NYU Langone Health

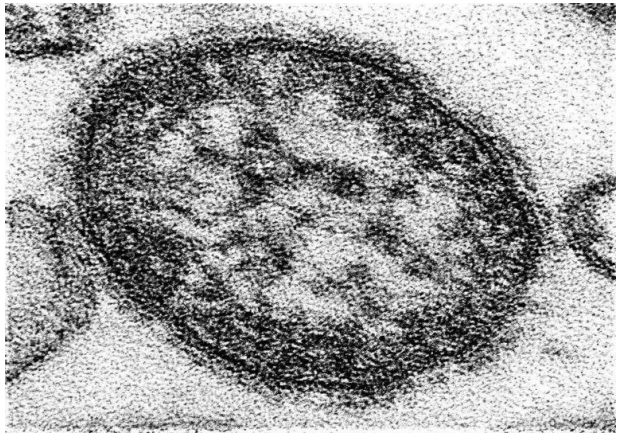
What? Me Worry? Measles…here, there & everywhere

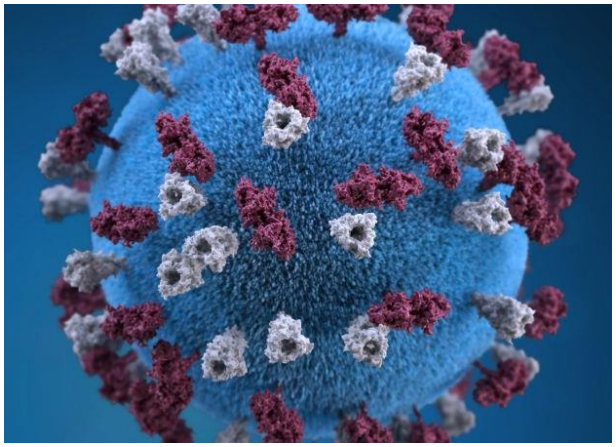
Steve Bock RN CIC FAPIC &
Jacqueline Obado MPH BS RN

Infection Prevention and Control Department
212-263-5454

Objectives

- **Review history and pathogenesis of Measles disease**
- Discuss the epidemiology of Measles in the US & NYS.
- Describe the current Measles outbreak in the NY metro area
- Review Measles disease and Measles prevention
- Discuss recent Measles cases at a NYC medical center
- Review control measures used to minimize the impact of Measles in a hospital or clinic setting





NYU Langone Health

History of Measles

- Imagine an apparently infectious disease with these symptoms: high fever, eye inflammation and eye/nose discharge, labored breathing and coughing, vomiting and diarrhea, loss of appetite and lethargy, and hardening of nose and footpads…**name this disease!**
- Hint #1: it's name suggests an imbalance of humors
- Hint #2: it is caused by a single-stranded RNA virus of the family *Paramyxoviridae*
- Hint #3: this disease is highly contagious via inhalation, and while morbidity and mortality may vary, it is often very high

History of Measles

- Imagine another infectious disease that causes fever, loss of appetite, nasal and eye discharges, irregular erosions in the mouth, the lining of the nose, and the genital tract, and diarrhea….**name this disease!**
- Hint #4: it is caused by an enveloped single-stranded RNA virus in the *Paramyxoviridae* family
- Hint #5: The fatality rate for this disease can approach 100% in susceptible populations
- Hint #6: This disease is spread by direct contact, drinking contaminated water, and is airborne

NYU Langone Health

History of Measles

- Disease #1 – Canine Distemper
- Disease #2 – Rinderpest, the 2nd infectious disease ever to be globally eradicated. And you thought smallpox was the only one! (me too…)
- So what you ask?
- Rinderpest has been known since the beginning of recorded history. This may have been one of the ten plagues recorded in Exodus 9. Has caused animal “plagues” repeatedly around the world for millennia.
- Rinderpest Virus is very closely related to Canine Distemper Virus, and...

History of Measles

- Measles!
- Measles is believed to have possibly originated as a mutation of Rinderpest virus sometime between 5000 BC and 500 AD
- NOT a true zoonosis; only humans get measles
- First described medically in 910 AD by a leading Persian physician and philosopher, Rhazes, who worked at the Baghdad Hospital in ancient Iran. European physicians began describing measles in their medical writings in the mid-1600s.

Pathogenesis of Measles

- In a susceptible person, Measles Virus (MV) binds to two different receptors in human cells
  - CD150, which is expressed by – or sticks out of – dendritic cells (which are designed to capture and bring antigens to lymphocytes) as well as B- and T- lymphocytes themselves
  - PVRL4, or poliovirus receptor-like 4, which is expressed by several types of respiratory epithelial cells, particularly columnar epithelial cells common in the upper respiratory tract.
- After binding, the virus enters these cells, replicates, lyses the cell, and releases more virus.

Pathogenesis of Measles

- Nasal mucosa – primary site of infected epithelial cells
- Creates ideal method for spreading the virus to others
- As disease progresses, increasing viral load is present in the tonsillar region, the trachea and bronchi, exacerbating viral spread when patients cough
- Rarely, and by uncertain mechanisms, MV can enter the brain and cause panencephalitis, affecting both white and grey matter
- Infection of lymphocytes creates transient immunosuppression, leading to opportunistic infections such as pneumonia and gastroenteritis

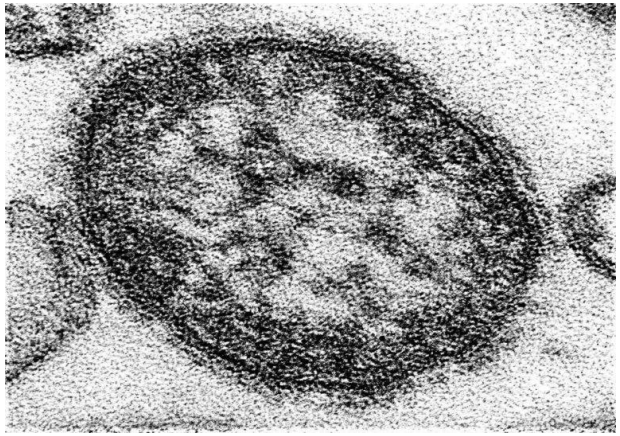
Pathogenesis of Measles

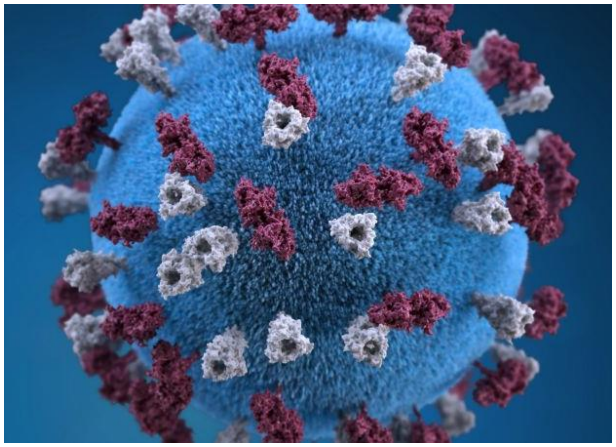
- Infection of the entire respiratory tract infection causes edema and loss of cilia function, resulting in secondary bacterial pneumonia … **name another viral disease that does this to people**
- Invasion of virus into lymphoid cells spreads it throughout the body, into skin, creating rash, Koplik spots, and conjunctivitis
- Immune memory cells often get depleted by MV infection, often for weeks to months following infection
- Eventually immune system cell counts normalize, but patients may lose immune memory (e.g., TB skin test reverts to negative)

NYU Langone Health

Objectives

- ☑ Review history and pathogenesis of Measles disease
- **Discuss the epidemiology of Measles in the US & NYS.**
- Describe the current Measles outbreak in the NY metro area
- Review Measles disease and Measles prevention
- Discuss recent Measles cases at a NYC medical center
- Review control measures used to minimize the impact of Measles in a hospital or clinic setting





NYU Langone Health

Measles Epidemiology

- History is rife with examples of outbreaks of Measles
- Because disease creates life-long immunity, populations generally need to be large to support ongoing transmission in perpetuity ~ 500,000 some authors suggest, so that there are always new people to infect.
- Outbreaks affected larger medieval cities, or when imported, disease-naive populations, often catastrophically
- Experts suggest that pre-1963, there were 30 million cases and 2 million deaths per year globally from measles

Measles Epidemiology - USA

- Reportable disease in the US starting in 1912!
- In the 20th century, several million infections, 400-500 deaths – per year. The first half of the century had more deaths.
- Improved sanitation, and later the introduction of antibiotics reduced the death rate but not the disease incidence (population grew…)
- Outbreaks somewhat seasonal (winter/spring), worse every 2-3 years, but overall steady rates

Measles Epidemiology - USA

- *Measles was #1 in 1888 - 2011 ~* ***318/100,000***
- *Diphtheria was #2 in 1888 - 2011 ~* ***237/100,000***
- In modern US, new HIV cases ~ 12.3/100,000 (2016)
- In modern US, new Chlamydia ~ **495/100,000** (2016)
- In modern US, new Gonorrhea ~ **145/100,000** (2016)
- In modern US, new Syphilis ~ 27/100,000 (2016)
- In modern US, new Salmonella ~ 16.7/100,000 (2016
- In modern US, new Hep B/Hep C ~ 1.0/100,000 (2016)
- In modern US, new Measles ~ **0.03/100,000** (2016)

