Implementing a Standardized Approach to Neonatal Herpes Simplex Virus

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DISCLOSURE STATEMENT

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Background

- Neonatal herpes simplex virus (HSV) infections are associated with high mortality and long-term morbidity
- Testing can lead to higher costs and longer length of hospital stay
- Acyclovir has risk of toxicity

Background

- Appropriate identification of who to test and empirically treat is challenging
  - Low incidence
  - Neonates can present with few to no symptoms

Hospital medicine and Emergency medicine: When do you test?

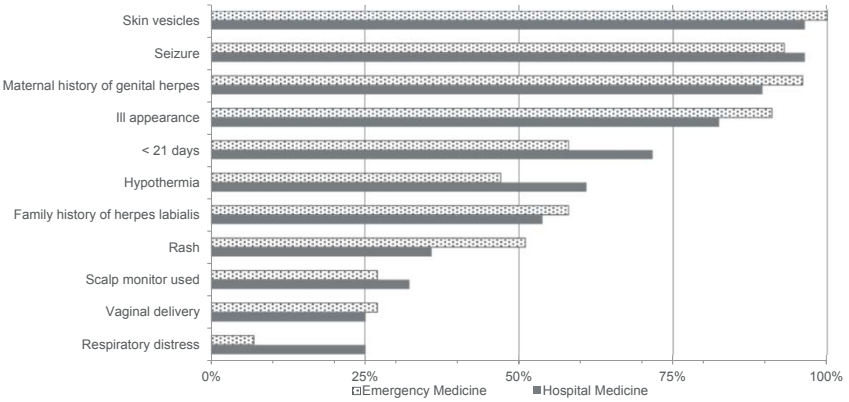


Table 1: Survey results to identify factors that prompt testing for herpes simplex virus in infants undergoing evaluation for serious infection

Hospital medicine and Emergency medicine: How do you test?

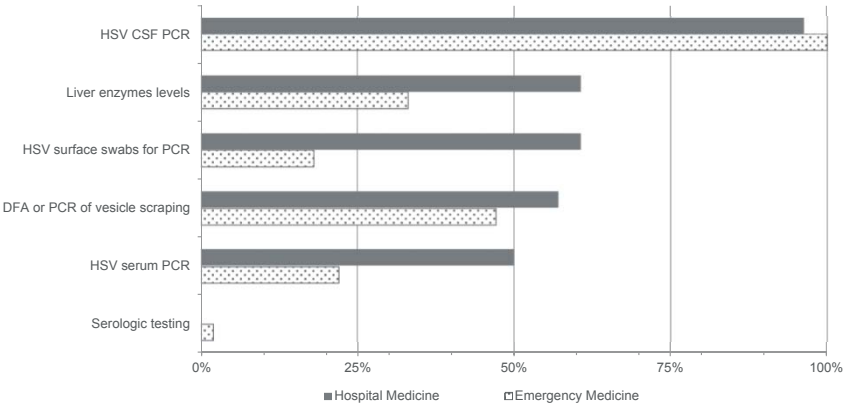
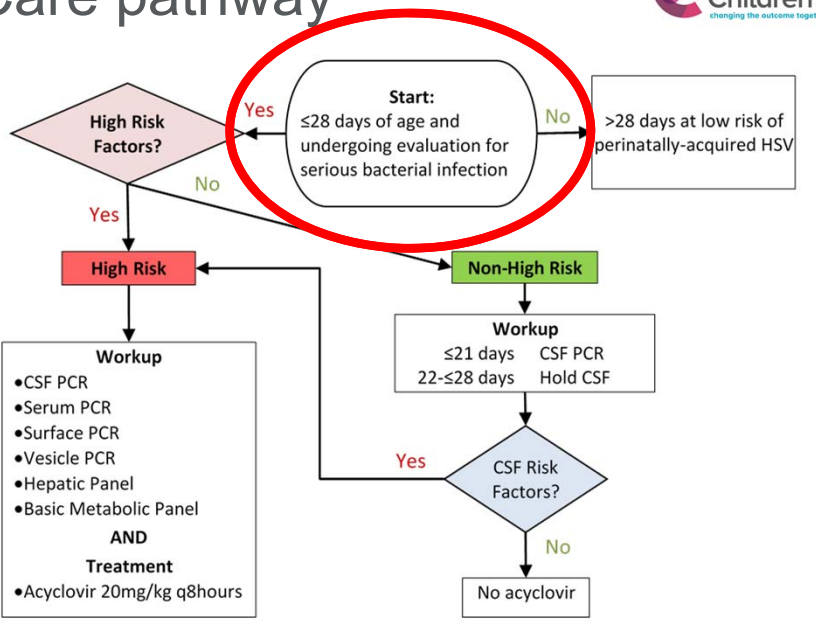


