

# Daily Dose Assessment of Medicines Administered in Intensive Care Unit and Inpatient Settings in Hospital del Mar Barcelona

European OHDSI Symposium, Rotterdam, 1-3 June 2024



## Background

The European Medicines Agency (EMA) is focusing on crisis preparedness by assessing medicine shortages during public health emergencies through the DARWIN EU initiative. This initiative oversees an observational study analyzing the use of essential medicines in Intensive Care Units (ICU) to identify usage patterns and potential shortages. The study measures administration rates, dosages, and treatment durations to aid EMA's monitoring efforts.

The **main objective** of this study is to show how **drug exposure data from inpatient and emergency room visits** is organized in Hospital del Mar EHR database (IMASIS) and how it can be used for the reliable assessment of daily dose.

## Methods

IMASIS medications from inpatient visits in the drug\_exposure\_table are:

- labelled with **drug\_type\_concept\_id = 32818 (EHR administration record)**. Prescribed and Dispensed drugs in outpatient visits (not considered in the study) have different values
- recorded as single drug\_exposure events at a specific time (**start\_datetime= end\_datetime**)
- '**drug\_exposure.quantity**' values are generally expressed in terms of "**single dose items**" (e.g. 1 oral tablet, 1 actuat) and not in terms of boxes of drug.
- mapped to "**quantified**" concepts when available (otherwise to unquantified concepts like "Clinical Drug")
- In general, '**Daily dose**' calculations need to consider several drug\_exposure records in the same day or time window.

We suggest how to assess dose calculations for a specific drug\_exposure record regardless of whether the drug\_concept\_id belongs to a quantified or an unquantified concept\_class. Dose in a drug\_exposure record ( $d_i$ ) can be calculated as follows:

- When the amount of ingredient is available in the ds.amount\_value:

$d_i = de.quantity \times ds.amount\_value$  expressed in terms of **ds.amount\_unit\_concept\_id** where **de** and **ds** stand for **drug\_exposure** and **drug\_strength**, respectively.

- When the amount of ingredient is expressed in terms of ds.numerator\_value and ds.denominator\_value:

$d_i = de.quantity \times (ds.numerator\_value / ds.denominator\_value)$  if ds.denominator\_value is NULL it has to be set to 1; expressed in terms of ds.numerator\_unit\_concept\_id / ds.denominator\_unit\_concept\_id

The Daily Dose of an ingredient can be derived from the collapse of different single drug\_exposure events/records (involving different **drug\_concept\_ids** including this **ingredient**) within a time window. Every record takes place at a specific datetime, and the corresponding dose  $d_i$  can be calculated according to formulae 1 or 2.

Dose within a day  $D_{DATE}$  can be calculated as the sum of doses this day

- $D_{DATE} = \sum d_i$  in this date

Thereby, total dose  $D_{TOTAL}$  in this time window can be calculated as

- $D_{TOTAL} = \sum d_i$  within the time window.

Daily dosage during this time window can be calculated as

- Daily Dose =  $D_{TOTAL}$  / number of days**

## Results

**Table 1. Calculation of dose ( $d_i$ ) in records with 'quantity' values expressed as "single dose items" and the amount of ingredient is expressed according to (1)**

concept_id	concept_name	concept_class_id	ingredient_concept_id	box_size	amount_value	amount_unit_concept_id	$d_i$ (de.quantity = 1 oral tablet)
36274912	Acetaminophen 1000 MG Oral Tablet Box of 120	Clinical Drug Box	1125315	120	1000	8576 (milligram)	1 x 1000 mg = 1000 mg
40977257	Acetaminophen 500 MG Oral Tablet Box of 10 by Hemopharm	Marketed Product	1125315	10	500	8576 (milligram)	1 x 500 mg = 500 mg
19020053	acetaminophen 500 MG Oral Tablet	Clinical Drug	1125315	No	500	8576 (milligram)	1 x 500 mg = 500 mg

If "**de.quantity**" values are expressed as "**single dose items**" (e.g. Oral Tablet), the "**box\_size**" value in the drug\_strength table available in quantified concept\_classes ("Marketed Product" and "Clinical Drug Box") is not involved in the calculation of doses. Otherwise (de.quantity expressed as number of boxes of Acetaminophen tablets), the box\_size value would be needed and "Clinical Drug" concept\_ids would not be useful for dose calculations.

