

Evaluation of ESSENCE: An ICD-9 Code Based Syndromic Surveillance



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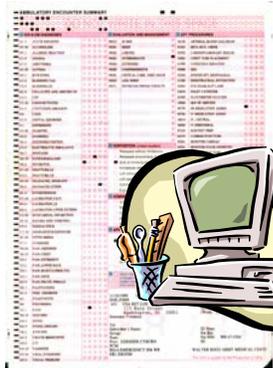
ESSENCE

- **E**lectronic **S**urveillance **S**ystem for the **E**arly **N**otification of **C**ommunity-based **E**pidemics
- Syndromic surveillance system
 - Began in 1999 at the Walter Reed Army Institute of Research
 - Early detection of infectious disease clusters in the National Capital Area
- Primary data source
 - Secondary or pre-diagnostic data source
 - Military beneficiary outpatient visit ICD-9 codes: ~50% women, all ages
 - Physician entered diagnoses
 - Ambulatory Data Module (ADM), required daily transmission
- In 2001, ESSENCE coverage expanded to include all DoD military treatment facilities (>300 worldwide)
- In 2003, military prescription drug information incorporated
 - Pharmacy Data Transaction Service (PDTS)



ESSENCE I

Worldwide Military Surveillance



Electronic visit records (ICD9 codes) sent daily to central repository

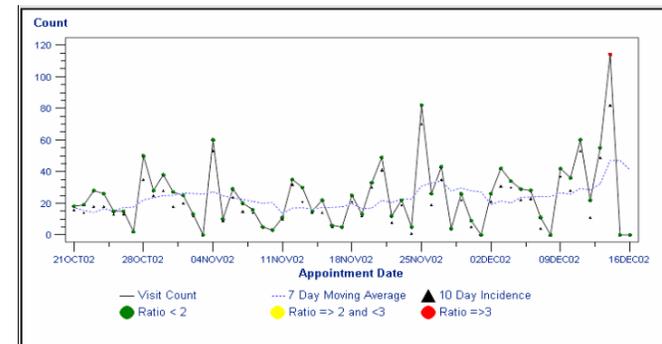
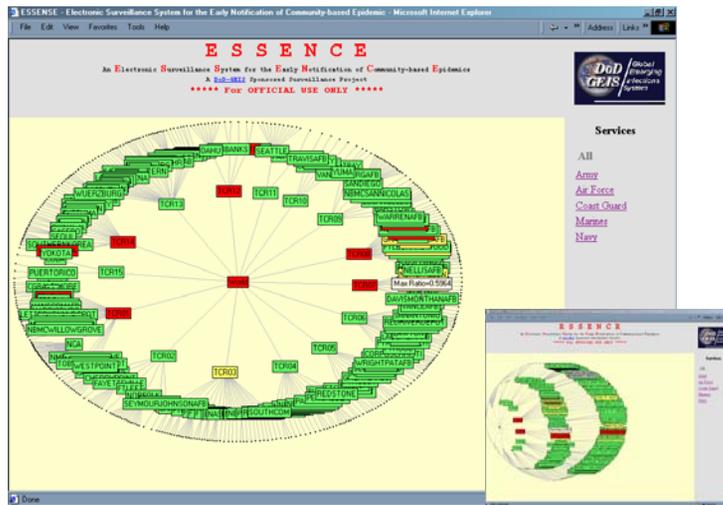
Average 1-3 days



Prescription data for DOD beneficiaries captured by PDS and sent to Tricare daily



Data updated every 8 hours. Analyzed by syndrome and organized into alerts by sites



Graphs of daily visit counts by syndrome

ESSENCE Syndrome Groups

- Respiratory
- Gastrointestinal
- Fever
- Rash
- Neurologic
- Botulism-like
- Hemorrhagic Illness
- Coma/Sudden Death