Table 2: Survey results that identify typical laboratory evaluation for neonatal HSV
Abbreviations: Herpes simplex virus (HSV); Cerebrospinal fluid (CSF); Polymerase chain reaction (PCR); Direct fluorescent antibody (DFA)

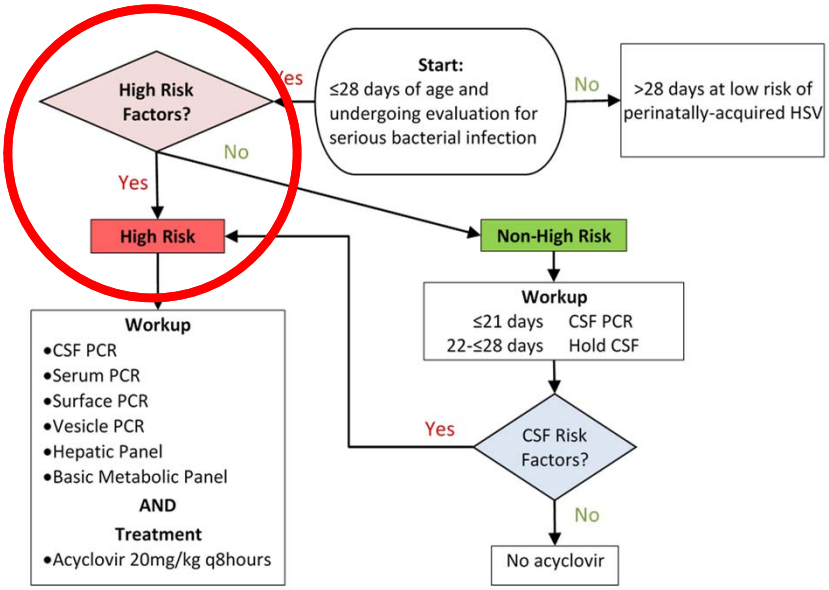
Background

- Multidisciplinary team collaborated to develop an evidence-based care pathway regarding HSV
  - Hospital medicine
  - Emergency medicine
  - Infectious disease
  - Neonatology
  - Pharmacy

Care pathway



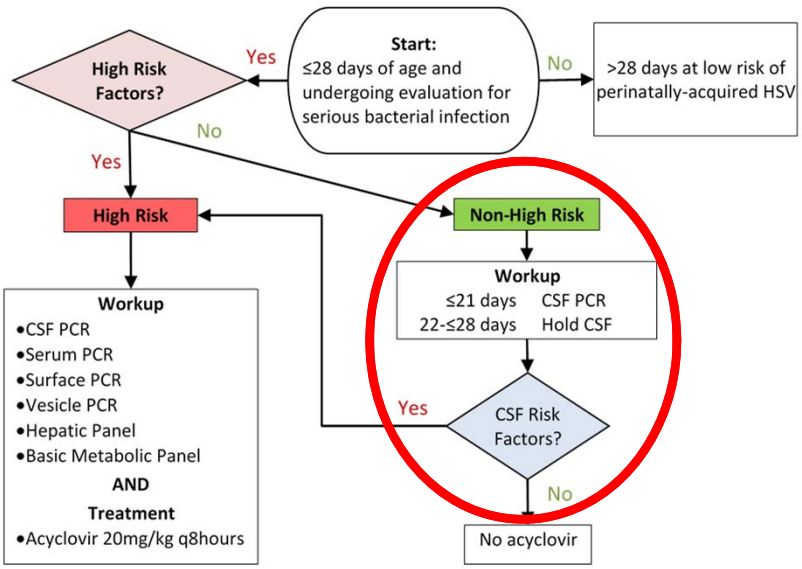
Care pathway



High risk factors: History and physical exam

Maternal HSV symptoms within 7 days of delivery
Household contacts with oral/cutaneous HSV present at any time since the infant's birth
Apnea in a former term infant
Hypothermia in a former term infant
Poor perfusion
Seizure, altered mental status, abnormal neurologic exam
Vesicular or petechial rash
Poorly healing scalp electrode site
Excessive bleeding

