



ICU to Behavioral Health: Using a Pathway Academy Method to Develop and Implement Pathways in a Wide Range of Care Settings

PATHWAYS4KIDS

Supporting Evidenced Based Practices

*Gerd McGwire MD, PhD; Rekha Voruganti MBOE, LSSBB; Tara Dinh;
Roopali Bapat MD, MSHQS; Aarti Gaglani MD; Laura Rust MD, MPH*

February 9th, 2026



**NATIONWIDE
CHILDREN'S®**

When your child needs a hospital, everything matters.



Disclosures



- Nothing To Disclose



PATHWAYS4KIDS



Learning Objectives

At the conclusion of this activity, participants will be able to:

1. Identify ways to recruit and support clinical pathway development champions.
2. Compare review processes to improve pathway quality and user friendliness in multiple health settings.
3. Describe examples of implementation strategies to meet pathway goals.
4. Define and standardize pathway populations and metrics to support consistent data and benchmarking of clinical pathway success.





Our Team





- 13,000 employee workforce located Columbus, Ohio
- 3rd largest children's hospital in the US
- >1.8 million patient visits per year
- The Ohio State University, Department of Pediatrics
- **Pathways Program Scope: Enterprise Wide**
 - Sites: Behavioral Health Pavillion, ED, UC, IP, NICU, Outpatient, Community/Regional Providers, Surgery
- **Clinical Pathways Program (CPP) Vision: Every child needs the care they get and gets the care they need.**



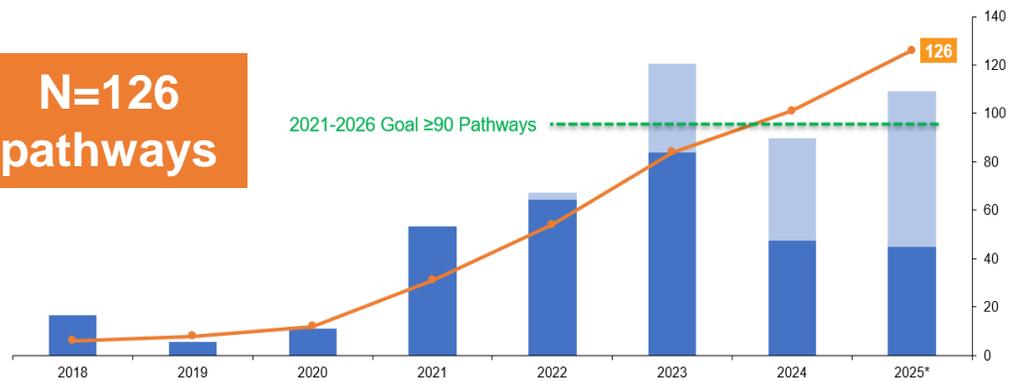


Pathway Development

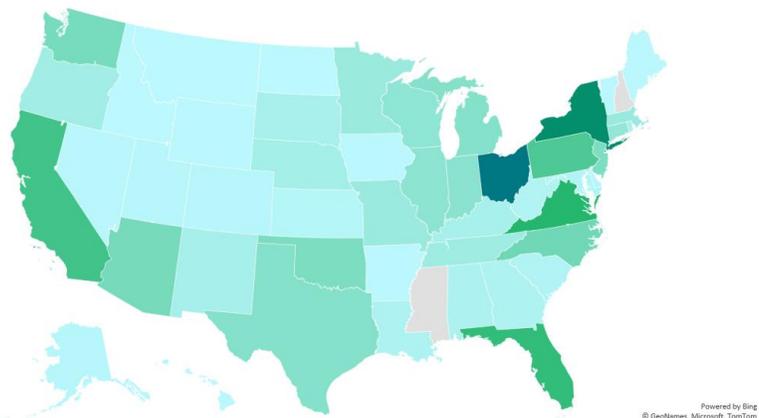
Pathway Development

Annual count of newly developed (dark blue) and reviewed pathways (light blue) each year. (Orange) Rolling count of total pathways produced.*Year to Date as of 10/6/2025.

