

Respiratory Syncytial Virus (RSV) Surveillance: A New Initiative for NM

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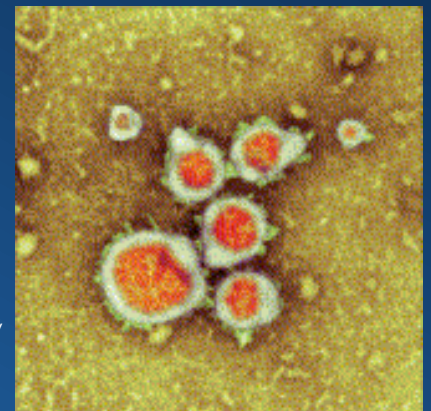
Objectives

1. Describe basic virology, symptoms, clinical course, epidemiology, and burden of RSV
2. Describe the history and current state of RSV vaccine development
3. Understand the importance of vaccinations in reducing the spread of RSV
4. Understand the potential benefits of participating in NM-specific RSV surveillance initiatives

RSV: Basic Overview

Respiratory Syncytial Virus

- Enveloped RNA virus (family *Paramyxoviridae*)
 - Two subgroups: A & B
 - Circulate concurrently
 - Clinical significance not determined, but some strains may be more virulent
- Humans only source of infection
 - Direct/close contact with secretions, via droplet, or via fomites
 - Persists on surfaces for several hours, hands for ~ 30 minutes
- Incubation period: 2-8 days (4-6 most common)



Colored transmission electron micrograph of respiratory syncytial virus particles, courtesy Science Photo Library

Symptoms

Symptoms of RSV infection are similar to other respiratory infections, such as flu, and include¹:



Runny nose



Decrease in appetite



Coughing



Fever



Sneezing



Breathing difficulties



Wheezing

In young infants symptoms may also include¹:



Irritability



Decreased activity



Sometimes the only symptom of infection is breathing difficulties¹

References

1. Centers for Disease Control and Prevention. Respiratory syncytial virus infection (RSV): Symptoms and Care. [Online]. Available at: <http://www.cdc.gov/rsv/about/symptoms.html> Last accessed October 2015.

Consequences

- Most common cause of bronchiolitis and pneumonia in children <1 year old
- Sequelae:
 - Upper respiratory tract infections
 - Otitis media
 - Bronchiolitis
 - Pneumonia
 - Exacerbated asthma
- When first exposed:
 - 25-40 out of 100 will have signs/symptoms of bronchiolitis or pneumonia
 - 5-20 out of 1,000 require hospitalization (most younger than 6 months)
 - Weakened immune system after recovery

Populations at Risk

- Infants
 - Prematurity
 - Male sex
 - Crowding
 - Daycare exposure
 - Children younger than 2 years old with chronic lung disease or heart problems
- Adults 65 years and older
- Immunocompromised patients

Burden of RSV

- In the US each year:
 - 57,527 hospitalizations among children younger than 5 years
 - 2.1 million outpatient visits among children younger than 5 years
 - 177,000 hospitalizations and 14,000 deaths among adults older than 65 years
- Underreporting almost certain
- Incurs great cost
 - 2-12% of admitted cases require intensive care unit admission

Vaccine History & Development

Previous RSV Vaccine Trials

- Merck and NIH developed an inactivated vaccine – 4-site clinical trials in winter of 1965-66
 - “Lot 100”
- Not only failed to protect, but more severe disease after wild-type infection
 - 16x fold increase in hospitalizations among vaccinated infants
 - 2 infant deaths
- Researchers and developers historically hesitant to work on RSV