Care pathway



High risk factors: Cerebrospinal fluid

Cell count	>19 white blood cells/ high power field
Differential	<50% neutrophils
Gram stain	No organisms

Care pathway

High risk

- Polymerase chain reaction (PCR) testing
  - CSF, serum, surface, lesion
- Hepatic panel
- Creatinine
- Acyclovir

Non- high risk

- ≤ 21 days: CSF PCR
- 22-28 days: Hold CSF
- No acyclovir

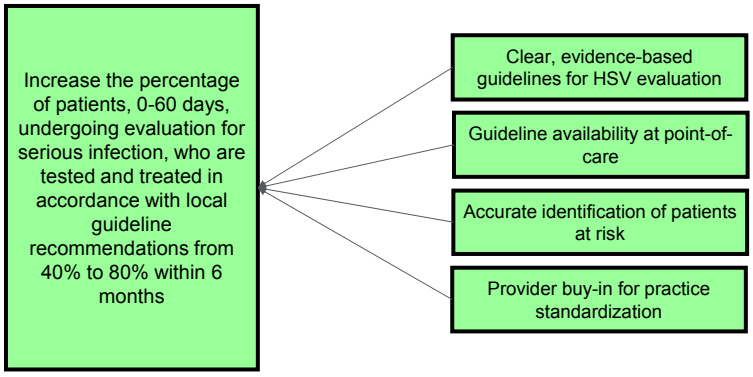
SMART AIM

- To increase the percentage of patients, 0-60 days, undergoing evaluation for serious infection, who are tested and treated for neonatal HSV in accordance with local guideline recommendations from 40% to 80%.

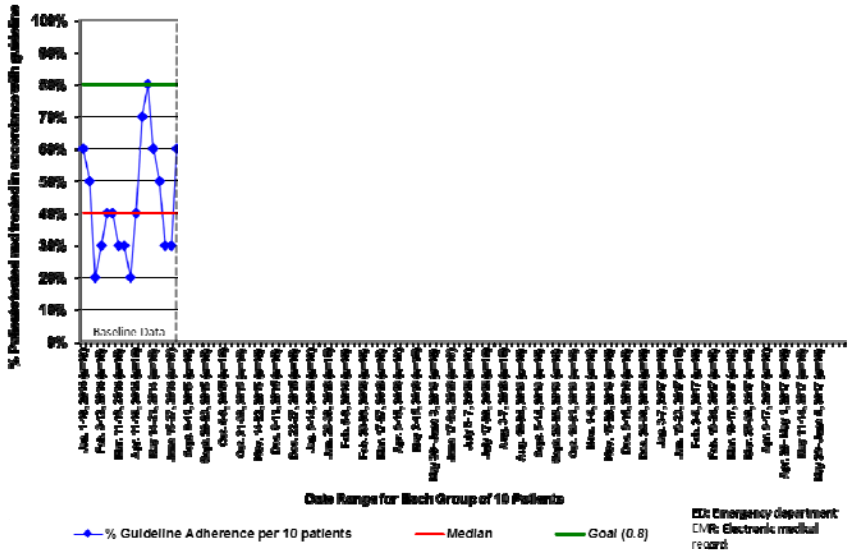
Secondary measures

- High risk:
  - % treated with acyclovir
  - % undergoing complete PCR evaluation
  - Length of stay
- Non-high risk
  - % treated with acyclovir
  - PCR test per 100 patients
  - Length of stay
- Delayed diagnosis of HSV

