"Solutions: The Next Generation" The Two Worlds

Getting on the same page:

Clinical/bedside  Epidemiology/

Medical care public health

A new perspective:

Microclinical  macroclinical

Clinical Medicine and Public Health

"When Worlds Collide"

Thailand 2005

Disease documented in 2 family members resulting from person-to-person transmission of a lethal avian influenza virus during unprotected exposure to a critically ill index patient

New England Journal Of Medicine 2005

Solutions: The Next Generation

The process of proceeding from one to the other requires:

- Aggregation and assembly of data in a rigorous prospective fashion
- Placement of data within an automated infrastructure located wi/legacy processes
- Access to e-infrastructure from multiple sites

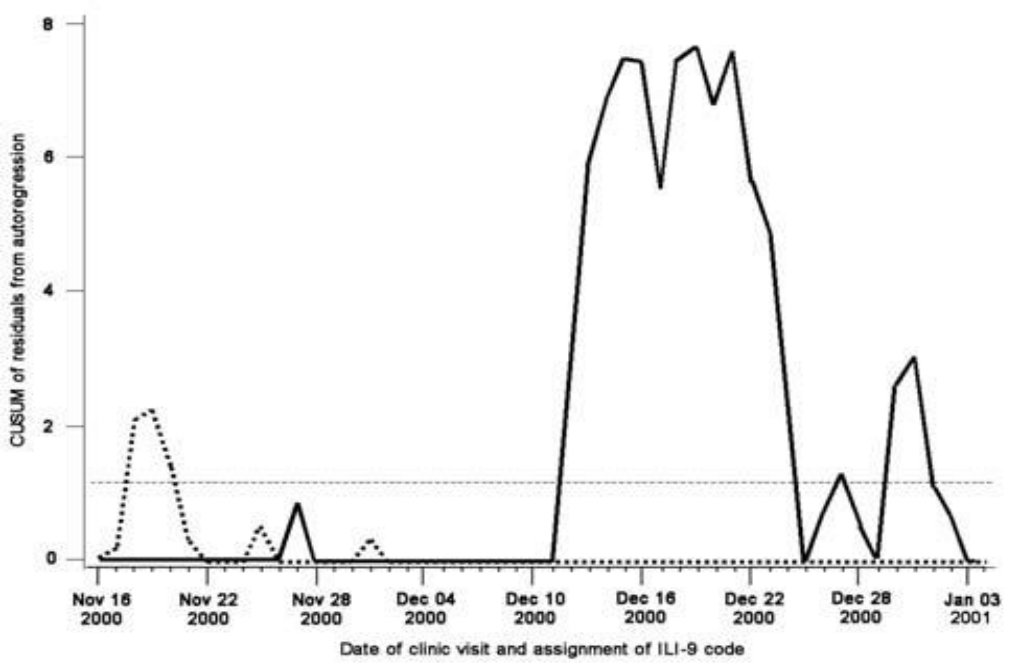
Solutions: The Next Generation

- Interpretation of data by metrics that evolve with time
- Communicability of interpretation so that it is relevant on both micro and macro levels
- Real time execution

Only bedside models can accomplish these objectives

Excellent Suitability of Avian Flu for an IT Solution: Microclinical & Macroclinical

Figure 2. Cumulative sum (CUSUM) chart signaling a significant signal corresponding to a confirmed influenza A outbreak occurring December 2000 and January 2001. CUSUM decision interval (horizontal broken line)



Why are we aiming beyond CuSum (pattern variance)?

The Clinical Problem

Respiratory illness caused by influenza is difficult to distinguish from illness caused by other respiratory pathogens on the basis of symptoms alone.

CDC 2005

- Speaks for all contributing data to be placed in a format that facilitates diagnosis
- Can we perhaps, uncover “nuances of diagnosis”?

Why is this important?

Clinical Medicine and Public Health

If formatted data includes:

. Age

. Vaccination status

. Concurrent illnesses

. Definitive diagnosis

. Patient disposition

. CXR appearance

relative risks may be stratified

“The Next Generation”

- Can then establish threshold of probability of diagnosis for triage decision making
- An effective tool, until immediate confirmatory testing with high predictive value becomes universally available
- Still has management capabilities based on trend analysis between certain signs and symptoms and outcomes (discharge, admit)

Syndromic Surveillance: The Next Generation

Data obtained is signs and symptoms, rather than codes, or categorized “free terminology” in real time at the bedside for on-line entry

The “Value-Added”

- By doing so, one may detect a syndrome that may have as unusual constellation of symptoms/signs

or

- A known syndrome/diagnosis that is changing in presentation (mutation)

Why?

