

# Are you ready for a measles outbreak? Lessons learned from Children's Minnesota

SE Minnesota Disaster Health Coalition Symposium  
October 9, 2018

## Children's Minnesota

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# Disclosures

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Nothing to disclose

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Nothing to disclose

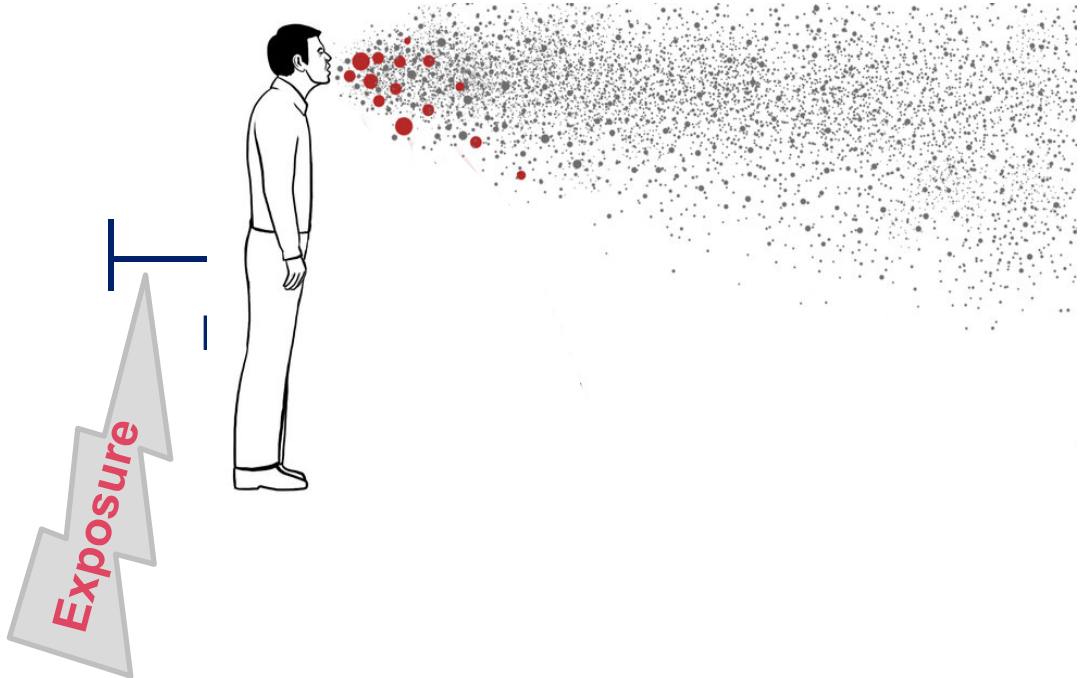
Ken Combs, CPP, EMCP-Mn

Nothing to disclose

# Objectives

- Recognize basic clinical features of measles and how those impact an event response.
- Describe exposure reduction interventions implemented at Children's MN during the 2017 Minnesota measles outbreak.
- Discuss the Children's MN post-exposure response plan, including prophylaxis and prioritization of exposed individuals.
- Explain the benefits of the Hospital Incident Command System in responding to infectious disease events and other public health emergencies.
- Review a pre-event planning questionnaire and apply the concepts to one's own organizational planning activities.