Key Drivers



Percentage of patients receiving guideline-adherent management



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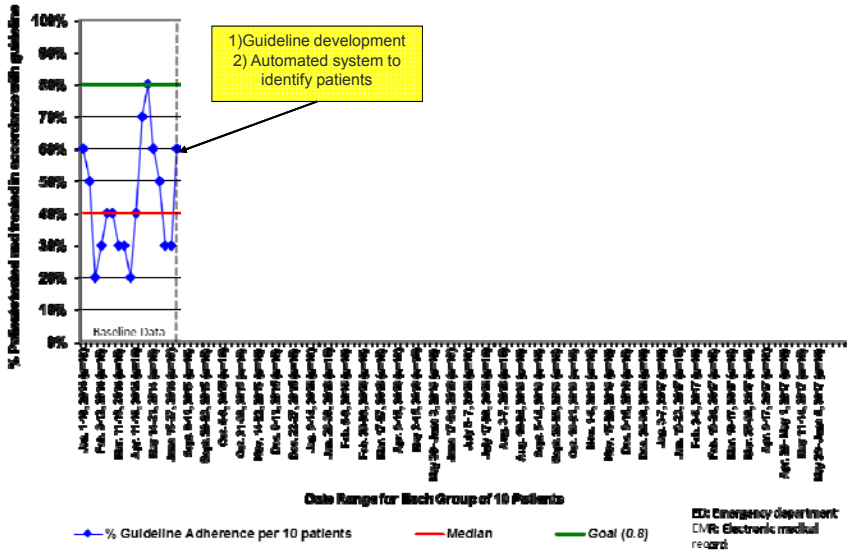
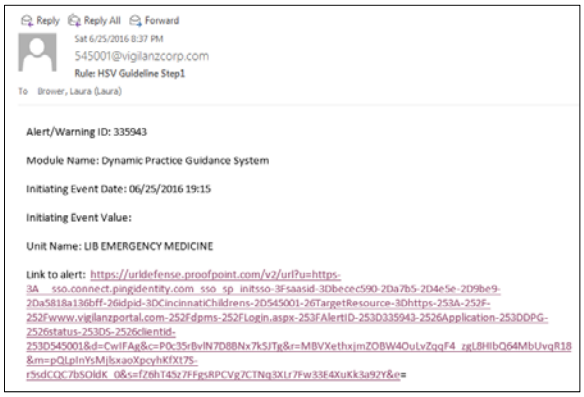


- Real-time identification of eligible patients
  - <60 days with collected blood culture or CSF culture



Reply Reply All Forward

Sat 6/25/2016 8:37 PM

545001@vigilanzcorp.com

Rule: HSV Guideline Step1

To Brower, Laura (Laura)

Alert/Warning ID: 335943

Module Name: Dynamic Practice Guidance System

Initiating Event Date: 06/25/2016 19:15

Initiating Event Value:

Unit Name: LIB EMERGENCY MEDICINE

Link to alert: https://urldefense.proofpoint.com/v2/url?u=https-3A__sso.connect.pingidentity.com_sso_sp_initsso-3Fsaasid-3Dbececc590-2Da7b5-2D4e5e-2D9be9-2Da5818a136bff-26idpid-3DCincinnatiChildrens-2D545001-26TargetResource-3Dhttps-253A-252F-252Fwww.vigilanzportal.com-252Fdpms-252FLogin.aspx-253FAlertID-253D335943-2526Application-253DDPG-2526status-253DS-2526clientid-253D545001&d=CwIFAg&c=P0c35rBvIN7D8BNx7k5JTg&r=MBVXethxjmZOBW4OuLvZqqF4_zgL8HlbQ64MbUvqR18&m=pQLpInYsMjlsxaoXpcyhKfXt7S-r5sdCQC7bSOldK_0&s=fZ6hT4Sz7FFgsRPCVg7CTNq3XLr7Fw33E4XuKk3a92Y&e=

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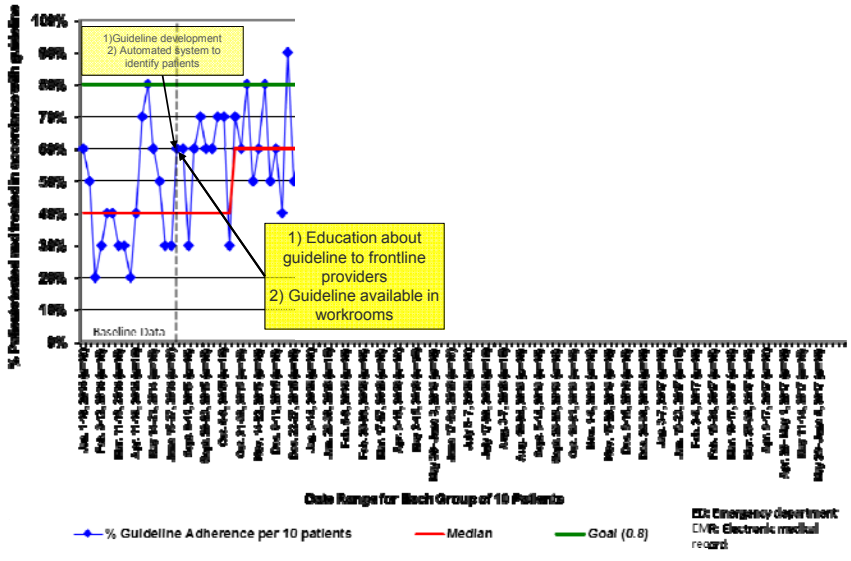
Percentage of patients receiving guideline-adherent management



