

Coding WHO-DDE: an automatic, easy and powerful SAS® tool

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The Center of Excellence for Clinical Trial Data



Agenda

- Introduction
- Overview on the Coding Process
- Structure of the Program
- The Coding Core
- Future Development
- Conclusions

20 Minutes + Questions



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Introduction

- Coding Medications using the WHO-DDE™ dictionary
 - can be difficult
 - time expensive task



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Introduction

- Coding Medications using the WHO-DDE™ dictionary
 - can be difficult
 - time expensive task
- With SAS
 - Golden Standard
 - Straight to the point

Overview on the Coding Process

- Coding Process:
 - Verbatim Term to Drug Name
 - Drug Name to Preferred Name
 - Preferred Name to ATC codes

Verbatim Term	Drug Name	Preferred Name	ATC Text
Allercrom 2% w/v eye drops	ALLERCROM	CROMOGLICATE SODIUM	OTHER ANTIALLERGICS

DGATC1C	DGATC2C	DGATC3C	DGATC4C	DGATC1D	DGATC2D	DGATC3D	DGATC4D
S	S01	S01G	S01GX	SENSORY ORGANS	OPHTHALMOLOGICALS	DECONGESTANTS AND ANTIALLERGICS	OTHER ANTIALLERGICS

Overview on the Coding Process

- Coding: Verbatim Term to Drug Name to Preferred Name to ATC codes.
- Main Challenge:
 - Simplify this process
 - With a focus on those cases that require an interaction

Verbatim Term	Drug Name	Preferred Name
Antibiotics	ANTIBIOTICS	ANTIBIOTICS

Verbatim Term	Drug Name	Preferred Name	ATC Text
Allercrom 2% w/v eye drops	ALLERCROM	CROMOGLICATE SODIUM	OTHER ANTIALLERGICS

HLC	direct_match	Drug record number	Sequence number 1	Sequence number 2	Check digit	Designation	Year of Reference	Reference code	Company code	Number of Ingredients	Salt/Ester Code	Year, Quarter	pname
Y	ALLERCROM	000821	02	380	1	T	12	254	UNS	01		131	CROMOGLICATE SODIUM
Y	ALLERCROM	000821	01	016	2	T	05	237	UNS	01		061	CROMOGLICIC ACID

direct_match	Drug record number	Sequence number 1	Sequence number 2	ATC code	DGATC1D	DGATC2D	DGATC3D	DGATC4D	DGATC1C	DGATC2C	DGATC3C	DGATC4C
ALLERCROM	000821	02	380	A07EB	ALIMENTARY TRACT AND METABOLISM	ANTIDIARRHEALS, INTESTINAL ANTIINFLAMMATORY/ANTIIN	INTESTINAL ANTIINFLAMMATORY AGENTS	ANTIALLERGIC AGENTS, EXCL. CORTICOSTEROIDS	A	A07	A07E	A07EB
ALLERCROM	000821	02	380	D11AH	DERMATOLOGICALS	OTHER DERMATOLOGICAL PREPARATIONS	OTHER DERMATOLOGICAL PREPARATIONS	AGENTS FOR DERMATITIS, EXCLUDING CORTICOSTEROIDS	D	D11	D11A	D11AH
ALLERCROM	000821	02	380	R01AC	RESPIRATORY SYSTEM	NASAL PREPARATIONS	DECONGESTANTS AND OTHER NASAL PREPARATIONS FOR TOP	ANTIALLERGIC AGENTS, EXCL. CORTICOSTEROIDS	R	R01	R01A	R01AC
ALLERCROM	000821	02	380	R01AC	RESPIRATORY SYSTEM	DRUGS FOR OBSTRUCTIVE AIRWAY	OTHER DRUGS FOR OBSTRUCTIVE	ANTIALLERGIC AGENTS, EXCL.	R	R01	R01A	R01AC



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Overview on the Coding Process

- Coding: Verbatim Term to Drug Name to Preferred Name to ATC codes.
- Main Challenge:
 - Simplify this process
 - With a focus on those cases that requires an interaction
- With SAS:
 - Can mechanize most of the phases of the process
 - asking for an interaction to the user only when necessary, leading him to its choice.



The Structure of the Program

Key Variables

cmtrt	cmroute	cmindc
5-HTP	ORAL	SUPPLEMENT
AMITRIPTYLINE	ORAL	MIGRAINE
AMITRIPTYLINE	ORAL	FIBROMYALGIA
Allercrom 2% w/v eye drops	OPHTHALMIC	Hayfever
Allopurinol	ORAL	Gout
Amitriptyline	ORAL	Overactive Bladder
Amitriptyline	ORAL	Anxiety
Amlodipine	ORAL	Hypertension
Amlodipine	ORAL	Hypertension

CODED ONCE

The Structure of the Program

- Key Variables
- Possibility to split the coding in multiple phases

The Structure of the Program

- Key Variables
- Possibility to split the coding in multiple phases
- Robust, flexible and easy to use

