



HEALTH

***Update on E-Prescribing Standards
CMS OESS–sponsored Pilot Testing of
RxNorm & NCPDP SCRIPT 10.5***

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February 24, 2009



E-Prescribing: Promise and Challenge

- **Promise**

- **Deliver information to the point of care that enables more informed decisions about appropriate and cost effective medications.** (*Medicare Modernization Act of 2003*)
- **Model for understanding more complex HIT systems**

- **Challenge**

- **Despite advances, < 10% of Rx's electronic**
- **Of prescribers who adopt, many revert to handwriting for a majority of their prescriptions**
 - **MA: avg. eRx 26% after 12 mo. use** (*Fischer et al., JGIM 2008*)
 - **NJ: avg. eRx 23%, stable** (*Pevnick et al., in submission*)
 - **Survey: Systems integration a leading reason** (*Wang et al., in submission*)

Standards-Related Challenges

- **Formulary and Benefit**

- **Use of NDC Codes hinders accuracy**

- “Because of the potential differences in NDC number, items in the formulary files may not result in a match on the vendor side. When the physician chooses a drug, he or she may get erroneous formulary messages or no message at all.”*

- Technical Expert Panel (Bell, et al., AMIA Annu Symp Proc. 2008)

- **Value of data is undercut**

- **2006 NJ e-prescriber interviews**

- “It’s funny, because it really hasn’t changed much of my prescribing habits, because I notice that, like nasal steroid sprays... I look under Nasonex, they all have the same yellow face.”*

- **2006 NJ prescriber Survey**

- **No difference between e-prescribers and non-e-prescribers in perceived time spent, pharmacy calls for coverage problems**

Standards-Related Challenges

- **Medication History**

- **Few prescribing systems attempt to merge medication history data into current medication list for use in alerting**

- **Use of NDC as drug identifier is a major reason**

- “If RxNorm becomes a reality and this value is stored on the history, it will make the drug alert checking that much better.”*

- **Technical Expert Panel (Bell, et al., AMIA Annu Symp Proc. 2008)**

- **Value of data is undercut**

- **2006 NJ prescriber Survey**

- **No difference between e-prescribers and non-e-prescribers in ability to identify medications from other physicians**

RxNorm

- **Clinical Drug concept (SCD) =
Ingredients – strengths – form**
Azithromycin 250 MG Oral Tablet = RxNorm CUI: 308460
- **Compositional:**
 - isa: Azithromycin Oral Tablet (clinical drug form)
 - has_tradename: Zithromax 250 MG Oral Tablet (branded drug)
- **2006 Evaluation w/ 10,000 NEWRX, 10,000 renewals:**
 - **99% of non-device Rx's had an NDC from 1 of 3 sources**
 - **Missing: vitamins, drug-device packages**
 - **5% of matches disagreed**
 - **MC: extended release, source error, synonymy**
 - **NLM implemented fixes**

Structured and Codified Sig 2006 Lab Evaluation

- 3 independent reviewers mapped 42 Sig strings into the Sig Format

- For 15 of 42 (36%) with no “repeats” used, values in fields agreed:
Reviewers Agreeing

<u>Segment</u>	<u>All 3</u>	<u>2 of 3</u>	<u>None</u>
– Dose	3	10	2
– Vehicle	1	0	14
– Route	0	1	14
– Site	0	3	12
– Frequency	1	6	8
– Interval	4	7	4
– Administration Timing	0	2	13
– Indication	0	2	13

- For 27 of 42 (64%) at least one reviewer used a repeat
 - 1 to 6 iterations; virtually no agreement among field values

→ NCPDP working group revised guidance

CMS OESS Pilot Testing Goals

- A.** Determine (for RxNorm, Sig Format, and SCRIPT 10.5)
 1. whether vocabularies and code sets are unequivocal and can communicate **needed information**
 2. how the standards to be tested **interoperate** with the existing e-prescribing standards

- B.** Define (if time and funding allow) how e-prescribing +/- implementation of the standards affects
 1. workflow in the prescriber and dispenser settings
 2. phone calls between pharmacy and prescriber
 3. pharmacy productivity (fill rate, counseling services)