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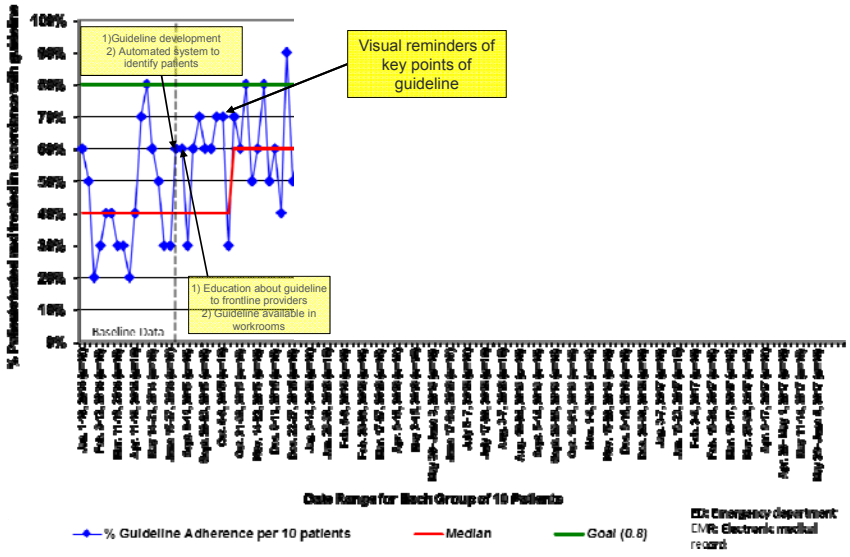
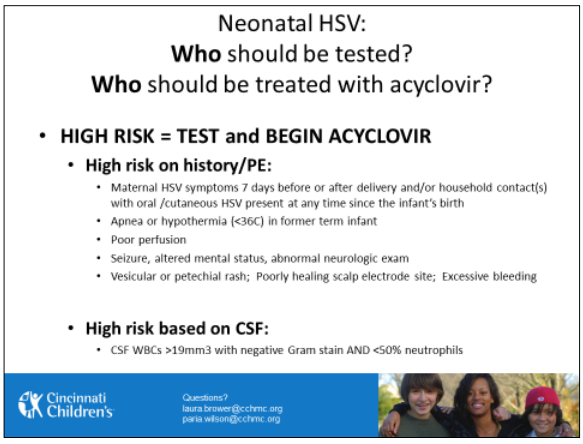


