



24th Annual Chicago Infection Control Conference

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Larry K. Kociolek, MD MSCI

Associate Medical Director of Infection Prevention and Control, Ann & Robert H. Lurie Children's
Hospital of Chicago

Assistant Professor of Pediatrics, Northwestern University Feinberg School of Medicine

Dr. Kociolek has disclosed that there is no actual or potential conflict of interest in regards to this presentation

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Learning Objectives

At the conclusion of this course participants will be able to:

- Describe how Chicago Department of Public Health is exploring the root causes of health disparities among those living in Chicago.
- Identify public health resources to contact for reportable disease conditions, obtain specialized treatments, or engage for antibiotic stewardship assessments through the Chicago Department of Public Health.
- Describe surveillance and response efforts around emerging and re-emerging infections including Legionnaires' disease, measles, and preparedness regarding the Ebola situation in the DRC.
- Identify mechanisms of surveillance for acute responses (such as emerging lung diseases in those with vaping history) and how to report these suspected cases to public health.

To obtain credit you must:

- **Complete an electronic evaluation**
- **After completing the evaluation you can generate your certificate immediately.**

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Infant botulism in Chicago: Case presentation and lessons learned

LARRY K. KOCIOLEK, MD MSCI

ASSOCIATE MEDICAL DIRECTOR OF INFECTION PREVENTION AND CONTROL, ANN & ROBERT H. LURIE
CHILDREN'S HOSPITAL OF CHICAGO

ASSISTANT PROFESSOR OF PEDIATRICS, NORTHWESTERN UNIVERSITY FEINBERG SCHOOL OF MEDICINE

24TH ANNUAL CHICAGO INFECTION CONTROL CONFERENCE

SEPTEMBER 18, 2019

Initial Presentation

- ▶ 4 month-old M with no PMHx presents with poor feeding and constipation
 - ▶ Constipation started 1m ago, has been getting worse over the last 2w
 - ▶ Making solid stools, once every 4-7 days
 - ▶ Intermittent emesis, non-bilious, non-bloody, <1 episode per day
- ▶ Poor PO intake for 48h prior to admission
 - ▶ Poor latch and difficulty feeding
 - ▶ Presented initially to OSH ED, where he tolerated 4 oz formula over 40 min
 - ▶ Discharged home with likely viral illness
 - ▶ Did not take anything PO for the next 24h
 - ▶ Weak cry and more lethargic today
 - ▶ Afebrile

Other History

- ▶ Social
 - ▶ First born (born in US); parents from Cameroon, emigrated >5 years ago
 - ▶ Mother is a nurse, father works in hospitality
- ▶ Prior Medical/Surgical History
 - ▶ Born full term, full prenatal testing was normal, no issues during pregnancy or delivery
 - ▶ Up to date on vaccinations
 - ▶ No other medical or surgical history
- ▶ Family History
 - ▶ Non-contributory

Physical Exam

VS: Temp 36.4, BP 85/63, **HR 178**, RR 36, Sat 100% in room air

Gen: Awake, looking around, **decreased responsiveness to exam**, intermittently fussy but has periods of calm

HEENT: **Fontanelle slightly sunken, nares congested and with copious rhinorrhea.** Oropharynx clear with **some drooling**. TMs normal.

Neck: Supple

CV: Regular rhythm, **tachycardic**, no murmur, strong peripheral pulses

Lungs: **Coarse breath sounds**, no wheezing, **mild increased work of breathing**

Abdomen: **Mildly distended**, soft, nontender, no hepatosplenomegaly

Ext: **Cap refill 4 seconds**

Neuro/MS: **Decreased arousal** but improving, awake, alert, normal extremity tone, moves all extremities, normal suck.