Partner Organizations

- **Physician E-Prescribing Vendors**
 - **DrFirst**
 - **Allscripts (eRxNow)**
- **Pharmacies/Pharmacy Vendors**
 - **QS/1**
 - **Medco**
 - **(Long's Drug) → seeking replacement**
- **Others**
 - **SureScripts-RxHub**
 - **Point of Care Partners**
 - **Industry experts (e.g. representing NCPDP)**

Methods Overview

- Piloting standards used *within* other standards
 - **RxNorm** in: **SCRIPT NEWRX, Refill, Med History; F & B**
 - **SCRIPT 10.5 = Sig, FMT** in: **SCRIPT NEWRX, Refill**
- For each use case:
 - Encode historical data, project effects
 - Develop & test software modules for
 - *Adding* new information to the transaction
 - *Using* new information in the application
 - Deploy new modules to pilot sites
 - Monitor exceptions
 - Site visits before & after
 - Analyze secondary data
- Delphi expert panel to judge readiness for adoption

RxNorm in NEWRX

- Prescribing system: Add RxCUI to transaction
- Pharmacy: Use SCD to suggest in-stock options
 - Improve **pharmacy productivity**
 - Live: Compare Rx fill time, accuracy before vs. after
- Pharmacy: Alert if SCD of Rx \neq SCD of fill
 - Reduce **potential dispensing errors**
 - Lab: Project alert rate, accuracy from pharmacy log
 - Live: *Possible*-error rate before vs. after

RxNorm in Refill Request

- **Pharmacy: Add RxCUI to transaction**
 - **Prescribing system: Compare SCD in Request to SCD of original**
 - **If same, Flag to streamline authorization**
 - **If different, Flag for attention**
- Improve **renewal processing time**
- **Lab: Prescribing system log of incoming vs. authorized REFREQs**
 - **Live: Involvement of non-MD staff; days to approve**

RxNorm in Formulary & Benefit

- **PBM: Replace multiple NDC codes with one RxCUI; add group-level variations in coverage**
- **Prescribing system: Match drugs to F&B info using RxCUI; no change in display**
 - **More-accurate F&B matches reduces pharmacy **call-backs** for coverage exceptions**
 - **Lab: Rate of non-formulary or tier 2/3 results from adjudication**
 - **Live: Rate of coverage exceptions, pilot-to-pilot site call volumes before/after**

RxNorm in Med History

- Pharmacy or aggregator: Add RxCUI
 - Prescribing system: Compare recent (active) med history SCDs to SCDs in current-medication list
 - Include outside meds in DDI alerting
 - Alert for possible duplicate therapy if same drug (or drug class) from different prescribers
- Reduce **DDI and Duplicate Therapy errors**
- Lab: Project rates of alerting
 - Live: Compare possible-error rate before-after

Sig Format in NEWRX

- **Prescribing system: Add standardized Sig segment to a feasible subset of New Rx (canned v. constructed)**
 - Reduce mis-specified Sigs (requiring **call-backs**)
 - Lab: Rate of mis-specified Sigs among lab sample
 - Live: Pilot-to-pilot site call volumes before/after
- **Pharmacy: Auto-populate patient instructions**
 - Reduce over- and under- dosage errors dispensed
 - Lab: Project rates of completion
 - Live: Compare rates of re-keying *Sig* and dispensing speed before-after

Sig Format in Refill Request

- **Pharmacy: Add standardized Sig segment to a feasible subset of Refill Requests**
 - **Prescribing system: Compare Sig of Request to Sig of original**
 - **If same, flag to streamline authorization**
 - **If different, use to help pre-populate Sig builder**
- Improve **renewal processing time**
- **Lab: Prescribing system log of incoming vs. authorized REFREQs**
 - **Live: Involvement of non-MD staff; days to approve**

Preliminary RxNorm Lab Evaluation

- **Initial analysis of 10,200 new Rx**
 - **2230 distinct *representative* NDCs (MediSpan)**
 - **195 (8.7%) no RxNorm match in NLM NDCs**
5.1% weighted by freq in 10,200
 - **54 (28%) supplies & devices**
 - **13 OTCs, e.g. Eucerin cream**
 - **Remaining NDCs not in any source**
54738-0925-01 Metformin 500 mg Tabs
 - **Direct mapping from MediSpan DDI and First DataBank MedIDs to RxNorm pending**
- **Pharmacy log file will match NEWRX to Fill**

