Influenza H1N1

Models of Hospital Preparedness and Response



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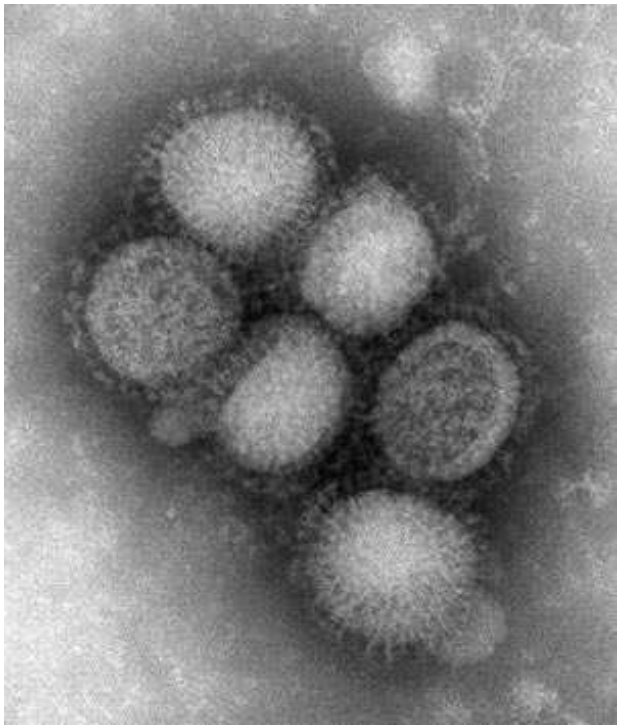
2005, June 10



WHO's influenza chief, Dr. Klaus Stohr.

H1N1 and Hospitals Summary

- Risk in the hospitals
- Role of the hospitals
- Main problems
- Hot points in the hospital:
  - Emergency Department
  - Isolation strategies
  - ICU
  - Laboratories
- Hospital response to pandemic:
  - Maintenance of essential service
  - Key-role of training