**482 Total
ICD9-Codes**

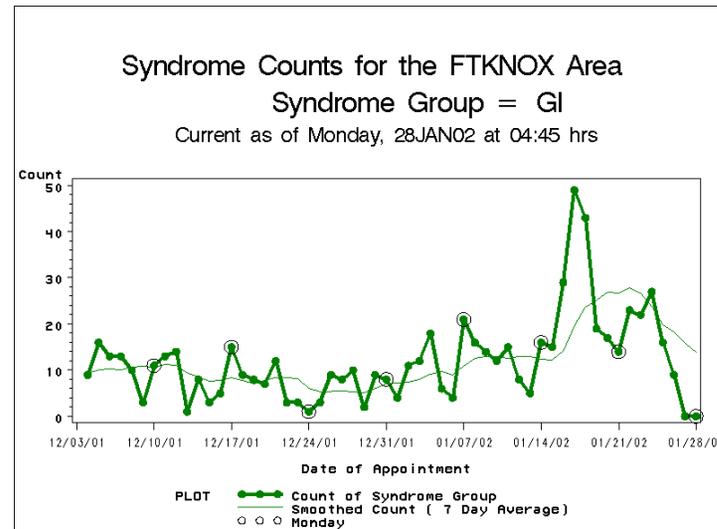
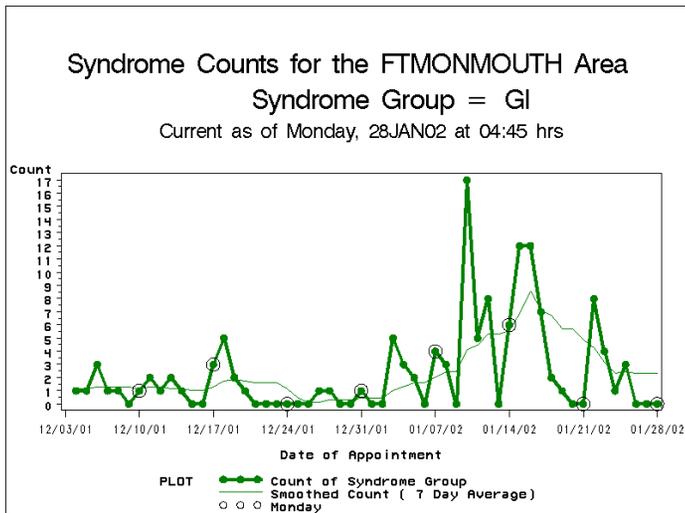
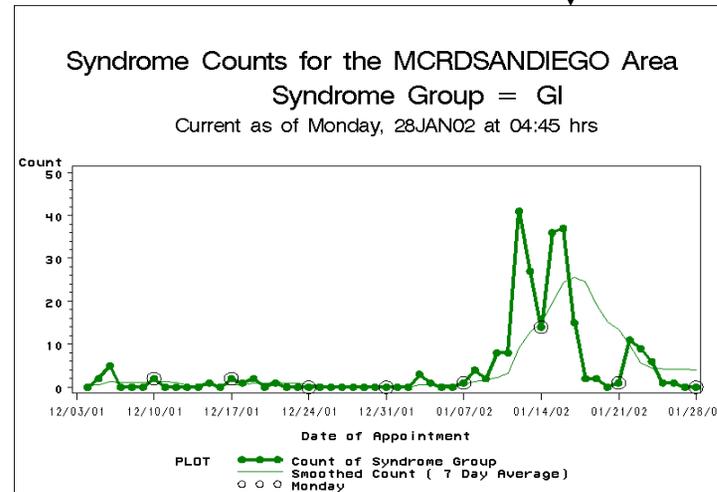
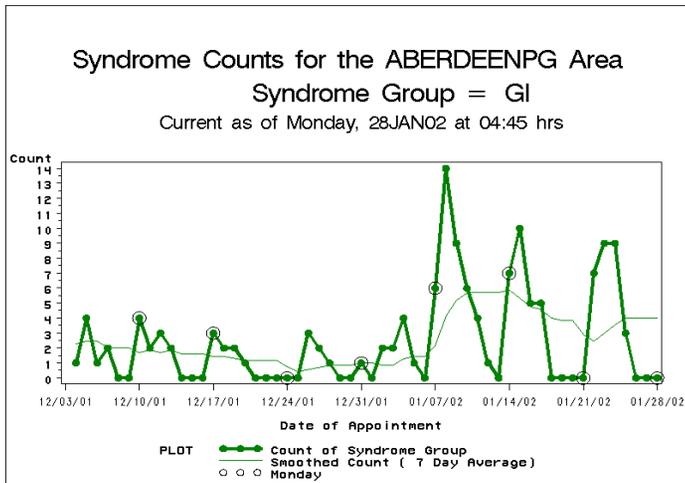
For a complete list of current ESSENCE codes see:

<http://www.geis.ha.osd.mil/GEIS/SurveillanceActivities/ESSENCE/ESSENCE.asp>



Does ESSENCE Detect Infectious Disease Outbreaks?