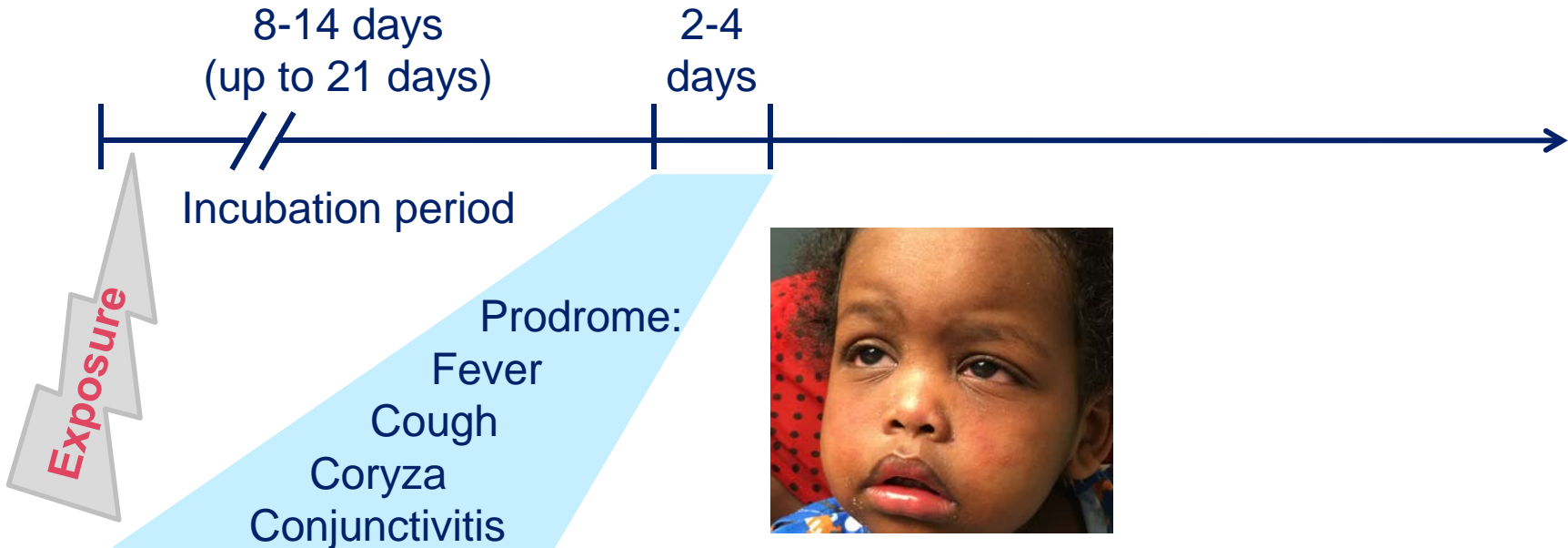
# Measles clinical course



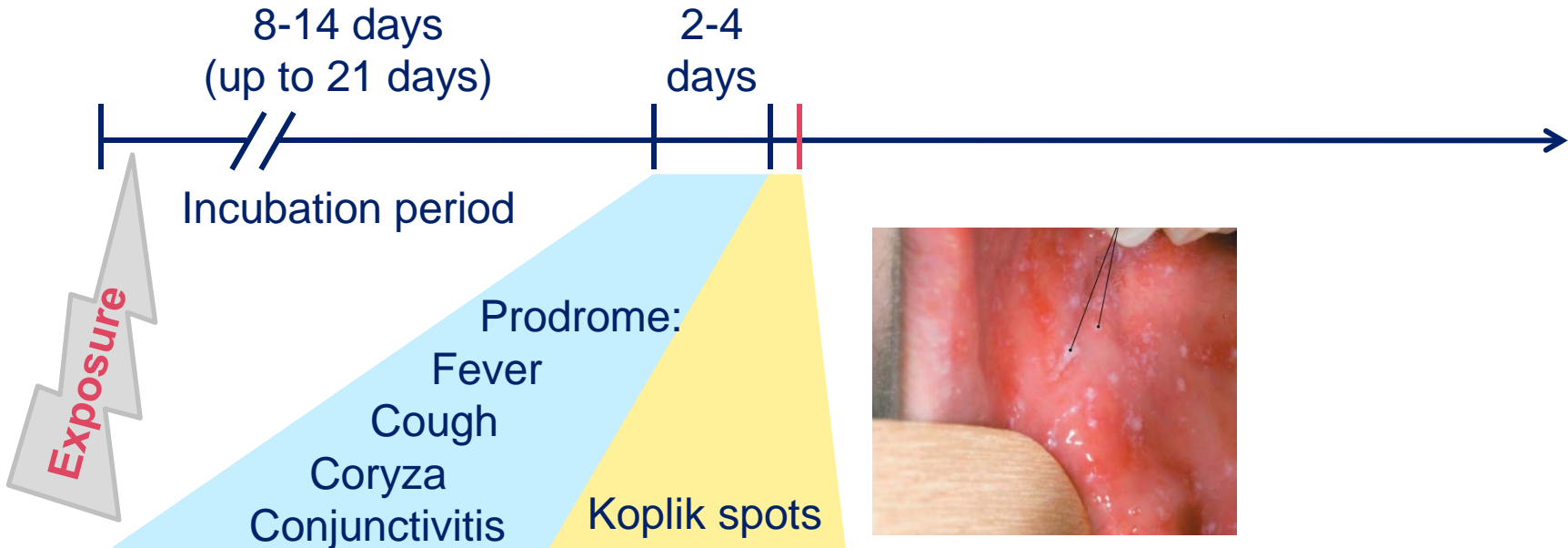
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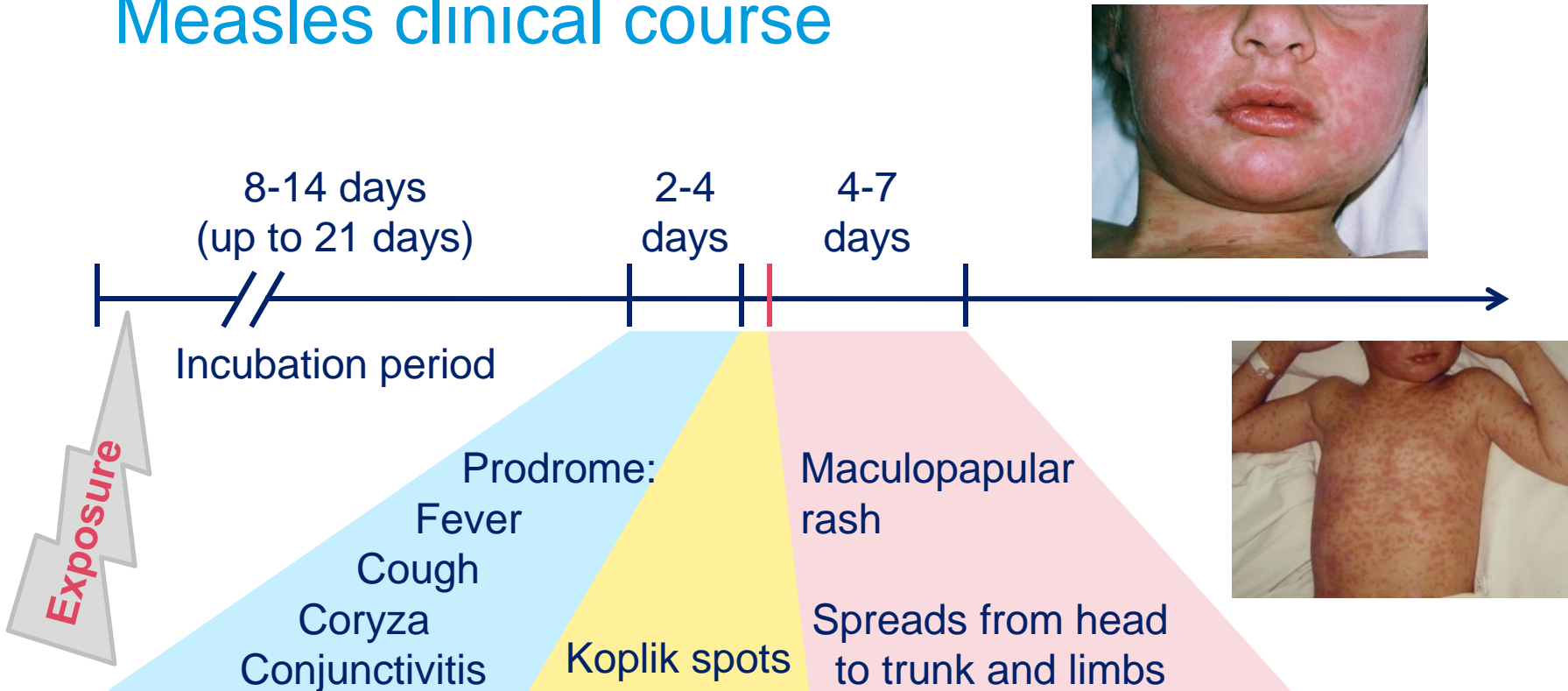