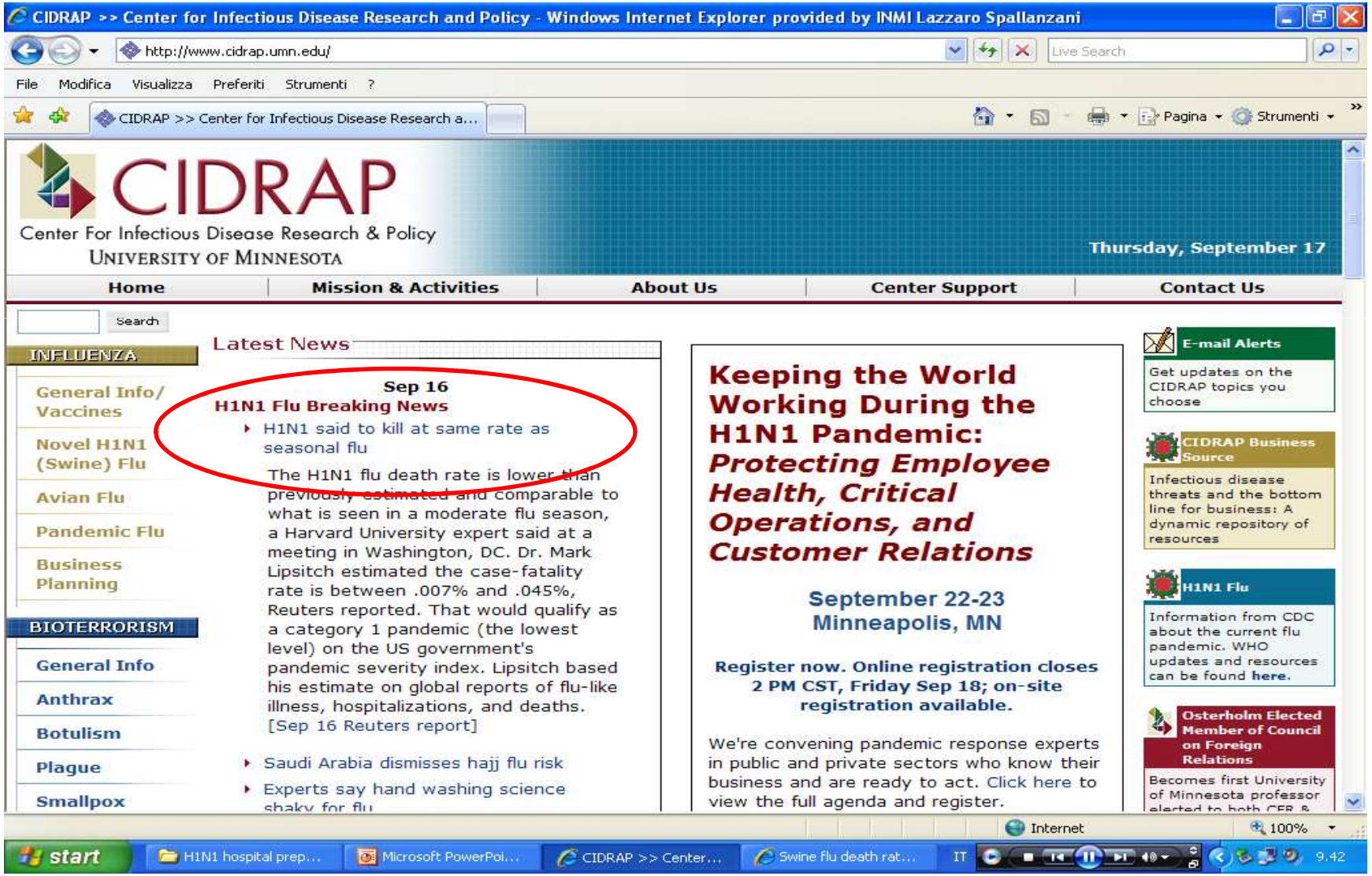


Estimates for nH1N1 flu

- Models vary widely
  - Total attack rate ranges from 20 to 30%
  - Percentage of those seeking care ranges from 30 to 50% of clinical cases
  - Hospitalization: from <1% to 2% of clinical cases
  - ICU admittance: from 15 to 35% of hospitalized.

More recent estimation, based on South side observation

- Case-fatality rate as for the seasonal flu



Pandemic H1N1 flu: More recent estimation, based on South side observation

death rate from
-is likely lower than earlier estimates
-compares to a moderate year of seasonal influenza

Pandemic H1N1 flu it's mildest in kids

Marc Lipsitch, Harvard University-
Flu meeting of U.S. IOM
September 15, 2009

Pandemic H1N1 flu: More recent estimation, based on South side observation

Pandemic Severity Index set by the U.S. government

five categories of pandemic
now are in a category 1 pandemic (barring any changes in the virus)

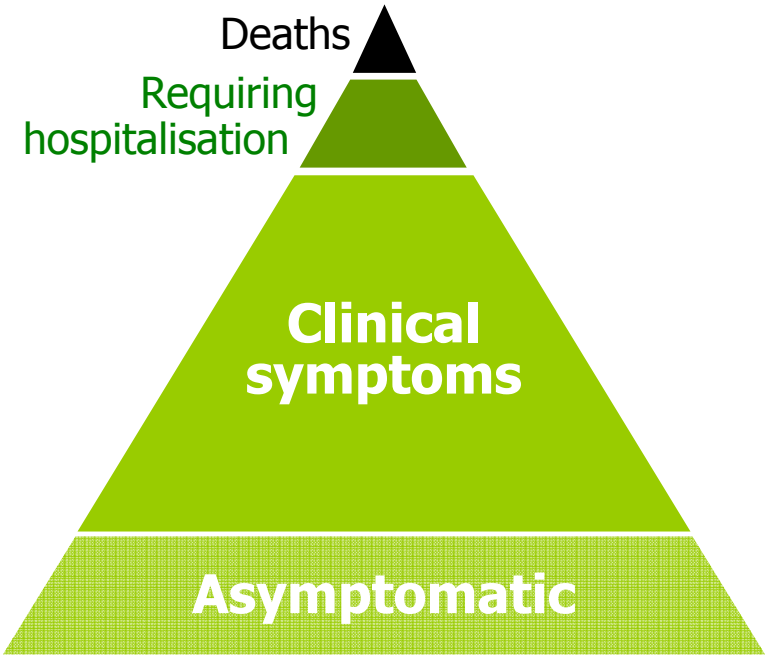
range of mortality from swine flu, from 0.007 percent to 0.045 percent.

Marc Lipsitch, Harvard University
Flu meeting of U.S.
IOM September 15, 2009

In any case…
Seasonal influenza compared to pandemic — proportions of types of cases



Seasonal influenza



Pandemic

Role of hospitals during the pandemic - 1

- The hospitals may play a key-role in the containment as well as in the amplification of the novel Influenza A H1N1:
  - Early recognition and appropriate infection control and clinical management of suspected, probable and confirmed cases are effective measures for the containment,
  - On the other hand, hospitals may have an important role in the amplification of the pandemic, if infection control measures are inconsistently applied.

Role of hospitals during the pandemic - 2

- Different roles at the beginning and during the pandemic:
  - At the beginning: need of prompt recognition and isolation of cases and risks (increase attention, knowledge and sensibility);
  - During the pandemic: need to use resource only for those who really need medical care (increase effectiveness)

Main problems and main solutions

Problems:

- Overcrowding and increased waiting time;
- Shortage of staff (for illness and other reasons);
- Shortage of resource (beds, medical devices – i.e. PPE -, medical instruments – i.e. ventilators -, drugs…).