RSV Vaccine and mAb Snapshot

TARGET INDICATION: P = PEDIATRIC M = MATERNAL E = ELDERLY T = TBD

	PRECLINICAL				PHASE 1	PHASE 2	PHASE 3	MARKET APPROVED
LIVE-ATTENUATED/ CHIMERIC	AmVac Sendai virus	Intravacc Delta-G RSV	Meissa Vaccines RSV	Sanofi Pasteur RSV	LID/NIAID/NIH ^P RSV LID ΔM2-2	LID/NIAID/NIH ^P RSV D46 cpΔM2-2	MedImmune, LID/NIAID/NIH ^P RSV cps2	
	Codagenix RSV	LID/NIAID/NIH PIV1-3/RSV	Pontificia Universidad Catolica de Chile BCG/RSV	St. Jude Hospital SeV/RSV	LID/NIAID/NIH ^P RSV ΔNS2 Δ1313	MedImmune, LID/NIAID/NIH ^P RSV Medi ΔM2-2		
WHOLE-INACTIVATED	NanoBio RSV							
PARTICLE-BASED	AgilVax VLP	Fraunhofer VLP	Ruhr-Universität Bochum VLP	University of Massachusetts VLP	Novavax ^P RSV F Nanoparticle		Novavax ^M RSV F Nanoparticle	
	Artificial Cell Technologies Peptide microparticle	Georgia State University VLP	TechnoVax VLP	VBI Vaccines RSV F eVLP			Novavax ^E RSV F Nanoparticle	
	DBV Technologies/INRA RSV N/F rings	Mucosis BLP RSV pre-F	University of Massachusetts VLP	VLP Biotech VLP				
SUBUNIT	Advaccine Biotech RSV G+CSA	Instituto de Salud Carlos III RSV F protein	NIH/NIAID/VRC RSV pre-F Protein	University of Saskatchewan RSV F protein	University of Illinois RSV F protein	GlaxoSmithKline ^M RSV post-F Protein	GlaxoSmithKline ^M RSV F protein	
	GlaxoSmithKline RSV F protein	Janssen Pharmaceutical RSV pre-F Protein	PeptiVir RSV peptides	University of Georgia RSV G protein	Immunovaccine/VIB ^E DPX-RSV-SH Protein	MedImmune ^E RSV F protein		
NUCLEIC ACID	CureVac RNA	GlaxoSmithKline RNA	Inovio Pharmaceuticals DNA	Ruhr-Universität Bochum DNA				
GENE-BASED VECTORS	AlphaVax Alphavirus	GenVec Adenovirus	University of Pittsburg Adenovirus		Bavarian Nordic ^T MVA	Janssen Pharmaceutical ^P Adenovirus		
	Emergent BioSolutions MVA	Ruhr-Universität Bochum Adenovirus	Vanderbilt University Alphavirus		GlaxoSmithKline ^P Adenovirus	Vaxart ^E Adenovirus		
COMBINATION/ IMMUNO-PROPHYLAXIS	Biomedical Research Models DNA prime, particle boost	Fudan University DNA+protein combo	UCAB/mAbXience Anti-F mAb			MedImmune ^P Anti-F mAb	Regeneron ^P Anti-F mAb	MedImmune ^P Synaxis

UPDATED: JULY 13, 2016

<http://sites.path.org/vaccinedevelopment/respiratory-syncytial-virus-rsv/>



Although Obstacles Seem Formidable...