Visible on screens in the ED



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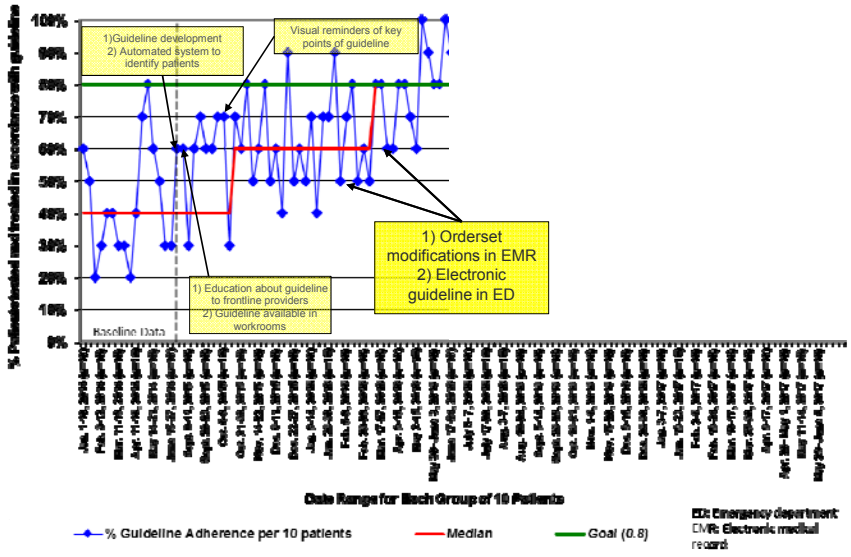
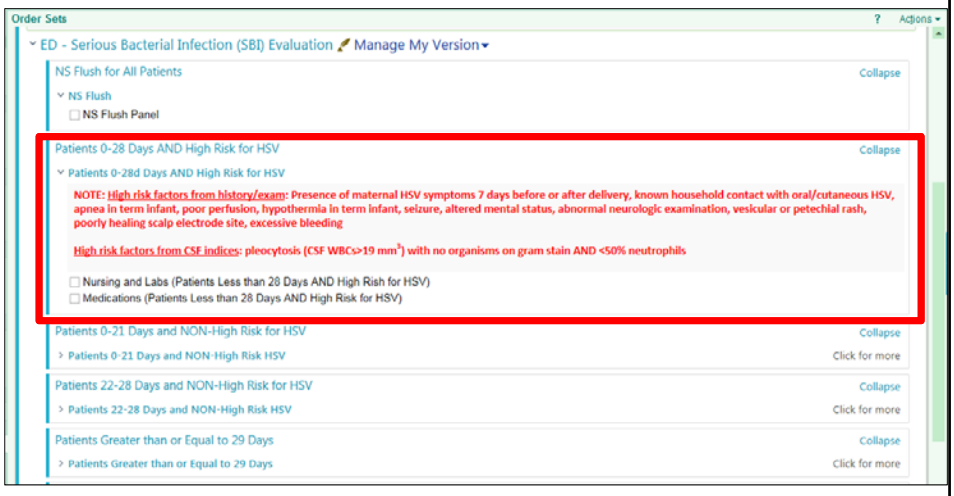


ED Orderset: SBI Evaluation



ED Orderset: SBI Evaluation

Cincinnati Children's

Medications (Patients Less than 28 Days AND High Risk for HSV)

Per CCHMC Guidelines, acyclovir should be empirically started for patients under 28 days who are high risk for HSV along with antibiotics.

- sodium chloride (NS) 0.9 % IV bolus infusion
  Intravenous
- acetaminophen (TYLENOL) 160mg/5mL suspension
  15 mg/kg, Oral, ONCE
- ampicillin (OMNIPEN) intermittent infusion (age <= 7 days)
  100 mg/kg, Intravenous, ONCE
- ampicillin (OMNIPEN) intermittent infusion (age <= 7 days; meningitic)
  200 mg/kg, Intravenous, ONCE
- ampicillin (OMNIPEN) intermittent infusion (age > 7 days)
  50 mg/kg, Intravenous, ONCE
- ampicillin (OMNIPEN) intermittent infusion (age > 7 days; meningitic)
  100 mg/kg, Intravenous, ONCE
- gentamicin (GARAMYCIN) intermittent infusion (age < 30 days)
  3.5 mg/kg, Intravenous, Administer over 30 Minutes, ONCE
- acyclovir (ZOVIRAX) intermittent infusion
  20 mg/kg, Intravenous, ONCE
- cefotaxime (CLAFORAN) intermittent infusion
  50 mg/kg, Intravenous, ONCE
- vancomycin (VANCOCIN) intermittent infusion
  15 mg/kg, Intravenous, ONCE

ED Orderset: SBI Evaluation

Cincinnati Children's

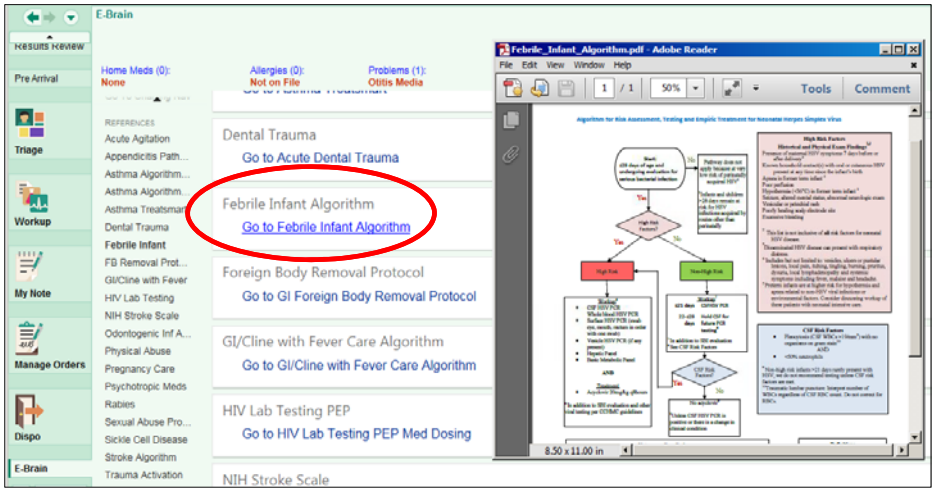
Medications (Patients Less than 28 Days AND High Risk for HSV)

