



Costs and a Proposed CDM Cost Table

OHDSI Community Conference Call

April 21, 2015

A Unified Cost Table in CDM

- We propose creating a new cost table for CDM.
- This cost table will combine all fields from the existing cost tables into one unified cost table.
- Each record in the cost table will link to any other record in the CDM, regardless of domain. This includes records in Observations, Measurements, and Visit_Occurrence tables.
- This Cost table will be applicable for both claims and EHR data analysts.

Current Problem: Vocab vs CDM

- CDMv5 currently has four cost tables associated with four domains
 - Procedure_Occurrence → Procedure_Cost
 - Drug_Exposure → Drug_Cost
 - Device_Exposure → Device_Cost
 - Visit_Occurrence → Visit_Cost
- Vocabulary v5 now maps ICD9, CPT, HCPCS codes to the following six domains:
 - Procedure_Occurrence
 - Condition_Occurrence
 - Drug_Exposure
 - Device_Exposure
 - Observation
 - Measurement
- Two of those domains (Observation and Measurement) do not have an associated cost table.
- There is currently no way to store costs associated with ICD9/HCPCS codes that have a domain of Observation or Measurement

One Table Addressing All Costs

Field	Description
cost_id	Auto generated ID
cost_event_id	ID linked to the code in CDM
domain_id	Link the cost to the table the original code is stored
currency_concept_id	
charge	Amount charged by the provider
paid_copay	
paid_coinsurance	
paid_toward_deductible	
paid_by_payer	
paid_by_coordination_benefits	
total_out_of_pocket	
total_paid	
ingredient_cost	*from drug_cost table
dispensing_fee	*from drug_cost table
cost	Was "average whole sale price" – now generic cost field
payer_plan_period_id	
amount_allowed	The contracted amount agreed between the payer & provider
revenue_code_concept_id	*from procedure_cost table
revenue_code_source_value	*from procedure_cost table

- All fields that exist in current cost tables have been combined into one table.
- New fields are marked in **RED**.
- The Cost table will hold all cost data and link to whatever domain is associated to the cost.

Details on the fields in the proposed Cost table available on this forum post:
<http://forums.ohdsi.org/t/proposal-for-a-unified-cost-table/393>

New Fields Added to the Cost Table

Field	Description
cost_id	Auto generated ID
cost_event_id	ID linked to the code in CDM
domain_id	Link the cost to the table the original code is stored
charge	Amount charged by the provider
paid_by_coordination_benefits	
cost	Was “average whole sale price” – now generic cost field
amount_allowed	The contracted amount agreed between the payer & provider
revenue_code_concept_id	*from procedure_cost table
revenue_code_source_value	*from procedure_cost table

- The **cost_id**, **cost_event_id** and **domain_id** fields are specifically used to link the cost to a record within the CDM
- The **charge** field is the amount the provider will charge for services rendered or products sold.
- **average_whole_sale_price** field has now changed to a generic **cost** field where the cost of the service/device/drug incurred by the provider is stored.
- **amount_allowed** field represents the contracted rate agreed upon by the payer and provider for services/products rendered.
- **paid_by_coordination_benefits** is not a new field but it represents previous payments made to services/products from other payers before the current payer paid.
- **revenue_code_concept_id** and **revenue_code_source_value** are fields specific to storing revenue codes claims data.

Ex: Linking one Cost to one Observation

Example of associating one cost record with an observation for HCPCS code G0248 – “demonstrating in-home use of INR monitoring by a physician.”

→ **Observation** Table – One Record with Cost

Observation_ID	Person_ID	Observation_Concept_ID	Observation_Source_Concept_ID	Observation_Date
1234	5678	2617333	G0248	2015-04-09

Cost_ID	Domain_ID	Cost_Event_ID	Total_Paid	Revenue_Code_Source_Value
2345	“Observation”	1234	89.85	0920

Cost Table – One Cost Associated to an Observation

Table Based on Current Standards

- The fields in the Cost table are based on data interoperability standards, specifically ANSI 835/837.
- Two main standards are used for cost data:

ANSI 835/837	HL7
Standards are set up between payers and providers to submit claim and payment information electronically.	Standards for sending information to labs, public health registries and other EHR provider systems.
Standards have been in existence since the 1990s.	Standards have been in existence since the 1990s.
Very specific fields associated with payment and contracted reimbursement.	Only payment amounts are addressed. Does not address deductibles, copays, other costs
US Based.	International scope but costs not used in the US.

- ANSI 835/837 formats carry more cost detail, are more heavily used in the U.S., and are more applicable to current use cases.
- HL7 is not specific enough to accommodate insurance payments/terms.

The Cost Table is Applicable to All Users

- Even though this solution is based on “claims” data standards, this solution is applicable to all OHDSI users (i.e. EHR and claims data analysts).
- Most healthcare procedures have a “cost”, which can currently be stored in the Cost table.
- Different kinds of “costs” can be stored for each procedure, using the “cost” field.
- Detailed reimbursements, as complicated as insurance payments, can also be stored in the Cost table.
 - Insurance terms (i.e. contracted paid amounts, deductible amounts, coinsurance amounts, etc) associated with each visit can be stored in each field.
- The following use cases will highlight the different ways the Cost table can be implemented to accommodate EHR and claims data.

