




Using SNOMED CT as a Mediation Terminology

Mapping Issues, Lessons Learned, and Next Steps Toward Achieving Semantic Interoperability

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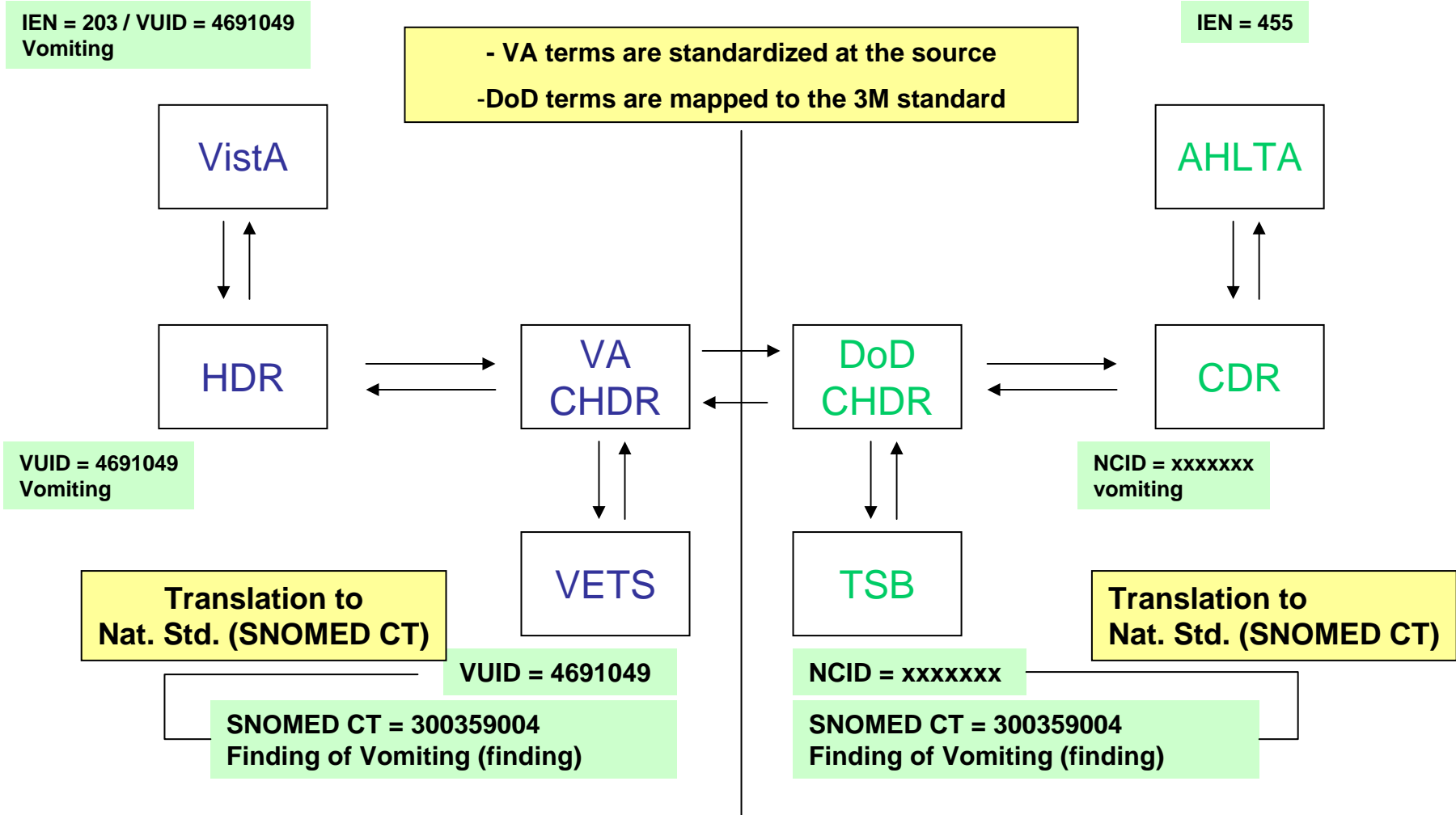
Introduction

- **The President has ordered Federal agencies to promote improved healthcare quality and efficiency through secure, standard-based data exchange**
- **The Clinical Data Repository/Health Data Repository (CHDR) project exchanges clinical information between VA and DoD**
- **CHDR exchanges standardized, computable data as opposed to text, allowing improved electronic decision support**





CHDR Allergy Data Exchange





VA-DoD CHDR Project

- **CHDR has been implemented at several sites where active dual consumers exist**
- **Allergy reactions are exchanged using SNOMED CT, in accordance with HITSP recommendations**
- **Each agency mapped its allergy reactions to SNOMED CT; the SNOMED codes were then exchanged bidirectionally**





CHDR Mediation Success

- **Mediation success rates were calculated for a 5-month period (February-June 2007) and ranged from 74-99%**
- **Analysis of mediation failures revealed issues related to mapping and SNOMED CT concept modeling**
- **We describe the methodology used, lessons learned, and next steps**