# Measles clinical course

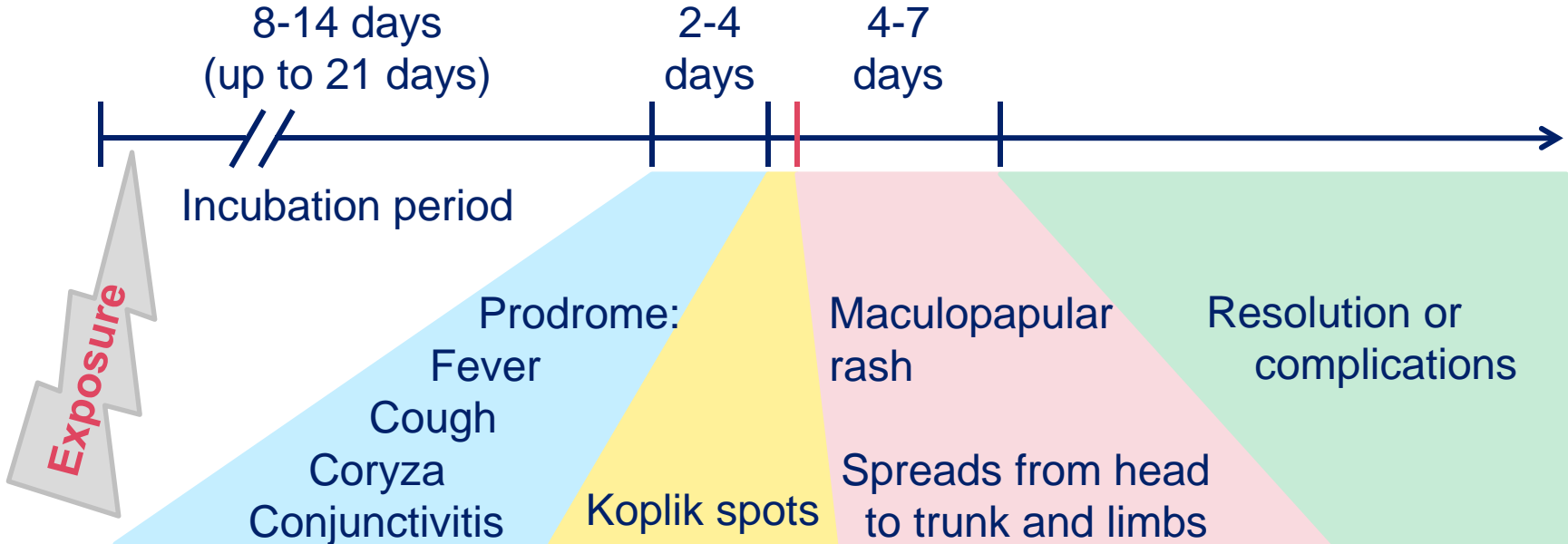




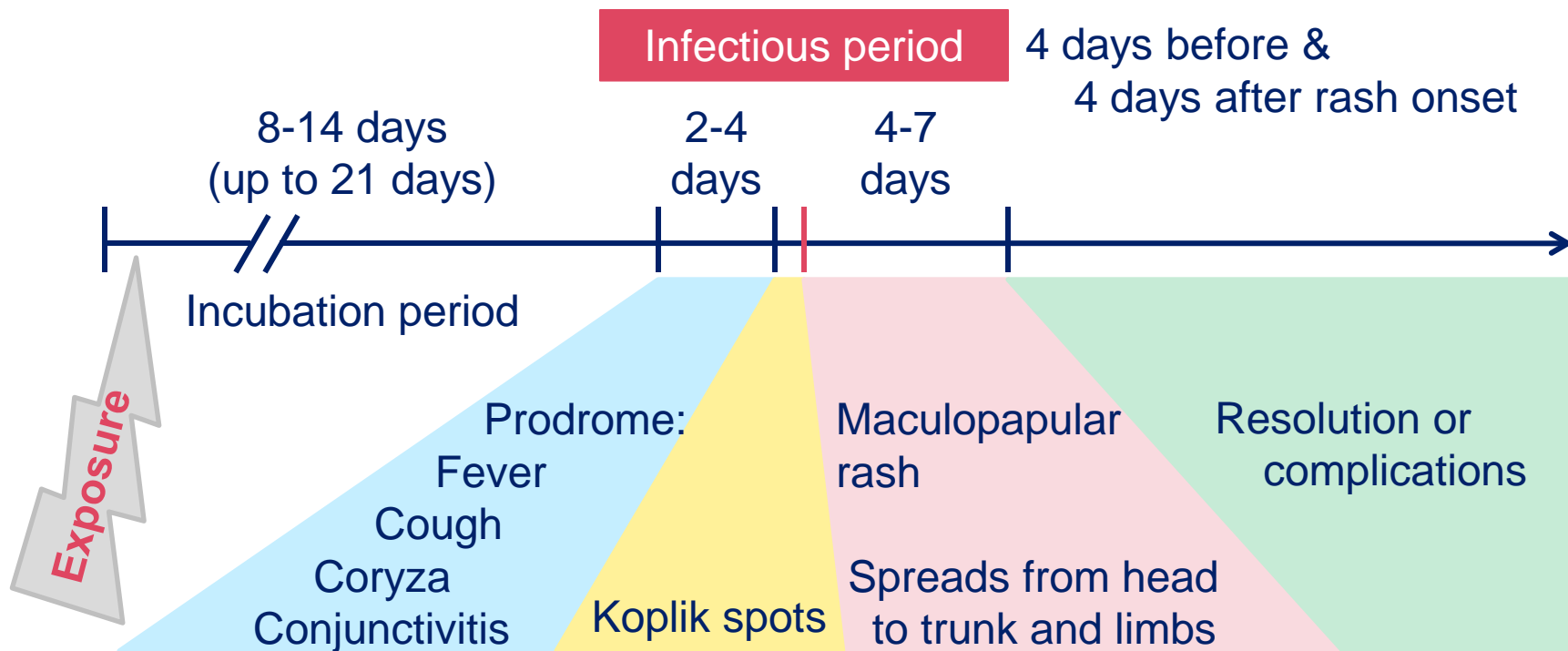
# Measles clinical course



# Measles clinical course



# Measles clinical course



## Measles complications

- Otitis media
- Pneumonia
- Bronchitis
- Diarrhea
- Acute encephalitis (1 in 1,000 measles cases)
- Death (1-2 in 1,000 children infected with measles)
- Subacute sclerosing panencephalitis (SSPE)
  - Develops 7-10 years after measles infection
  - Incidence is likely higher than previously thought

# Measles rash



Amoxicillin rash



Strep rash



**Measles rash**

# Measles rash in children of color



## Measles – outbreak status

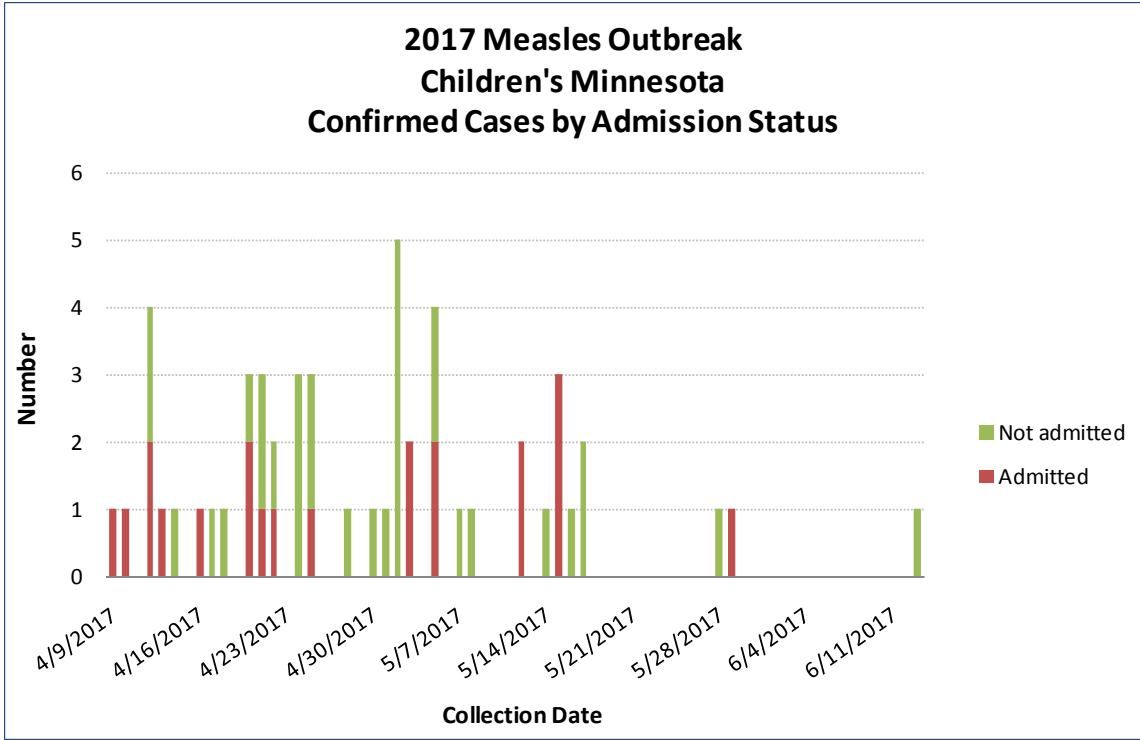
### Minnesota:

- 75 total cases
- 91% confirmed unvaccinated
- 93% in children under 10 years of age
- 61 cases in Minnesotan Somali community

### Children's MN:

- 275 patients tested at Children's
- 41 cases confirmed at Children's
- 52 cases cared for at Children's
- 100% of the outbreak's inpatient admissions occurred at Children's
  - 21 children admitted
  - One child readmitted for 22 hospitalizations

# Children's confirmed cases





## Children's exposures

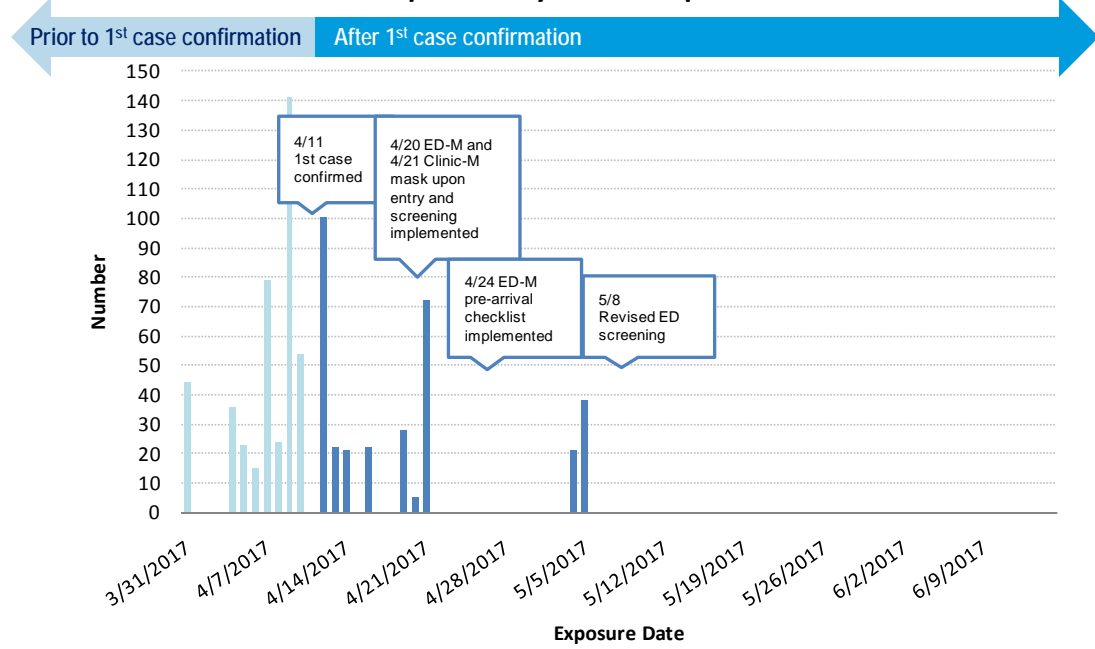
- Total exposures: 745 individuals in 3 locations
  - ED: 638
  - General pediatrics clinic: 64
  - Inpatient unit: 43
- Eligible for post-exposure prophylaxis: 173
- Received post-exposure prophylaxis: 138
  - IMIG: 90
  - IVIG: 21 immunocompromised
  - MMR: 27

## How to stop a measles outbreak

- Decrease transmission of and the number of individuals exposed to measles virus
  - Rapid identification and isolation of potential cases
  - Post-exposure prophylaxis or exclusion of exposed
- Increase the number of individuals in the community with immunity to measles
  - Vaccination rates must be close to 95% to prevent measles transmission

# Exposure prevention measures

## 2017 Measles Outbreak Children's Minnesota Exposures by Date of Exposure



## Decrease exposure: intervention measures

- Universal masking of all patients/families
- Updated ED and clinic screening tool to be more inclusive of patients without history of travel
- Reduced “clicks” to access state vaccine registry from EMR
- Immediately isolated patients meeting screening criteria
- Pre-arrival checklist

**MEASLES ALERT**

**HENNEPIN COUNTY IS CURRENTLY EXPERIENCING A MEASLES OUTBREAK.**  
Children's Minnesota is working to ensure all patients are healthy and protected.

To enter the Emergency Department triage,  
**EVERYONE MUST WEAR A MASK.**

Intadaan soo galiin Emergencigaa,  
**WAA INAAD HIRAATAN MASK.**

Para entrar al área de registro del departamento de Emergencias,  
**TODO EL MUNDO DEBE USAR MASCARILLA.**

Thank you for your cooperation.

Children's  
MINNESOTA

## Decrease exposure: management of inpatients

- Assessed admitted measles patients daily
- Updated transmission-based precautions as needed
- Worked with bed placement daily
- Daily face-to-face with charge RN and other staff to answer questions and assess needs
- Provided education and information related to care at home, especially if discharged during infectious period
- Limited visitors to only parents/guardians

## Decrease exposure: facility management

- Created temporary Airborne Infection Isolation (AII) rooms in ED and for inpatient unit
- Implemented process to monitor functionality of temporary AII rooms
- Worked collaboratively with supply chain to increase levels of PPE
- Purchased additional portable HEPA filter units for clinic



# Decrease exposure: visitor guidance



## VISITOR GUIDELINES



### Legal guardians and visitor wellness screening tool

To protect our patients, please do not visit today if you do not feel well or if you answer "yes" to any of these questions:

	No	Yes
<p><b>Measles Screening:</b>            Have you been informed that you've been exposed to measles in the past three weeks? *</p> <p>*If yes to this question, mask the exposed person, and exclude from visiting.            *If the exposed person is a legal guardian, page infection prevention at 651-629-4444</p>		
<p><b>Symptom Screening:</b>  <b>Do you have:</b>            Fever?            Cough?            Runny nose, sore throat or other cold symptoms?            Diarrhea or vomiting?</p>		

## Decrease exposure: employee safety

- MMR as a condition of employment
- Supply chain increased stock of N95 respirators
- Provided education/information to charge nurses daily
- Worked with employee health services to verify staff measles immunity (documentation of MMR, serology, previous disease, birth before 1957)
- Increased presence and rounding on the units most impacted by the outbreak





## Selected exposures resulting in infections

- Children's ED exposures
  - Triage RN: prolonged exposure to two initial cases prior to suspecting measles, fully vaccinated with 2 MMR, not wearing a respirator
  - Mother of patient: believed herself to be immune, but was not
    - ↳ 3-month old at home was subsequently exposed and infected when mom developed measles
- Unknown location
  - Sibling of inpatient: unvaccinated by parent choice, also visited neighborhood businesses
    - ↳ Went on to expose and infect 3 unvaccinated siblings and 2 unvaccinated cousins in two additional Minnesota counties