USE CASES

Costs and a Proposed CDM Cost Table

Use Case: Medicare Inpatient Claim

- Inpatient claims have one bulk payment assigned to each visit.
- Associate the cost information to the Visit since actual the cost cannot be split between billed ICD9 codes.

Visit_Occurrence_ID	Visit_Start_Date	Visit_End_Date	Person_ID
1234	“Admit Date”	“Discharge Date”	5678

Domain_ID	Cost_Event_ID	Charge	Total_paid	Payer_plan_ID
Visit_Occurrence	1234	\$24,000	\$10,851	“Medicare Part A”

Note: linked IDs are marked in RED and information from the Cost table is in the dark blue table.

Use Case: Medicare Outpatient Facility

- Outpatient Facility Claims include HCPCS and Revenue Codes.
- Associate Cost information on a per code basis.
- Below is a cost associated with a HCPCS code.

Procedure_Occurrence_ID	Procedure_Source_Value	Procedure_Concept_ID	Person_ID
1234	90999	2213601	5678

Domain_ID	Cost_Event_ID	Charge	Total_paid	Revenue Code
Procedure_Occurrence	1234	\$150	\$108.34	0821

Note: linked IDs are marked in RED and information from the Cost table is in the dark blue table.

Use Case: Medicare Outpatient Facility

- The Cost table also solves a problem in CDMv4 and CDMv5 where costs associated with Revenue Codes without a procedure code are now tracked.
- Assign costs associated with Revenue Codes to the Visit_Occurrence table.

Visit_Occurrence_ID	Visit_Start_Date	Visit_End_Date	Person_ID
1234	“Procedure Date”	“Procedure Date”	5678

Domain_ID	Cost_Event_ID	Charge	Total_paid	Revenue Code
Visit_Occurrence	1234	\$100	\$12.13	0250

Note: linked IDs are marked in RED and information from the Cost table is in the dark blue table.

Use Case: EHR/Ledger Data

- Cost information from different payers can be tracked by adding a Cost record for each payer and referencing the cost records to one procedure.

Procedure_Occurrence_ID	Procedure_Source_Value	Procedure_Concept_ID	Person_ID
1234	99214	2213601	5678

Domain_ID	Cost_Event_ID	Paid_by_COB*	Total_paid	Payer_plan_ID
Procedure	1234	\$0	\$89.82	“Medicare Part B”
Procedure	1234	\$89.82	\$18.52	“AARP”

Note: linked IDs are marked in RED and information from the Cost table is in the dark blue table.

Use Case: Survey Data

- The Nationwide Inpatient Sample (NIS), handled by HCUP*, is an all-payer sample of inpatient hospital stays in the US, used to create national estimates.
- Each inpatient record is defined as a “person” in CDM.
- Charges and associated cost-to-charge ratios are given.
- Example: An inpatient visit charges \$24,000 and has a cost-to-charge ratio of 0.50.

Domain_ID	Cost_Event_ID	Charge	Cost	Payer_plan_ID
Visit_Occurrence	1234	\$24,000	\$12,000	0

The Payer_Plan_ID is set to “0” because the source of the cost information comes from the hospital and does not include a breakdown by payer.

Payer information for each person is kept in the payer_plan_period table.

Limitations

- The Cost table is very “U.S. – centric”
 - Most of the fields in the Cost table are specific to U.S. insurance payments.
 - However, most of the OHDSI use cases for costs are based on U.S. costs, for now.
- Specific fields not applicable to all scenarios
 - Revenue_code_source_value and ingredient_cost are specific fields that address very specific costs.
 - It is possible that many specific fields can be added to the Cost table, creating an “unwieldy” Cost table.
 - We may need to reevaluate splitting the Cost table into multiple Cost tables in the future.
- Generic “cost” field needs to be specified at the ETL spec level.
 - Example: drug costs could be represented by average wholesale price (AWP), wholesale acquisition cost (WAC), average sales price (ASP), etc. Could specify the type of “cost” in the ETL specification.
 - Alternative is to create a vocabulary for types of costs? But perhaps is overkill.
- With these limitations in mind, the Cost table addresses most use cases for general cost recording.

Thank You for Listening!

Please feel free to contact me with any questions or if you are interested in collaborating!