Skin: No rash

ED Evaluation/Management

Labs

- ▶ CBC: WBC 7.8, Hgb 12.2, Hct 36.1, Platelets 424. Diff: 83% L, 13% N, 0% Bands
- ▶ Chem: Na 139, K 4.7, Cl 101, Bicarb 19, BUN 12, Cr 0.31, Gluc 69, Ca 10.8
- ▶ LFT: TP 6.4, Alb 4.4, Tbili 1.2, Direct Bili 0.3, AP 298, AST 39, ALT 17
- ▶ VBG: 7.36/36/39/20/-5, Lactate 1.6
- ▶ Blood culture sent
- ▶ RVP: **Rhinovirus/enterovirus Positive**

Imaging

- ▶ CXR: No acute cardiopulmonary process identified
- ▶ AXR: Nonspecific, nonobstructive bowel gas pattern with **mild to moderate diffuse gaseous distention of large and small bowel**

ED Evaluation/Management

- ▶ Rule-out hypoglycemia: Glucose 67- D10 bolus → improved arousal and reactivity
- ▶ Dehydration: Normal saline bolus x 2 → HR improved
- ▶ Concern for bronchiolitis: Nasal suctioning → improved congestion and work of breathing
- ▶ Abdominal distension, poor PO intake
 - ▶ Pediatric surgery consult
 - ▶ Anderson placed, 120 ml air evacuated, subsequent reassuring exam
- ▶ Patient admitted to general pediatrics service
 - ▶ Presumed diagnosis of bronchiolitis secondary to rhinovirus/enterovirus complicated by dehydration and constipation possibly due to viral ileus
 - ▶ Plan for continued hydration and observation

Hospital Course: Progression of Neurologic Examination

- ▶ Eyes closed, gurgling secretions, hypotonic throughout with significant head lag, high-pitched & gurgling cry with stimulation, minimal spontaneous movements at rest
- ▶ CN - pupils symmetric 4-2 mm bilaterally but sluggish, eyes conjugate, unable to track but briefly fixes on light as checking pupils
- ▶ Motor/Sensory - severe & diffuse hypotonia throughout, severe head lag, briefly & rarely lifts extremities anti-gravity, briefly engages shoulder girdle when pulled to sit
- ▶ Reflexes - 2+ reflexes in b/l pec, bicep, BR, patella, achilles, no clonus; No suck - just holds mouth open and briefly cries when attempt to encourage suck