The Structure of the Program

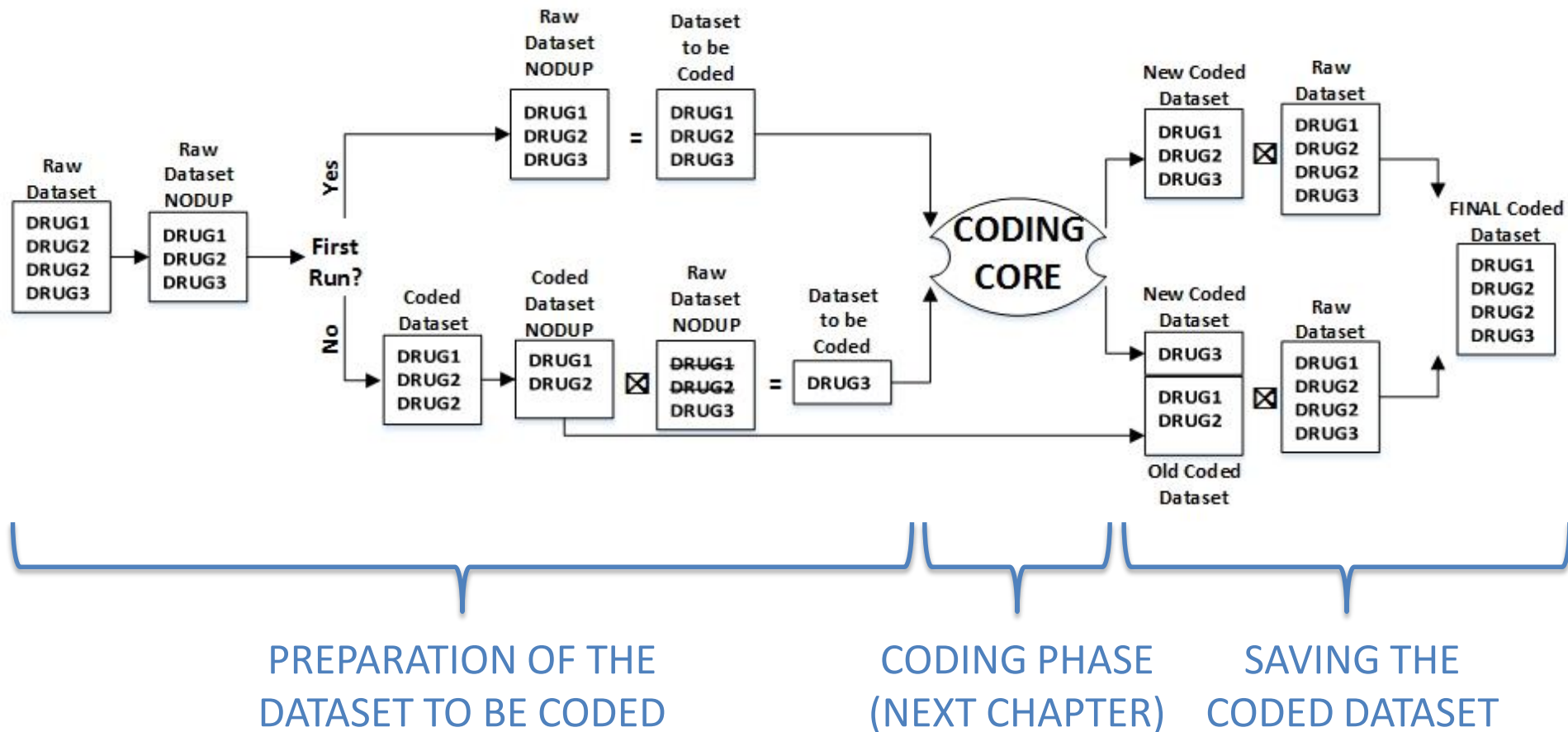
- Key Variables
- Possibility to split the coding in multiple phase
- Robust, flexible and easy to use
- No SAS knowledge required.

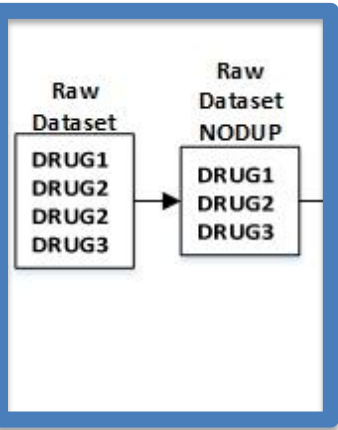


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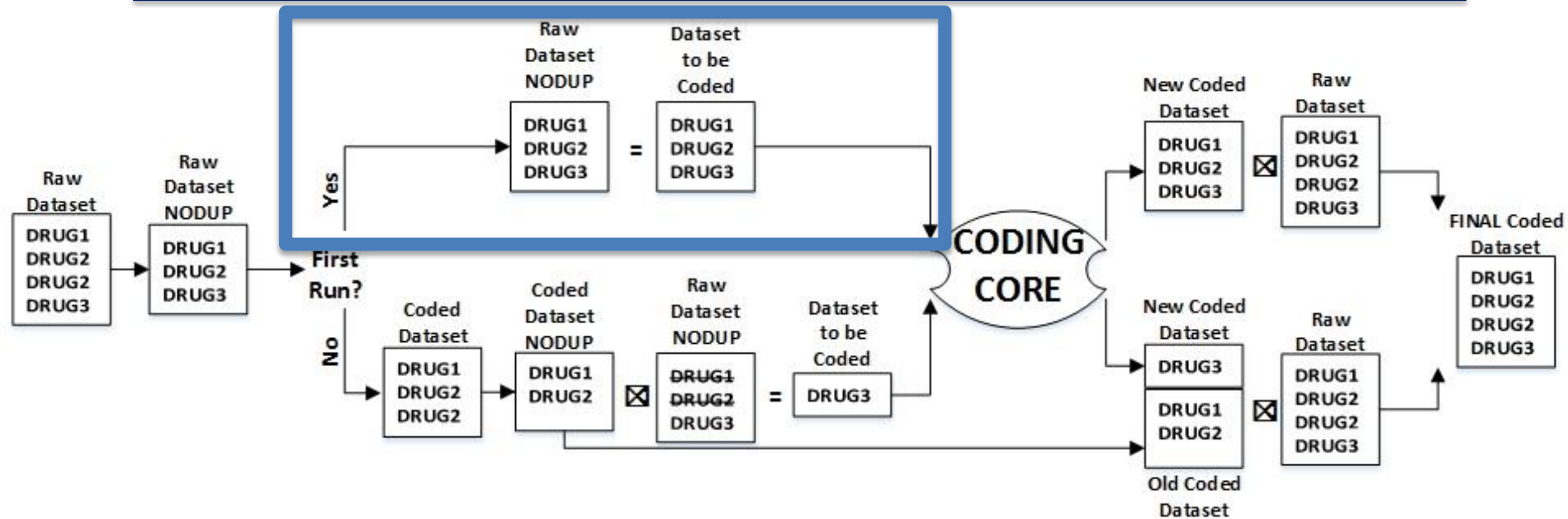
The Structure of the Program





