



Analysis of LAB dataset

Unit Conversion

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Agenda

- Unit conversion
- Need for unit conversion
- Standard Conventions
- Conversion using SAS
- Challenges faced and solution
- Reference paper for reading

Unit Conversion

- In clinical studies, data is usually collected through many different investigators, often in different parts of the country or even the world.
- We may end up with height collected in inches by some investigators and in centimeters by others.
- To do any sort of summary on these numbers, even something as straightforward as mean, min, or max, we must first somehow convert everyone to the same scale or “unit”.
- This is the basic concept of unit conversions.

Need for Unit Conversion

- **Central Lab:** Some clinical studies choose to use the same central lab to do all of their lab testing, and thus report all the results for a specific lab test in the same unit. Conversion is not an issue here.
- **Local Lab:** Unfortunately, this is often not the case. Often a central lab is too impractical or too expensive to justify. If a trial utilizes laboratories local to the study sites, many different standards may be used and data is received in differing units, which cannot be analyzed together.
- For example, at one lab the test BUN might be reported in units of mg/dL, but at another they report in units of mmol/L. To work with this data, we need to convert into some common unit.

Standard Conventions

- There are two main standard conventions for lab values, Conventional Units (U.S. standard) and the International Standard of Units (SI).
- Laboratories in the United States generally collect their labs in conventional units; however, many trials choose to analyze the data in SI units. Therefore, the lab values must all be converted from conventional units to SI units.
- You need to check with your study team (usually specified in SAP), which conventional units will be used for reporting purpose. In some studies, reporting is done in SI unit, some use US unit and some studies may require reports in both SI and US unit, in such cases you need to create two ADS LAB datasets: One for SI and another for US units

Conversion using SAS

- We first need a list of all the units we're converting from, the units we're converting to, and the conversion factor for each pair.
- E.g. Convert test BUN into standard units of mmol/L
Assume that in your raw data BUN is collected in different units like g/dL, mg/dL, MCG/L, MG/L
Identify the conversion factor, to convert the unit captured in raw data to mmol/L

Example of SAS code for Unit conversion

```
if (test = 'BUN') then do;  
    * Convert mg/dL into mmol/L for reporting;
```

```
    if (unit = 'mg/dL') then do;
```

```
        result_rpt = result x 0.357;
```

```
        unit_rpt = 'mmol/L';
```

```
    end;
```

```
    else if (unit = 'g/dL') then do;
```

```
        result_rpt = result x 0.626;
```

```
        unit_rpt = 'mmol/L';
```

```
    end;
```

```
    else if (unit = 'mmol/L') then do;
```

```
        result_rpt = result;
```

```
        unit_rpt = unit;
```

```
    end;
```

```
End;
```

Imagine the amount of coding required for all parameters, there should be a better way to manage these conversions

Unit conversions using Excel file/SAS dataset

- Create a Excel file and convert to SAS dataset OR create a sas dataset which will have contents as given in example below. Let us assume the dataset name as factor

LBTESTCD	LBTEST	Original Unit	Standard Unit	Conversion Factor	Digit
HGB	Hemoglobin			1	0
HGB	Hemoglobin	g/L	g/L	1	0
HGB	Hemoglobin	g/dL	g/L	10	0
HGB	Hemoglobin	g/dL	g/L	10	0
HGB	Hemoglobin	g/dL	g/L	10	0
HGB	Hemoglobin	g/dL	g/L	10	0
HGB	Hemoglobin	g/dL	g/L	10	0
HGB	Hemoglobin	g/dL	g/L	10	0
HGB	Hemoglobin	g/dL	g/L	10	0
HGB	Hemoglobin	g/dL	ug/L	10000000	1
HGB	Hemoglobin	g/mL	g/L	1000	0
HGB	Hemoglobin	mcg/L	ug/L	1	1
HGB	Hemoglobin	mg/dL	g/L	0.01	0
HGB	Hemoglobin	mkmol/l	g/L	0.0161	0
HGB	Hemoglobin	mmol/L	g/L	16.1	0
HGB	Hemoglobin	ng/mL	ug/L	1	1
HGB	Hemoglobin	ug/L	ug/L	1	1
HGB	Hemoglobin	umol/L	g/L	0.0161	0
HGB	Hemoglobin	umol/L	g/L	0.0161	0

Unit conversions using Excel file/SAS dataset

- Sort the Factor dataset by Lbtestcd Lborresu
- Sort the raw lab dataset by Lbtestcd Lborresu
- Merge two datasets by Lbtestcd Lborresu
- After merge you will get the conversion factor and digit for each parameter.
- Multiply the result value by conversion factor
- Round off the result from above step upto the number of places as given in digit variable.

Challenges faced and solutions

- While merging the “Factor” dataset with raw LAB dataset:

Problem: The lbtestcd names may be different.

Solution: E.g. lab test Hemoglobin may have a LBTESTCD as “HGB” in one dataset and “HB” in another dataset, in such cases make the LBTESTCD same before merging datasets.

Problem: The same unit may be presented differently in different datasets.