Documented
Norwalk-like
virus



Need for Evaluation of ESSENCE ICD-9 Codes

- Why evaluate?
 - Important to validate underlying data source(s), especially secondary or “opportunistic” data
 - Comparison to gold standards including chart reviews, sentinel data
 - Instill confidence in alerts
- ESSENCE specifically?
 - Address concern that data coded at the time of visit may not accurately reflect true illness
 - Provider selected ICD-9 codes, variation in code selection
 - May reflect unconfirmed diagnoses and non-specific symptoms
 - ~ 70% of outpatient records contain just one ICD-9 code



Study Objective

- Quantify how well ICD-9 code syndrome groups reflect actual diagnoses documented in ambulatory care medical records (gold standard)

Methods

- Locate and review 3,004 ER records from 3 large military treatment facilities in the National Capital Area
- Complete 5 required IRBs
- Each chart reviewed independently by 2 medical epidemiologists (3rd reviewer if tie)
- Conduct sensitivity/specificity analysis



Methods

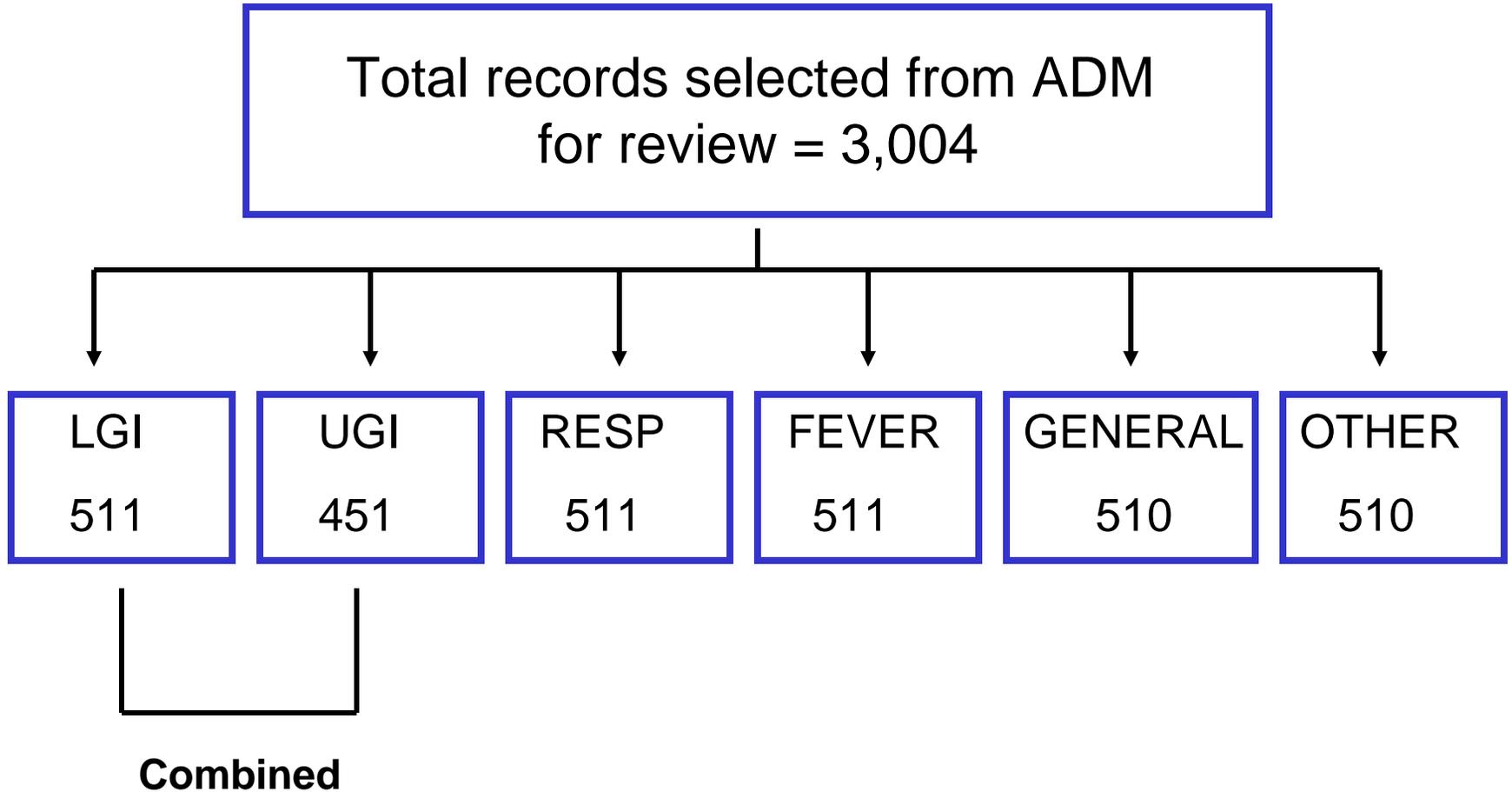


Chart Review Results

Distribution of records by chart reviewers

	GI	RESP	FEVER	GENERAL	OTHER	TOTAL
FEVER	2	12	411	7	12	444
GI	852	11	5	14	24	906
→ No agreement	3	2	-	5	1	14
RESP	16	414	27	19	49	525
GENERAL	5	8	10	238	9	270
→ OTHER	43	41	44	196	390	714
TOTAL	921	488	497	479	485	2870
(MISSING)	(41)	(23)	(14)	(31)	(25)	(134)



Chart Review Results

FEVER

ER A	CHART		
	ESSENCE	FEVER +	FEVER -
FEVER +	150	23	173
FEVER -	22	759	781
TOTAL	172	782	954
Sensitivity	87.2 %		
Specificity	97.1 %		
PPV	86.7 %		
NPV	97.2 %		

ER B	CHART		
	ESSENCE	FEVER +	FEVER -
FEVER +	123	27	150
FEVER -	14	694	708