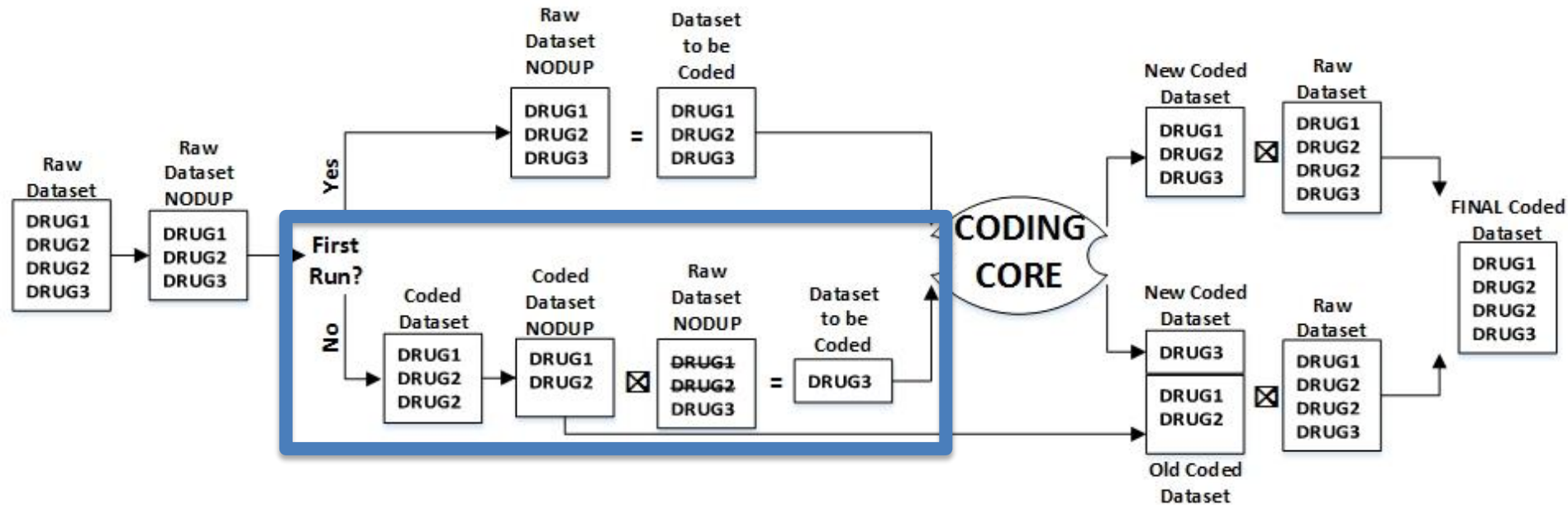
- 

The Structure of the Program



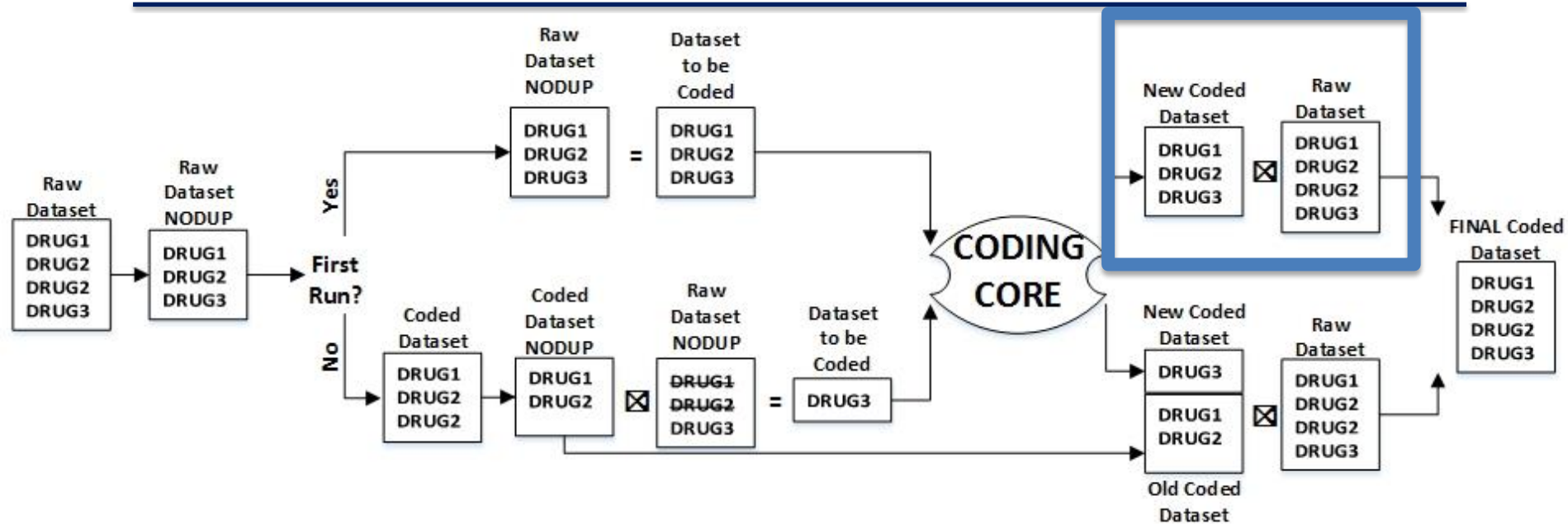
First coding phase?