Methods

- **A 4-part terminology mediation strategy was employed:**
 1. Select a mediation terminology compliant with CHI/HITSP standards (if possible)
 2. Map each agency's terms to the mediation standard
 3. Exchange the mediation codes
 4. Coordinate content maintenance plans





Methods continued

- **Business rules for mapping allergy reactions to SNOMED CT were developed jointly by VA and DoD**
- **Allergy reactions were primarily signs and symptoms (SNOMED CT's Clinical Findings hierarchy), but could be Disorders or other conditions**





Methods continued

SNOMED CT hierarchies were used in preferential order for mapping:

- 1. Clinical Findings (“headache”)**
- 2. Disorders (“dermatitis”)**
- 3. Morphologic Abnormality (“blister”)**
- 4. Observable Entity (“disinhibition”)**
- 5. Context-dependent Category (“abdominal cramps”)**





Methods continued

- **For mapping validation, 2 reviewers conducted 3 separate reviews**
- **Discrepancies were identified in about 5% of total terms, and were corrected**
- **An independent review of concepts common to both agencies was performed to ensure accurate translations**





Common and Unique Allergy Reaction Concepts

Agency	Total	Common Terms	Mapped Terms Unique to Each Agency	Unmapped Terms
VA	346	299	25 (7%)	22 (6%)
DoD	456	299	47 (10%)	110 (24%)





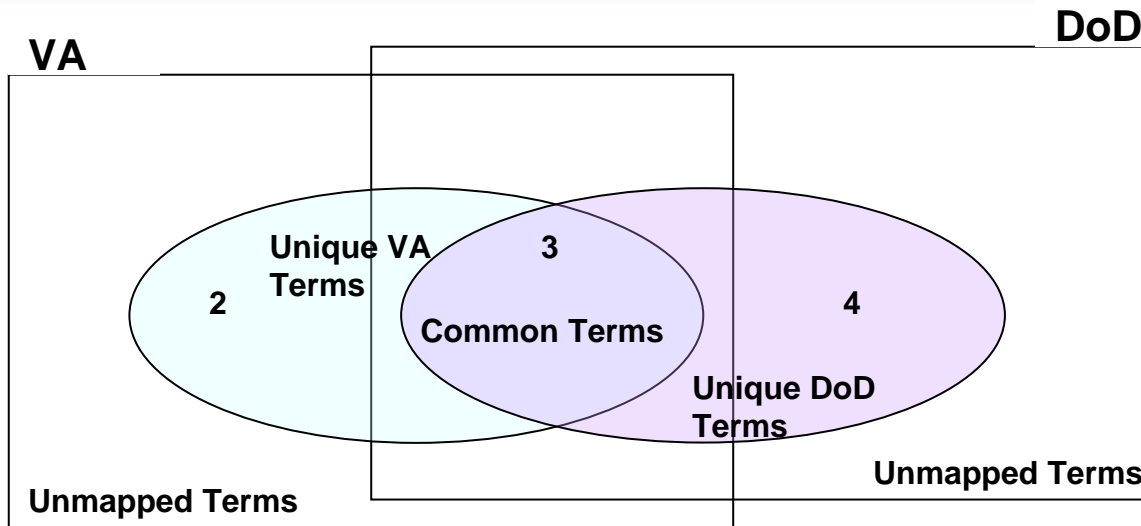
Mediation Success Rates

- **Mediation success rate: the percentage of data in one system that is understood and computable by the other system**
- **For each direction of data exchange (outbound vs. inbound) there is a different mediation success rate**





Mediation Success Rates



Inbound Mediation Success Rate (VA \leftarrow DoD)
= Sum of Freq (3) / Sum of Freq (3+4)

Outbound Mediation Success Rate (VA \rightarrow DoD)
= Sum of Freq (3) / Sum of Freq (2+3)



VA-to-DoD Mediation Statistics

VA-to-DoD Mediation Statistics for Allergy Reactions, Feb-June 2007

VA-to-DoD	Feb	Mar	Apr	May	Jun
Total VA-to-SNOMED CT translation attempts	168	193	338	959	502
Translation failures (VA-to-SNOMED CT)	4	0	1	13	1
Total VA allergy reactions sent to DoD	164	193	337	946	501
Translation Success Rate: VA-to-SNOMED CT	98%	100%	100%	99%	100%
Total allergy reactions received by DoD	164	193	337	946	501
Translation failures (SNOMED CT-to-DoD)	17	17	34	121	5
Total VA allergy reactions sent to DoD CDR	147	176	303	825	496
Translation Success Rate: SNOMED CT-to-DoD	90%	91%	90%	87%	99%
MEDIATION SUCCESS RATE: VA-to-DoD	88%	91%	90%	86%	99%