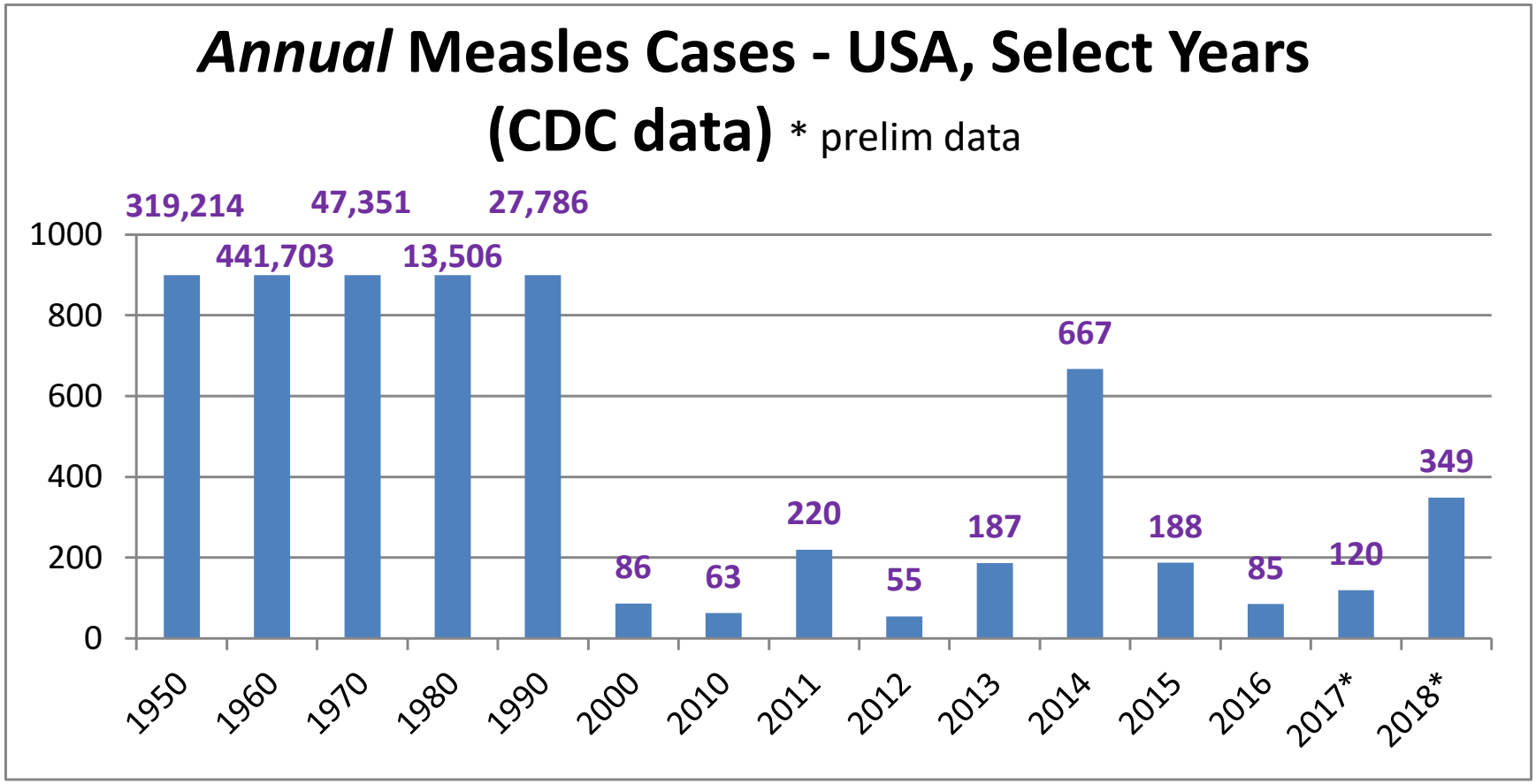
NYU Langone Health

Measles Epidemiology - USA

- In the pre-vaccine era, nearly everyone had measles by age 15
- Worst outcomes were usually infants/small children
- Vaccine released in 1963, single dose
- Within 5 years of vaccine use, 95% cases were being prevented; most successful vaccine preventable disease effort ever
- Two dose requirement began in 1989, and measles was declared “eradicated” in 2000.

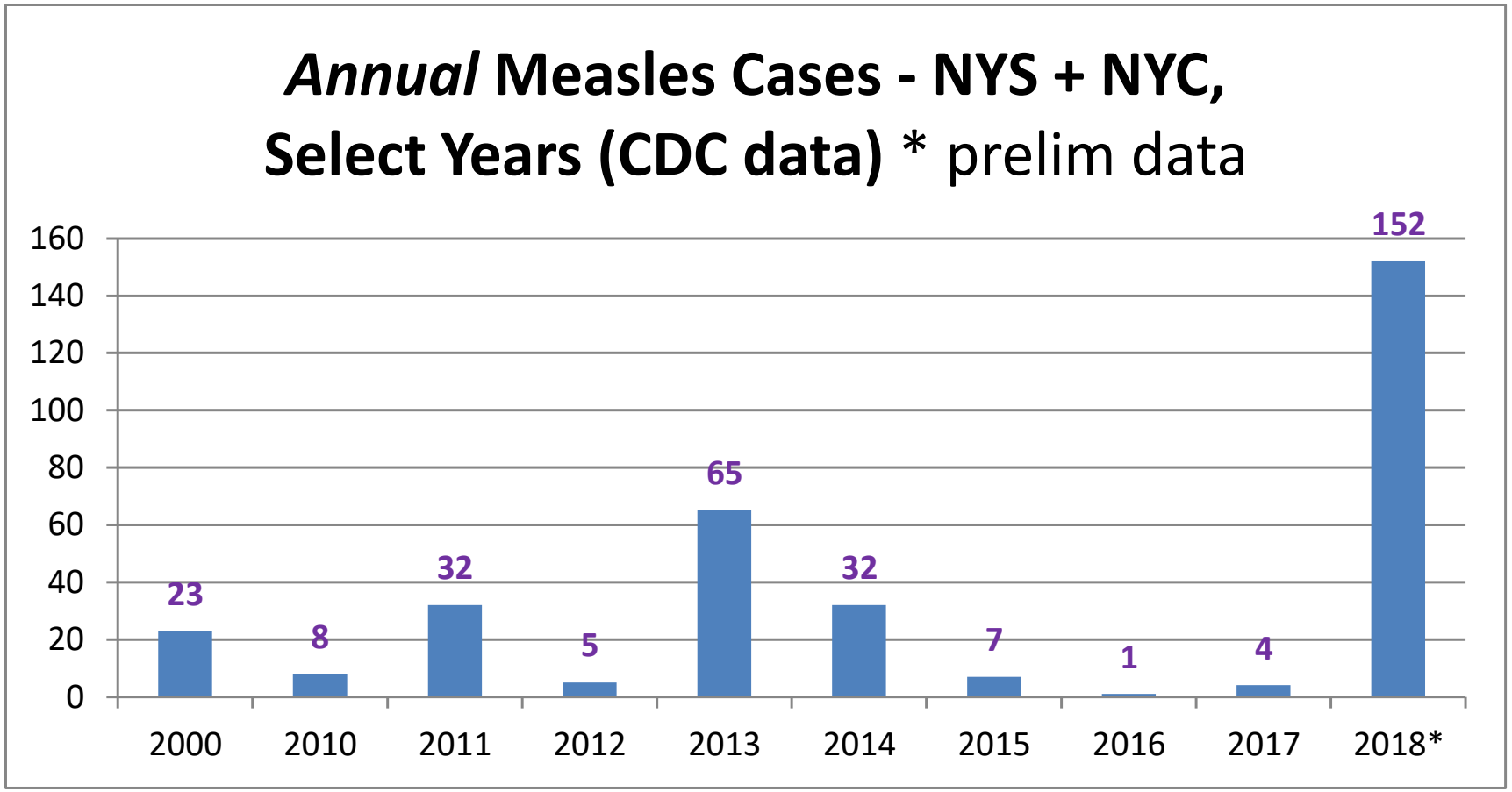
Measles Epidemiology - USA

- In the US, measles cases dropped dramatically after the introduction of vaccination in 1963.