The Structure of the Program



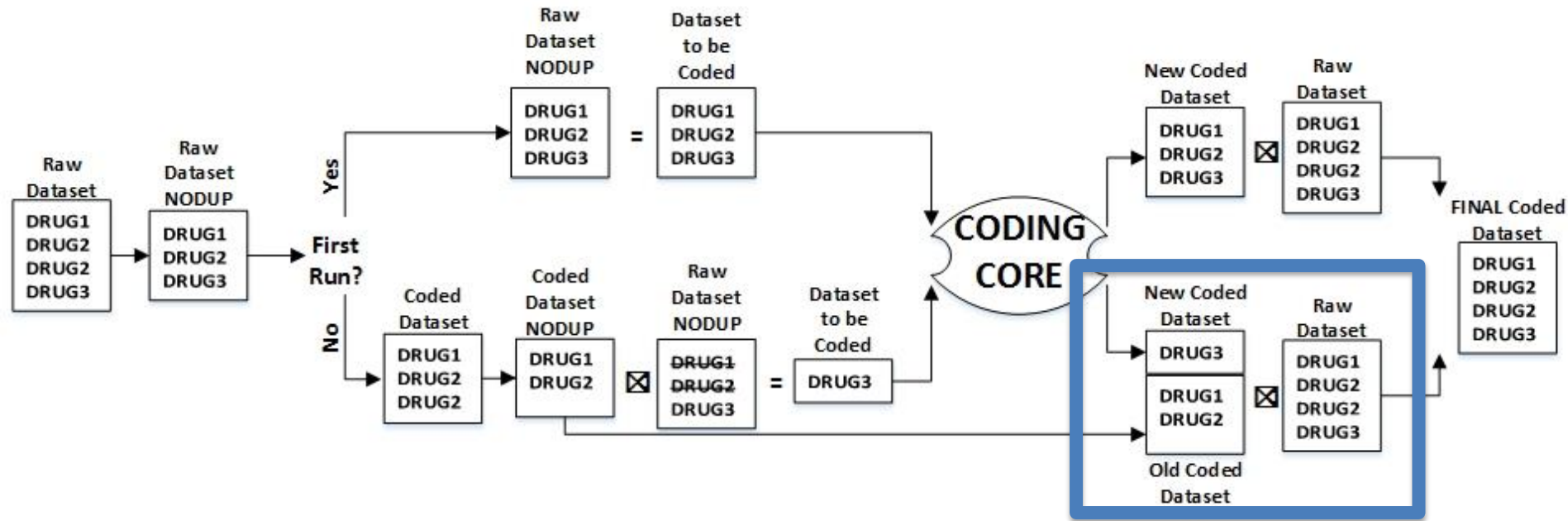
- First coding Phase?
- If not, proceed with the selection of observations

The Structure of the Program



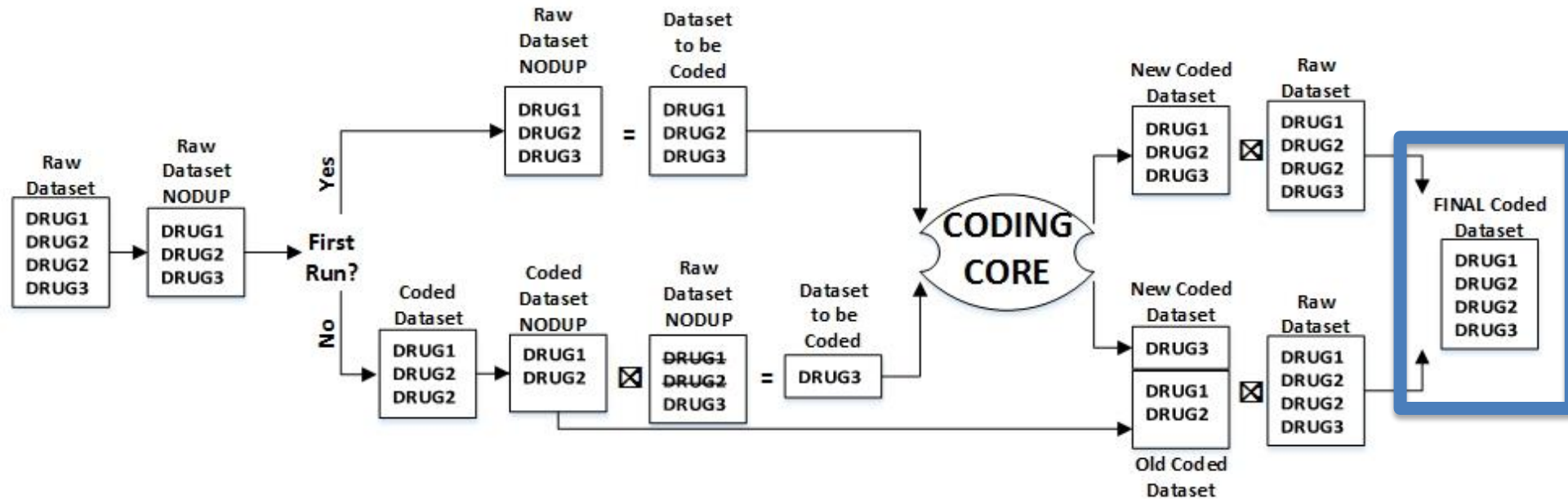
After the coding

The Structure of the Program



- After the coding
- If not the first coding phase, reinclude coded terms

The Structure of the Program



- After the coding
- If not the first coding phase reinclude coded terms
- Finally saving the coded dataset