Solutions:

- Clear and effective procedures and criteria;
- Training and vaccination;
- Adequate hospital preparedness

Nonvirologic indexes of epidemiologic influenza activity

- School absenteeism
- Industrial absenteeism
- Emergency room visits
  - % visits for respiratory activity
- Pneumonia admissions
  - % among adults
- Pneumonia/influenza mortality which lags behind the other reporting

Hot points in the hospital

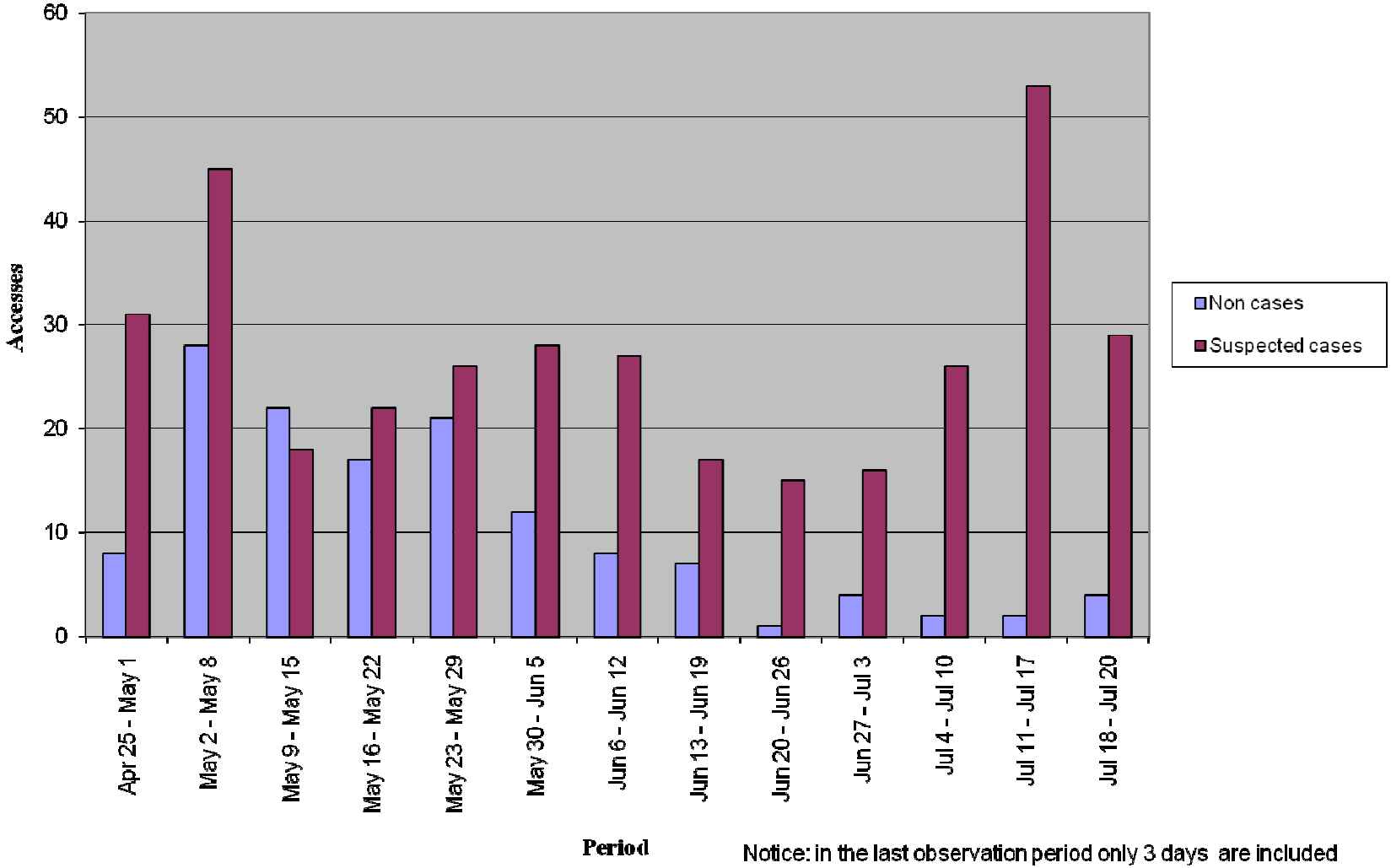
- Emergency Department;
- Admission wards;
- ICUs;

Hot points in the hospital - 1

- Emergency Department;
- Admission wards;
- ICUs;