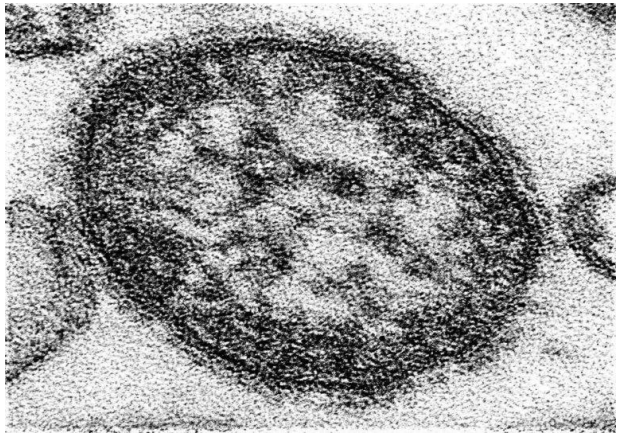
Measles Epidemiology – New York State & NYC

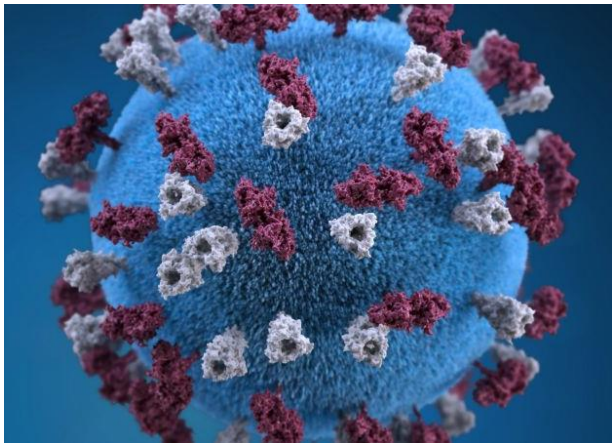
- In NY, most years, cases were far more numerous in NYC than upstate, except 2018



Objectives

- ☑ Review history and pathogenesis of Measles disease
- ☑ Discuss the epidemiology of Measles in the US & NYS.
- **Describe the current Measles outbreak in the NY metro area**
- Review Measles disease and Measles prevention
- Discuss recent Measles cases at a NYC medical center
- Review control measures used to minimize the impact of Measles in a hospital or clinic setting



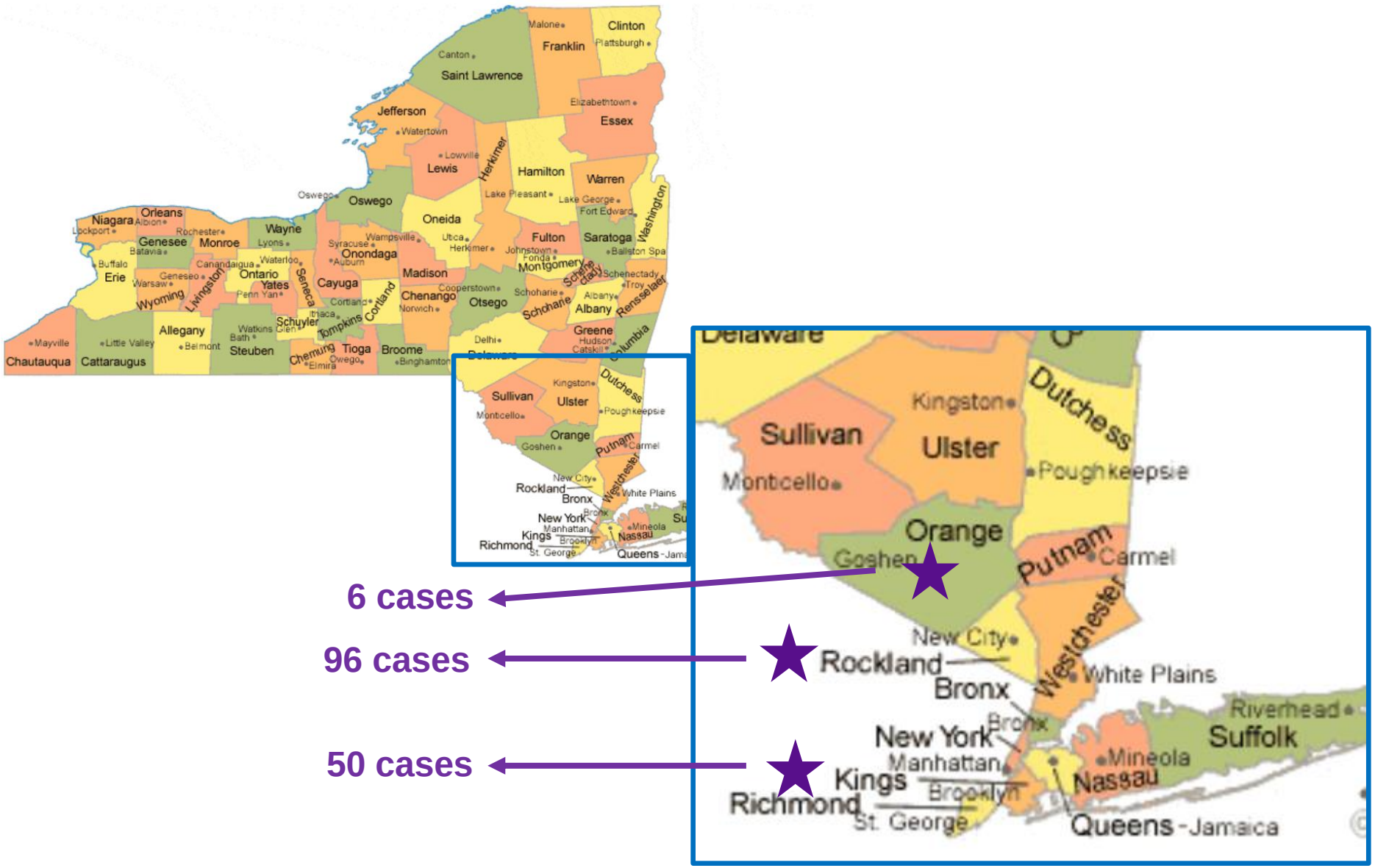


NYU Langone Health

Current Measles Outbreak – New York State & NYC

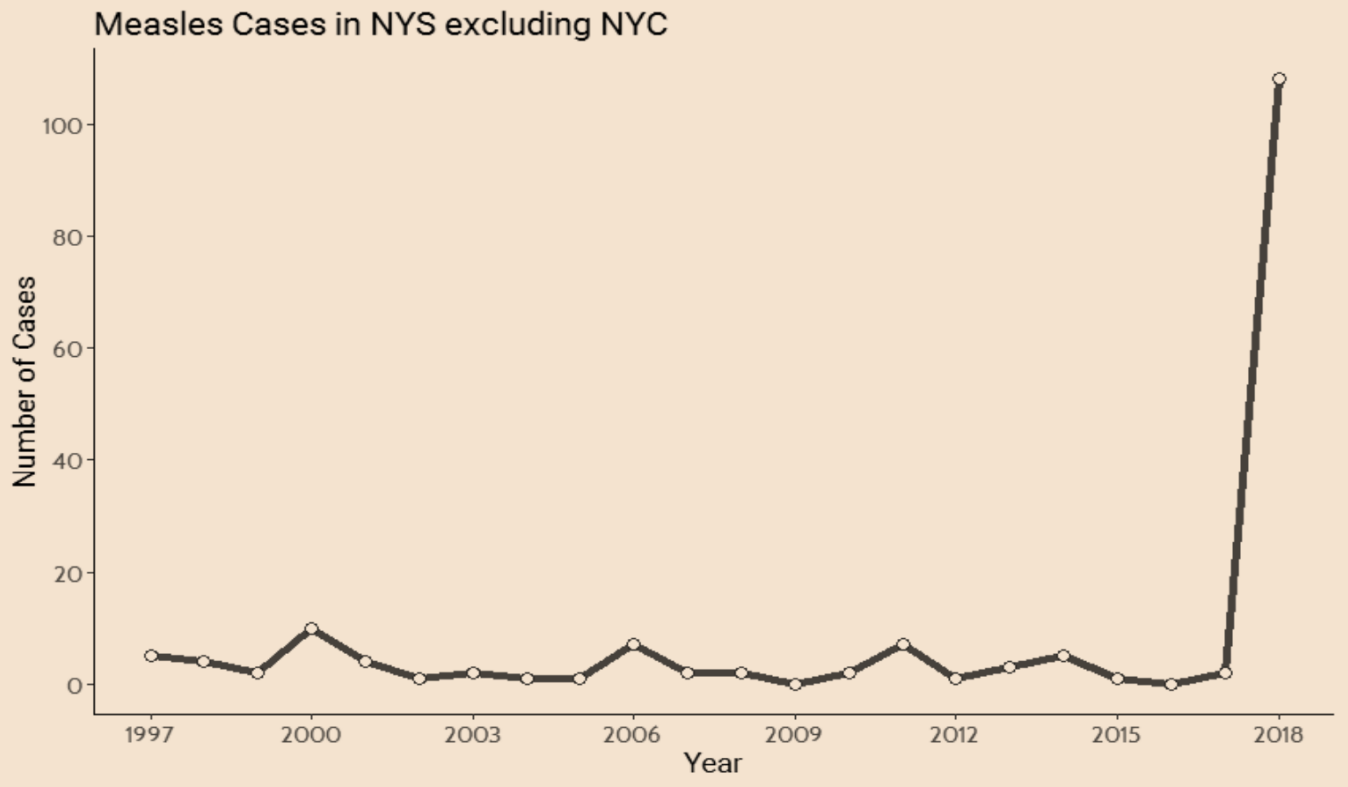
- Current Measles Outbreak
- Rockland County = 96 cases (New Square, Spring Valley, Monsey, New City)
- New York City = 50 cases (Williamsburg, Borough Park, and Bensonhurst, Brooklyn)
- Orange County = 6 cases
- Rockland County - 8 separate index cases, all with exposures to ongoing measles outbreak in Israel
- Orange County - all cases linked to outbreak in Rockland County