Per CCHMC Guidelines, acyclovir should be empirically started for patients under 28 days who are high risk for HSV along with antibiotics.

Medications (Patients Less than 21 Days AND NON-High Risk for HSV)

Per CCHMC Guidelines, acyclovir should NOT be empirically started for patients 0-28 days who are non-high risk for HSV.

ED Electronic Availability



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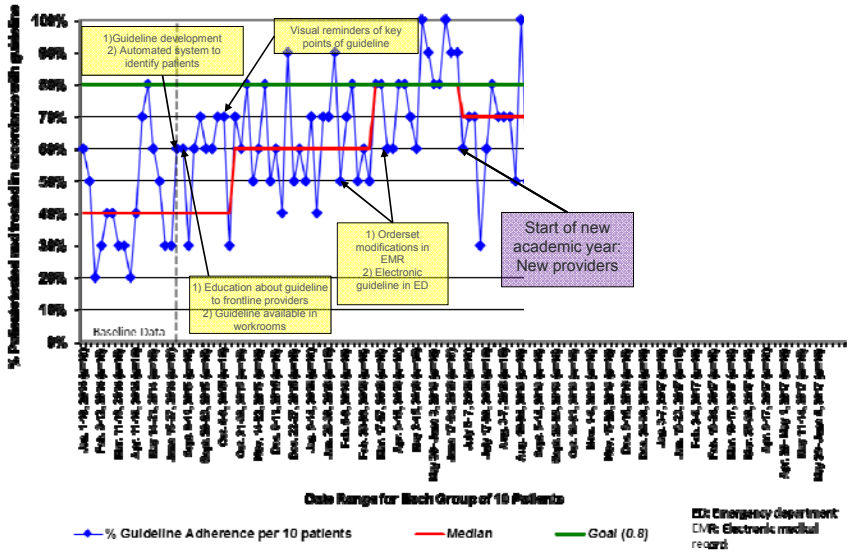

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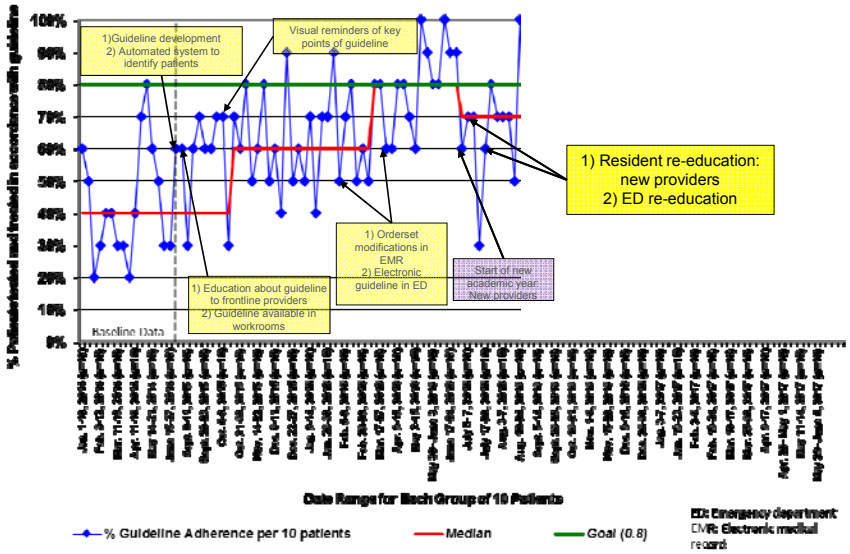