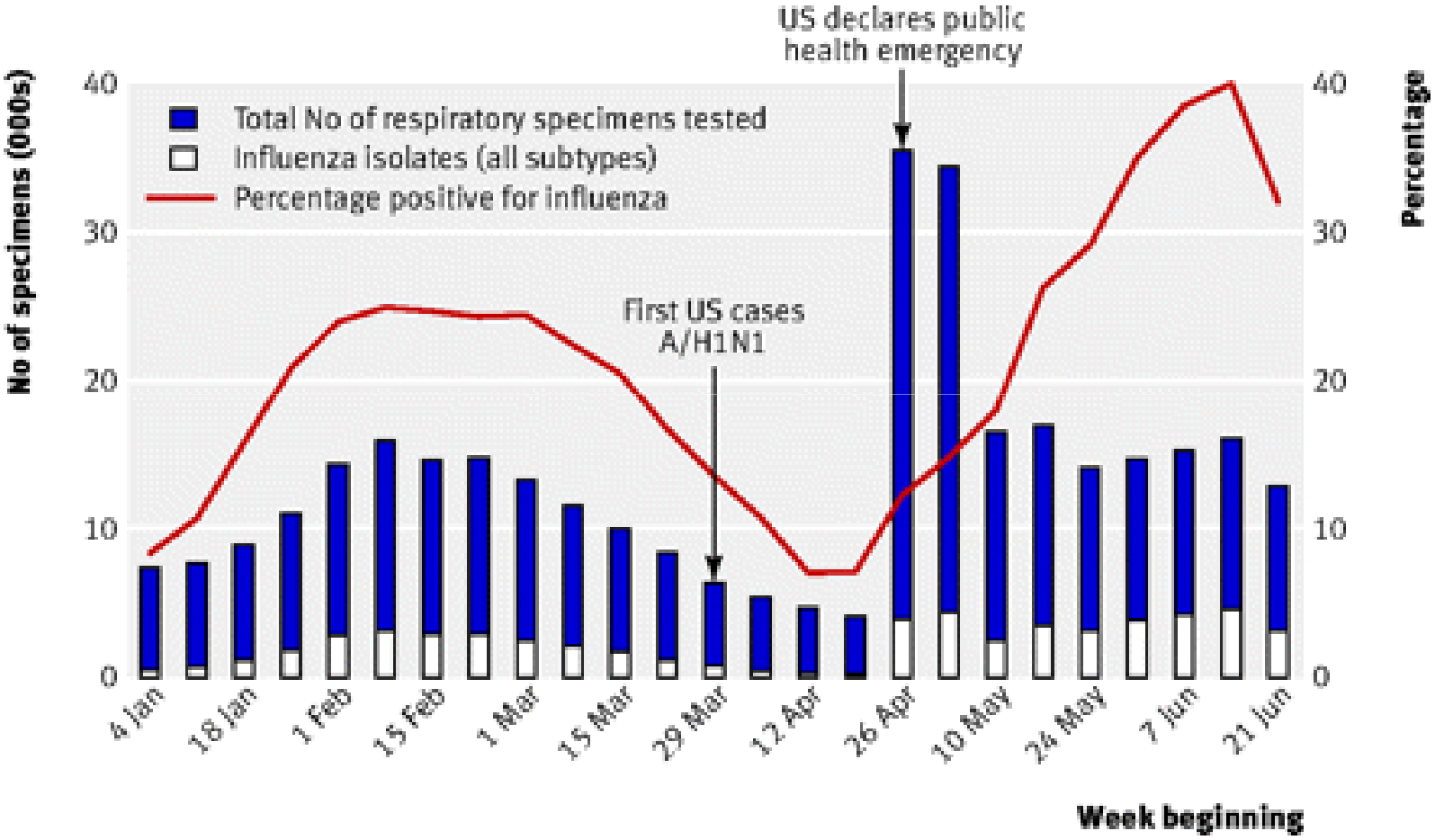
Pandemic vs. “PANIC emic”

Figure 3 - Distribution of non-cases and suspected cases attending at INMI MAD in the period from April 25 to July 20



Pandemic vs. “PANIC emic”

Numbers of respiratory specimens testing positive for influenza virus in US, January-June 2009



www.cdc.gov/flu/weekly/weeklyarchives2008-2009/data/whoAllregt31.htm

Hot points in the hospital – 1
Emergency Department

In order to avoid the risk of transmission during the waiting period (which may last for several hours):

- Triage procedures
- Reserved pathways/waiting areas

Hot points in the hospital – 1
Emergency Department

Triage procedures should be developed, not only based on diseases severity, but on risk of transmission too:

- A simply form exploring the presence of clinical and epidemiological criteria (contact with another case) should be submitted to all persons attending to ED;
- This form should been (optimally) submitted through telephone/entry phone or outside the waiting room.

Hot points in the hospital – 1
Emergency Department

Reserved pathway/waiting areas

Learning from the past: from temporary solution during SARS…



Figure 1. Due to limited space within the facility, temporary tents used for staff screening were set up at the entrance of the Toronto Western hospital.



