service.join_cd   clearly mapped

Service_intent_or_order.join_cd   clearly mapped

Service_relationship.pause_qty   C04-R091.02.15

2.4.1.5   PQ   0 s   ~ 1 s

The time that should elapse after this activity has got clearance to execute and the actual begin of execution. Any entering pre-conditions are tested before the slot is entered, so the pause specifies a minimal waiting time before the service is executed after its pre-conditions become true.

Service_scheduling_request.start_offset_qty   mapped

Service_relationship.priority_nmb   C04-R091.02.14

2.4.1.4   INT   1

This integer number allows to specify another kind of ordering amongst the outgoing relationships of a service. This is used to represent the priority ordering of conditional branches in service execution plans, or priority ranking in pre-condition, outcome or support links, and preferences among options.

The ordering may be total or partial. A total ordering exists if every relationship in a relationship bundle (a relationship bundle is a sub-set of the relationships originating in the same service instance and usually having the same relationship type) has a distinct priority number. If, however, some relationships in the bundle share the same priority number, we have a partial ordering. Those links with the same priority will have undefined ordering of consideration.

Rule_link.priority_nbr   clearly mapped

Service_relationship.sequence_nmb   C04-R091.02.13

    2.4.1.3   INT   1

This integer number allows one to specify an ordering amongst the outgoing relationships of a service. This is used to represent sequences of actions in execution plans.

The ordering may be total or partial. A total ordering exists if every relationship in a relationship bundle has a distinct sequence number. (A relationship "bundle" is a sub-set of the relationships originating in the same service instance and usually having the same relationship type). If, however, some relationships in the bundle share the same sequence number, we have a partial ordering. In such a case the services with the same sequence number are concurrent.

Treatment_intent_or_order_revision.refills_doses_dispensed_nbr   mapped

Treatment_service_administration.administration_nbr   mapped

Service_relationship.type_cd   C04-R091.02.11

    2.4.1.1   CV

Determines the meaning of a relationship between two Services. This attribute is probably the most important attribute in this entire model besides the Service.mood_cd. It is a "structural" attribute inasmuch as each of its values implies specific constraints to what kinds of Service objects can be related and in which way. Refer to the USAM specification document for defined service relationship types and examples of their use.

Judgement_link.type_cd   clearly mapped

Master_service_relationship.relationship_type_cd   clearly mapped

Service_event_relationship.relationship_type_cd   clearly mapped

Service_intent_or_order_relationship.relationship_type_cd   clearly mapped

Specimen   C04-R091.23.00

    2.8.1

According to Webster's dictionary, a specimen is "an individual, item, or part considered typical of a group, class, or whole" or "a portion or quantity of material for use in testing, examination, or study." In the practice of clinical medicine and especially in previous HL7 specifications, specimen was tightly related to the container which holds the specimen. However, there is an important difference between a container and a specimen. Through the material class with roles for both specimen and container one can manage containers separately from specimen. With the same class one can manage empty specimen containers (material management) the same way as the container filled

Collected_specimen_sample   mapped

Specimen :: is_sourced_from(0..1) :: Living_subject :: is_source_for(0..*)   C04-R091.23.02

Collected_specimen_sample :: is_sourced from(0..1) :: Living_subject :: is_source_for(0..n)   mapped with issues

Specimen :: is_sourced_from(0..1) :: Person :: is_source_for(0..*)   C04-R091.23.03

Collected_specimen_sample :: is_sourced_from(0..1) :: Patient :: is_source_for(0..n)   mapped with issues

Specimen.body_site_cd

2.8.1.1   CD

Body site has been retained as an attribute of the specimen, since it may be relevant in some cases, e.g., if multiple liver needle biopsies are taken from different lobes and locations of the liver. The value of the Specimen.body_site_cd should be identical to the value of the Service.body_site_cd of an associated specimen collection service. This attribute therefore is used only if such an associated specimen collection service is not communicated. When the rule is to always send a specimen along with a record of the specimen collection service, this attribute needs not be valued.

Collected_specimen_sample.body_site_cd   clearly mapped

Collected_specimen_sample.collection_body_site_modifier_cd   mapped

Supply   C04-R091.08.00

2.6.7

Supply orders and deliveries are very simple services that mainly focus on the delivered product. The product is associated with the supply service as a Material target of type product (PRD). Just as with Medication services there are in principle two ways to represent the type and identity of supplied material, i.e. as the Supply.type_cd or as the Material.type_cd of the target material (Target.type_cd = product.) With general supply orders the precise identification of the Material, its manufacturer, serial numbers, etc. is important, and supply services are only very marginal parts of the electronic patient record. Therefore, most of the detail information about the supply should be represented using the Material class.

Note that if delivery needs to be scheduled, tracked, and billed separately, one can associate Transportation services with the supply.