Hospital Course: Management

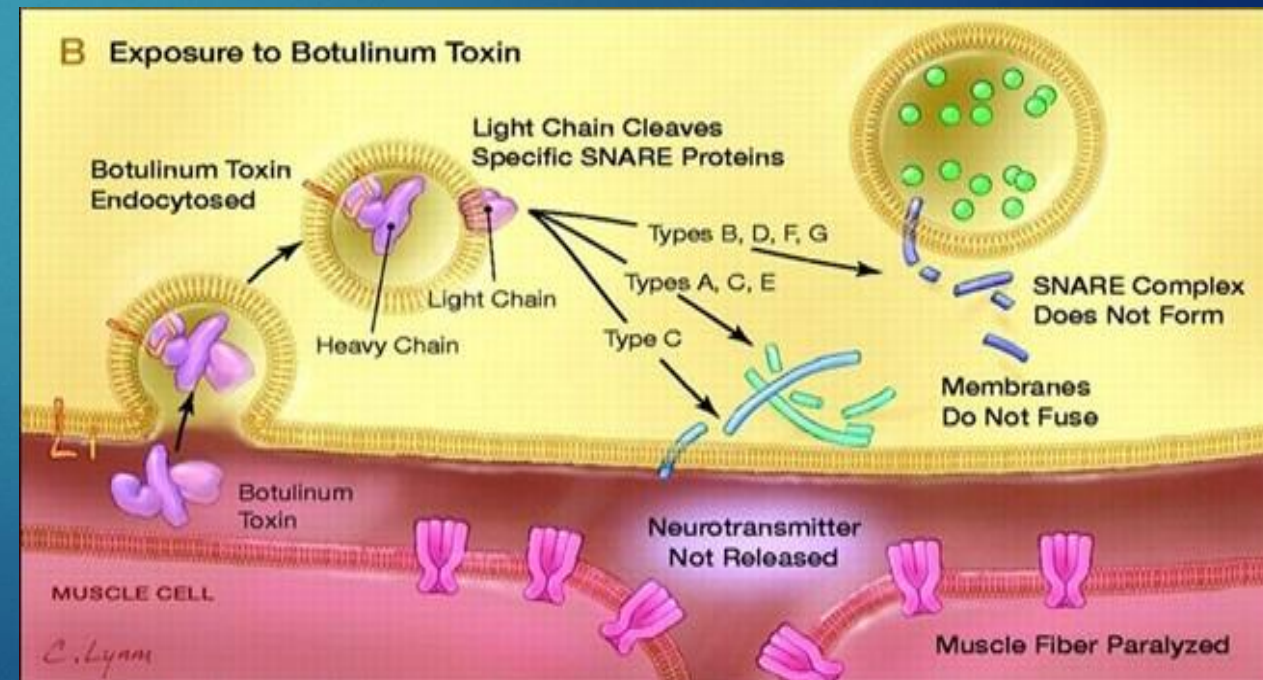
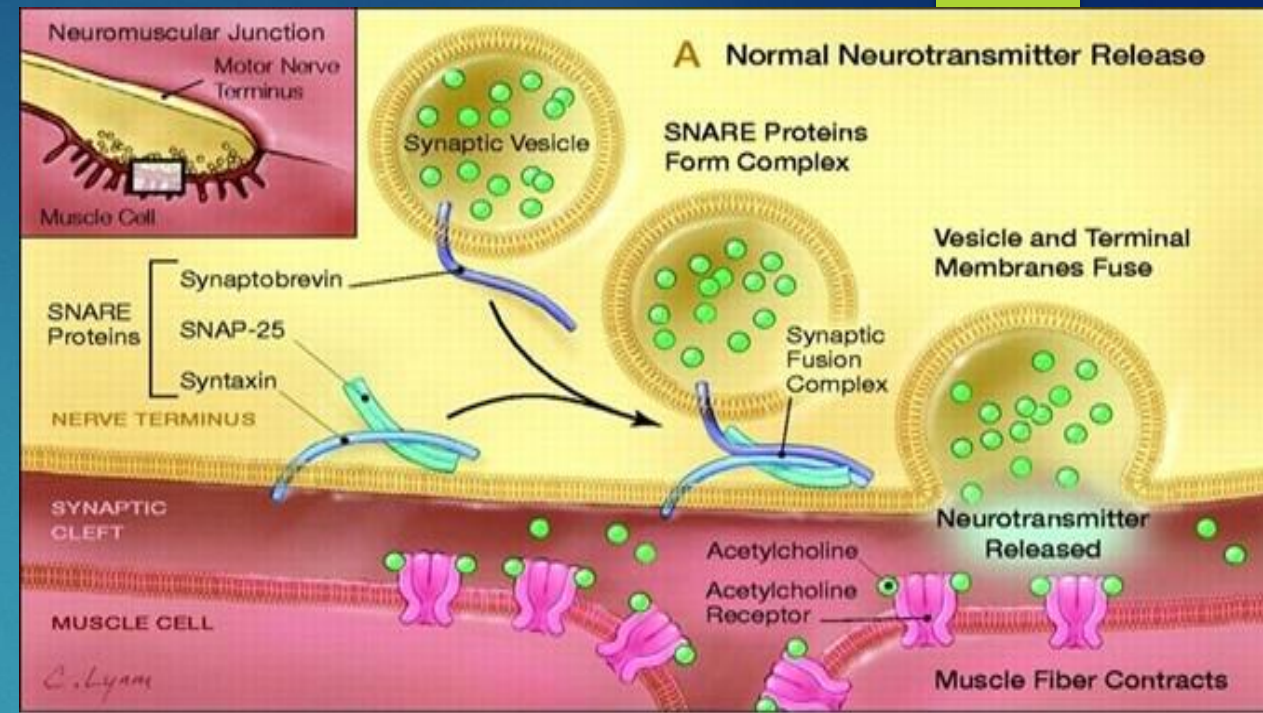
- ▶ Labs
 - ▶ Urine tox screen negative, normal thyroid functions and ammonia
- ▶ Concern for infection
 - ▶ Lumbar puncture (CSF unremarkable) and broad spectrum antibiotics
- ▶ Transferred to PICU
 - ▶ Progressive hypotonia, concern for encephalopathy and decreased ability to protect airway
- ▶ Infectious diseases and neurology called by an astute PICU physician concerned for infant botulism