Hot points in the hospital – 1
Emergency Department

Reserved pathway/waiting areas

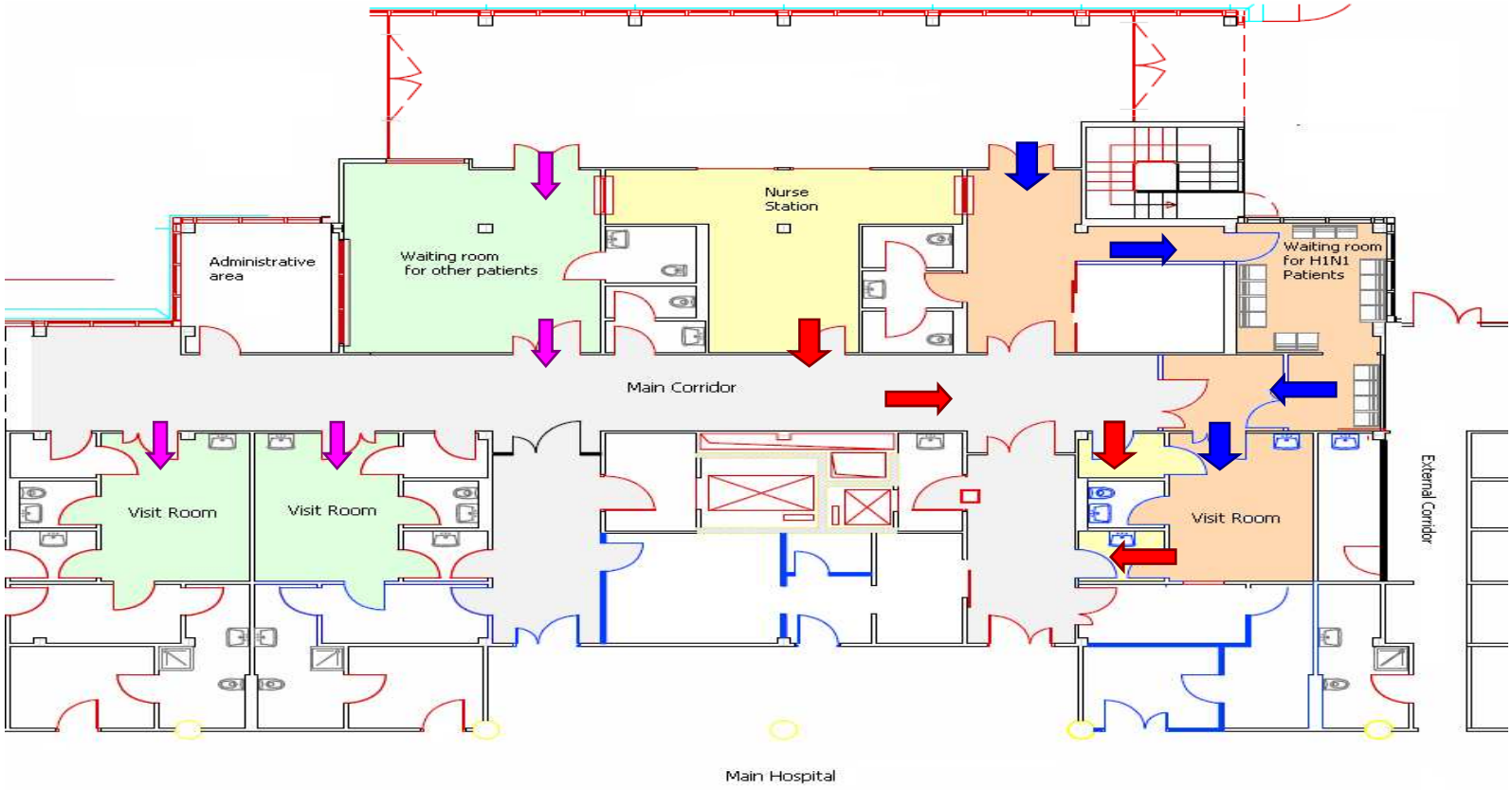
… to logistic solution at INMI

Map of MAD at INMI and pathways for HCWs, H1N1 patients and other patients

Pathway for HCWs visiting H1N1 patients

Pathway for H1N1 patients

Pathway for other patients



Hot points in the hospital – 2
Admission ward

- Emergency Department;
- Admission wards;
- ICUs;

Hot points in the hospital – 2
Admission wards

- In order to avoid the shortage of beds, it is mandatory to develop strict, evidence-based admission criteria.

Pandemic Medical Early Warning Score: **Physiological-social score (PMEWS) and CURB- 65**

Algoritmo per l'ammissione al ricovero per sindrome influenzale

Sede .....

Data ..... Ora .....

Paziente .....

Data nascita ..... Età ..... Sesso [M] [F]

Indirizzo .....