N=126 pathways

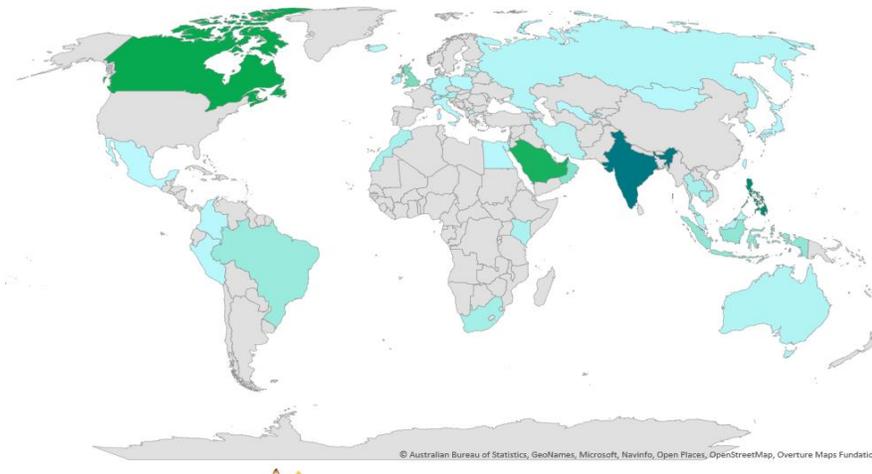


2025 Internet Views



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2025 Clinical Pathways International Internet Views

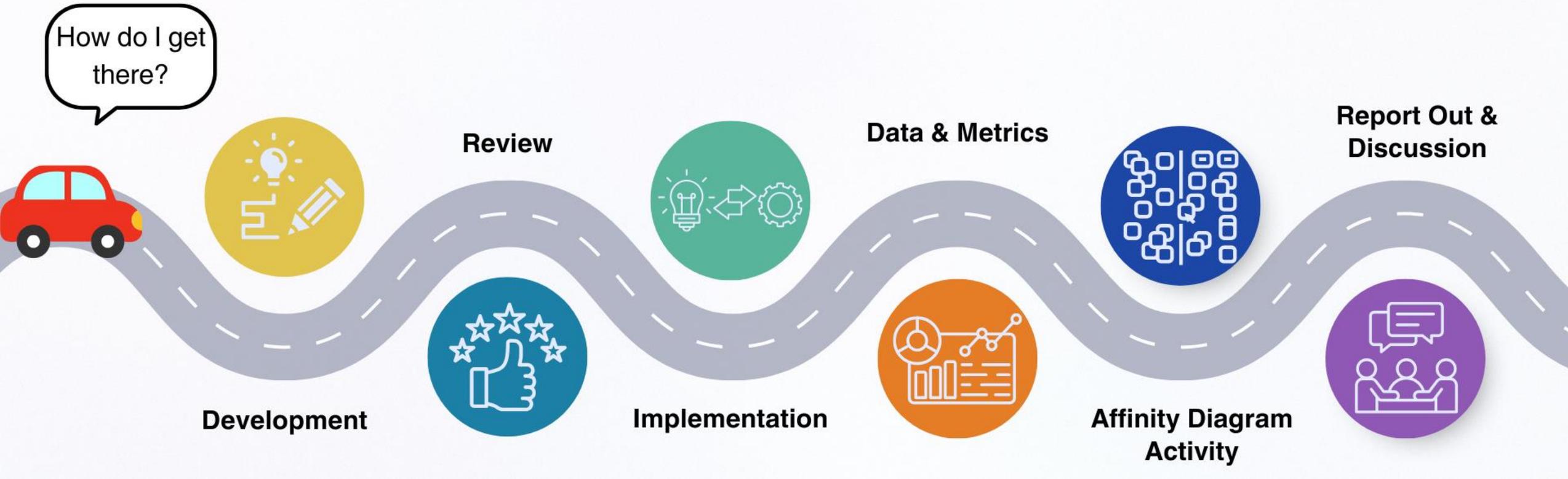


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Clinical Pathway Program Roadmap





Clinical Pathway Development Steps

1. Pre-Planning: Pathway request with goals, care setting & patient population

2. Pathway Selection & Team Formation

3. Evidence Review & Pathway Development

4. Peer/Informatics Review followed by Advisory Committee Review

Pathway finalized. Post on Intranet & Education.

