

## 120. Modifier Support in IDRT

The [i2b2 star schema](#) in its initial setup defined a one fact per concept per patient approach to a medical data warehouse design. The central i2b2 *table observation\_fact* is an enhanced EAV (entity-attribute-value) design with additional entity identifiers (patient, visit, provider). The visit dimension defines a (financial) encounter. This allows for the extension of the one-to-one relation (concept to fact) to a one-to-many relation by defining n financial encounters per patient. But source data often does not contain financial encounters and/or a fact bundling of much finer entities is needed.

With the addition of modifiers in i2b2 version 1.6 (see: [Data Model of Modifiers in i2b2](#)) a more useful functionality for an undefined (meaning: not just financial encounter related) one-to-many relationship was introduced. Modifiers offer a way of bundling concepts in the i2b2 hierarchy and give these concepts a unique (for that patient, encounter and modifier path) sub-identifier in the *observation\_fact* to connect facts of one patient.

The absence of an i2b2 feature to bundle a collection of concepts and link it with a secondary entity, was the main cause for using modifiers. Our approach began with the implementation of bio specimen as shown in the following table showing a condensed *observation\_fact*.

Patient_num	Instance_num	Concept_cd	Modifier_cd	Value
1	1	i2b2 PD BSP_STUDIE SPECIMEN:item	@	
1	1	i2b2 PD BSP_STUDIE SPECIMEN:item	SPECIMEN_ID:VALUE	SID01
1	1	i2b2 PD BSP_STUDIE SPECIMEN:item	AMOUNT_LEFT:XML	0.05
1	1	i2b2 PD BSP_STUDIE SPECIMEN:item	SPREC FLU TOS:SER	SER
1	2	i2b2 PD BSP_STUDIE SPECIMEN:item	@	
1	2	i2b2 PD BSP_STUDIE SPECIMEN:item	SPECIMEN_ID:VALUE	SID02
1	2	i2b2 PD BSP_STUDIE SPECIMEN:item	AMOUNT_LEFT:XML	0.15
1	2	i2b2 PD BSP_STUDIE SPECIMEN:item	SPREC FLU TOS:SER	SER

In this example the patient with the patient\_num "1" has two specimens with three attributes: the specimen ID, the amount left and the type of specimen as an SPREC code. Although a query with the i2b2 Web Client for serum specimen with an amount\_left higher than 0.1 will return patient "1" with all specimens, the IDRT i2b2 Web Client plugin is able to show only secondary entities of patients which really match the query.

This approach to i2b2 modifiers was implemented in a generic way in the [CSV](#) and [SQL](#) import modules of the IDRT Import and Mapping Tool. Modifiers are also used automatically when importing [CDSIC ODM](#) files with repeating elements within ODM forms.