Current Measles Outbreak – New York State & NYC



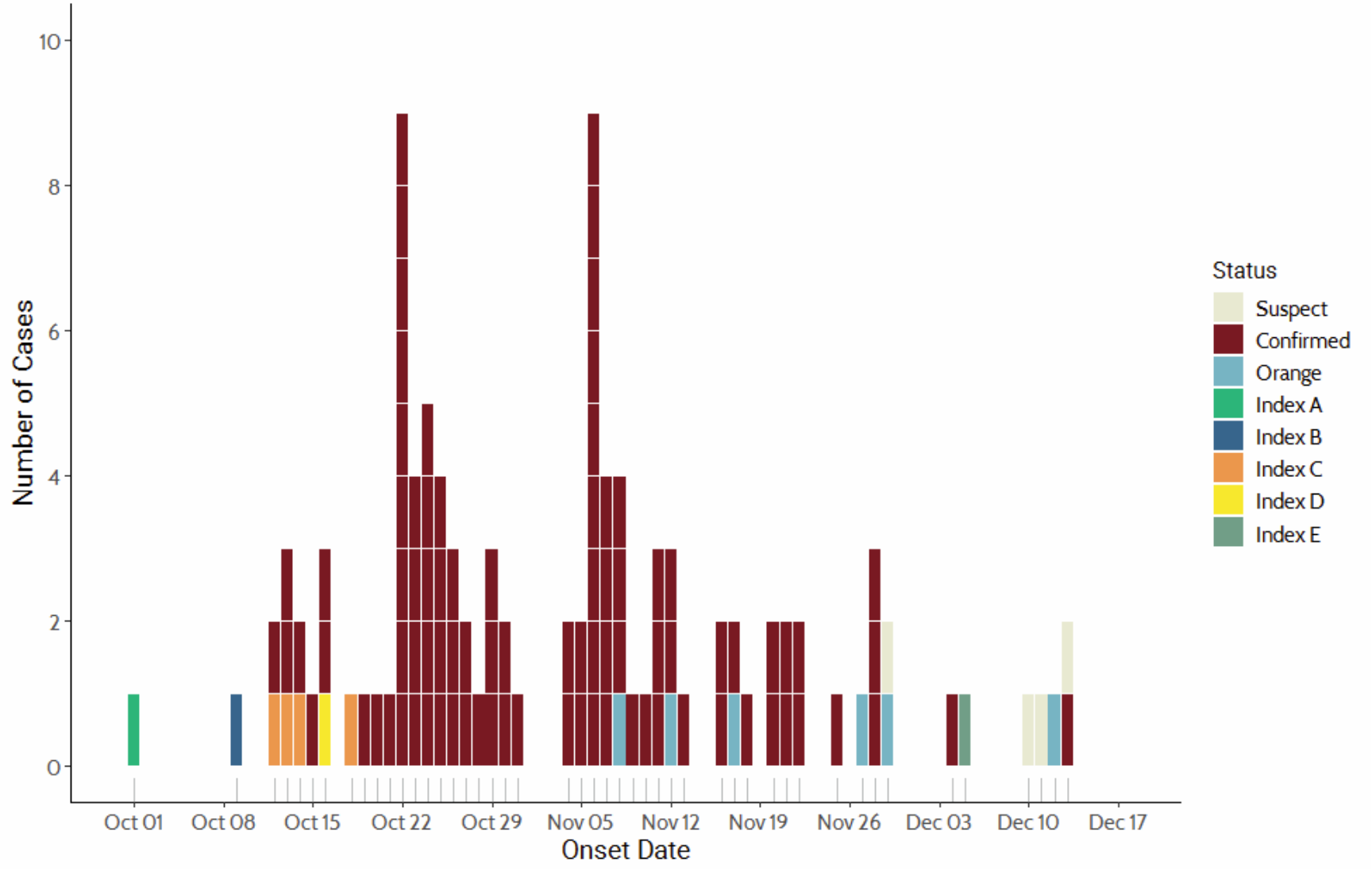
Current Measles Outbreak – New York State & NYC

- Measles Cases in NY State, 1997-2018* *As of 12-19-2018
- The current outbreak is the largest in New York State since the 1990's



NYU Langone Health

Current Measles Outbreak – New York State & NYC



NYU Langone Health

Current Measles Outbreak – New York State & NYC

- Public Health Response

- Community Outreach
- Posters
- Postings in local journals
- School visits
- Conference call with moms
- Door hangers
- PSAs
- Provider visits
- Visit school principals
- School exclusions

NYU Langone Health

Current Measles Outbreak – New York State & NYC

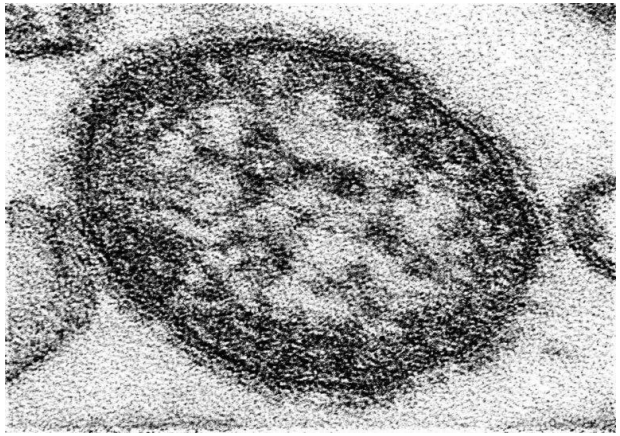
- Health Care Provider and School Support
  - Advisories
  - Clinical support
  - Fact sheets
  - Letters to school administrators
  - Epi X
  - Letters to providers
  - School exclusion algorithm

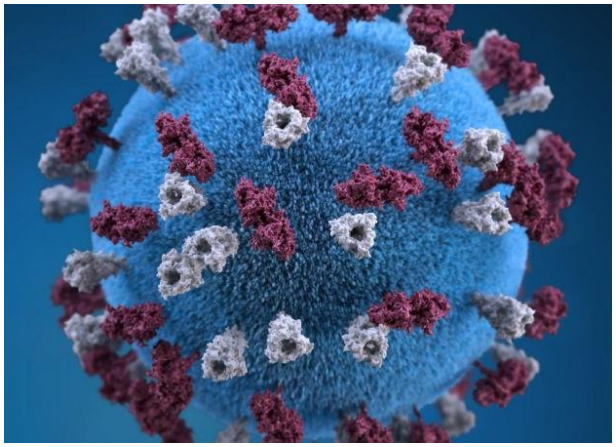
- Vaccination, Immune globulin administration

NYU Langone Health

Objectives

- ☑ Review history and pathogenesis of Measles disease
- ☑ Discuss the epidemiology of Measles in the US & NYS.
- ☑ Describe the current Measles outbreak in the NY metro area
- **Review Measles disease and Measles prevention**
- Discuss recent Measles cases at a NYC medical center
- Review control measures used to minimize the impact of Measles in a hospital or clinic setting