5. EHR Tool Development: 3 Meeting Series with EHR builder, Informatics & Pathway team

EHR finalized. "Go Live" & Education.

6. Outcome Reporting & Visualization: Data & Pathway team meetings, Data report & Dashboard development, Validation

7. Review & Revision: 5-year cycle





Coordinator View – Teams





Coordinator View – Management

01

Pathway Development & Review

- SharePoint Site
- Meeting coordination and facilitation
- Email Distribution groups

03

Pathway Access & Marketing

- Internal (Desktop/app)
- External (Desktop/app)
- Physician Connect app
- GEMBA
- Feedback mechanisms
 - Group email/EHR buttons

02

Documents & Templates

- New Pathway Request Form
- Development Manual
- Visio Template
- Pathway Updates
- Clinical Validation Worksheet

04

Data Analytics/Reporting Dashboards

- Qlik
- Power BI
- Scorecards

How Do You Manage It?





Coordinator View - Management



01

CPP Program Tracker

Pathway Name ↑	Care Setting	Status: Lifecycle	Status: Dev
Afebrile Seizure	ED UC	3. Data Deployment	1.6 Comp
Airway Clearance & Expansion	IP	2. Epic Implementa...	1.6 Comp
Alcohol Withdrawal	BHP OP IP ED	2. Epic Implementa...	1.6 Comp
Anaphylaxis	IP ED UC	3. Data Deployment	1.6 Comp
Appendicitis	IP ED	3. Data Deployment	1.6 Comp
Appendicitis	Toledo	1. Pathway Develo...	1.0 Develo
Asthma	IP	3. Data Deployment	1.6 Comp
Asthma	ED	3. Data Deployment	1.6 Comp

Clinical Pathway Update Febrile Infant (ED)

The clinical pathway Epic tools for Febrile Infant [0-21 days](#), [22-28 days](#), and [29-60 days](#) are now available!

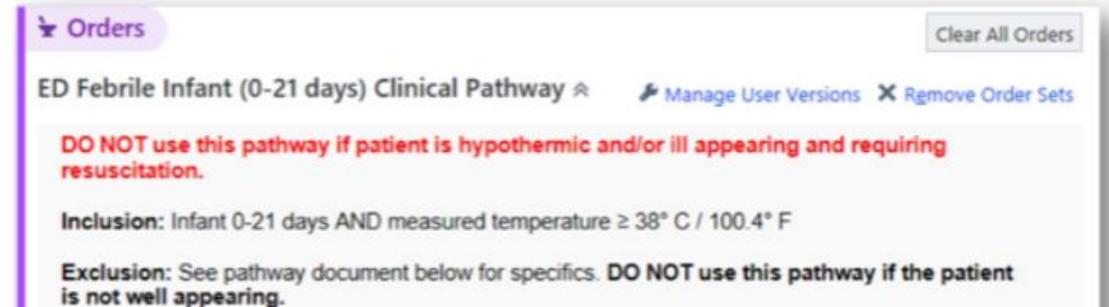
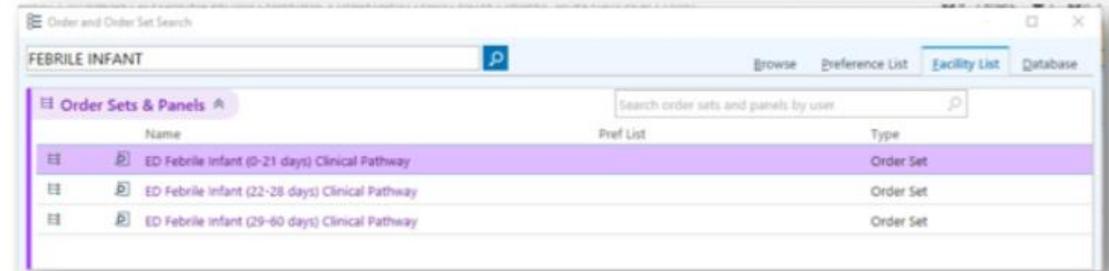
As always, we welcome your feedback! Feel free to email me or ClinicalPathwaysProgram@nationwidechildrens.org.