Structured and Codified Sig Format

- **Chicago Sig meeting with Laura Topor & experts from each partner**
 - **Achieved consensus on meaning of fields**
 - **Frequency** – “x **times per** day|week|...”
 - **Interval** – “**every** y hours|days|weeks|...”
 - **Completed encoding exercises**
 - **Plan to derive terms from Sig lab testing sample**
 - **These will be mapped into SNOMED or FMT codes, as dictated by standard**

Sig Parsing Algorithm

- Perl program

- Sig strings → Field values, unparsed

“TAKE 1 TABLET 3 TIMES DAILY AFTER MEALS AS NEEDED FOR 3 DAYS”

Action	TAKE	Admin Timing	AFTER MEALS
Dose	1 TABLET	Duration	3 DAYS
Route		Max Dose	
Site		Indic. Precursor	AS NEEDED
Vehicle		Indication	
Frequency	3 DAY	Stop	
Interval			

- For 5620 New Rx, 89% fully parsed

- For 1130 Refill requests, 92% fully parsed

- 6 distinct strings equivalent to “Take 1 tablet daily,”

- e.g. “Take 1 tablet per day”, “Take 1 tablet once a day”

Future Challenge: SNOMED

119415007 general finding of abdomen
106100005 lower urinary tract finding
252041008 micturition finding
366279009 bladder control - finding
162120004 control of micturition normal
252030006 dysfunctional voiding of urine
300472004 finding of desire for urination
249275009 desire for urination
75088002 urgent desire to urinate
366274004 finding related to awareness of bladder function
249276005 lack of desire for urination
300473009 finding of measures of urination
300470007 finding of pattern of urination
47252008 alteration in patterns of urinary elimination
65078002 automatic micturition
165233007 bladder: occasional accident
248537002 delayed toilet training
300471006 finding of frequency of urination
162116003 increased frequency of urination
249291007 infrequent urination
162115004 micturition frequency normal
274734008 micturition frequency and polyuria
249289004 must urinate repeatedly to empty bladder
366273005 finding related to ability to pass urine
366276002 flow of urine - finding
249287002 incomplete urination
307541003 lower urinary tract symptoms

Impact Evaluation

- **Comparisons**
 - **Baseline vs. after 10.1+RxNorm live ≥ 1 month for transactions conducted with other pilot site**
 - **vs. same difference for transactions conducted with non-pilot sites (Difference of differences)**
- **Qualitative Measures (site visit interviews and observations)**
 - **Prescriber & pharmacist attitudes; work processes**
- **Quantitative Measures (secondary data and observations)**
 - **Potential prescribing & dispensing errors (pharmacy log)**
 - **Work process times (time-motion observation)**
 - **Others outlined above**



Delphi Process to Integrate Results

- **Advisory expert panel -- want 11 to 15 members**
 - **Proposed:**
 - **7 subcontractors**
 - **2 experts from CMS, NCPDP**
 - **2 to 6 other experts**
- **Rate each “application’s” readiness for adoption & potential benefits (i.e. importance)**
 - **Present study results to panel**
 - **Panel rates each application on 9-point scale**
 - **Panelists meet to discuss disagreements**
 - **Panelists revise their ratings**