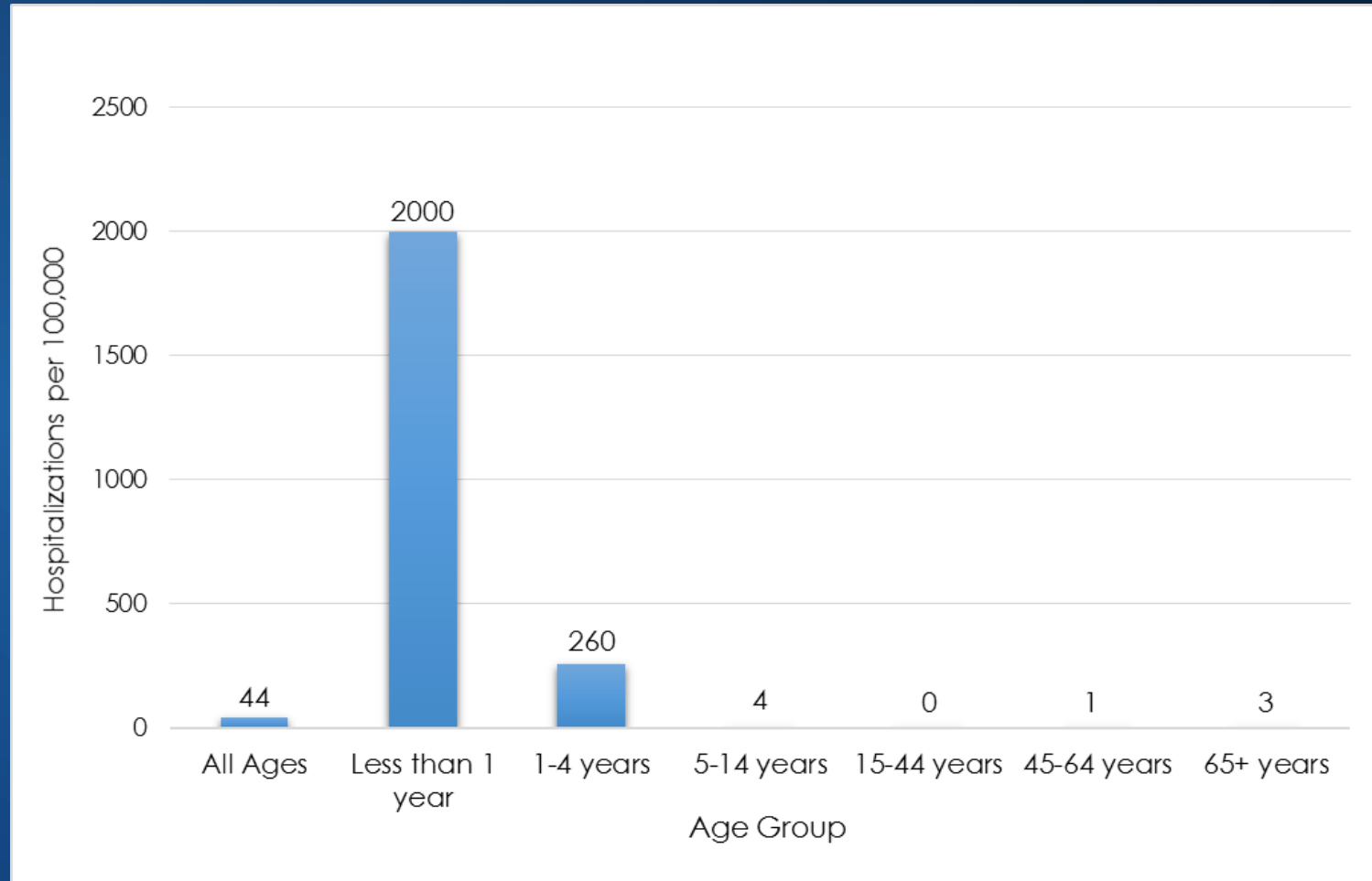
RSV vaccine would prevent:

- 23,069 hospitalizations annually
- 66 deaths annually per vaccinated birth cohort
- Direct medical costs (excluding vaccine): \$236 million annually
- Income and productivity losses: \$134 million



RSV
Surveillance
Initiative in NM

Hospital Discharge Rates per 100,000 (1999-2014)