Further Evaluation

- ▶ Nerve conduction and electromyography consistent with a disorder of the **pre-synaptic component of the neuromuscular junction**
- ▶ Further History
 - ▶ No street construction near home
 - ▶ Apartment below family being remodeled
 - ▶ Mother trying OTC treatments at the discretion of pediatrician for constipation for the last month
 - ▶ Gripe Water: Sodium bicarbonate and various herbs
 - ▶ Karo corn syrup
 - ▶ Recently transitioned to Enfamil Gentlease
 - ▶ No honey administration

Infant Botulism

- ▶ Exposure to spores of *Clostridium botulinum*
- ▶ Spores germinate in the gut
 - ▶ Germination enhanced in an infant microbiome
 - ▶ Vegetative bacteria secrete botulinum toxin
- ▶ Descending paralysis
 - ▶ Constipation
 - ▶ Weak cry
 - ▶ Diminished facial expression
 - ▶ Difficulty feeding/swallowing
 - ▶ Ultimately diaphragmatic and limb paralysis
 - ▶ Respiratory failure (SIDS)



C. botulinum Exposure and Risk Factors

▶ Exposures

- ▶ Honey
- ▶ Dust
- ▶ Upturned soil
- ▶ Construction
- ▶ Karo Syrup?

▶ Risk factors

- ▶ Poorly understood
- ▶ Breastfeeding?



Treat First – Diagnose Later

- ▶ Botulism immune globulin
 - ▶ BabyBIG
 - ▶ **Human-derived** immune globulin that neutralizes botulinum toxins
 - ▶ Pooled adult plasma from persons immunized with pentavalent botulinum toxoid
 - ▶ Intravenous administration
 - ▶ Weight-based dosing



BabyBIG

Botulism Immune Globulin Intravenous (human) BIG-IV

- ▶ Orphan drug consists of human-derived anti-botulism-toxin antibodies approved by FDA for treatment of botulism A and B
- ▶ California Department of Public Health Infant Botulism Treatment and Prevention Program supplies BabyBIG
- ▶ Treatment ends toxemia and enables motor nerve regeneration to begin
 - ▶ HALTS PROGRESSION BUT DOES **NOT** REVERSE SYMPTOMS
- ▶ BabyBIG has been used to treat > 1500 infant botulism patients
 - ▶ Resulted in more than 90 aggregate years of avoided hospital stay and >\$130M of avoided hospital costs
 - ▶ COST-EFFECTIVE **AND** CLINICALLY BENEFICIAL EVEN WHEN CONSIDERING COST OF BABYBIG



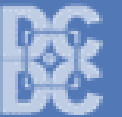
HEALTHY
CHICAGO

CHICAGO DEPARTMENT OF PUBLIC HEALTH



Infant Botulism Treatment and Prevention Program

Division of Communicable Disease Control, California Department of Public Health



Initial Steps to Acquire BabyBIG

- ▶ Call your local health department to report your suspicion and to request testing
 - ▶ Local health department will facilitate
- ▶ Contact California Department of Public Health Infant Botulism Treatment and Prevention Program (IBTPP)
 - ▶ IBTPP on-call physician (510-231-7600)
 - ▶ Rapid coordination of shipping BabyBIG by IBTPP
- ▶ Patient specimens are processed at CDC
 - ▶ California IBTPP only provides testing for residents of California
 - ▶ Arrangements for testing made among hospital provider, local and state public health departments, and CDC
 - ▶ In general, specimens go from hospital to IDPH lab to CDC but in some circumstances, may go directly from hospital to CDC

Infant Botulism Interview Questionnaire

- ▶ Decision to treat based on clinical presentation and exam
 - ▶ Local health department will request completion of the Infant Botulism Interview
 - ▶ Or health department will complete with the parents
- ▶ Questionnaire
 - ▶ Medical history
 - ▶ Recent illness/symptoms
 - ▶ Nutrition history (formula, sugar water, other, jarred baby foods, tea, honey, Karo syrup)
 - ▶ Environmental exposures (yard work, nearby construction, excessive dust)
 - ▶ Immunization history