We Welcome Your Input



The NDC Code Problem

- **NDC represents the package**
 - **metformin 850mg has >100 NDC codes**

066267-*497-40	53489-468-88	062037-*675-01	051129-2460-*1	013411-*164-09	065243-*239-12	068115-*232-45
066267-*497-40	55111-430-01	062037-*675-05	051129-2610-*1	013411-*164-10	065243-*239-18	068115-*232-45
066267-*497-45	55111-430-05	062037-*675-10	051129-3594-*1	013668-*002-01	065243-*239-27	068115-*232-60
066267-*497-45	55111-430-30	062147-5001-*0	051129-3594-*2	013668-*002-05	065841-*029-01	068115-*232-60
066267-*497-60	55111-430-60	062318-0191-*0	051129-3943-*1	013668-*002-12	065841-*029-05	068382-*029-01
066267-*497-60	55111-430-78	062318-0191-*1	051129-3943-*2	013668-*002-30	065841-*029-10	068382-*029-05
066267-*497-90	55567-145-18	062584-*332-01	051655-*291-24	013668-*002-60	065862-*009-01	068382-*029-10
066267-*497-90	55567-145-25	063629-1396-*1	051655-*291-25	013668-*002-90	065862-*009-05	068788-0435-*3
066336-*883-60	57315-048-01	063629-1396-*2	051655-*291-52	020091-*533-01	065862-*009-26	068788-0435-*6
066689-*012-01	57315-048-04	063739-*300-10	051655-*291-53	020091-*533-05	065862-*009-50	0781-5051-01
066689-*012-30	57315-048-05	064679-*529-01	053489-*468-01	020091-*533-10	065862-*009-60	0781-5051-05
066689-*012-60	62037-675-01	064679-*529-02	053489-*468-03	0228-2715-10	065862-*009-90	20091-533-01
067090-*533-01	62037-675-05	064679-*529-03	053489-*468-05	0228-2715-11	066105-*601-10	20091-533-05
067090-*533-05	62037-675-10	064679-*529-04	053489-*468-10	0228-2715-50	066105-*744-23	20091-533-10
067090-*533-10	65862-009-01	064679-*529-05	054569-5353-*0	0228-2715-96	066267-*497-20	53489-468-01
067228-0268-*3	65862-009-05	064725-0209-*3	054569-5353-*3	023490-0898-*0	066267-*497-20	53489-468-03
067228-0268-*6	65862-009-50	064725-0209-*3	055045-2905-*0	023490-0898-*3	066267-*497-30	53489-468-05
067544-*107-53	65862-009-60	065243-*239-06	055045-2905-*0	023490-0898-*6	066267-*497-30	53489-468-10

- **Each packager maintains their own codes**
- **Changes aren't always tracked at FDA**



Search By: String



Enter Search String: glucophage

Search



ingredient_of
has_ingredient

Ingredient
1 elements
Metformin

RxNorm ID: 6809

Clinical Drug Component
3 elements
Metformin 1000 MG
Metformin 500 MG
Metformin 850 MG

constitutes | consists_of

Clinical Drug
3 elements
Metformin 1000 MG Oral Tablet
Metformin 500 MG Oral Tablet
Metformin 850 MG Oral Tablet

is inverse_isa

Clinical Drug Form
1 elements
Metformin Oral Tablet

ingredient_of
has_ingredient

Ingredient Variant
1 elements
Metformin hydrochloride

form_of
has_form

precise_ingr_of
has_precise_ingr

precise_ingredient_of | has_precise_ingredient

tradename_of
has_tradename

constitutes | consists_of

tradename_of
has_tradename

dose_form_of
has_dose_form

dose_form_of
has_dose_form

is inverse_isa

Dose Form
1 elements
Oral Tablet

tradename_of
has_tradename

Brand Name
1 elements
Glucophage

ingredient_of | has_ingredient

Branded Drug Component
3 elements
Metformin 1000 MG [Glucophage]
Metformin 500 MG [Glucophage]
Metformin 850 MG [Glucophage]

constitutes | consists_of

Branded Drug
3 elements
Metformin 1000 MG Oral Tablet [Glucophage]
Metformin 500 MG Oral Tablet [Glucophage]
Metformin 850 MG Oral Tablet [Glucophage]

Branded Drug Form
1 elements
Metformin Oral Tablet [Glucophage]