The Coding Core

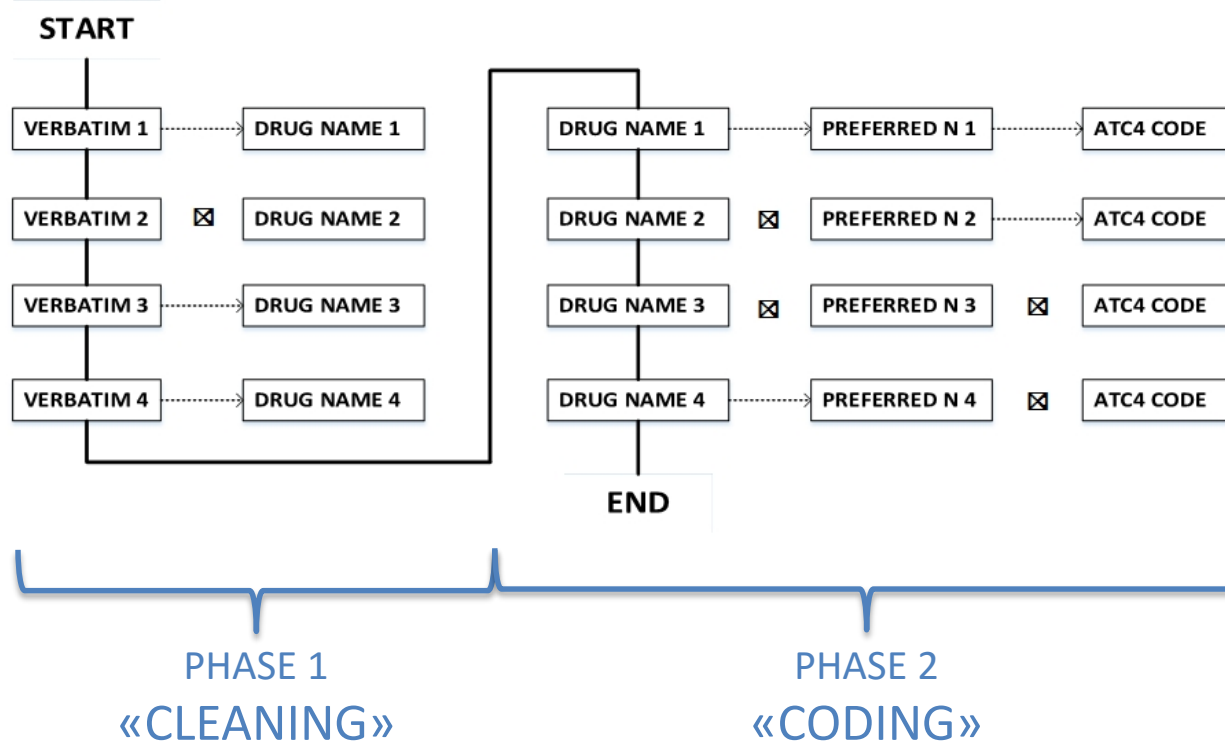
- At each phase of the coding
 - Perfect matches automatically attached
 - When an interaction by the user is required a GUI will be prompted



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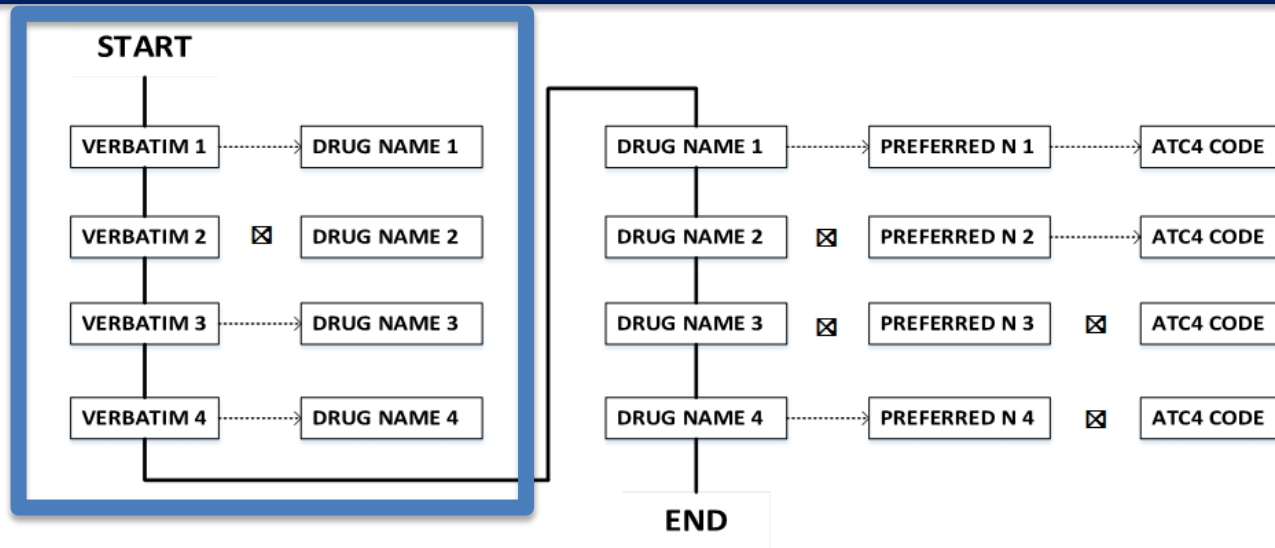
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The Coding Core