Cost

STATE OF CALIFORNIA – HEALTH AND HUMAN SERVICES AGENCY

Gavin Newsom, Governor

INVOICE and PURCHASE AGREEMENT for BabyBIG®



Patient Name _____

Invoice Number _____

(To be obtained from IBTPP)

Hospital Name _____

Hospital P.O. Number _____

(If assigned by hospital; not required by CDPH)

City, State _____

Date _____

Patient weight in kilograms at the time of order (# of vials needed is based on weight) _____

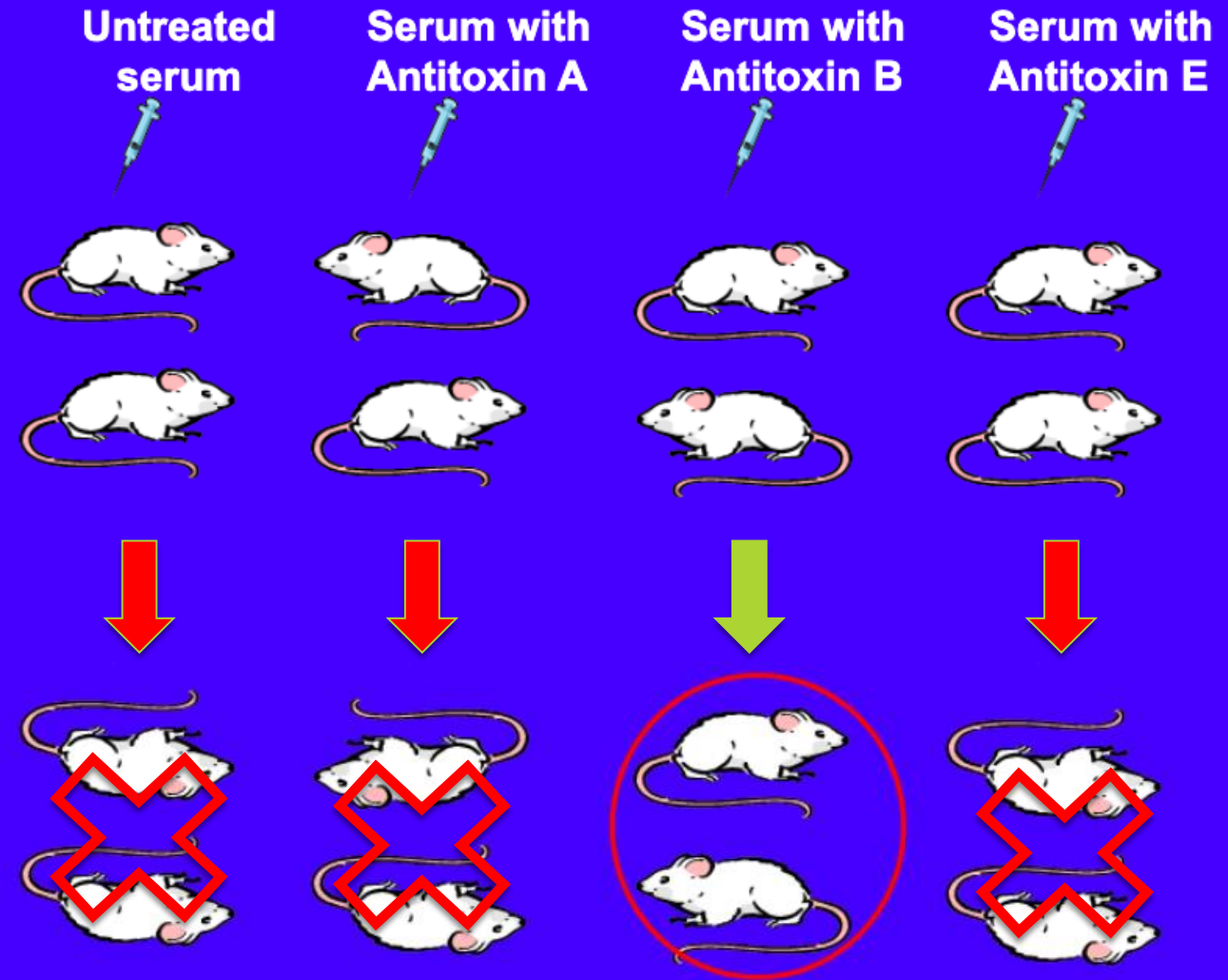
***** INVOICE *****

BabyBIG® FEE for the treatment of the above-named patient:.....\$57,300--

Laboratory Diagnosis

- ▶ Detection of botulinum toxin in stool of patient is the preferred diagnostic test
 - ▶ Performed through mouse bioassay
 - ▶ Inject fecal filtrate into peritoneum of mouse and watch for development of botulism symptoms
 - ▶ Mice are also injected with specific anti-toxins
- ▶ Constipation may make stool collection difficult
- ▶ Other testing is supportive but not the gold standard

Toxin Neutralization Bioassay



Clostridium botulinum Test Results

Test	Source	Result
Botulinum Neurotoxin (BoNT) Direct Detection- Mouse Bioassay	Enema	Negative
C. botulinum Culture	Enema	Positive- C. botulinum type B
BoNT Direct Detection- Mouse Bioassay	Stool	Positive- BoNT type B
C. botulinum Culture	Stool	Positive- C. botulinum type B