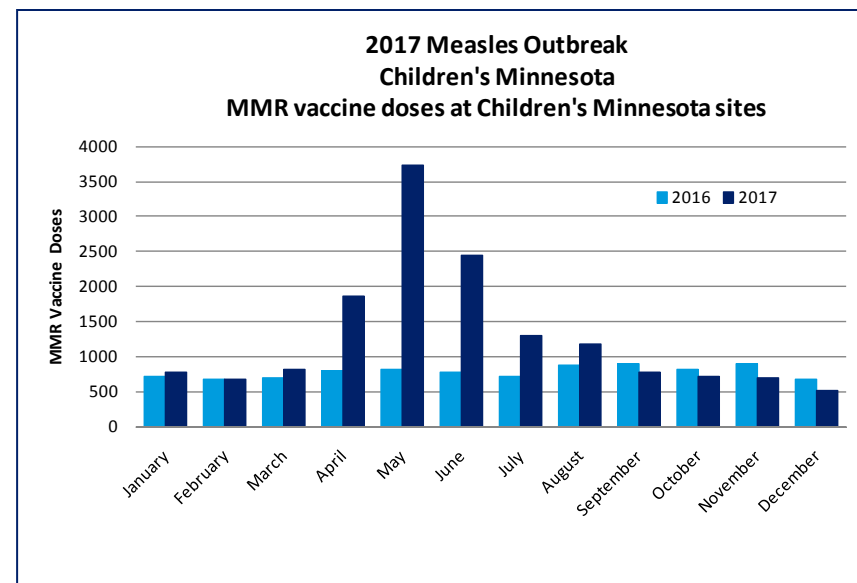
# Increase community immunity: MMR vaccine uptake

## State:

- MDH recommended an accelerated vaccine schedule
- MMR administered above statewide baseline: 51,706 doses

## Children's MN:

- MMR vaccine uptake increased by **325%** May-July 2017 compared to May-July 2016



# Increase community immunity: working with the Minnesota Somali Community

- Somali employee resource group
- Somali clinicians listening dinner
- Ramadan meetings and dinners
- Phone conversations and really listening
- Imam meetings
- Public meetings
- Day-to-day 1:1
- Translated materials



# PEP window



## Measles Post-Exposure Prophylaxis (PEP) for Non-Symptomatic Susceptible Contacts

### To determine appropriate post-exposure prophylaxis:

1. Determine patient's risk factor and identify time from first exposure to measles case.
2. Read the reminders and footnotes for definitions and special considerations.
3. Contact MDH with questions or if further guidance is needed (651-2014-5414 or toll free 1-877-676-5414).

Risk Factor	Time from first exposure <sup>1</sup>	
	< 72 hours	72 hours through day 6
Infant less than 6 months old	Give intramuscular IG <sup>2</sup> (IGIM): 0.5 mL/kg <sup>3</sup>	Give IGIM <sup>2</sup> : 0.5 mL/kg <sup>3</sup>
Infant age 6 through 11 months	Give IGIM <sup>2</sup> : 0.5 mL/kg <sup>3</sup> or Give MMR <sup>4</sup> vaccine	Give IGIM <sup>2</sup> : 0.5 mL/kg <sup>3</sup>
Susceptible <sup>4</sup> pregnant woman	Give intravenous IG <sup>2</sup> (IGIV): 400 mg/kg	Give IGIV <sup>2</sup> : 400 mg/kg
Severely immunocompromised <sup>5</sup>	Give IGIV <sup>2</sup> : 400 mg/kg	Give IGIV <sup>2</sup> : 400 mg/kg
Susceptible close contact over 1 year old <sup>6</sup>	Give MMR <sup>2</sup> vaccine if no contraindications	Give IGIM <sup>2</sup> : 0.5 mL/kg to those <66 pounds (≥66 pounds, see footnote 6)



# PEP window

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Infant age 6 through 11 months	Give IGIM <sup>2</sup> : 0.5 mL/kg <sup>3</sup> <b>or</b> Give MMR <sup>1</sup> vaccine	Give IGIM <sup>2</sup> : 0.5 mL/kg <sup>3</sup>
Susceptible <sup>4</sup> pregnant woman	Give intravenous IG <sup>2</sup> (IGIV): 400 mg/kg	Give IGIV <sup>2</sup> : 400 mg/kg
Severely immunocompromised <sup>5</sup>	Give IGIV <sup>2</sup> : 400 mg/kg	Give IGIV <sup>2</sup> : 400 mg/kg
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## A child comes to the ED....

- 2 years old
- 4 day history of fever
- Rash that started the day prior
- Cough and congestion
- No travel history
- Vaccine up to date except 1 MMR
- Diagnosed with otitis media 5 days prior and started on amoxicillin
- Hospitalist believes this is likely a rash from the amoxicillin
- Measles in differential but suspicion for measles is low

# ...measles is confirmed

- Contagious period = 4 days before and 4 days after rash onset



**MEASLES**

is **highly contagious** and spreads through the air when an infected person **coughs or sneezes**.

It is so contagious that if one person has it, **9 out of 10 people** of all ages around him or her will also become infected if they are not protected.

The infographic features a CDC logo and a visual of 10 human figures: one red figure (infected) and nine yellow figures (susceptible), illustrating the 9 out of 10 statistic.

# Exposure assessment

- Determine if exposures occurred



## Airborne Precautions

**Door must remain completely closed at all times.**

**Family and visitors**

- Verify family/visitor immune status - check with nurse before entering
- Wear if soiling with care involving blood or body fluids
- Hand hygiene when entering and leaving room

**Staff**

In addition to Standard Precautions:

- Airborne infection isolation (AII) room required - audible alarm, notify facilities
- Hand hygiene when entering and leaving room
- Staff immunity requirements must be met to enter

**Patient care equipment**

- Disinfect equipment when removing from room

**Transport**

- Unit transport for essential purposes only
- Patient wear mask

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# The clock is ticking!

- Identify post-exposure prophylaxis window



## Meanwhile...

...you find out the patient in the room next door (who has been inpatient for 4 days and not in airborne precautions) is being tested for measles.