Two Independent phases

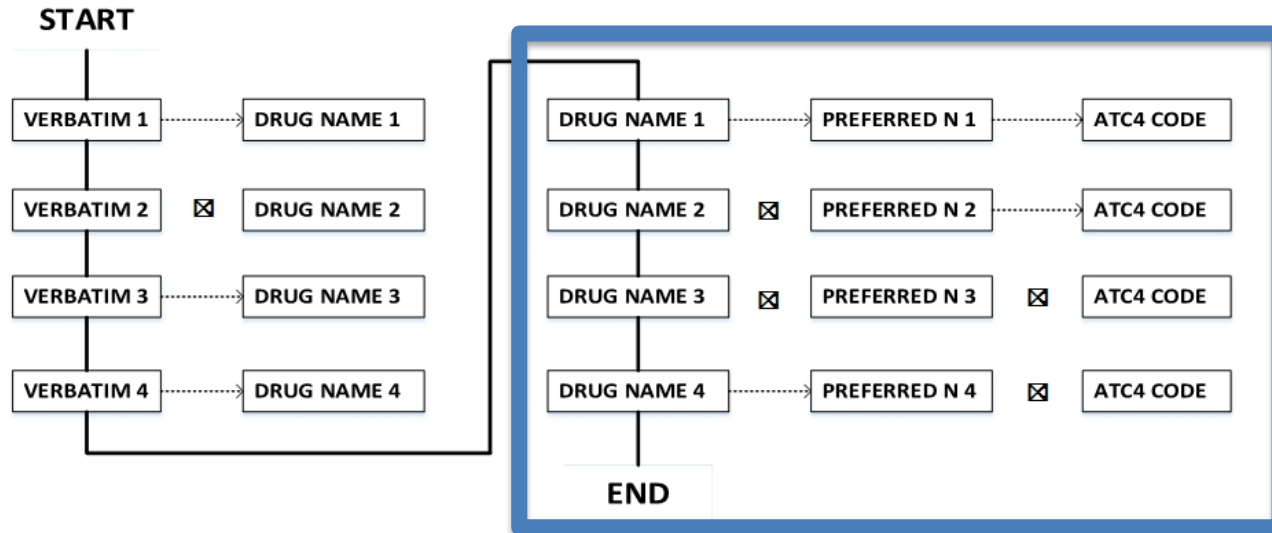
The Coding Core



- Two Independent phases
- The Phase 1 is the «CLEANING»

Verbatim Term	Drug Name	Preferred Name	ATC Text
Allercrom 2% w/v eye drops	ALLERCROM	CROMOGLICATE SODIUM	OTHER ANTIALLERGICS

The Coding Core



- Two Independent phases
- The Phase 1 is the «CLEANING»
- The Phase 2 will include two steps,
 - Associate the Preferred Name to each Drug Name,
 - Associate the Preferred Name to the ATC code



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The Coding Core

- GUI built inside the output window with the %window and %display code.

```
----- STEP 1: Select the direct match -----
DRUG (Verbatim): ALLERCROM 2% W/V EYE DROPS
ROUTE: OPTHALMIC
INDIC: Hayfever
STEP1 - COMPLETED: 1 / 33

1  HOMATROPINE EYE DROPS
2  PILOCARPINE EYE DROPS
3  NEO DECA EAR/EYE DROPS
4  ALLERCROM
5  ALLERDROP
6  ALLERGY EYES
7  ALLERGOFERON
8  ALLANTOIN W/GLYCEROL
9  BETASOL-N EYE DROP
10 GOLDEN CUP EYE DROP
11 ALLERCROM
12 ALLERCORT
13 ALLERCOM D
14 ALLERGOCROM
15 ALLERMED
16 ALLERCLEAR
17 ALENDROMED
18 ALLERGOCROME
19 ALLERCET-DC
20 ALLERGOPOS
21 ALLERGENER
22 ALLERGODOSE
23 ALLERCET COLD
24 ALLERGOSTOP
25 ALLERGY DN PE
26 ACEDROPS
27 ALLERGOSOVIS
28 ALLER EZE PLUS
29 ALLERGENS NOS
30 ALLERGIEL EYE
31 ALLERGOPREVENT
32 ALLERGOCROM COMOD
33 ALLERX PE PM DOSE
34 AURO EAR DROP
35 ALLER-EZE PLUS
36 ALLERGODIL NEVEL
37 ALLERGO VISION
38 ALLEXOFEDRIN
39 AEROMETROL
40 ARTROVERON
41 EYE DROPS
42 ALENDRONATO EXELS
43 FERRO DROPS L
44 SUPER CROMER ORTO
45 ALENDRONATE ARROW
46 ALENDRONATE MERCK
47 ALLERGEX NON DROWSY
48 ALPRAZOLAM GENERICS
49 AMBROXOL AZEVEDOS
50 LACTOSE ANHYDROUS
51 ALOE VERA W/MENTHOL
52 ALVIMOPAN ANHYDROUS
53 ALFUZOSIN/GENERICS
54 20/20 EYE DROP
55 ALLERGENS, SNAKE VENOM
56 ANTIBI-OTIC EAR DROPS
57 GLUCOSE W/GLYCEROL
58 LETROZOL WINTHROP
59 UNIVERSAL EYE DROP
60 LETROZOL GENERIS
```

Write the number of the correct direct match or enter search followed by new term to search.
You can also check in coding.DRUG_CHECK_STEM or DRUG_CHECK_AZ and write the direct match here.
Hit enter leaving this space blank to ignore this drug. Write SAVEANDEXIT to save and exit.

The Coding Core

----- STEP 1: Select the direct match -----

DRUG (Verbatim): ALLERCROM 2% W/V EYE DROPS
 ROUTE: OPTHALMIC
 INDIC: Hayfever

STEP1 - COMPLETED: 1 / 33

BOX WITH TREATMENT
INFORMATION

COUNTER

- 1 HOMATROPINE EYE DROPS
- 2 PILOCARPINE EYE DROPS
- 3 NEO DECA EAR/EYE DROPS
- 4 ALLERCROM
- 5 ALLERDROP
- 6 ALLERGY EYES
- 7 ALLERGOFERON
- 8 ALLANTOIN W/GLYCEROL
- 9 BETASOL-N EYE DROP
- 10 GOLDEN CUP EYE DROP
- 11 ALLERCROM
- 12 ALLERCORT
- 13 ALLERCOM D
- 14 ALLERGOCROM
- 15 ALLERMED
- 16 ALLERCLEAR
- 17 ALENDROMED
- 18 ALLERGOCROME
- 19 ALLERCET-DC
- 20 ALLERGOPUS
- 21 ALLERGENER
- 22 ALLERGODOSE
- 23 ALLERCET COLD
- 24 ALLERGOSTOP
- 25 ALLERGY DN PE
- 26 ACEDROPS
- 27 ALLERGOSOVIS
- 28 ALLER EZE PLUS
- 29 ALLERGENS NOS
- 30 ALLERGIEL EYE