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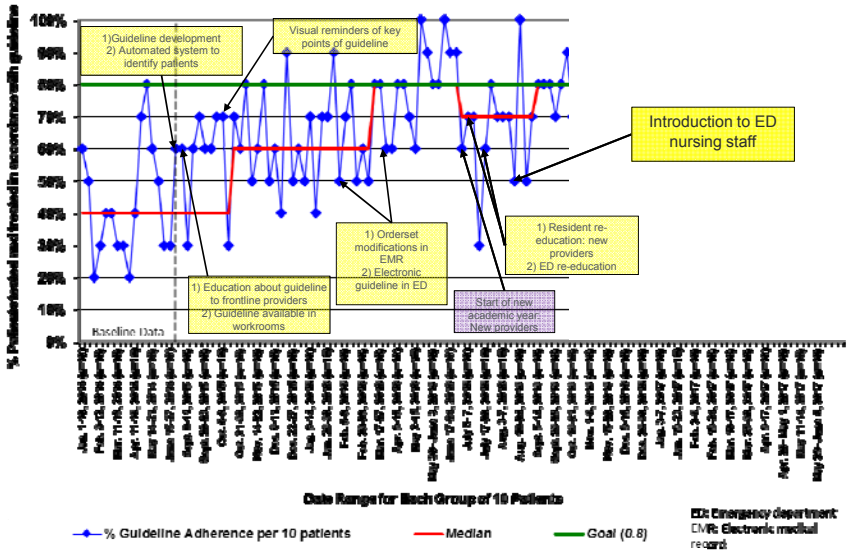
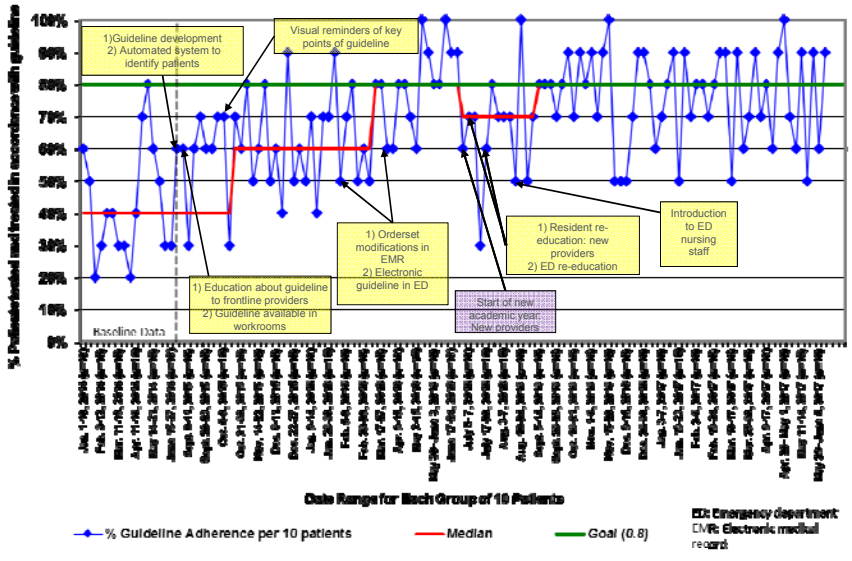


Swab Guidelines

- For all swabs: Can use red or green-topped Stuart culturette swabs
  - For lesions/vesicles:
    - Unroof vesicle (if present) with sterile needle
    - Swab deepest portion of unroofed vesicle or lesion
    - Swab specimens should be submitted in a sterile culturette
    - Swab specimens should be labeled as to the specific site of the collection and the patient label
  - For Surface swabs:
    - Swab conjunctiva (along lower lid), nares (can be one or both), mouth and rectum
    - Can use 1 swab (done in above order) or multiple swabs
    - Rotate or rub swab on mucosal surface
    - Swab specimens should be submitted in a sterile culturette
    - Swab specimens should be labeled as to the specific site of the collection and the patient label

Percentage of patients receiving guideline-adherent management



Secondary outcomes

Conclusions

- We increased the percentage infants undergoing evaluation for serious infection who are tested and treated for neonatal HSV in accordance with local guideline recommendations from 40% to 80% within 8 months
- Increased complete evaluations
- Optimized acyclovir usage

Limitations

- Single center
  - Small number of HSV cases
- Person-dependent process

Next Steps

- Continue sustainability work with EMR changes on the inpatient side
- Continue to follow the performance of the care pathway

- Thank you to the members of the team
- Providers in the ED and inpatient setting

- Questions?