TOTAL	137	721	858
Sensitivity	89.8 %		
Specificity	96.3 %		
PPV	82.0 %		
NPV	98.0 %		

ER C	CHART		
	ESSENCE	FEVER +	FEVER -
FEVER +	115	50	165
FEVER -	24	756	780
TOTAL	139	806	945
Sensitivity	82.7 %		
Specificity	93.8 %		
PPV	69.7 %		
NPV	96.9 %		

RESP

ER A	CHART		
	ESSENCE	RESP +	RESP -
RESP +	149	23	172
RESP -	44	738	782
TOTAL	193	761	954
Sensitivity	77.2 %		
Specificity	97.0 %		
PPV	86.6 %		
NPV	94.4 %		

ER B	CHART		
	ESSENCE	RESP +	RESP -
RESP +	123	18	141
RESP -	30	687	717
TOTAL	153	705	858
Sensitivity	80.4 %		
Specificity	97.4 %		
PPV	87.2 %		
NPV	95.8 %		

ER C	CHART		
	ESSENCE	RESP +	RESP -
RESP +	100	61	161
RESP -	50	734	784
TOTAL	150	795	945
Sensitivity	66.7 %		
Specificity	92.3 %		
PPV	62.1 %		
NPV	93.6 %		



Chart Review Results

GI

ER A	CHART		TOTAL
	GI +	GI -	
ESSENCE			
GI +	267	13	280
GI -	32	642	674
TOTAL	299	655	954
Sensitivity	89.3 %		
Specificity	98.0 %		
PPV	95.4 %		
NPV	95.3 %		

ER B	CHART		TOTAL
	GI +	GI-	
ESSENCE			
GI +	249	37	286
GI -	20	552	572
TOTAL	269	589	858
Sensitivity	92.6 %		
Specificity	93.7 %		
PPV	87.1 %		
NPV	96.5 %		

ER C	CHART		TOTAL
	GI +	GI -	
ESSENCE			
GI +	304	23	327
GI -	12	606	618
TOTAL	316	629	945
Sensitivity	96.2 %		
Specificity	96.3 %		
PPV	93.0 %		
NPV	98.1 %		

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Conclusions

- Overall, ADM ICD-9 codes grouped by syndrome are very good indicators of actual patient diagnoses
- Plan to do a similar analysis for chief complaint text parser when DoD data becomes available
- Dr. Hakre's presentation will show an evaluation of pharmacy data using documented outbreaks as the gold standard



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Questions?