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BACKGROUND SLIDES

Revenue Codes

- Revenue Codes are used for Outpatient Facility claims only.
- They are represented on a claim and paid at the code level as in the table below:

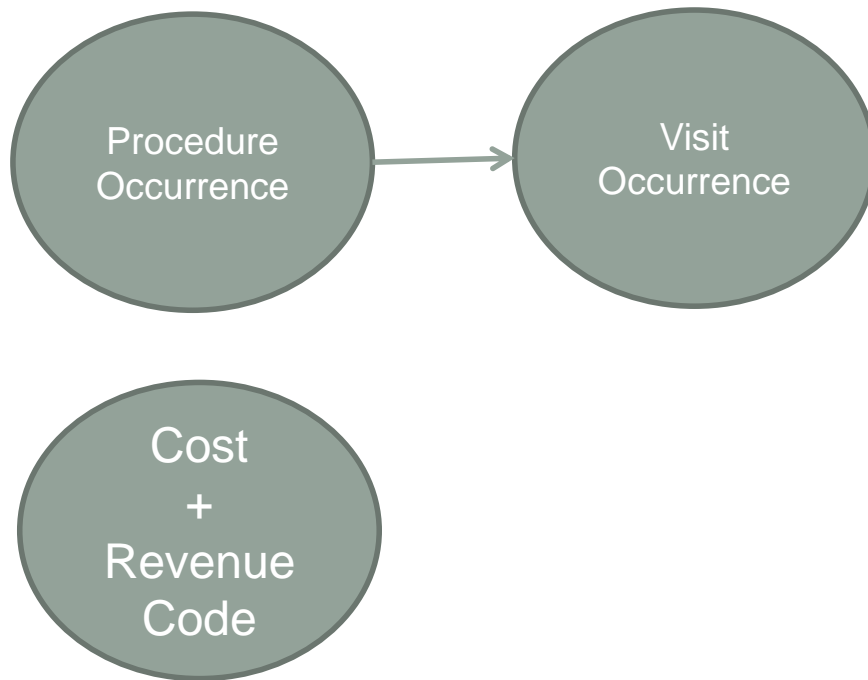
Date	Revenue	HCPCS	Charge	Paid
4/9/2015	0470	99283	150.00	80.05
4/9/2015	0470	12011	300.00	251.01
4/9/2015	0250		70.00	12.51
4/9/2015	0001		520.00	343.57

- This is an example of an ER visit for a lacerated ear. Revenue code 0470 = audiology services and revenue code 0250 = general pharmacy charges.

CDMv4 and CDMv5 – Revenue Codes

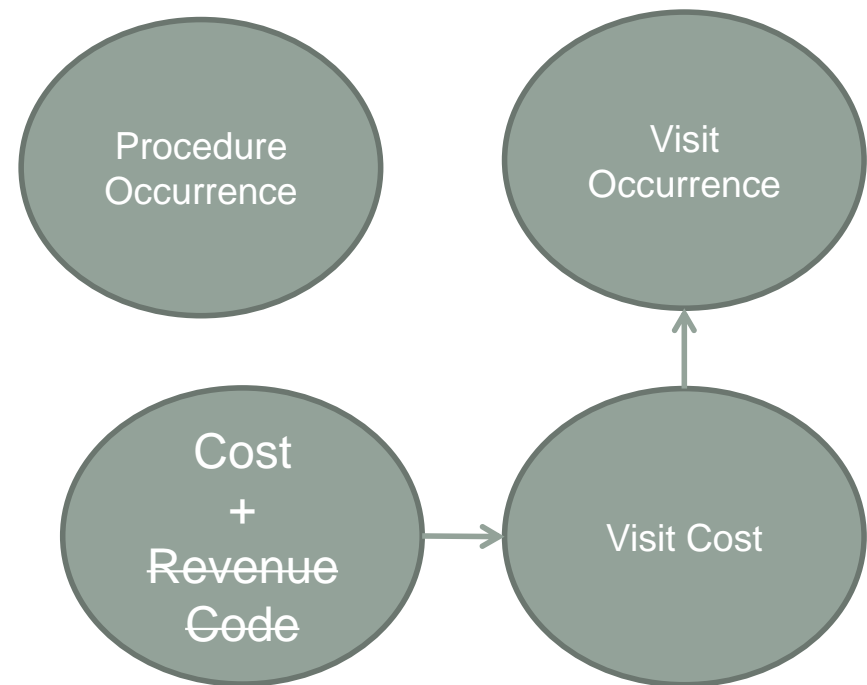
CDMv4

- Could not store a cost without an associated procedure



CDMv5

- Cost could be recorded under the Visit_cost table, but you lose the associated revenue code.



Revenue Codes

- Revenue codes add specificity about a procedure performed
 - E.g. a surgery performed in a certain procedure specialty
- In outpatient claims, all procedures (reported through HCPCS codes) are reported along with a Revenue Code
- Additional Revenue Codes may be reported without being associated with a procedure (HCPCS code).
 - E.g. A Revenue Code for bandages
- So HCPCS \Leftrightarrow Revenue Codes share a 0-1 to 1 relationship
- Revenue Codes therefore should not live in the procedure_occurrence table, but instead the cost table
- A Revenue Code reported with a procedure will be stored in the cost row associated with that procedure_occurrence (or measurement or observation or ...)
- A Revenue Code reported without a specific procedure will be stored in the cost record for the visit itself.