Pharmacy dispense services are represented as supply services, associated with a medication service. The medication class represents the administration of medication, while dispensing is supply.

Treatment_service_dispense   mapped

Target   C04-R091.04.00

2.3.2

Target is an associative class linking physical entities, including humans, other living subjects and inanimate material to the Service. The targets of a Service are like the objects and adverbial phrases of a verb in a sentence. This include direct objects (the things subjected to the action), indirect objects (e.g., beneficiary), and adverbials (e.g., means, location.)

Every target object is linked with the Service through a target instance. The target has a type_cd that identifies the function (or role) played by the target in the service. In the natural language analogy, the type_cd provides the case of the object and the preposition of an adverbial phrase.

The Target class maintains a choice to link to either a Person or a Material as its substance.

Collected_specimen_sample :: is_collected_during(0..1) :: Procedure :: collects(0..n)   clearly mapped

Durable_medical_equipment_request :: requests(0..1) :: Durable_medical_equipment_group ::   mapped

Durable_medical_equipment_request :: requests(1..1) :: Durable_medical_equipment ::   mapped

Durable_medical_equipment_request.type_cd   mapped

Master_observation_service :: has(0..n) :: Master_specimen_requirement :: is_specified_for(1..1)   mapped

Master_observation_service.instrument_cd   mapped with issues

Master_patient_service_location :: is_entry_location_for(0..n) :: Service_intent_or_order ::   mapped

Patient_service_location_group :: is_requested_by(0..n) :: Patient_service_location_request ::   mapped with issues

Resource_request   mapped

Resource_request :: generalizes(1..1) :: Durable_medical_equipment_request :: specializes(1..1)   mapped

Resource_request :: generalizes(1..1) :: Patient_service_location_request :: specializes(1..1)   mapped

Service_event :: is_performed_at(0..1) :: Master_patient_service_location :: is_location_for(0..n)	mapped
Service_intent_or_order :: expects_patient_located_at(0..1) :: Master_patient_service_location ::	mapped
Service_intent_or_order.entering_device_cd	mapped with issues
Target_participation	clearly mapped

Target :: in(1..1) :: Service :: has(0..*) C04-R091.04.02

Target_participation :: is_target_of(0..1) :: Service_event :: has_as_target(0..n)	clearly mapped
Target_participation :: is_target_of(0..1) :: Service_intent_or_order :: has_as_target(1..n)	clearly mapped

Target :: participation_of(0..1) :: Living_subject :: participates_as(0..*) C04-R091.04.05

Any one Target instance connects one Service to either a Person or a Material but not both.

Living_subject :: is_target_of(0..n) :: Target_participation :: has_as_target(0..1)	clearly mapped

Target :: participation_of(0..1) :: Material :: participates_as(0..*) C04-R091.04.04

Any one Target instance connects one Service to either a Person or a Material but not both.

Collected_specimen_sample :: is_target_of(0..n) :: Target_participation :: has_as_target(0..1)	clearly mapped
Master_patient_service_location :: is_target_for(0..n) :: Target_participation :: has_as_target(0..1)	mapped

Target.awareness_cd C04-R091.04.13

2.3.2.3 CV

For person targets indicates whether the associated patient or family member is aware of the service, and especially of the observation made. For example, a patient (or his next family members) may not be aware of a malignancy diagnosis, the patient and family may be aware at different times, and some patients may go through a phase of denial. For other than person targets this attribute is not applicable and shall not be valued.

Advance_directive.competence_ind	mapped with issues
Service_event.family_awareness_txt	mapped
Service_event.individual_awareness_cd	mapped

Target.tmr C04-R091.04.12

2.3.2.2 SET<CV>

This is the time range in which the associated person or thing was a target of the specified Target.type_cd in the associated service.

Resource_request.start_offset_qty	mapped
Target_participation.tmr	clearly mapped

Target.type_cd   C04-R091.04.11

2.3.2.1   SET<CV>

Just as with actors, different participation types can be identified for targets. By "target" of an action we basically mean objects of a verb. Objects appear in different cases: direct objects, indirect objects or adverbial objects according to their roles in a sentence. Target participation type codes distinguish those different roles. For instance, patient, guarantor, custodian, or family members are examples of target participation types. These are in the role of direct target on whom (accusative) or the indirect beneficiary (on behalf of whom) the service action is performed. In addition any material, specimen, device, or location used or produced by a service is a target of the service.

Target_participation.participation_type_cd   clearly mapped

Transportation   C04-R091.11.00

2.6.6

Transportation is the moving of a payload (people or material) from a location of origin to a destination location. Thus, any transport service has the three target instances of type payload, origin, and destination, besides the targets that are generally used for any service (i.e., performer, device, etc.)

Collected_specimen_sample.transport_logistics_cd   mapped

Service_intent_or_order.planned_patient_transport_cd   mapped