- 31 ALLERGOPREVENT
- 32 ALLERGOCROM COMOD
- 33 ALLERX PE PM DOSE
- 34 AURO EAR DROP
- 35 ALLER-EZE PLUS
- 36 ALLERGODIL NEVEL
- 37 ALLERGO VISION
- 38 ALLEXOFEDRIN
- 39 AEROMETROL
- 40 ARTROVERON
- 41 EYE DROPS
- 42 ALENDRONATO EXELS
- 43 FERRO DROPS L
- 44 SUPER CROMER ORTO
- 45 ALENDRONATE ARROW
- 46 ALENDRONATE MERCK
- 47 ALLERGEX NON DROWSY
- 48 ALPRAZOLAM GENERICS
- 49 AMBROXOL AZEVEDOS
- 50 LACTOSE ANHYDROUS
- 51 ALOE VERA W/MENTHOL
- 52 ALVIMOPAN ANHYDROUS
- 53 ALFUZOSIN/GENERICS
- 54 20/20 EYE DROP
- 55 ALLERGENS, SNAKE VENOM
- 56 ANTIBI-OTIC EAR DROPS
- 57 GLUCOSE W/GLYCEROL
- 58 LETROZOL WINTHROP
- 59 UNIVERSAL EYE DROP
- 60 LETROZOL GENERIS

```
%window frsstep
#2 @5 "/-----
#3 @5 "|----- STEP 1
#4 @5 "|-----
#5 @5 "| DRUG (Verbatim): &valuez."
#5 @103 "|"
#6 @5 "| ROUTE: &routez."
#6 @103 "|"
#7 @5 "| INDIC: &cmindez."
#7 @45 " STEP1 - COMPLETED: &k. / %cmpres(&nob
#7 @103 "|"
#8 @5 "%\-----
#10 @2 " 1"
#10 @7 "&drug1"
#10 @70 "31"
#10 @75 "&drug31"
```

Write the number of the correct direct match or enter search followed by new term to search
 You can also check in coding.DRUG_CHECK_STEM or DRUG_CHECK_AZ and write the direct match here.
 Hit enter leaving this space blank to ignore this drug. Write SAVEANDEXIT to save and exit.

The Coding Core

----- STEP 1: Select the direct match -----

DRUG (Verbatim): ALLERCROM 2% W/V EYE DROPS
ROUTE: OPHTHALMIC
INDIC: Hayfever

STEP1 - COMPLETED: 1 / 33

1	HOMATROPINE EYE DROPS	31	ALLERGOPREVENT
2	PILOCARPINE EYE DROPS	32	ALLERGOCROM COMOD
3	NEO DECA EAR/EYE DROPS	33	ALLERX PE PM DOSE
4	ALLERCROM	34	AURO EAR DROP
5	ALLERDROP	35	ALLER-EZE PLUS
6	ALLERGY EYES	36	ALLERGODIL NEVEL
7	ALLERGOFERON	37	ALLERGO VISION
8	ALLANTOIN W/GLYCEROL	38	ALLEXOFEDRIN
9	BETASOL-N EYE DROP	39	AEROMETROL
10	GOLDEN CUP EYE DROP	40	ARTROVERON
11	ALERCROM	41	EYE DROPS
12	ALLERCORT	42	ALENDRONATO EXELS
13	ALERCROM D	43	FERRO DROPS L
14	ALLERGOCROM	44	SUPER CROMER ORTO
15	ALLERMED	45	ALENDRONATE ARROW
16	ALLERCLEAR	46	ALENDRONATE MERCK
17	ALENDROMED	47	ALLERGEX NON DROWSY
18	ALLERGOCROME	48	ALPRAZOLAM GENERICS
19	ALLERCET-DC	49	AMBROXOL AZEVEDOS
20	ALLERGOPOS	50	LACTOSE ANHYDROUS
21	ALLERGENER	51	ALOE VERA W/MENTHOL
22	ALLERGODOSE	52	ALVIMOPAN ANHYDROUS
23	ALLERCET COLD	53	ALFUZOSIN/GENERICS
24	ALLERGOSTOP	54	20/20 EYE DROP
25	ALLERGY DN PE	55	ALLERGENS, SNAKE VENOM
26	ACEDROPS	56	ANTIBI-OTIC EAR DROPS
27	ALLERGOSOVIS	57	GLUCOSE W/GLYCEROL
28	ALLER EZE PLUS	58	LETROZOL WINTHROP
29	ALLERGENS NOS	59	UNIVERSAL EYE DROP
30	ALLERGIEL EYE	60	LETROZOL GENERIS

CODING CHOICES

In PHASE1 a stemming algorithm will be calculated.

In PHASE2 the possible choices of coding will be displayed

Write the number of the correct direct match or enter search followed by new term to search.
You can also check in coding.DRUG_CHECK_STEM or DRUG_CHECK_AZ and write the direct match here.
Hit enter leaving this space blank to ignore this drug. Write SAVEANDEXIT to save and exit.

```
%let fetcher=%sysfunc(open(chem_t2,i));
%syscall set(fetcher);
%do i=1 %to 60;
    %let drugf&i= ;
    %let drugf&i.= ;
    %let fetching= %sysfunc(fetchobs(&fetcher,&i));
    %let drugf&i.= %qtrim(%nrquote(&drugf.));
    %let drugf&i.= %nrquote(&direct_match.);
%end;
%let fetcher=%sysfunc(close(&fetcher));
```