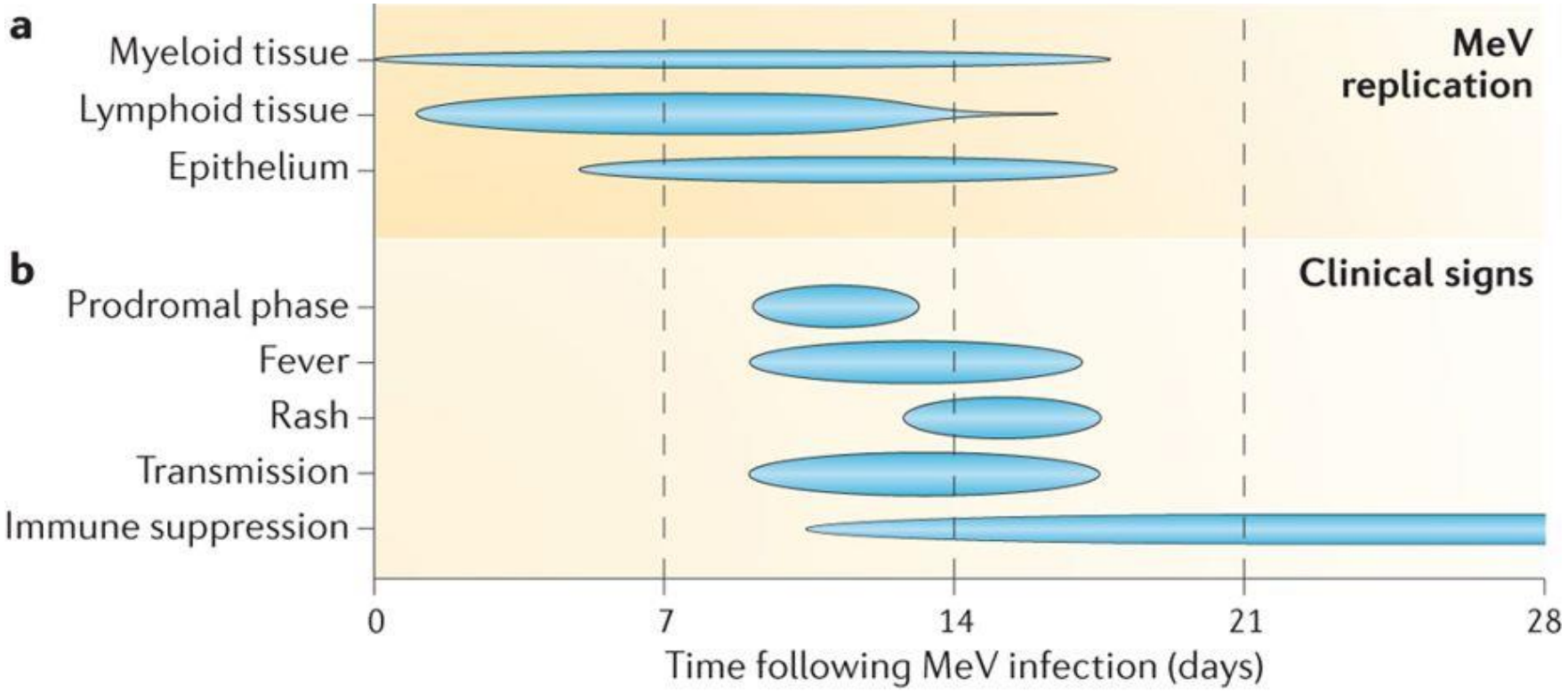


NYU Langone Health

Measles – Clinical Review

- Course of illness explained by pathogenesis
  - Inoculation of virus infects dendritic cells and lymphocytes in the respiratory tract (CD150 receptor-mediated)
  - These immune system cells spread virus throughout body
  - Virus transmitted to respiratory epithelium cells (PVRL4 receptor-mediated) directly and by lymphocytes. Virus spread to peripheral lymphoid tissues
  - Virus spread to epithelium and keratinocytes in dermis, creating rash
  - Activation of immune system creates fever, destruction of respiratory epithelium causes cough, coryza, and conjunctivitis (ocular epithelium infection)

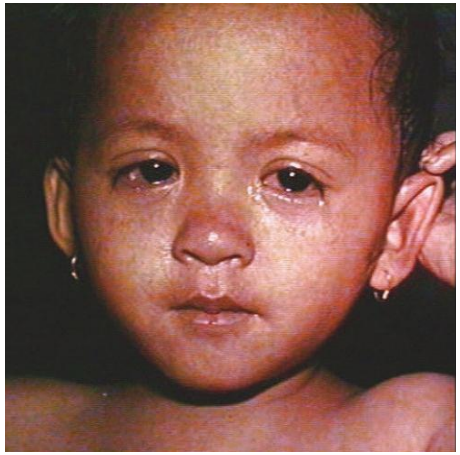
Measles – Clinical Review



NYU Langone Health

Measles – Clinical Review

- **Measles Presentation**
  - Classic Presentation: **Fever, rash, and the "three C's"**:
  - Cough
  - Coryza (redness and swelling of nasal mucosa)
  - Conjunctivitis (red, watery eyes)
- Can also have
  - Koplik spots (scattered blue-white tiny spots on a bright red background) may appear inside the mouth (think intra-oral rash)
  - Malaise
  - Diarrhea
  - Anorexia
  - Lymphadenopathy

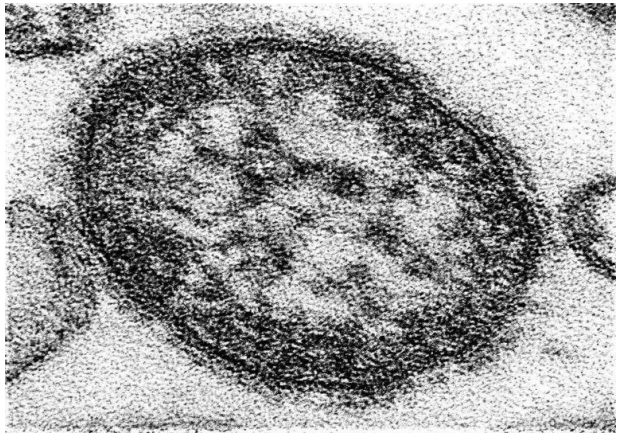


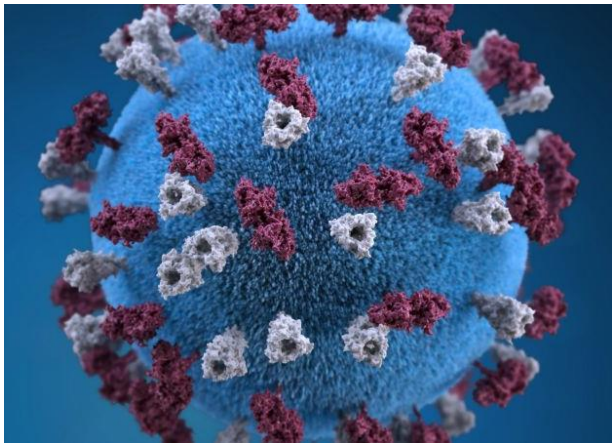
Measles – Clinical Review

- **Measles Complications**
- Children younger than 5 years of age and adults older than 20 years of age are more likely to suffer from measles complications
  - Acute otitis media (ear infections) - occurs in about 1 in 10 children with measles
  - Can result in ***permanent hearing loss***
  - Pneumonia - As many as 1 in 20 children with measles gets pneumonia, the most common cause of death from measles in young children
  - Subacute Sclerosing Panencephalitis (SSPE) – very rare delayed condition (several *years* after infection), progressive and has no known cure. Most individuals with SSPE will die within 1-3 years of diagnosis, more likely if patient under 2 yrs of age when infected

Objectives

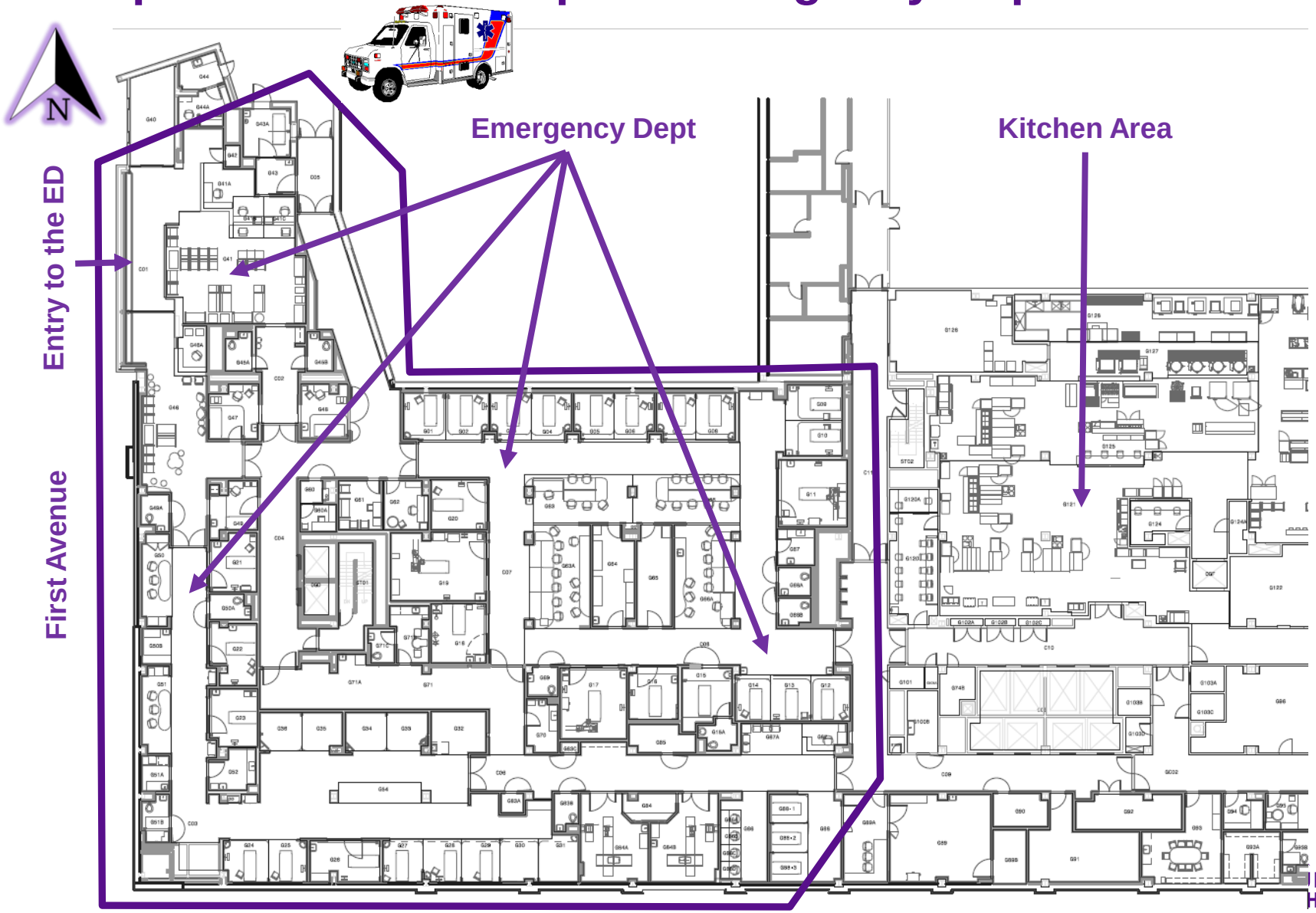
- ☑ Review history and pathogenesis of Measles disease
- ☑ Discuss the epidemiology of Measles in the US & NYS.
- ☑ Describe the current Measles outbreak in the NY metro area
- ☑ Review Measles disease and Measles prevention
- **Discuss recent Measles cases at a NYC medical center**
- **Review control measures used to minimize the impact of Measles in a hospital or clinic setting**