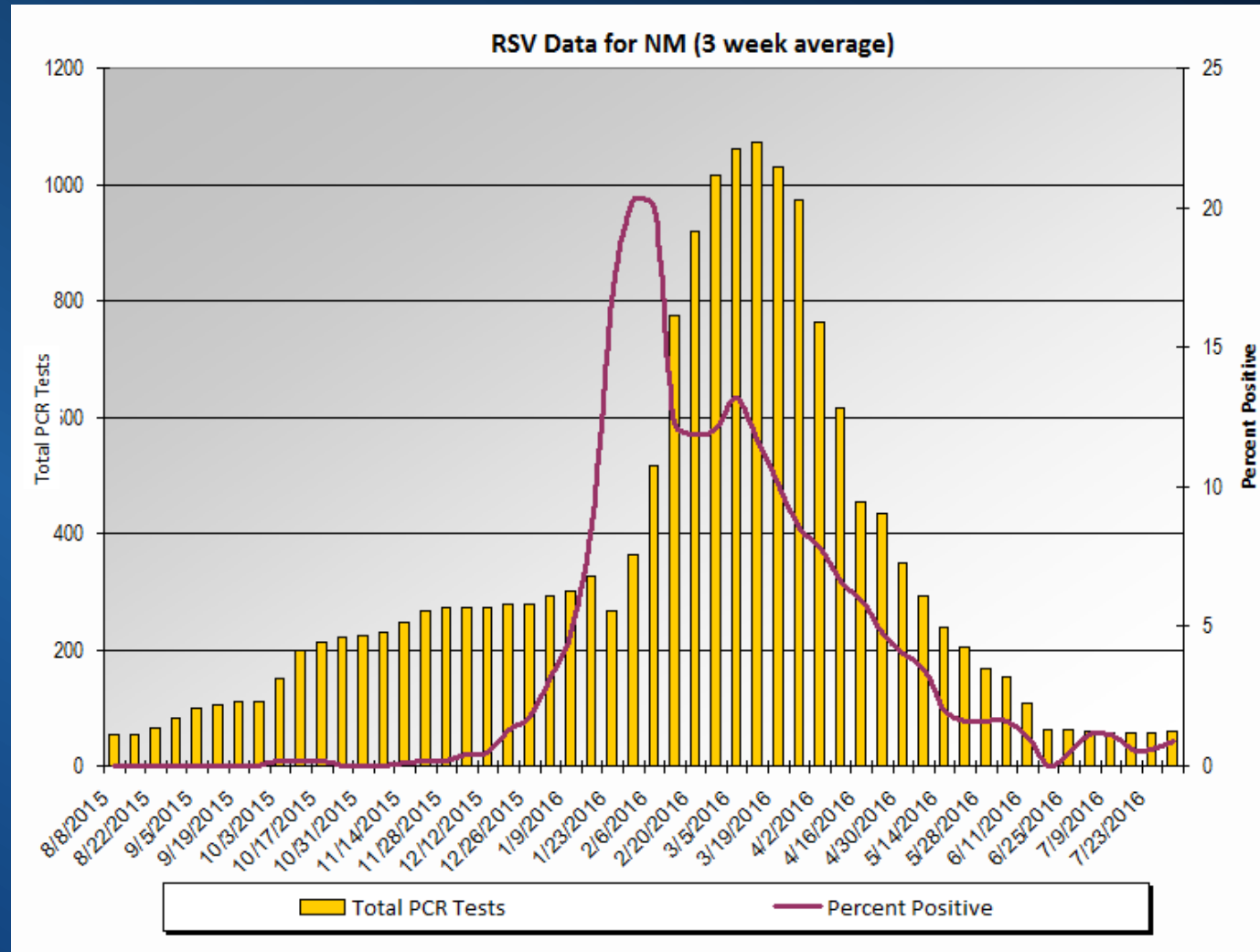


Source: NMDOH IBIS

Bed Shortages

- According to Bureau of Health Emergency Management (BHEM), bed shortages have been a historical problem in NM
- Pediatric RSV patients have overwhelmed facilities
- Led to creation of BHEM's electronic system for tracking bed shortages, and working with other states (AZ, CO, TX) to manage overflow

Burden of RSV in New Mexico – PCR Tests



Courtesy of: National Center for Immunization and Respiratory Diseases, Division of Viral Diseases

Unanswered Questions

- Currently:
 - Clinical characteristics of RSV in NM?
 - Specific populations at risk in New Mexico?
 - Cost/burden on healthcare system?
- When vaccines are introduced:
 - How do trends change?
 - Establishing baseline helps differentiate adverse events