The Coding Core

----- STEP 1: Select the direct match -----

DRUG (Verbatim): ALLERCROM 2% W/V EYE DROPS
ROUTE: OPTHALMIC
INDIC: Hayfever
STEP1 - COMPLETED: 1 / 33

1	HOMATROPINE EYE DROPS	31	ALLERGOPREVENT
2	PILOCARPINE EYE DROPS	32	ALLERGOCROM COMOD
3	NEO DECA EAR/EYE DROPS	33	ALLERX PE PM DOSE
4	ALLERCROM	34	AURO EAR DROP
5	ALLERDROP	35	ALLER-EZE PLUS
6	ALLERGY EYES	36	ALLERGODIL NEVEL
7	ALLERGOFERON	37	ALLERGO VISION
8	ALLANTOIN W/GLYCEROL	38	ALLEXOFEDRIN
9	BETASOL-N EYE DROP	39	AEROMETROL
10	GOLDEN CUP EYE DROP	40	ARTROVEROL
11	ALLERCROM	41	EYE DROPS
12	ALLERCORT	42	ALENDRONATO EXELS
13	ALLERCOM D	43	FERRO DROPS L
14	ALLERGOCROM	44	SUPER CROMER ORTO
15	ALLERMED	45	ALENDRONATE ARROW
16	ALLERCLEAR	46	ALENDRONATE MERCK
17	ALENDROMED	47	ALLERGEX NON DROWSY
18	ALLERGOCROME	48	ALPRAZOLAM GENERICS
19	ALLERCET-DC	49	AMBROXOL AZEVEDOS
20	ALLERGOPOS	50	LACTOSE ANHYDROUS
21	ALLERGENER	51	ALOE VERA W/MENTHOL
22	ALLERGODOSE	52	ALVIMOPAN ANHYDROUS
23	ALLERCET COLD	53	ALFUZOSIN/GENERICS
24	ALLERGOSTOP	54	20/20 EYE DROP
25	ALLERGY DN PE	55	ALLERGENS, SNAKE VENOM
26	ACEDROPS	56	ANTIBI-OTIC EAR DROPS
27	ALLERGOSOVIS	57	GLUCOSE W/GLYCEROL
28	ALLER EZE PLUS	58	LETROZOL WINTHROP
29	ALLERGENS NOS	59	UNIVERSAL EYE DROP
30	ALLERGIEL EYE	60	LETROZOL GENERIS

Write the number of the correct direct match or enter search followed by new term to search.
You can also check in coding DRUG CHECK STEM or DRUG CHECK AZ and write the direct match here.
Do not enter leaving this space blank to ignore this drug. Write SAVEANDEXIT to save and exit.

UNDERLINED FIELD
ON WHICH THE USER
CAN INTERACT
WRITING THE ACTION

- Numeric (%datatype function).
- SEARCH xyz
- SAVEANDEXIT (%GOTO)
- XYZ (free text)
- Blank



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The Coding Core

----- STEP 2: Select the Preferred Term -----

DRUG (direct match): AMITRIPTYLINE
ROUTE: ORAL
INDIC: Anxiety

STEP2 - COMPLETED: 4 / 10

1	AMITRIPTYLINE	31
2	AMITRIPTYLINE HYDROCHLORIDE	32
3	AMITRIPTYLINE PAMOATE	33
4		34
5		35
6		36
7		37
8		38
9		39
10		40
11		41
12		42
13		43
14		44
15		45
16		46
17		47
18		48
19		49
20		50
21		51
22		52
23		53
24		54
25		55
26		56
27		57
28		58
29		59
30		60

Can you see listed the correct Preferred Term? If yes, please write the number.
You can find more information for these preferred terms in coding.PT_CHECK.
Hit enter leaving this space blank to ignore this drug. Write SAVEANDEXIT to save and exit.



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The Coding Core

----- STEP 3: Choose the correct ATC -----

DRUG (direct match): ALLERCROM
PREFERRED NAME: CROMOGLICATE SODIUM
ROUTE: OPHTHALMIC
INDIC: Hayfever

STEP3 - COMPLETED: 2 / 10

- 1 LEVEL:4 ATC-Code: A07EB
A : ALIMENTARY TRACT AND METABOLISM ; A07 : ANTIDIARRHEALS, INTESTINAL ANTIINFLAMMATORY/ANTIIN
A07E : INTESTINAL ANTIINFLAMMATORY AGENTS ; A07EB : ANTIALLERGIC AGENTS, EXCL. CORTICOSTEROIDS
- 2 LEVEL:4 ATC-Code: D11AH
D : DERMATOLOGICALS ; D11 : OTHER DERMATOLOGICAL PREPARATIONS
D11A : OTHER DERMATOLOGICAL PREPARATIONS ; D11AH : AGENTS FOR DERMATITIS, EXCLUDING CORTICOSTEROIDS
- 3 LEVEL:4 ATC-Code: R01AC
R : RESPIRATORY SYSTEM ; R01 : NASAL PREPARATIONS
R01A : DECONGESTANTS AND OTHER NASAL PREPARATIONS FOR TOP ; R01AC : ANTIALLERGIC AGENTS, EXCL. CORTICOSTEROIDS
- 4 LEVEL:4 ATC-Code: R03BC
R : RESPIRATORY SYSTEM ; R03 : DRUGS FOR OBSTRUCTIVE AIRWAY DISEASES
R03B : OTHER DRUGS FOR OBSTRUCTIVE AIRWAY DISEASES, INHAL ; R03BC : ANTIALLERGIC AGENTS, EXCL. CORTICOSTEROIDS
- 5 LEVEL:4 ATC-Code: S01GX
S : SENSORY ORGANS ; S01 : OPHTHALMOLOGICALS
S01G : DECONGESTANTS AND ANTIALLERGICS ; S01GX : OTHER ANTIALLERGICS

6

7

Can you see here the real atc code? If yes, please write the number.
Else check in coding.ATC_CHECK and write here the ATC-CODE.
Hit enter leaving blank this space to ignore this atc-code. Write SAVEANDEXIT to save and exit.



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Future Development

- A real GUI built with SAS/AF (end-user application in closed format)
- Improve the guessing algorithm in PHASE 1 with more advanced functions
- SAS is the golden standard for clinical trials but coding can be done outside. Porting to PYTHON?
- Waiting for new format B3/C3
- SAS DS2?
- Continue development - maintenance

Conclusion

- Great time saving and simplification
- In the paper the procedure is more detailed and it includes more code, why not download it? 😊



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Thank you!

Thank you very much for your attention!

Contact:

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