NYU Langone Health

Map of the Tisch Hospital Emergency Department c. 2018



Langone Health

Inpatient Measles Case Examples

- One fine Sunday evening in late September…
  a toddler < 2 y old is admitted to a very full Peds ED …
  so the patient is put in the adjacent “overflow” (adult) area, in a curtained bay next to adults…
- Initial RN notes:
  - Pt has rash all over body, s/p abx drops for red eyes. Has purulent bilat eye drainage x 3 days, Parent reports malaise x 5 days before eye drainage began. Rash began on face yesterday – still all over face, now all over body. Has runny nose.
- Initial MD notes:
  - [above repeated] No wheezing or cyanosis. Pt appears to have some increased difficulty breathing. No foreign body swallowed. No sick contacts. Was in Israel 2 weeks ago. Pt vaccinated on schedule.
- **What do you think?**

NYU Langone Health

Inpatient Measles Case Study

- After 6 hours, pt is admitted to 30+ general peds inpt unit
- Three hours later...different MD adds:
  - Pt partially vaccinated only, did not receive MMR. Rash on face, scalp, trunk, arms, palms, upper legs. Patient may have Measles, or Kowasaki's, or Roseola, or drug rash. RVP negative, so doubt enterovirus infection. Begin Airborne Precautions….
- Four hours later, case is reported to NYCDOH as possible Measles and later that day, Measles testing is collected, and results IgM and PCR positive the next day.
- **What do you think now? What do you do now?**

NYU Langone Health

Inpatient Measles Case Study

- **Differential Diagnosis of Measles / Other febrile rash illnesses**
  - Parvovirus B19 (Fifth's Disease)
  - Human Herpesvirus –6 (Roseola)
  - Enteroviruses
  - Streptococcal infection (Scarlet Fever)
  - Adenovirus
  - Infectious mononucleosis
  - Influenza: "Fleasles"
  - Dengue
  - Drug rash
- If you have a patient presenting with a febrile rash illness, consider the patient presentation and differential carefully. If measles is a concern, enact infection control practices immediately, and immediately report the case to your local health department.
- **DO NOT WAIT FOR LABORATORY CONFIRMATION TO REPORT**

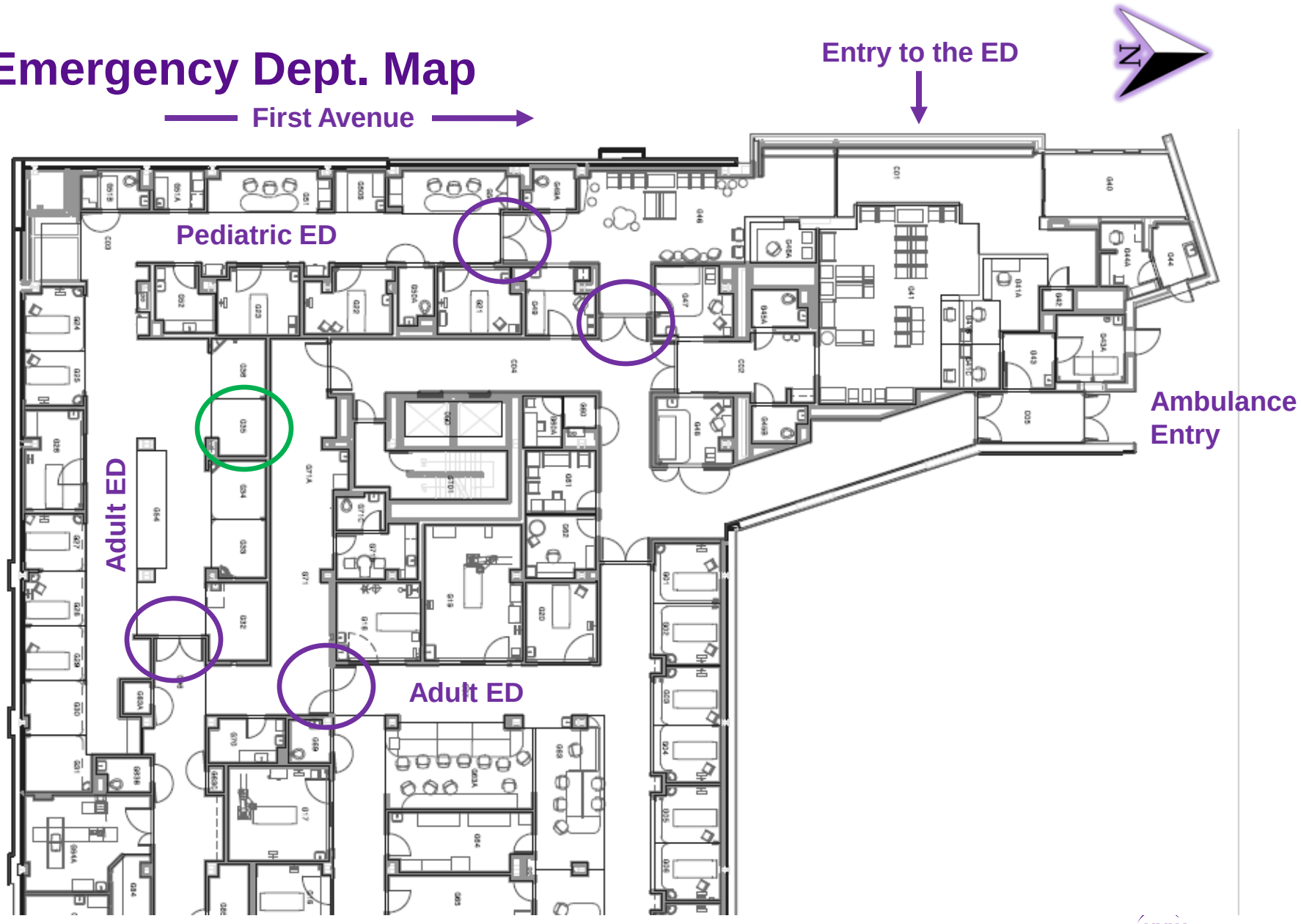
NYU Langone Health

Inpatient Measles Case Study

- Start with the usual – confirm the diagnosis (done)
- Characterize the case by person, place, & time
  - IPC team met to review facts – time spent in ED, route of travel in the ED, Room on general peds unit, layout of ED, Peds unit
  - IPC team began to gather lists of exposed staff, requested Occupational Health to verify Measles immunity for these staff … **What challenges do you think occur here?**
- IPC consulted with NYCDOH
  - Help define risks to other patients, visitors, staff, exposure "duration" (two hours beyond time patient was present)
  - Determine extent of contact tracing to be done … **What challenges do you think occur here?**