SINTOMI DI INFLUENZA PANDEMICA (WHO)

- febbre > 38°C
- cefalea
- mal di gola
- rinorrea
- tosse
- dispnea
- mialgia
- dolori osteo-articolari

DATI DEL PAZIENTE (1 punto per ogni fattore)

- età > 65 [ ]
- isolamento sociale (vive solo, e/o senza fissa dimora: 1 punto) [ ]
- malattie croniche(polmonari, cardiache, renali, sistema immunitario, oncologiche, metaboliche: 1 punto per malattia) [ ]
- gravidanze al terzo trimestre [ ]
- performance status > 2 [ ]

PERFORMANCE STATUS

- attività normale senza restrizioni: 1 punto
- limitate le attività intense, può svolgere quelle lievi: 2 punti
- attività limitata, ma autosufficiente: 3 punti
- attività limitata, limitata autosufficienza: 4 punti
- confinato a letto/sedia, non autosufficiente: 5 punti

DATI FISIOLOGICI (indicare un solo valore per ogni fattore)

Punteggio	3	2	1	0	1	2	3
Frequenza respiratoria	≤8			9-18	19-25	26-29	≥30
Saturazione 02	<89	90-93	94-96	>96			
Frequenza cardiaca	<40	41-50		51-100	101-110	111-129	≥130
Pressione sistolica	<70	71-90	91-100	>100			
Temperatura		<35°C	35.1-36	36.1-37.9	38-38.9	>39°C	
Sintomi neurologici				Sveglio cosciente	Confuso agitato	Fortemente agitato	Elevata compromissione con disorientamento spazio-tempo-persona

PUNTEGGIO TOTALE: ..... Paziente Ricoverato [ ] Paziente Non ricoverato [ ]

Deceduto [sì] [no] Firma del Medico .....

Data eventuale decesso .....

Qualifica. .....

Figura 1. Algoritmo per l'indicazione al ricovero per sindrome influenzale

Challen K., et al., BMC Health Services Research 2007; 7: 33

Hot points in the hospital – 2
Admission wards

- Admission in a negative-pressure room: yes or not?

- Hierarchical model of response:
  - Negative-pressure rooms,
  - Single rooms,
  - Cohorting of patients (only confirmed cases, cohorting of ILI patients may be very dangerous!).

- Development of surge capacity plan, that include evacuation of wards/structures.

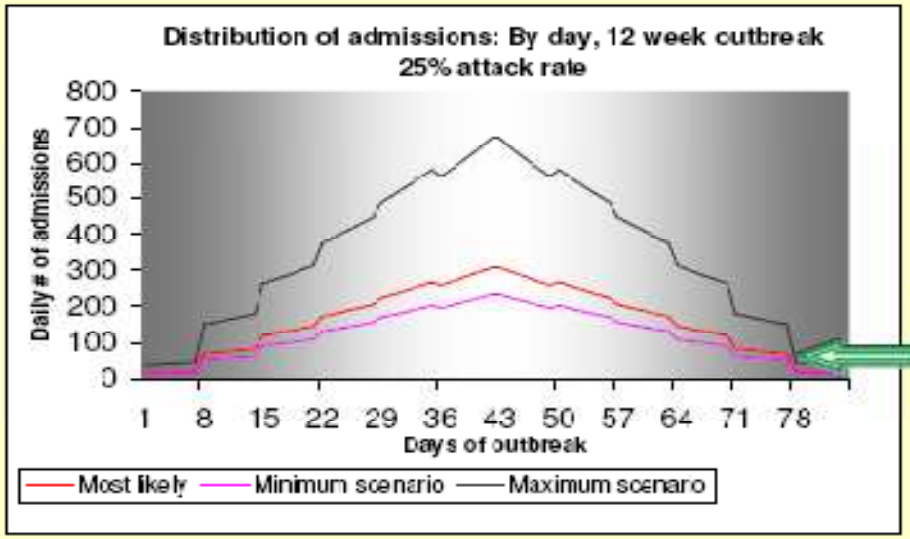
Hospitals with Infectious Diseases Wards, ICU beds and ventilators in Lazio, Italy

Hospitals	11
Negative pressure hospital beds	297
Hospital beds in single rooms	452
ICU hospital beds	459
Ventilators	1193

Fonte: Ministero della salute - Elaborazione Direzione Generale Prevenzione - Ufficio V Malattie Infettive e Profilassi Internazionale,

FluSurge2.0 Simulator - CDC

- Attack rate 25%, 12 weeks, hospitalization 1%, 100% Infectious Diseases beds dedicated; 60% ICU beds dedicated:



Total Hospital Admissions (most likely)	13,174
Total Deaths (most likely)	4,448

Pandemic Influenza Impact / Weeks		1	2	3	4	5	6	7	8	9	10	11	12	13	14
Hospital Admission	Weekly admissions	132	527	922	1,317	1,713	1,976	1,976	1,713	1,317	922	527	132		
	Peak admissions/day						308	308							
Hospital Capacity	# of influenza patients in hospital	97	387	678	968	1,259	1,453	1,504	1,346	1,140	863	586	308		
	% of hospital capacity needed	21%	83%	152%	214%	279%	321%	333%	298%	252%	191%	130%	68%		
ICU Capacity	# of influenza patients in ICU	13	59	116	174	231	275	291	285	244	191	135	79		
	% of ICU capacity needed	5%	21%	42%	63%	84%	100%	105%	103%	89%	70%	49%	29%		
Ventilator Capacity	# of influenza patients on ventilators	7	29	58	87	116	138	145	142	122	96	68	40		
	% usage of ventilator	1%	2%	5%	7%	10%	12%	12%	12%	10%	8%	6%	3%		
Deaths	# of deaths from influenza			44	178	311	445	578	667	667	578	445	311	178	44
	# of influenza deaths in hospital			42	169	296	423	549	634	634	549	423	296	169	42

Notes: 1. All results showed in this table are based on most likely scenario.
2. Number of influenza patients in hospital, in ICU, and number of influenza patients on ventilators are based on maximum daily number in a relevant week.
3. Hospital capacity used, ICU capacity used, and % usage of ventilator are calculated as a percentage of total capacity available (see manual for details).
4. The maximum number of influenza patients in the hospital each week is lower than the number of weekly admissions because we assume a 5-day stay in general wards (see manual for details).

Hot points in the hospital – 3
ICUs

- Emergency Department;
- Admission wards;
- ICUs;

Hot points in the hospital – 3
ICUs

ICUs will be probably severly involved in the management of severe H1N1 cases

Chile (pop 16.6 million)

- until **week 34: 12 190 confirmed cases** .
- **1 504 (12,23%) presented Severe Acute Respiratory Illness**

Brazil (pop. 192 million)

- until **week 34: 36 542 Severe Acute Respiratory Illness** of which **6 592 laboratory-confirmed as influenza A (H1N1)v**

  657 (10%) died.

New Zealand (pop. 4.2 million)

- At 6 September a total of **3219 confirmed cases of Pandemic Influenza (H1N1)v**,
- 988 cases have been hospitalised.
- Pneumonia : 300 cases 30.36 and ARDS 46 cases (15.33%).

Hot points in the hospital – 3 ICUs

A model just developed in USA, that assume:

- Attack rate 15%
- Hospitalization rate 6% of attack rate
- ARF-MV (acute respiratory failure necessitating mechanical ventilation) 12% of hospitalized

Calculate that:

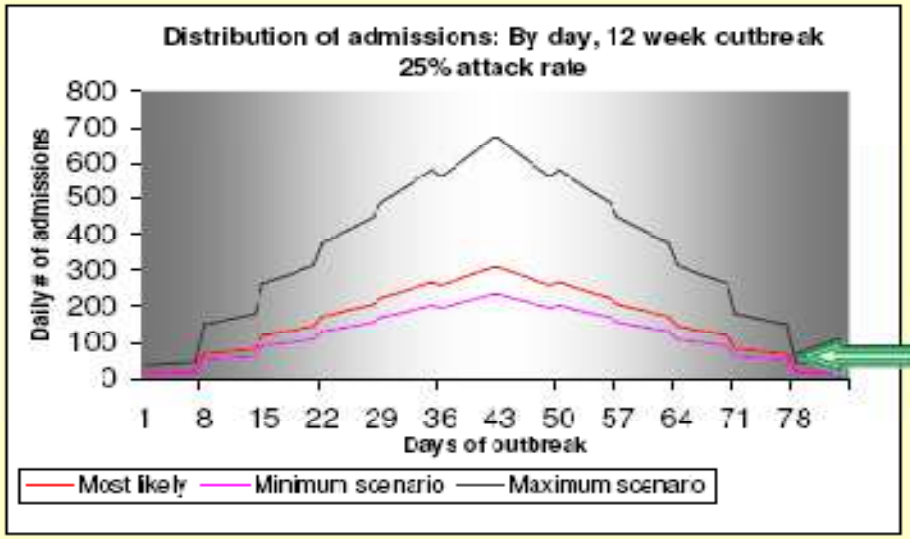
- About 330.000 ICU admittance are expected in USA;
- About 190.000 deaths are expected;
- ICU will work at 25 to 45% of current capability.



Swine origin influenza A (H1N1) virus and ICU capacity in the US. Are we prepared? Zilberberg MD et al.

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Shortage of staff

Due to:

- H1N1 infections among HCWs;
- Family reasons (i.e., in case of school closure, need to give care to children);
- Psychological reasons.