BoNT Direct Detection- Mouse Bioassay	Infant Formula	Negative
C. botulinum Culture	Infant Formula	Negative
BoNT Direct Detection- Mouse Bioassay	Karo Syrup	Negative
C. botulinum Culture	Karo Syrup	Negative
BoNT Direct Detection- Mouse Bioassay	Gripe Water	Negative
C. botulinum Culture	Gripe Water	Negative

Karo

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FREQUENTLY ASKED QUESTIONS

KARO SYRUP

[STORAGE](#)

[COOKING/PREPARATION](#)

[NUTRITION](#)

[INGREDIENTS](#)

[GENERAL INFORMATION](#)

[WHERE TO BUY](#)

KARO PANCAKE SYRUP

[STORAGE](#)

[COOKING/PREPARATION](#)

[INGREDIENTS](#)

[WHERE TO BUY](#)

GENERAL INFORMATION

Q. Should Karo syrup be used for infant feeding?

A. We are aware that some health care professionals suggest feeding Karo syrup to infants in a formula or for relief of constipation. Because corn syrup, like many other foods is not a sterile product, there is a remote possibility that it may contain *C. botulinum* spores.

These spores are common in the environment and generally not harmful to older children and adults. In fact, in the FDA study conducted in 1991, corn syrup and other syrups are not identified as food sources of *C. botulinum* spores for infants.

However, because Karo is not specifically intended for infant feeding, we suggest you consult your pediatrician for advice.