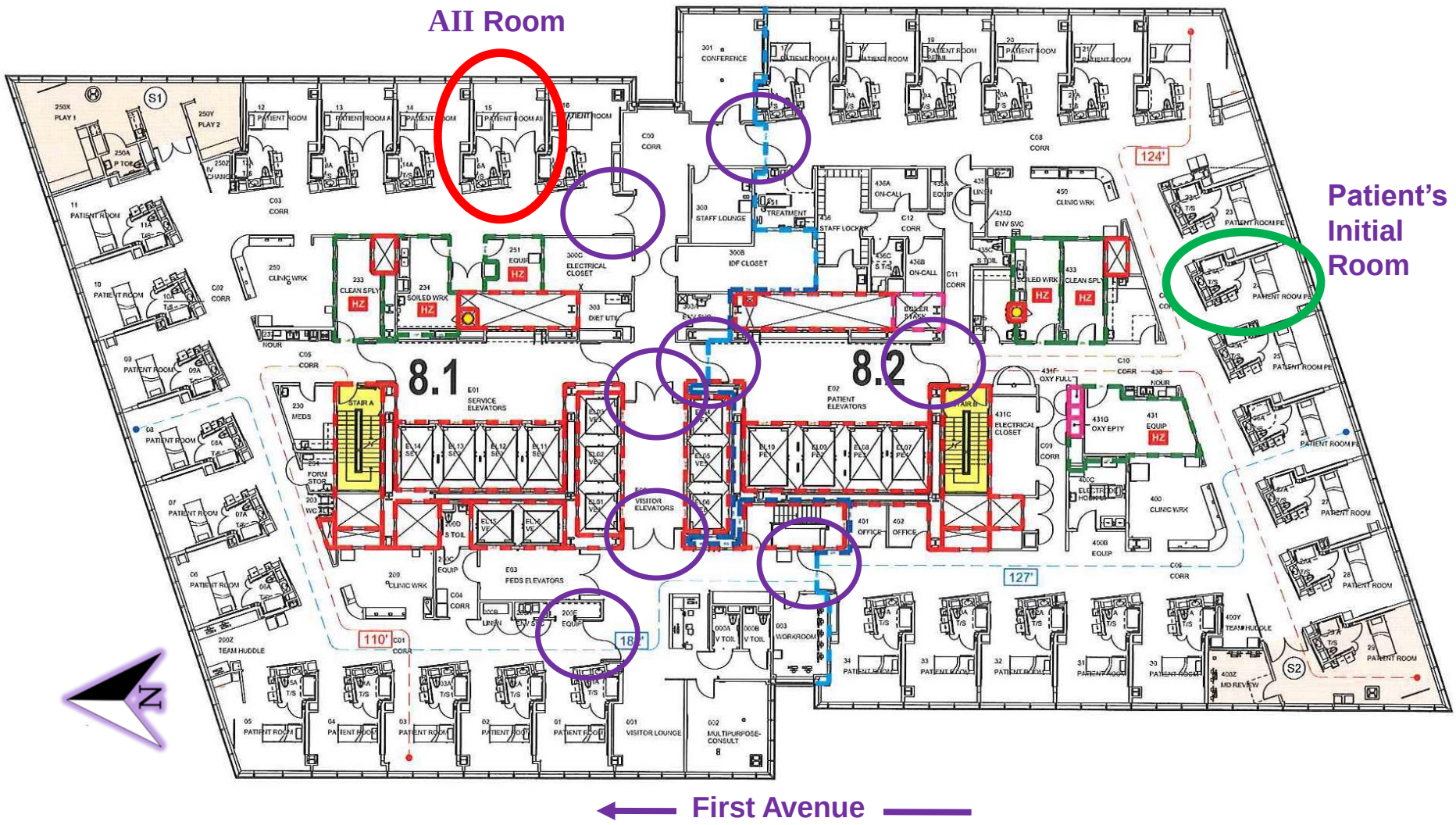
NYU Langone Health

Emergency Dept. Map



NYU Langone Health

Inpatient Pediatric Unit Map (Kimmel 8)



Inpatient Measles Case Study

- Contacts will be patients in the Pediatric and Adult ED – in the zone where the patient was, not the entire ED; similarly, and one half of inpatient Peds unit **…Why?**
- Will include family/visitors, especially on Peds unit
- Who else do we need to focus on? **What would you do about "them?"**
- Peds ID consulted to assist with treatment decisions for exposed pediatric patients, adult ID consulted similarly for adult exposed patients/visitors
- **Who else do we need to check on? The EMS crew!**

NYU Langone Health

Inpatient Measles Case Study

- **Post Exposure Prophylaxis (PEP)**
- For exposed individuals without evidence of immunity (priority includes pregnant women, infants <12 month and severely immunocompromised)
- May prevent or modify disease
- MMR vaccine or Immunoglobulin (IG), MMR and Ig cannot be given at the same time
  - **MMR vaccine**
  - Within 72 hours of initial exposure
  - Persons age ≥ 6 months
  - Vaccination should be offered at any interval following exposure to protect from future exposures
  - **IG**
  - Within 6 days of initial exposure
  - Individuals who are at risk for severe disease and complications from measles should receive IG, via IV route (not IM) for pregnant women and severely immunosuppressed
    - IGIM can be given to other exposed persons without evidence of immunity -- Priority for those with intense, prolonged contact
    - If vaccine is contraindicated

NYU Langone Health

Inpatient Measles Case Study

- When all was said and done…
  - About 120 patients' records had to be reviewed to determine where in the ED they received care
  - 58 patients/visitors exposed; many had to be called using DOH's script, took several days
  - 5 patients given RX (vaccine or IVIG)
  - 0 visitors given Rx (all were vaccinated / born before 1957
  - 25 staff exposed, all immune (some needed urgent titers)
  - 3 of 4 EMS crew quickly confirmed as immune, 4th was left to be checked by NYCDOH
- **What kinds of challenges did we face?**

NYU Langone Health

Measles in the Ambulatory Setting

- Seven cases identified at NYU clinics from Nov. 2018 to date
- Two cases generated significant exposures requiring post-exposure evaluation & prophylaxis.
  - Immunoglobulin
  - MMR
  - Check immunity
  - Quarantine for 21 days after exposure
- IPC involved in the follow up of both
- What about the other 5???
  - IPC notified after the fact
  - Patients examined outside of the clinic

NYU Langone Health

Measles in the Ambulatory Setting

Case # 1. Exposure date 11/13/18

4 month old female presenting with cough runny nose x 2 days, fever, sore throat, nausea, vomiting, diarrhea, rashes, and ear pain. Dx - Viral URI and discharged. Returned following day with worsening fever and rash. Patient examined in the car for the 2nd encounter. IgM and measles PCR nasal swab obtained and sent to the DOH lab. IPC notified of POSITIVE Measles results by DOH on 11/16/18 (Friday afternoon). Clinic closed for the day.

Discuss……

- No. of exposed individuals 26 (patients & relatives)
- Immune (i.e., had 2 doses of MMR) - 6
- Contacts requiring Immunoglobulin - 3
- 2nd dose MMR needed/given - 5
- IgG positive titers - 1

NYU Langone Health

Measles in the Ambulatory Setting

Case # 2. Exposure date 12/16/18 and12/17/18

8 month old male presenting with cough and runny nose x 2 days, No sore throat, rash or conjunctivitis, dx - URI. Returned the next day with worsening fever and now has rash, ear pain, conjunctivitis, D&V, dx - Acute viral conjunctivitis of both eyes along with fever of unspecified cause. Retuned to clinic on 12/18/18 (seen outside). Measles suspected. Parent disclosed contact with someone with Measles at a family gathering 3 ½ weeks ago and was given MMR prophylaxis.

- Total no. exposed - 21
- Immune contacts (i.e., had 2 doses of MMR) - 8
- Non-vaccinated contacts – 4
- Contacts given Immunoglobulin – 4
- What happened to the rest of the exposed individuals?
  - Declined any intervention
  - Lost to follow up

NYU Langone Health

Measles in the Ambulatory Setting

Case # 3 - 1/11/19

- Adult male presented to an ambulatory location with diffuse rash and history of subjective fever, cough, and runny nose. Negative for conjunctivitis. Onset 6-7 days ago, History of contact with friends who traveled from Hong Kong.
- Physician suspects Measles and orders IgM, no Measles PCR nasal swab was collected

  1/14/19 - IgM positive, IgG negative, Remember - no PCR swab was obtained

  DOH verdict - False positive, further testing to be done and serum sample to CDC lab to re-test

  Hong Kong does not have any ongoing Measles outbreak

- https://wwwnc.cdc.gov/travel

NYU Langone Health

Measles in the Ambulatory Setting

- Challenges
- Lack of Airborne isolation facilities
  - Only one clinic has airborne isolation room in Staten Island!
- Information regarding exposures difficult to obtain in a timely manner
  - First ambulatory case was an incidental finding
- Unclear workflows
  - Who does what?
- Access to DOH lab to expedite testing
- Staff not familiar with the process of reporting and notification of communicable diseases
  - Clinics that have recently transitioned to our institution not always familiar with IPC role in ambulatory setting

NYU Langone Health

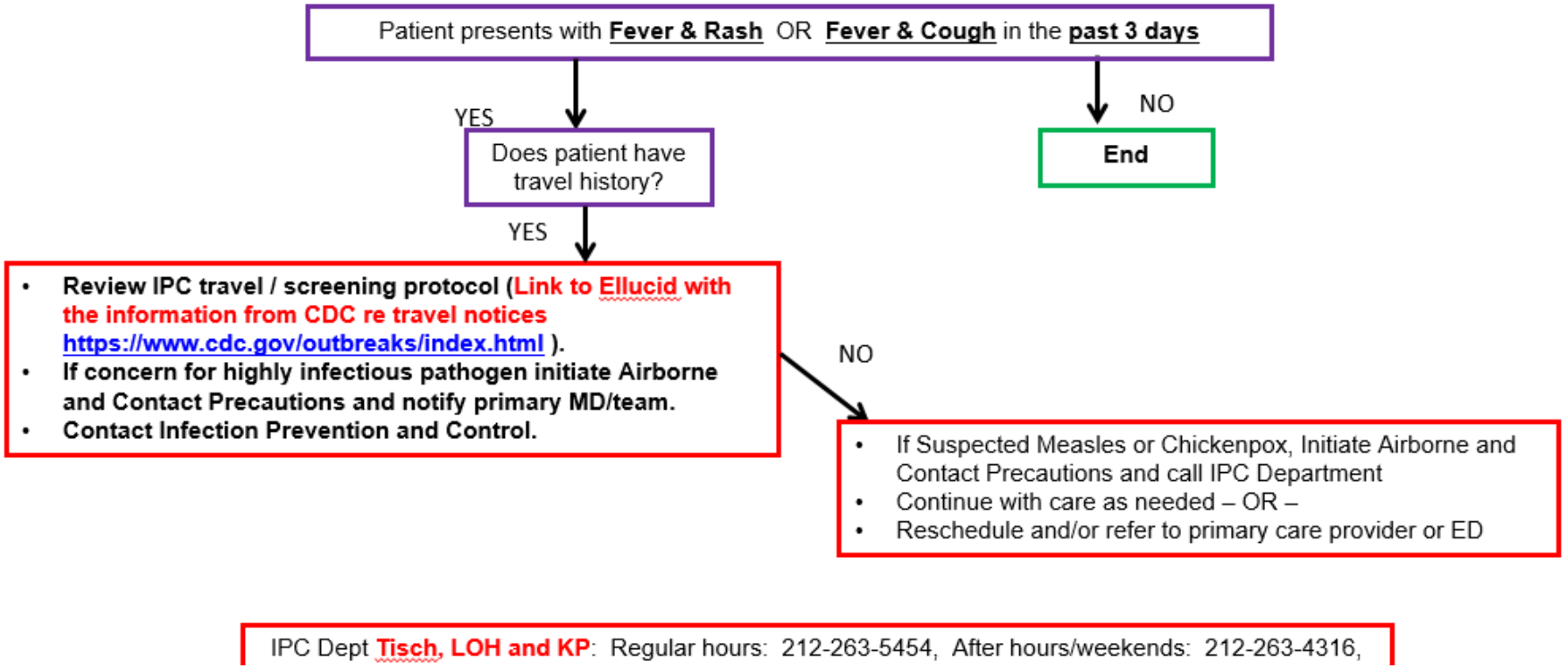
Measles in the Ambulatory Setting – Patient Screening