Shortage of staff

In the ECDC preliminary report (3 june 2009), 4% of patients were HCW;



In the Mexico outbreak, 22% of initially described patients were HCWs;



Also in the preliminary report from USA, several cases were descibed among HCWs



Shortage of staff

BMC Public Health *2009, 9:142*

BioMed Central

Will the NHS continue to function in an influenza pandemic?

Initial estimates assumed absenteeism to be around twice that of normal National Health Service (NHS) levels, which are typically between 4–5%.

More recent modelling has predicted between 30–35% absenteeism at the peak of a pandemic, based on cumulative effects of staff illness and the possible closure of schools/childcare services .

Recent human resources guidelines issued by the UK Department of Health (DH) increase estimates further, suggesting that up to 50% of HCWs may require time off at the peak of a pandemic.

Shortage of staff

School absenteeism strongly influence HCWs absenteeism

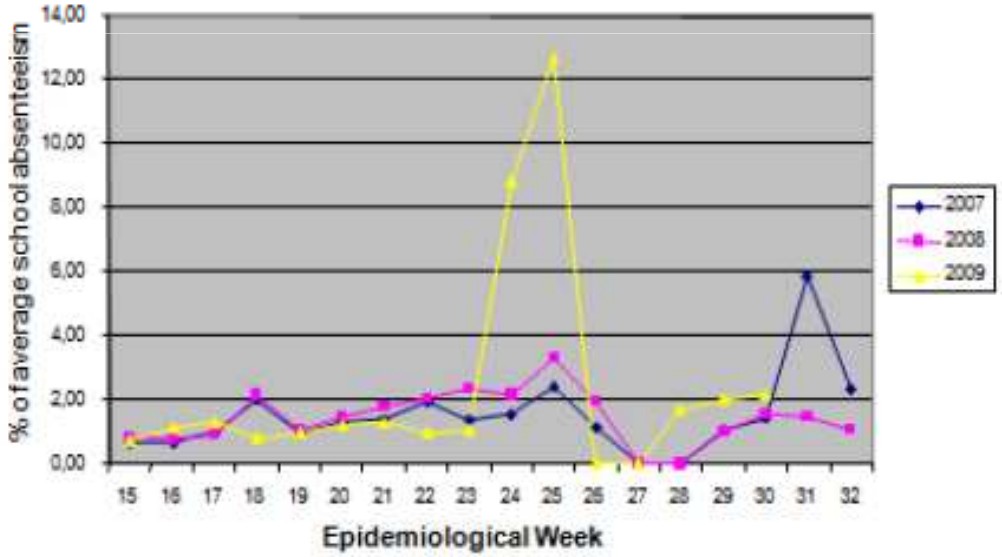


Figure 12. ***Comparative absenteeism in sentinel schools in Uruguay during the flu seasons of 2007-2009.*** Ministry of Health, Uruguay, 2009 H1N1 report, August 8, 2009.

Shortage of staff: main solution is vaccination. But…

BMJ 2009;339:b3461

Opposition to swine flu vaccine seems to be growing worldwide

Just over half of 8500 healthcare workers in Hong Kong said they would not be vaccinated against swine flu because of fears of side effects and doubts about the vaccine's effectiveness.

Evidence from 11 focus groups conducted in Canada before the current pandemic also indicates that parents and healthcare workers may refuse to be vaccinated or to vaccinate their children if they believe that the risks outweigh the benefits.

An online poll for *Nursing Times* last week indicated that in England almost a third of nurses who responded would not take up the offer of the vaccine, with 60% of respondents citing concerns about the safety of the vaccine as their primary reason.

A survey by Israel's ministry of health similarly found that at least 25% of the population is not willing to be vaccinated against swine flu.

The model of response at INMI at the beginning of the pandemic

- Development of procedures for clinical management and infection control:
  - Case definitions
  - Triage procedures
  - Clear procedures for the management of patients
  - Clear indication for therapy and prophylaxis
  - PPE (selection and procedures for donning and removal)
  - Surveillance and management of exposed HCWs
- Logistical interventions at ED
- Training and update programmes

Hospital Response to H1N1 pandemic

Maintenance of Critical Services

- Estimate existing capacity in health care sector
  - ✓ **hospital and ICU beds**
  - ✓ **ventilators**
  - ✓ **supply of antibiotic and antiviral drugs**
  - ✓ **medical staff and support staff**
  - ✓ **contingency medical care facilities**
  - ✓ **emergency response plans**
  - ✓ **mortuary/burial services**
  - ✓ **social and psychological services**

Hospital Response to H1N1 pandemic

To Measure Capacity, Hospitals must:

- Evaluate existing & immediately available services for inpatient & outpatient care;
- Assess its rapid expansion capacity – physical plant, personnel, supplies & equipment;
- Consider maintenance of standards for medical care, monitoring & tracking;
- Consider contingency plans to ensure patient care – alternative care centers, discontinuance of services & patient transfers.

Cost myopia