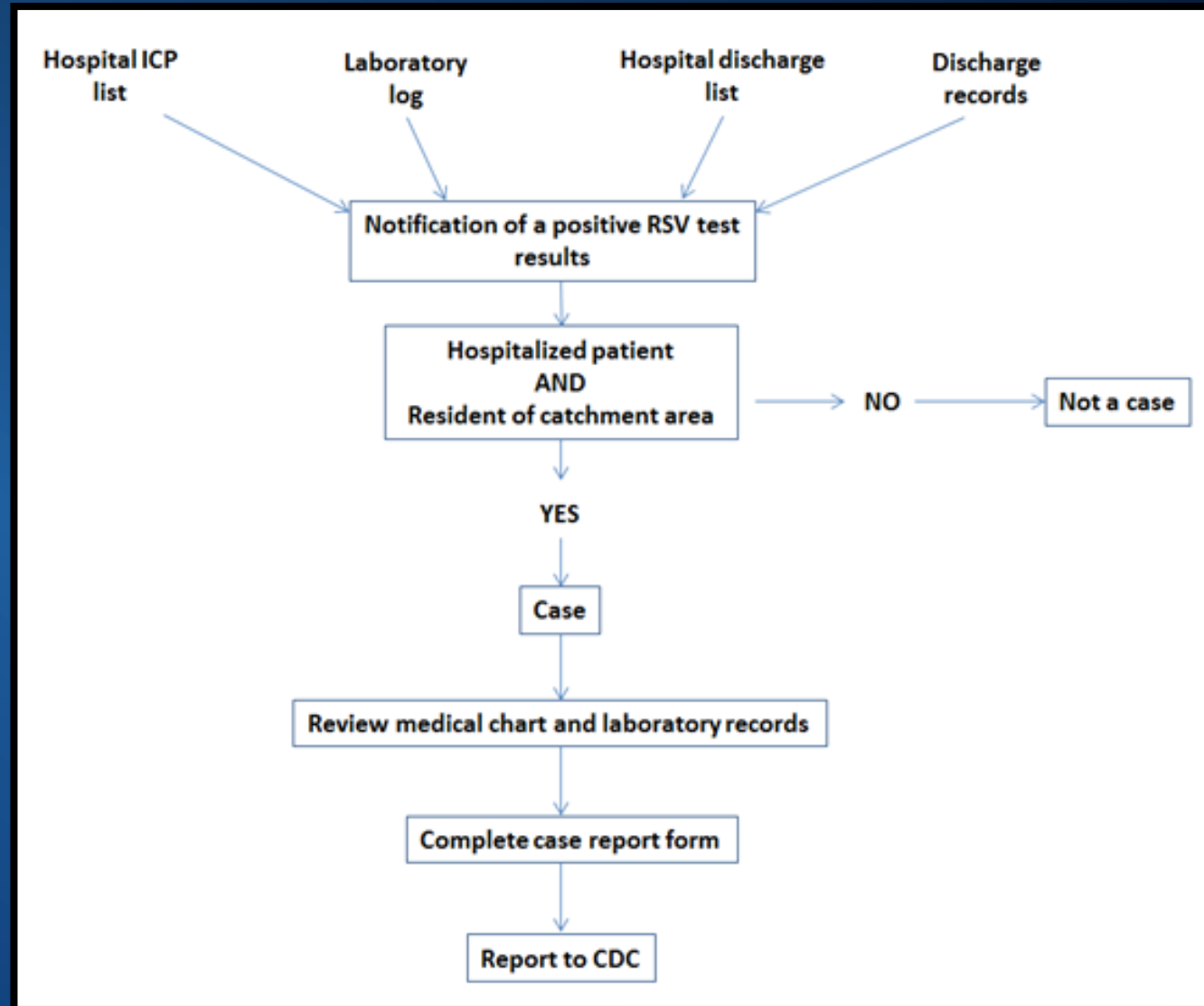
Objectives for Surveillance

- Describe age-specific rates for RSV infection among target populations during respiratory season (October 1st – April 30th)
- Describe RSV testing frequency by hospital and/or surveillance site to correct for under-detection
- Describe characteristics of individuals with lab-confirmed RSV
- Describe rates of severe RSV-associated complications
- Assess risk factors for RSV-associated complications
- Disseminate information to clinicians regarding RSV season

Case Definition

- A resident of a pre-identified geographic area
 - Bernalillo, Santa Fe, San Juan, Grant, Chaves, Dona, Luna
- Admitted from October 1-April 30 to a hospital where FluSurv catchment residents receive care
- Positive RSV test 7 days prior or 3 days after hospital admission
- Evidence of a positive RSV test by at least one of the following methods:
 - Viral culture
 - Immunofluorescence antibody staining (Direct [DFA] or indirect [IFA])
 - Molecular assay (e.g., Biofire, RT-PCR)
 - A commercially available rapid diagnostic test

Population-Based Surveillance Project



Benefits of Participation

- Ability to assess burden of RSV in NM and nationally
- Answer how vaccine affects burden of disease
- Obtain better information around RSV season in NM
- Opportunity for leadership
- RSV surveillance will mimic that of FluSurv-NET

How to Participate

- In order to participate in this study, will most likely require IRB approval
 - Any questions, concerns, etc. can be addressed to either:
 - Sarah Shrum, EIP Surveillance Officer
505-827-2305
Sarah.Shrum@state.nm.us
- Or
- Marisa Bargsten, FluSurv-NET Principal Investigator
505-827-0082
Marisa.Bargsten@state.nm.us

Thank You!

- Thanks to all NMEIP partners for their cooperation and assistance