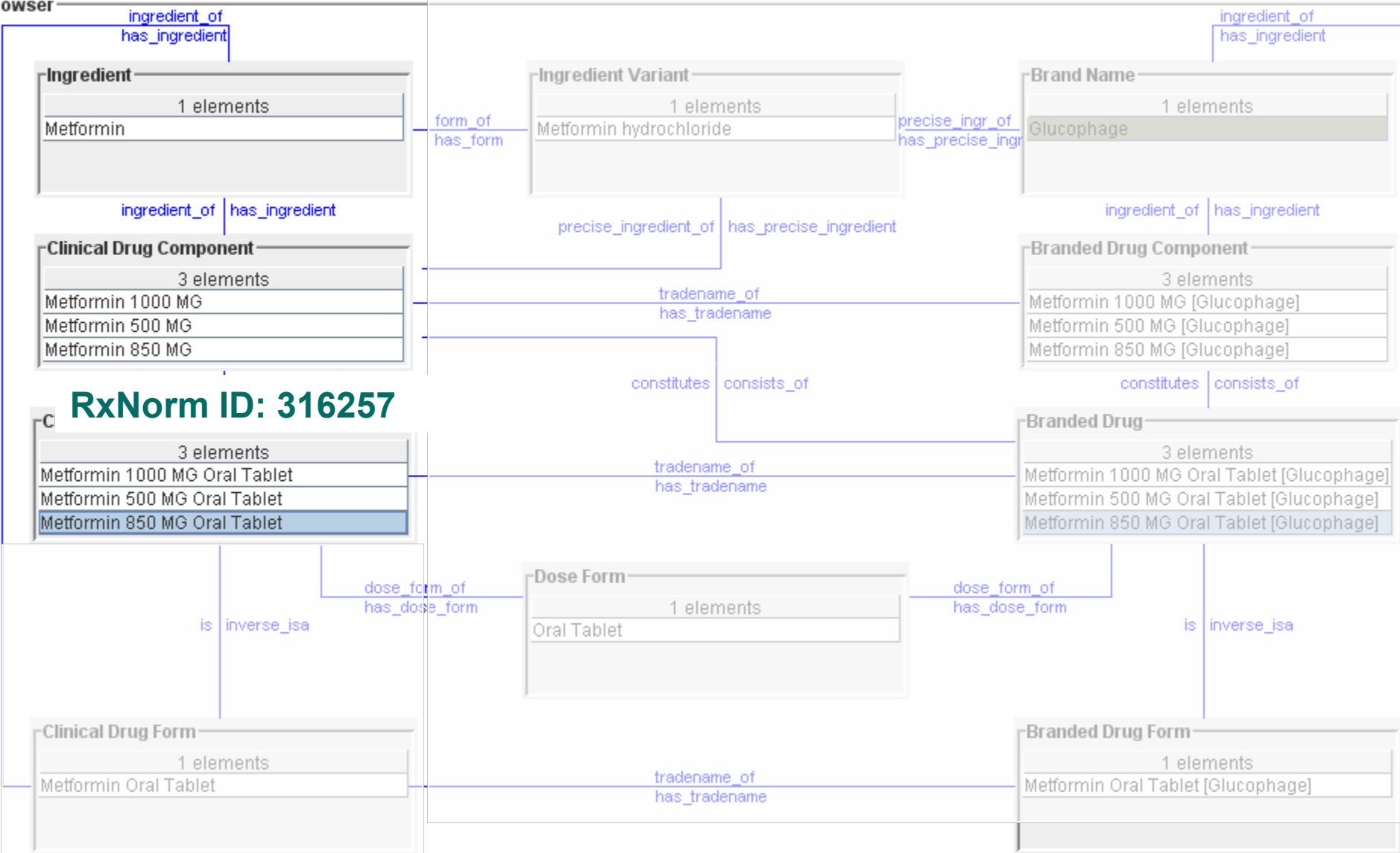


Search By: String



Enter Search String: glucophage

Search





Search By: String

Enter Search String: glucophage

Search

ingredient_of
has_ingredient

Ingredient
1 elements
Metformin

ingredient_of | has_ingredient

Clinical Drug Component
3 elements
Metformin 1000 MG
Metformin 500 MG
Metformin 850 MG

constitutes | consists_of

Clinical Drug
3 elements
Metformin 1000 MG Oral Tablet
Metformin 500 MG Oral Tablet
Metformin 850 MG Oral Tablet

RxNormID: 311752 (SCD)

is | inverse_isa

Clinical Drug Form
1 elements
Metformin Oral Tablet

Ingredient Variant
1 elements
Metformin hydrochloride

form_of | has_form

precise_ingredient_of | has_precise_ingredient

tradename_of | has_tradename

constitutes | consists_of

tradename_of | has_tradename

Dose Form
1 elements
Oral Tablet

ingredient_of | has_ingredient

Brand Name
1 elements
Glucophage

ingredient_of | has_ingredient

Branded Drug Component
3 elements
Metformin 1000 MG [Glucophage]
Metformin 500 MG [Glucophage]
Metformin 850 MG [Glucophage]

constitutes | consists_of

Branded Drug
3 elements
Metformin 1000 MG Oral Tablet [Glucophage]
Metformin 500 MG Oral Tablet [Glucophage]
Metformin 850 MG Oral Tablet [Glucophage]

dose_form_of | has_dose_form

is | inverse_isa

Drug **Dose** **Dose Form**

Metformin **850 MG** **Oral Tablet**