**Table 2. Calculation of dose ( $d_i$ ) in records with 'quantity' values expressed as "single dose items" and the amount of ingredient is expressed according to (2)**

concept_id	concept_name	concept_class_id	# actuats	ingredient_concept_id	box_size	numerator_value	denominator_value	$d_i$ (de.quantity = 1 Actuat)
784967	120 ACTUAT fluticasone 0.25 MG/ACTUAT / salmeterol 0.025 MG/ACTUAT Inhalation Solution [Airlusol] Box of 1 by Sandoz	Marketed Product	120	1149380 (fluticasone)	1	30	120	1 Actuat x 30 mg / (120 actuats) = 0.25 mg
784962	120 ACTUAT fluticasone 0.25 MG/ACTUAT / salmeterol 0.025 MG/ACTUAT Inhalation Solution Box of 1	Quant Clinical Box	120	1149380 (fluticasone)	1	30	120	1 Actuat x 30 mg / (120 actuats) = 0.25 mg
21167968	120 ACTUAT fluticasone 0.25 MG/ACTUAT / salmeterol 0.025 MG/ACTUAT Inhalant Solution	Quant Clinical Drug	120	1149380 (fluticasone)	No	30	120	1 Actuat x 30 mg / (120 actuats) = 0.25 mg
782481	fluticasone 0.25 MG/ACTUAT / salmeterol 0.025 MG/ACTUAT Inhalation Solution Box of 1	Clinical Drug Box	No	1149380 (fluticasone)	1	0.25	No	1 Actuat x 0.25 mg / (1 actuats) = 0.25 mg
21079794	fluticasone 0.25 MG/ACTUAT / salmeterol 0.025 MG/ACTUAT Inhalant Solution [Seretide] by Glaxosmithkline	Marketed Product	No	1149380 (fluticasone)	No	0.25	No	1 Actuat x 0.25 mg / (1 actuats) = 0.25 mg
21109264	fluticasone 0.25 MG/ACTUAT / salmeterol 0.025 MG/ACTUAT Inhalant Solution	Clinical Drug	No	1149380 (fluticasone)	No	0.25	No	1 Actuat x 0.25 mg / (1 actuats) = 0.25 mg

All rows have **numerator\_unit\_concept\_id** values set to **8576 (milligram)** and **denominator\_unit\_concept\_id** set to **45744809 (Actuat)**

If "**de.quantity**" values are expressed as "**single dose items**" (e.g. actuats) and the amount of ingredient is given in terms of numerator and denominator values, the latter is needed for the proper calculation of doses as the numerator\_value / denominator\_value yields the actual amount of fluticasone per actuat described in the concept\_name. The "box\_size" value is not involved in dose calculations.

**Figure 1. Daily dose calculation from a set of drug exposure records within a time window embedded in an inpatient visit**

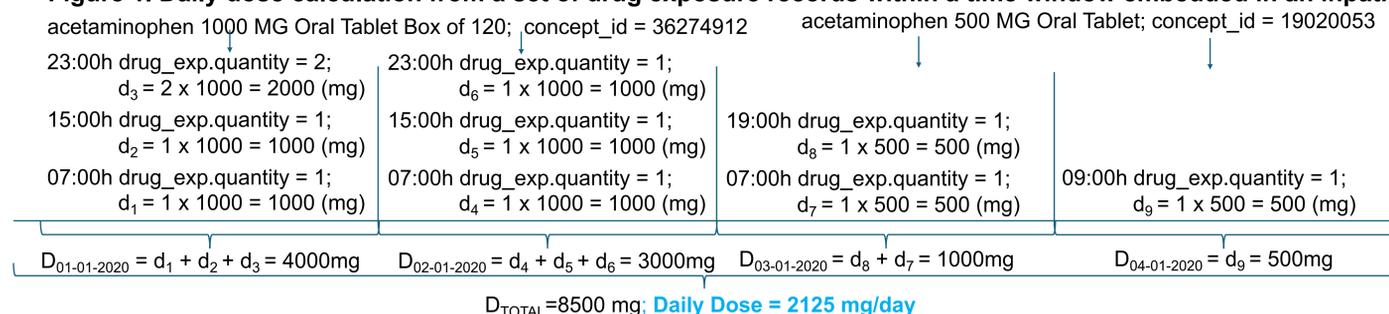


Figure 1 shows a set of drug\_exposure records involving a patient within a time window embedded in an inpatient visit. Doses for every record ( $d_1$  to  $d_9$ ) have been calculated according to (1). Doses within a day ( $D_{DATE}$ ) have been calculated according to (3). Total Dose ( $D_{TOTAL}$ ) and Daily Dose within this period have been calculated according formula (4) and (5), respectively.

## Conclusions

We explain how drug\_exposure data from inpatient visits is organized in IMASIS to assess daily dose values, which could be considered for the implementation of the analytical tools used in observational studies on medications administered in hospitals using the OMOP CDM.