**“I was called to assess pt due to new onset of rash on his face. No worsening on WOB. Still febrile.”**


**“Patient's mom mentioned that his friend from Daycare, which usually plays with him, is admitted to the hospital with concern for Measles.”**



2011 Minnesota Measles Outbreak

Ready to respond

# Measles triage and testing decision grid

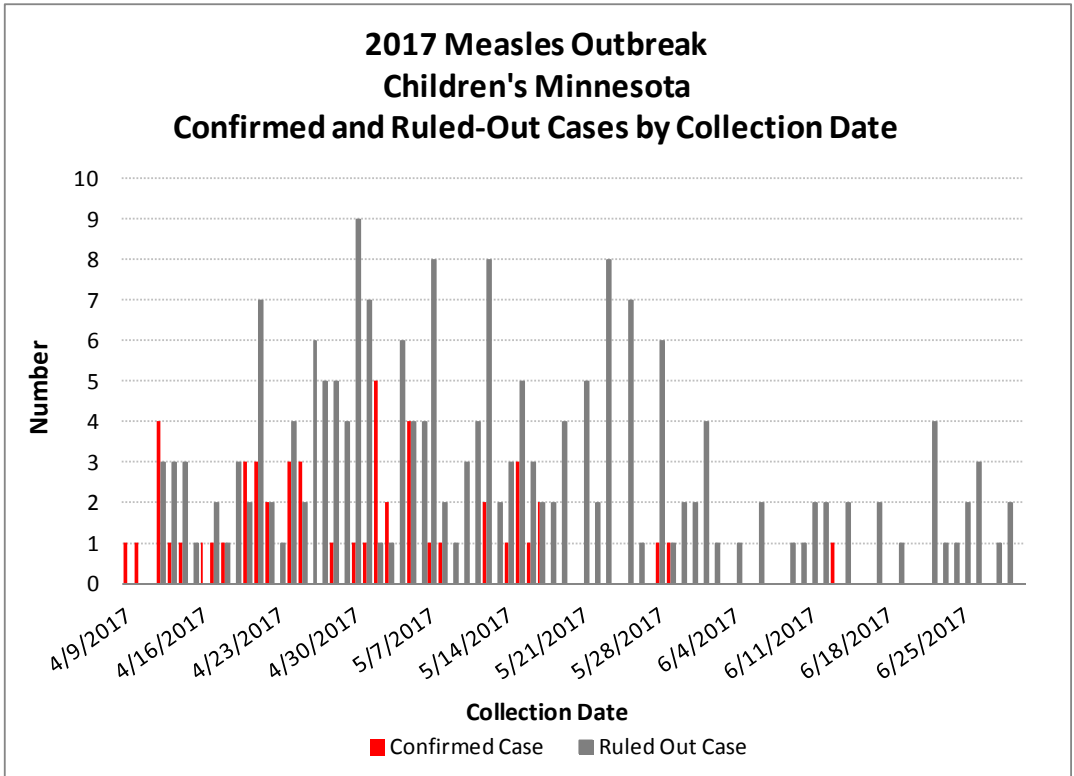
<b>INFECTION PREVENTION AND CONTROL</b> 		
5/2/2017	<b>CHILDREN'S MEASLES TRIAGE AND TESTING DECISION GRID</b>	<b>PAGE 1 of 2</b>
<p style="color: red; margin: 0;"><b>Page Infection Prevention 651-629-4444 with all suspected cases immediately.</b></p> <p style="font-size: small; margin: 0;">Rash is generally first seen 14 days from exposure (range 7-18 days but as far out as 21 days). Most contagious period is 4 days <u>before</u> rash onset to 4 days <u>after</u> rash onset. Immunocompromised patients are contagious for duration of illness.</p>		
<b>SUSPECT CASE DEFINITIONS</b>		
<b>FIRST: Determine if patient has a known exposure.</b>		
<p style="color: red; margin: 0;"><b>There is a measles outbreak in the community.</b></p> <ul style="list-style-type: none"> <li>Consider patient a KNOWN EXPOSURE if patient/family reports being notified by a healthcare facility or health department that they were exposed to a confirmed measles case.</li> <li>Have a HIGH LEVEL OF SUSPICION for measles if patient/family reports being notified by a daycare or other facility of measles at that location.</li> <li>Measles as a potential differential diagnosis should be assessed for any patient with a fever and history of international travel in the past 30 days.</li> </ul>		
<b>SECOND: Determine if patient meets symptom criteria.</b>		
<b>If known exposure or high level of suspicion:</b>	<b>If NO known exposure or NOT high level of suspicion:</b>	
Suspect and test for measles if patient has: <ul style="list-style-type: none"> <li>Fever</li> </ul> <b>AND</b> <ul style="list-style-type: none"> <li>Rash <b>OR</b> Cough <b>OR</b> Coryza <b>OR</b> Conjunctivitis</li> </ul>	Patient has <u>no</u> history of international travel in the past 30 days  Suspect and test for measles if patient has: <ul style="list-style-type: none"> <li>Rash</li> </ul> <b>AND</b> <ul style="list-style-type: none"> <li>Fever</li> </ul> <b>AND</b> at least one of Cough <b>OR</b> coryza <b>OR</b> conjunctivitis	Patient has history of international travel within the past 30 days  Suspect and test for measles if patient has: <ul style="list-style-type: none"> <li>Rash</li> </ul> <b>AND</b> <ul style="list-style-type: none"> <li>Fever</li> </ul> If patient has received 2 doses of MMR vaccine, follow criteria for patients with no history of travel.
<b>FOR PATIENTS MEETING SUSPECT CASE DEFINITION: SEE PAGE 2.</b>		

## Exposure definition

- Visit(s) during contagious period (4 days prior/4 days post rash onset)
- Not in Airborne Infection Isolation (AII)
- Exposure timeframe = time not in AII plus 2 hours
- Where was the patient?
  - What department(s) and room(s) was the patient in?
  - What time were they there?
  - What time were they in the waiting room, room A, room B, room C, etc.



# Ruled out cases



234 tested and ruled out

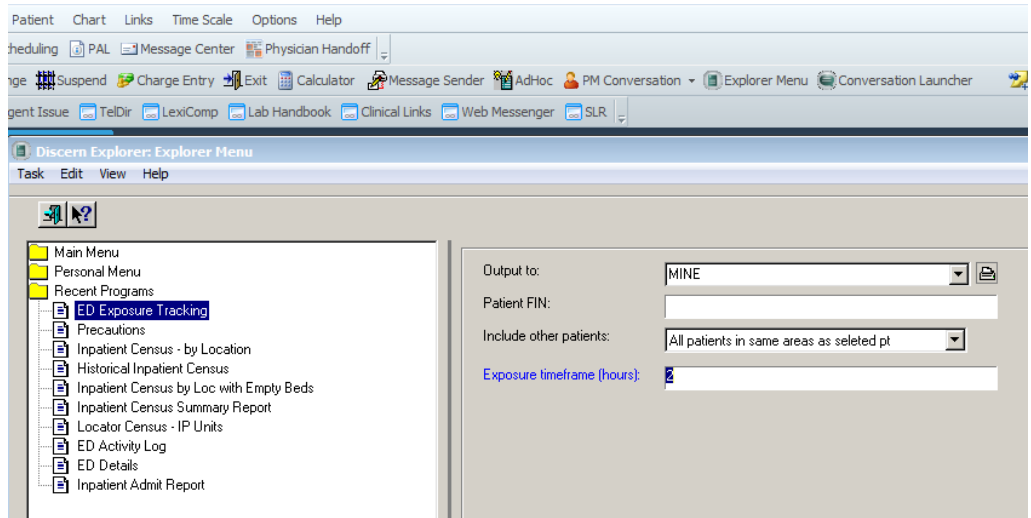
Top etiologies identified:

- Adenovirus
- Influenza
- Parainfluenza
- Enterovirus/rhinovirus

**Confirm the diagnosis!**

# Identifying exposures

- Who else was in the same area(s) at the same time?
- How quickly can you figure this out?
- EMR report
  - Unit
  - Room
  - Arrived date/time
  - Departed date/time
  - Patient demographics
  - Language
  - Patient address
  - PCP address





# Prioritizing exposures

- MMR status
  - Step 1: Determine MMR status
    - EMR Minnesota Immunization Information Connection (MIIC) tab
    - Primary care provider
    - MDH contacted other state health departments
  - Step 2: Prioritize by MMR status
    - 1<sup>st</sup> Priority – 0 doses
    - 2<sup>nd</sup> Priority – 1 dose
    - 3<sup>rd</sup> Priority – 2 doses
- High-risk (e.g. immunocompromised)



## Contacting the exposed

- 1st Priority = phone calls
  - Who is going to make the calls
  - Who is going to answer when people call back
  - Call bank with dedicated phone line
- 2<sup>nd</sup> and 3<sup>rd</sup> Priority = letters
  - Easy access to addresses (part of exposure report)
  - Who is going to send the letters (stuffing hundreds of envelopes!)
- Templates ready to go!
- Interpreters



## Call script

- Inform of exposure
- Verify immune status of patient
- Assess immune status of those accompanying the patient
- What to do next
- Where to go
- Challenges (e.g. transportation)



**Refusal or unable to reach – send to public health**

# Administering PEP

- Does your facility have IMIG and IVIG?
- Where will it be given?
- Extended hours?
- Who will give it?
- Family education sheet
- Notifying PCP that PEP was given



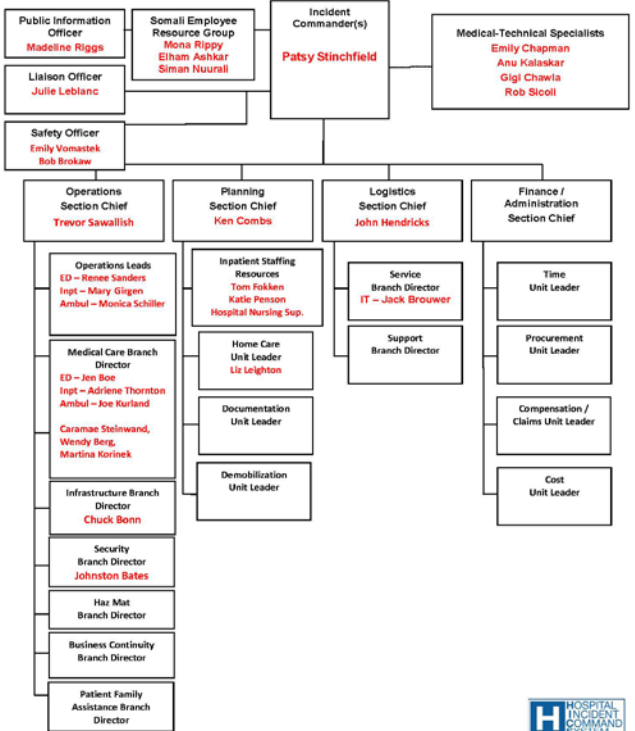
# Tracking it all

Confirmed Case Exposure	EXPOSURE DATE	Exposure Location	MRN	PATIENT NAME	PATIENT DOB	MMR status	Priority Level	PEP Window (at time of case confirmation)	Exposure Follow-up Status	Accompanying Individuals
AB 4.4	April 4, 2017	ED-M				0 - Overdue	Send to MDH	Past PEP window	Sent to MDH 4/11/17 (social isolation indicated)	
CD 4.6	April 6, 2017	ED-M				0 - Overdue	Send to MDH	MMR window closed IMIG by 4/12 0100	Sent to MDH 4/12/17 (social isolation indicated) Patient did not arrive for PEP	
EF 4.8	April 8, 2017	ED-M				0 - Overdue	1st Priority	MMR by 4/11 2300 IMIG by 4/14 2300	Complete (MMR given 4/11 PEP Clinic)	Mother- Vaccinated upon arrival to country Aunt-Vaccinated upon arrival to country 6yo female sibling - 2 doses in MIC, 2/2/12 and 9/8/15
GH 4.9	April 9, 2017	ED-M				0 - Overdue	1st Priority	MMR by 4/12 1600 IMIG by 4/15 1600	Complete (MMR given 4/12 PEP Clinic)	Mom - thinks she has had MMR Brother (3 yrs) - thinks he has had first dose
IJ 4.16	April 16, 2017	ED-M				0 - Too young	1st Priority	Too young for MMR IMIG by 4/22 at 1421	Complete (IMIG given 4/19 PEP Clinic)	Per mom, mom and dad were vaccinated in Mexico
KL 4.21	April 21, 2017	ED-M				1 - current for age 9/16/15	2nd Priority	No PEP Indicated for exposed patient	Complete (Letter sent to printer 5/1/17, mailed on 5/3/17)	
MN 4.21	April 21, 2017	ED-M				2 - current for age, 1/15/09, 1/13/12	3rd Priority	No PEP Indicated for exposed patient	Complete (Letter sent to printer 5/1/17, mailed on 5/3/17)	