DoD-to-VA Mediation Statistics

DoD-to-VA Mediation Statistics for Allergy Reactions, Feb-June 2007

DoD-to-VA	Feb	Mar	Apr	May	Jun
Total DoD-to-SNOMED CT translation attempts	1,509	1,788	2,025	3,521	4,030
Translation failures (DoD-to-SNOMED CT)	306	467	432	432	107
Total allergy reactions sent to VA	1,203	1,321	1,593	3,089	3,923
Translation success rate: DoD-to-SNOMED CT	80%	74%	79%	88%	97%
Total allergy reactions received by VA	1,203	1,321	1,593	3,089	3,923
Translation failures (SNOMED CT-to-VA)	1	0	8	11	69
Total DoD allergy reactions sent to VA HDR	1,202	1,321	1,585	3,078	3,854
Translation success rate: SNOMED CT-to-VA	100%	100%	99%	100%	98%
MEDIATION SUCCESS RATE: DoD-to-VA	80%	74%	78%	87%	96%





Discussion

5 main causes of mediation failures

1. SNOMED CT concept modeling allowed for divergent mapping options
2. New reactions were added independently at each agency
3. Updates to new releases of SNOMED CT did not occur simultaneously at each agency
4. Criteria for inclusion of specific terms as allergy reactions differed between VA and DoD
5. Divergent approaches to SNOMED CT mapping emerged, despite shared business rules





Discussion continued

1. SNOMED CT concept modeling allowed for divergent mapping options.

SCTID	Fully Specified Name
249366005	Bleeding from nose (finding)
162371009	Nosebleed/epistaxis symptom (finding)
12441001	Epistaxis (disorder)
162373007	Has nosebleeds - epistaxis (disorder)
206993003	[D]Epistaxis (situation)





Discussion continued

- **Other SNOMED CT mapping dilemmas**

84229001	Fatigue (finding)
272060000	Fatigue - <u>symptom</u> (finding)
272044004	<u>Complaining of vomiting</u> (finding)
249497008	Vomiting symptom (finding)
162288000	Has an itchy eye (finding)
74776002	Itching of eye (finding)





Discussion continued

- 2. New reactions were added independently at each agency**
- 3. Updates to new releases of SNOMED CT did not occur simultaneously at each agency**
 - Needed a maintenance process addressing changes in SNOMED CT Concept status (to ambiguous, duplicate, erroneous, retired, etc.)





Discussion continued

4. Criteria for inclusion of specific terms as allergy reactions differed between VA and DoD

- Examples:
 - » “allergic reaction”
 - » “systemic disease”





Discussion continued

5. Divergent mapping approaches emerged, despite common rules

– Examples:

- » “Orthostatic hypotension (disorder)” vs. “postural drop in blood pressure (finding)”
- » “Hypertension” : “Hypertensive disorder, systemic arterial (disorder)” vs. “finding of increased blood pressure (finding)”





Lessons Learned

- **Mapping rules must always be tailored to the specific purpose of the mapping.**
 - Mapping practices may be influenced by many issues
 - Potential for entire message to fail if any part failed led to establishment of particular mapping guidelines in this context





Lessons Learned

- **Ongoing communication between agencies is essential, even with established mapping rules in place**
- **Mappers' clinical backgrounds, familiarity with CliniClue®, and knowledge of SNOMED can influence mapping results**
- **Ideally, a common team, process, and toolset would be used for mapping**





Lessons Learned

- **SNOMED CT modeling issues were probably the most difficult to address, as these require a sophisticated knowledge of concept modeling and of the evolution of SNOMED hierarchies over time**





Lessons Learned

- **Maintenance plans must include coordination of updates to the standard (SNOMED CT), including plans for synchronization with release schedules**
- **Coordination of updates between agencies must be maintained on a regular basis**





New Subset for Allergy Reactions

- **A significant outcome of this project is the generation of a new, unique subset of Allergy Reactions which could be submitted for inclusion in SNOMED CT as an official subset**
- **It could also be published and shared among federal agencies and non-federal partners**





HITSP Recommendations Regarding Allergy Reactions Terminology

- In December 2007, HITSP designated the VA/Kaiser Permanente (KP) Problem List subset (16,430 entries) as the recommended standard for allergy reactions
- The previous (CHI) recommendation had been to use the VA/DoD Allergy Reactions subset (864 entries)





HITSP Recommendations Regarding Allergy Reactions Terminology

- **Use of the Problem List subset to record allergy reactions may prove problematic**
 - “circumoral paresthesia” and “edema of pharynx” are allergy reactions not found in the current Problem List subset
- **Use of the smaller subset, which is specifically created for documenting allergy reactions, would enable simpler data entry, better computing speed and preservation of data integrity**





Conclusions

- **Mapping is relatively resource-intensive and costs of maintenance must be considered**
- **Adopting standards natively is more efficient, but we're not there yet**
- **Use of mediation terminologies is an effective, practical method for advancing the goal of semantic interoperability**





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