- Better data capture/better data
- Better representation of the true clinical picture (micro & macro) and spectrum of disease

“The Next Generation”

A series of carefully selected, standardized H&P questions, with multiple choice selections clearly demarcated for answers

All questions to be answered, then the data base is completed

Only then will data be processed

Clinical Signs and Symptoms

Factors that impact on bedside decision making (“micro-clinical”)

and

Epidemiologic decision making (“macro-clinical”)

Test Characteristics of Clinical Findings, by Study

Table 3. Test Characteristics of Clinical Findings, by Study

Symptoms, Authors	Sensitivity	Specificity	Positive LR (95% CI)*	Negative LR (95% CI)*	DOR (95% CI)*
Sore throat					
No age restriction					
Monto et al	0.84	0.16	1.0 (0.97-1.0)	1.0 (0.85-1.2)	1.0 (0.8-1.2)
Hulson et al	0.75	0.28	1.0 (0.91-1.2)	0.89 (0.62-1.3)	1.2 (0.72-2.0)
van Elden et al	0.80	0.33	1.2 (0.91-1.6)	0.61 (0.28-1.3)	1.9 (0.69-5.3)
Summary			1.0 (0.98-1.0)	0.96 (0.83-1.1)	1.1 (0.87-1.3)†
Only patients ≥60 y					
Nicholson et al	0.58	0.36	0.91 (0.61-1.4)	1.2 (0.66-2.1)	0.8 (0.3-2.1)
Govaert et al	0.40	0.81	2.1 (1.7-2.7)	0.74 (0.64-0.85)	2.9 (2.0-4.3)
Summary			1.4 (0.81-2.5)	0.77 (0.66-0.89)	1.8 (0.81-4.0)
Sneezing					
No age restriction					
Carrat et al	0.50	0.59	1.2 (1.0-1.5)	0.85 (0.71-1.0)	1.4 (1.0-2.1)
van Elden et al	0.33	0.69	1.1 (0.55-2.0)	0.97 (0.71-1.3)	1.1 (0.42-2.8)
Summary			1.2 (1.0-1.5)	0.87 (0.75-1.0)	1.3 (0.95-1.9)†
Only patients ≥60 y					
Nicholson et al	0.32	0.33	0.47 (0.24-0.92)	2.1 (1.4-3.1)	0.2 (0.1-0.6)
Nasal congestion					
No age restriction					
Monto et al	0.91	0.19	1.1 (1.1-1.2)	0.47 (0.40-0.56)	2.4 (2.0-2.9)
van Elden et al	0.68	0.41	1.1 (0.81-1.6)	0.79 (0.44-1.4)	1.4 (0.58-3.6)
Summary			1.1 (1.1-1.2)	0.49 (0.42-0.59)	2.3 (1.9-2.8)†
Only patients ≥60 y					
Nicholson et al	0.47	0.50	0.95 (0.57-1.6)	1.0 (0.67-1.7)	0.9 (0.3-2.4)
Chills					
No age restriction					
Carrat et al	0.83	0.25	1.1 (1.0-1.2)	0.68 (0.46-0.99)	1.6 (1.0-3.0)
Only patients ≥60 y					
Govaert et al	0.46	0.82	2.6 (2.0-3.2)	0.66 (0.55-0.77)	3.9 (2.7-5.7)
Vaccine history					
No age restriction					
Hulson et al	0.12	0.83	0.71 (0.41-1.2)	1.1 (0.96-1.2)	0.69 (0.37-1.3)
van Elden et al	0.02	0.82	0.11 (0.01-1.1)	1.2 (0.02-1.4)	0.12 (0.01-1.0)
Summary			0.63 (0.37-1.1)	1.1 (1.0-1.2)	0.60 (0.33-1.1)†
Fever and cough					
No age restriction					
Monto et al	0.64	0.67	1.9 (1.8-2.1)	0.54 (0.50-0.57)	3.6 (3.1-4.2)
Only patients ≥60 y					
Govaert et al	0.30	0.94	5.0 (3.5-6.9)	0.75 (0.66-0.84)	6.6 (4.2-10.0)
Fever and cough and acute onset					
No age restriction					
Monto et al	0.63	0.68	2.0 (1.8-2.1)	0.54 (0.51-0.58)	3.6 (3.1-4.1)
Only patients ≥60 y					
Govaert et al	0.27	0.95	5.4 (3.8-7.7)	0.77 (0.68-0.85)	7.1 (4.5-11.0)

Abbreviations: CI, confidence interval; DOR, diagnostic odds ratio; LR, likelihood ratio.
*Positive LR is the LR when the finding is present; negative LR is the LR when the finding is absent; DOR is an indicator of the test's overall accuracy.
†Homogeneous DOR ($P>.05$). When the DOR was heterogeneous, we assessed for homogeneity separately for the positive and negative LRs.

Call, S. A. et al. JAMA 2005;293:987-997.

JAMA

Does this patient have influenza?

No independent sign(s) and/or symptom(s) in all age groups overall raised likelihood of influenza

In >60 age group . . .		LR
fever, cough, and acute onset		5.4
fever and cough	5.0	
fever alone	3.8	
malaise	2.6	

JAMA 2005

Does this patient have influenza? (cont'd)

To decrease the likelihood of influenza . . .

	LR
absence of fever	.40
cough	.42
nasal congestion	.49

JAMA 2005

Does this patient have influenza? (cont'd)

Author's conclusions:

- Clinical findings identify patients with influenza like illness but are not particularly useful for confirming or excluding the diagnosis of influenza
- Clinicians should use

  - timely epidemiologic data to either

    treat empirically or rapid test then treat

JAMA 2005

Emerging/Changing Spectrum of Disease

"Atypical Avian Influenza"

Thailand 2004

Emerging Inf Diseases 2004

. Fever
. Diarrhea
. No respiratory symptoms
. Exposure to poultry

ICD-9 Coding – based tools??