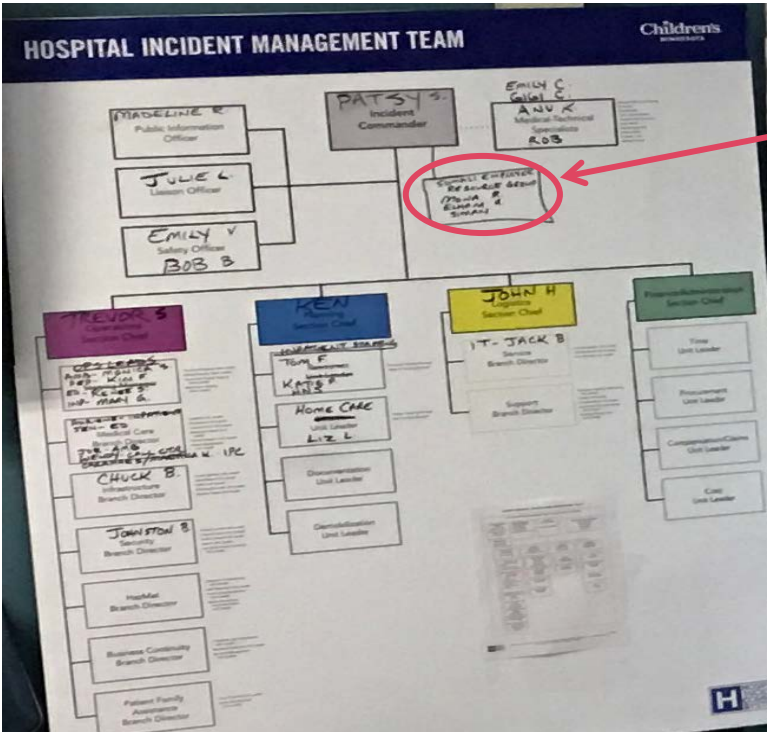


# Hospital Incident Command System – HICS

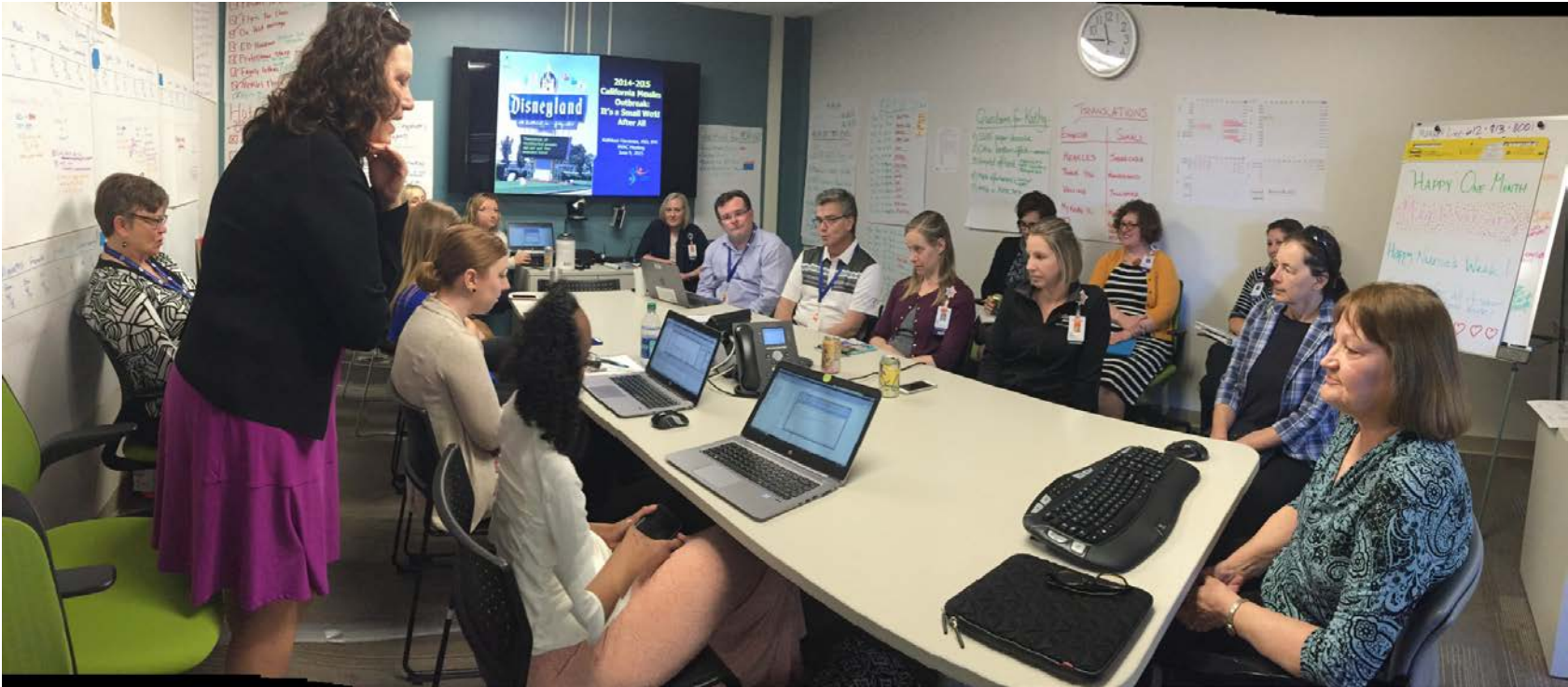
Children's Minnesota – Measles Incident Command Team 5.30.2017



# Hospital Incident Command System – HICS



# Measles day 1: implement HICS





## Incident command overview

- Incident command activation: 137 days
- Versions of HICS charts: 8
- Operational periods: 5
- Incident command team: 28 individuals at peak of outbreak
- A LOT of paperwork

# Successes

- “Let the clinicians be clinicians”
  - Common operating language for clinicians and operations
  - Able to troubleshoot problems without offending
- Public Information Officer
- Somali Employee Resource Group

## Successes

- HICS structure provided clarity when working with external agencies
- Ongoing community contact
- Intentional collaboration with Somali clinicians
- Multi-disciplinary exposure reduction efforts
- Building trust one patient and family at a time



## HICS lessons learned

- Don't underestimate the role of clinics and outpatient areas
- Activating incident command – how is the decision made and how is activation communicated to the organization?
- Command center start-up
  - Practice physical set-up
  - Include information systems
  - Define alternate command center locations

## HICS lessons learned

- Reinforce the message that HICS means “no longer business as usual”
- Stronger system for documentation
- Equipment distribution and return
- Don't overlook Finance Section Chief

## Biggest takeaways

- Activate PIO immediately with incident command
- If in doubt, don't wait – push the button and **activate**
- Proactive investment in relationships:
  - Infection prevention
  - IT and network systems
  - Home health
  - Public health
  - Organization executives
  - Security
  - Facilities
  - Clinics
  - Local emergency mgmt

## How does HICS help in a measles outbreak?

- Adds organization to a chaotic situation
- Clarifies leadership structure
- Fosters clear communication, internally and externally
- Ensures event documentation
- Fully engages responders
- Allows clinicians to be clinicians
- Garner internal resources quickly
- Sets as an organizational priority
- Defines clear accountability
- Declares “this is not business as usual people!”

## Pre-event planning checklist

1. Do we have a strong relationship with local and state public health?
2. Are there individuals in public health we can call to quickly consult?
3. Who would our resources be to call exposed patients?
  - Can we easily access an interpreter at odd hours when needed?
4. Is our marketing and communications department able to dedicate staff to assist event communication, including signage, internal FAQs, external media responses, etc.?
5. Are internal communications systems in place so staff know where to go for event updates? Are those updates quickly accessible and user-friendly?



## Pre-event planning checklist

6. Does our lab and our state health department have a lab capability to quickly do PCR tests?
  - Is the lab order for measles PCR hard-wired?
7. Do we have a standard screening process in ED triage or clinic check-in to identify potential infectious disease exposures?
  - Does the process adequately capture potential measles exposures?
8. Can our ED and clinics recognize measles and immediately isolate?

## Pre-event planning checklist

9. Do we have an All room for isolation?
  - If not, is our organization ready to create an All room?
  - Do we have enough All rooms?
  - What is our back up plan?
10. Does our facility carry a supply of IMIG?
  - If not, do we know how and where to get it quickly? The clock is ticking.
11. Do we have a standing order for IMIG measles post-exposure prophylaxis in the EMR?

## Pre-event planning checklist

12. Are our healthcare workers vaccinated with 2 doses of MMR vaccine?
13. Do we have a case definition or resources to define a case definition to identify suspect cases that require testing?
14. Have we done staff education on transport and care of measles and other highly infectious diseases?
  - Is there a quick reference readily available for staff?
15. Is our hospital proficient in using HICS and willing to use it for infectious disease outbreak situations?

## Pre-event planning checklist

16. Is the organization clear that one case of measles should be considered an emergency?
  - Are they supportive of providing resources we need when asked?
17. Do we have IT systems in place to retrospectively identify individual patients in a given location at a given time or range of time?

# Questions?



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