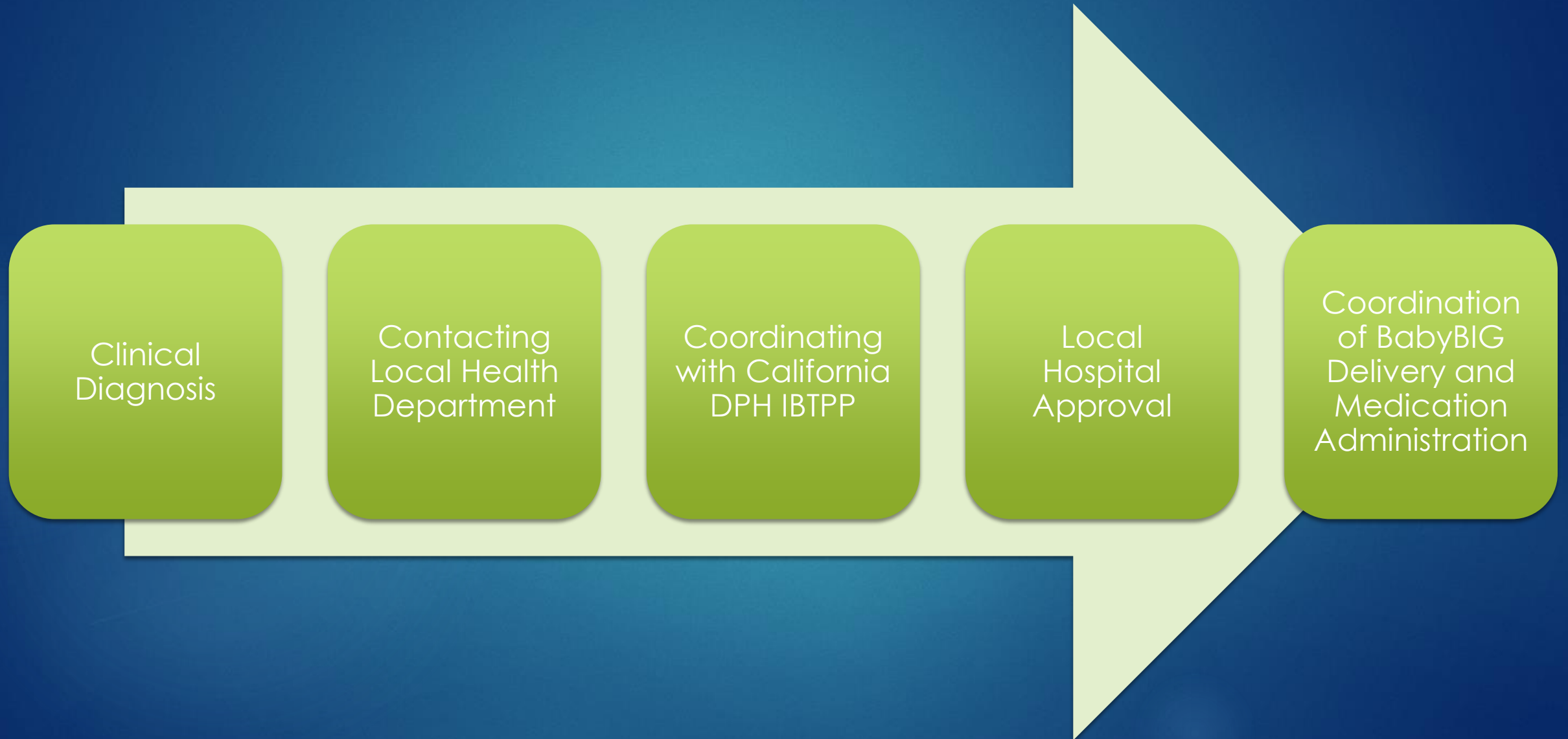
Hospital Course and Follow-up

- ▶ Weakening respiratory effort required intubation between time BabyBIG requested and received
 - ▶ BabyBIG administered the following day and well tolerated
 - ▶ Extubated 1 week later
- ▶ PO feeding slow to improve
 - ▶ Tolerating full PO diet at time of discharge
- ▶ Discharged on HD19
 - ▶ “Profound weakness” still present on exam at time of discharge but improvements with PT
- ▶ Neurology evaluation 3m post-discharge
 - ▶ Normal examination

Lessons Learned: Clinical

- ▶ Always maintain skepticism, especially when clinical picture does not fit with a common diagnosis
 - ▶ Clinical significance of positive findings on respiratory viral PCR panel
- ▶ Infant botulism: if suspect, consult with public health officials and initiate process to treat
- ▶ Role of antibiotics in infant botulism
- ▶ Source of *C. botulinum* frequently not identified

Lessons Learned: Logistics



Lessons Learned: Logistics

**Clinical
Diagnosis**

Contacting
Local Health
Department

Coordinating
with California
DPH IBTPP

**Local
Hospital
Approval**

Coordination
of BabyBIG
Delivery and
Medication
Administration

Lessons Learned: Logistics

- ▶ Contract needed to be signed/reviewed by
 - ▶ Authorized official: e.g., VP of Clinical Operations
 - ▶ Account payable contact: e.g., Senior Director of Finance
 - ▶ Hospital responsible official: e.g., CEO, CFO, COO
 - ▶ Hospital legal team
- ▶ Payment (\$57,300) needed to be processed
- ▶ We are reviewing this process to streamline this in the future