Solution: E.g. in one dataset the unit may be g/L and in other it may be G/L. Make units consistent before merging two datasets

A easy method to check for such differences is to merge two datasets on the basis of TESTCD Original Unit and create a dataset where these two do not match.

Now use the information from this dataset and do the pre/post processing for TESTCD and Original Units.

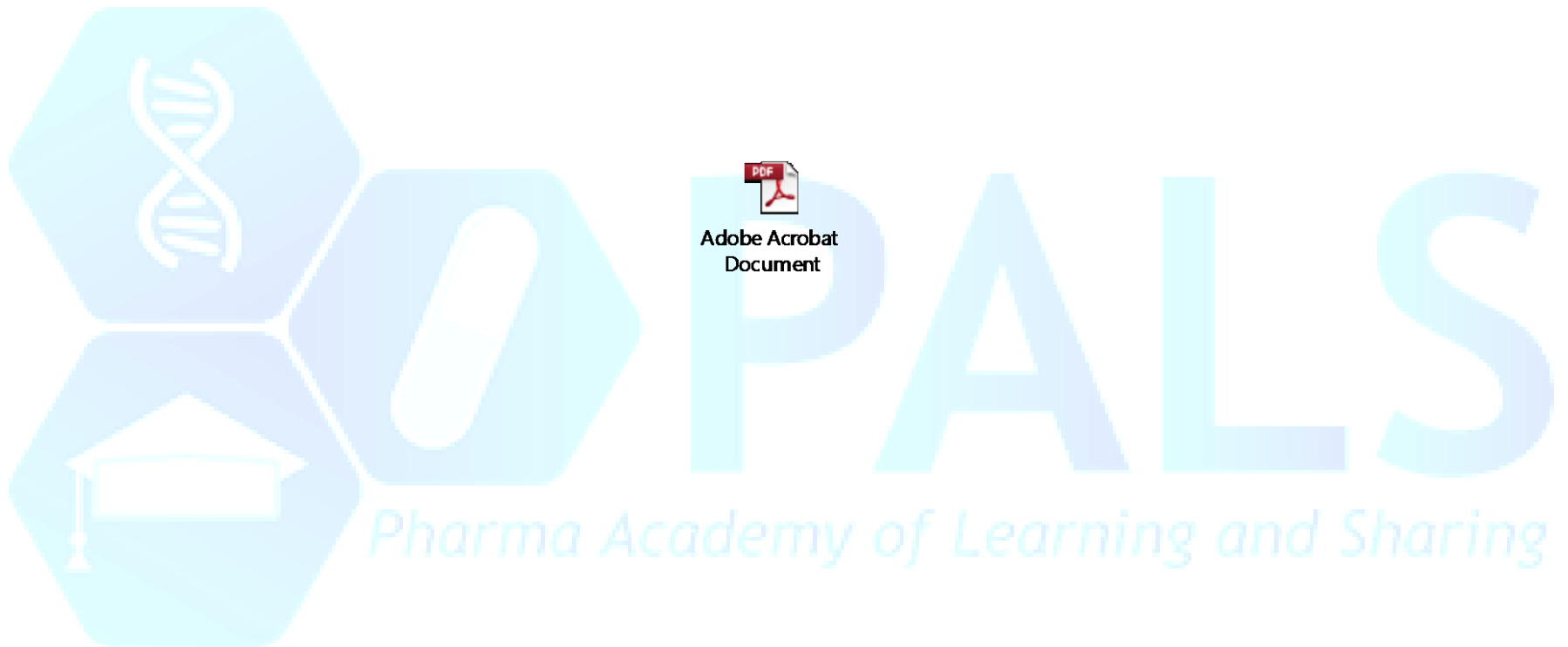
Example of Pre/Post processing

```
data oc_lab miss_dtres;
  length lborresu or_unit $40 lbstresu $25;
  set lablib.lab_updated(rename=(lborresu=o_lborresu));*rdb$.lab(rename=(lborresu=o_lborresu));
  lborresu=strip(o_lborresu);
  if strip(upcase(lbtestcd)) in (/*"PROTT",*/"TPRO") then lbtestcd="TPROT";
  if strip(upcase(lbtestcd)) in ("PLT","PLAT") then lbtestcd="PLT";

  if lbtestcd eq "BAS" then lbtestcd="BASOLE";
  if lbtestcd eq "NEU" then lbtestcd="NEUTLE";

  if upcase(lborresu) in ("10^3/UL" "X10^3/UL", "10E3/UL","X10^3/UL") then lborresu="10E3/UL";
  else if upcase(lborresu) in ("X10^6/UL" "10^6/UL","10E6/UL") then lborresu="10E6/UL";
  else if upcase(lborresu) in ("X10^9/L" "10^9/L","10E9/L") then lborresu="10E9/L";
  else if upcase(lborresu) in ("X10^12/L" "10^12/L","10E12/L","TI/L") then lborresu="10E12/L";
  or_unit=upcase(strip(lborresu));
  drop o_lborresu;
  if lbdt eq "" and lborres eq "" then output miss_dtres;
  if lbdt ne "" or lborres ne "" then output oc_lab;
run;
```

Reference paper on Unit conversion



- Thank You