NYU Langone MEDICAL CENTER

Highly Infectious Communicable Disease and Emerging Pathogens Screening Algorithm ED/Inpatient

v. 9.13.2018

Clinical Staff:



IPC Dept Tisch, LOH and KP: Regular hours: 212-263-5454, After hours/weekends: 212-263-4316,

NYU Langone Health

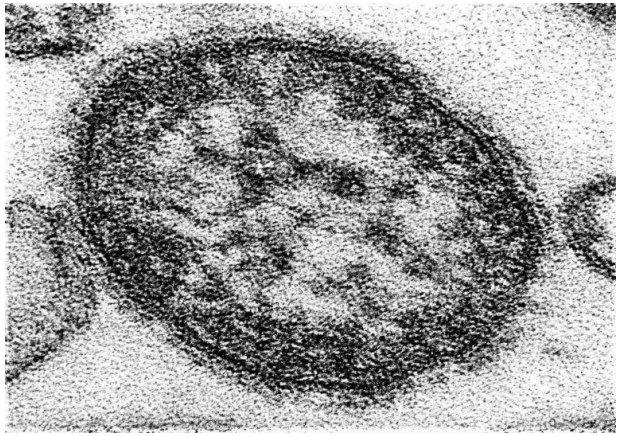
Measles in the Ambulatory Setting

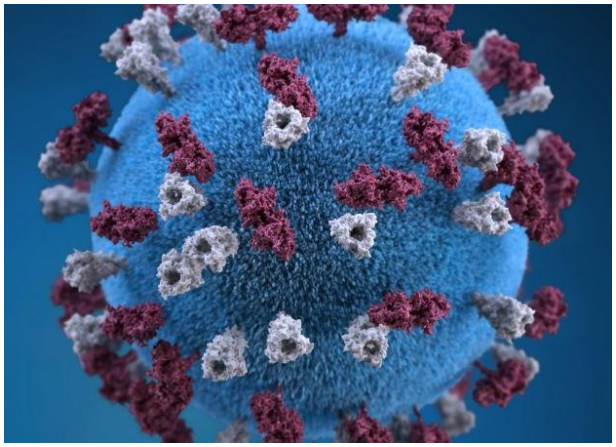
- Strategies
- Enhanced screening of patients by intake staff – Messaging our communicable disease screening algorithm
- Targeted screening of patients when booking appointments – clinic actively asking for symptoms (fever & rash) before scheduling appointments
- ‘Side walk’ consultation – when it is safe to do, clinicians evaluating patient in a car or an alternative location to minimize exposures indoors
- Engaging the DOH in a timely manner. This will aid in expediting testing and timely prophylaxis
- Provider education – Alerts to ED & Ambulatory clinics – 1 page educational updates to providers

NYU Langone Health

Objectives

- Review history and pathogenesis of Measles disease
- Discuss the epidemiology of Measles in the US & NYS.
- Describe the current Measles outbreak in the NY metro area
- Review Measles disease and Measles prevention
- Discuss recent Measles cases at a NYC medical center
- Review control measures used to minimize the impact of Measles in a hospital or clinic setting





NYU Langone Health

References

- https://en.wikipedia.org/wiki/Canine_distemper
- https://en.wikipedia.org/wiki/Rinderpest
- https://en.wikipedia.org/wiki/Measles
- The Leeuwenhoek Lecture 2001. Animal origins of human infectious disease, W. Hamilton, R. A. Weiss, S. Wain–Hobson, and Robin A. Weiss. Philosophical Transactions of the Royal Society of London. Series B: Biological Sciences, 29 June 2001, Volume 356, Issue 1410 (https://doi-org.ezproxy.med.nyu.edu/10.1098/rstb.2001.0838)
- Measles and immunomodulation, Sheldon G. Cohen, MD. The Journal of Allergy and Clinical Immunology, February 2008, Volume 121, Issue 2, pp 543–544 (https://www.jacionline.org/article/S0091-6749(07)03604-4/fulltext)
- Pathogenesis Of Measles Virus Infection: An Hypothesis For Altered Immune Responses, Diane E. Griffin, Brian J. Ward, Lisa M. Esolen. The Journal of Infectious Diseases, Volume 170, Issue Supplement 1, 1 November 1994, pp S24–S31 (https://doi.org/10.1093/infdis/170.Supplement_1.S24)
- Pathological consequences of systemic measles virus infection. Martin Ludlow, Stephen McQuaid, Dan Milner, Rik L de Swart, W. Paul Duprex. Journal of Pathology, 2015 Jan;235(2):253-65. (https://onlinelibrary.wiley.com/doi/full/10.1002/path.4457)

NYU Langone Health

References

- Pathological consequences of systemic measles virus infection. Martin Ludlow, Stephen McQuaid, Dan Milner, Rik L de Swart, W. Paul Duprex. Journal of Pathology, 2015 Jan;235(2):253-65. (https://onlinelibrary.wiley.com/doi/full/10.1002/path.4457)
- The pathogenesis of measles revisited. Rik L. de Swart. The Pediatric Infectious Disease Journal. 27(10):S84-S88, Oct. 2008 (https://www.ncbi.nlm.nih.gov/pubmed/18820585)
- Measles Virus (Rubeola). Anne A. Gershon, in Mandell, Douglas, & Bennett's Principles and Practice of Infectious Diseases, 8th edition, Elsevier Saunders, Philadelphia, PA. 2015, pp1967-1973
- Measles. Paul A. Rota, William J. Moss, Makoto Takeda, Rik L. de Swart, Kimberly M. Thompson & James L. Goodson. Nature Reviews Disease Primers volume 2, Article number: 16049, published 14 July 2016. (https://www.ncbi.nlm.nih.gov/pubmed/27411684)
- CDC – Measles (Rubeola) - Measles Cases and Outbreaks – Measles Cases in 2018 https://www.cdc.gov/measles/cases-outbreaks.html
- CDC – National Center for Health Statistics, Measles, Mumps, Rubella – Morbidity (table 33) https://www.cdc.gov/nchs/fastats/measles.htm
- NYS Map from https://geology.com/county-map/new-york.shtml

NYU Langone Health

References

- Measles Review for Providers - Responding to New York State's largest outbreak since measles elimination (https://www.health.ny.gov/publications/2170/)
- Centers for Disease Control and Prevention. *HIV Surveillance Report, 2016*; vol. 28. http://www.cdc.gov/hiv/library/reports/hiv-surveillance.html. Published November 2017. Accessed 1/15/19.
- CDC. National Center for Health Statistics. Table 33. Selected nationally notifiable disease rates and number of new cases: United States, selected years 1950–2016. (https://www.cdc.gov/nchs/fastats/stds.htm)
- Contagious Diseases in the United States from 1888 to the Present. Willem G. van Panhuis, M.D., Ph.D., John Grefenstette, Ph.D., Su Yon Jung, Ph.D., Nian Shong Chok, M.Sc., Anne Cross, M.L.I.S., Heather Eng, B.A., Bruce Y. Lee, M.D., Vladimir Zadorozhny, Ph.D., Shawn Brown, Ph.D., Derek Cummings, Ph.D., M.P.H., and Donald S. Burke, M.D. N Engl J Med 2013; 369:2152-2158. 11/28/2013. DOI: 10.1056/NEJMms1215400
- NYSDOH - Measles Review for Providers; Responding to New York State's largest outbreak since measles elimination, November 28, 2018 (https://www.health.ny.gov/publications/2170/)

NYU Langone Health

THANK YOU!

- Steve Bock RN CIC FAPIC
  - steven.bock@nyulangone.org
  - 212-263-5454

- Jacqueline Obado MPH BS RN
  - jacqueline.obado@nyulangone.org
  - 212-263-5454

  - **NYU Langone Health**

NYU Langone Health