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

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NCVHS Subcommittee on Standards
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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.”
  – 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:

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- 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 ≠ 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
    - Interval
    - Stop

- 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”
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

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– Each packager maintains their own codes
– Changes aren’t always tracked at FDA