Pathway Highlights:

- Updated management guidance that reflects the recent AAP Clinical Practice Guideline
- Recommendations for when to consider an LP in those 22 days and older
- Recommendations for when to consider discharge for those 29 days and older

Epic Tools: *THREE* New Order Sets and *TWO* new Discharge Smart Sets

- Appropriate order set suggested based on patient age and chief complaint. Inclusion/Exclusion criteria reminders at the top of each order set with optimized defaulting.



02



Coordinator View - Management

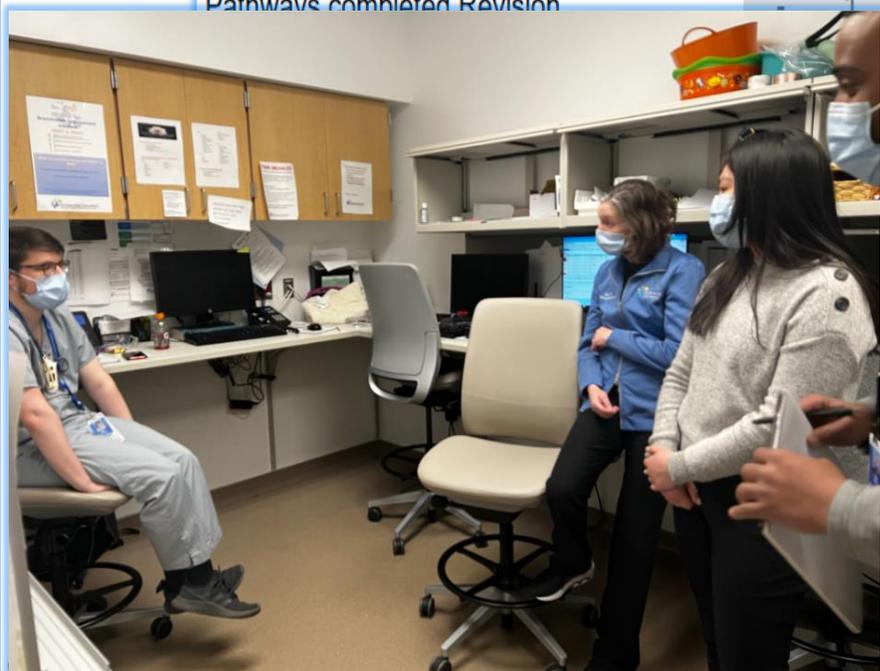



NATIONWIDE CHILDREN'S
When your child needs a hospital, everything matters.

Today's Date: _____
 Due Date: _____

- Clinical Pathways**
- Surgery**
- Pathway
 - Adhesive Small Bowel Obstruction
 - Appendicitis
 - Bilious Emesis
 - Cervical Spine Injury Evaluation
 - Gastrostomy Tube Placement
 - High Risk Abdomen
 - Ileocolic Intussusception
 - Mediastinal Mass
 - Non-Accidental Trauma
 - Ovarian Torsion/Mass
 - Pneumomediastinum - Spontaneous
 - Pneumothorax - Spontaneous
 - Pyloric Stenosis
 - Solid Organ Injury
 - Spinal Fusion & Scoliosis

Inpatient CPP Scorecard		2021	2022	2023	2024	Performance 2021 - 2024	Q1 2025	Q2 2025	Q3 2025	Q4 2025	YTD
DEVELOPMENT											
New pathways posted to ANCHOR		10	7	13	9	10	1	3	4	-	8
Pathways with Implemented Epic tools		4	5	11	9	7	4	2	1	1	8
Pathways Data Deployed (Qlik Dashboard)		-	-	-	-	-	-	-	4	1	5
Pathways completed Revision		-	1	7	7	5	5	4	1	4	14
		-	-	-	-	-	1	-	-	-	1
		38,604	66,400			52,502	19,903	17,113	19,897	7,776	64,689
		85%	75%			80%	76%	78%	72%	65%	74%
		-	4			4	4	2	-	-	6



Pathway Access & Marketing

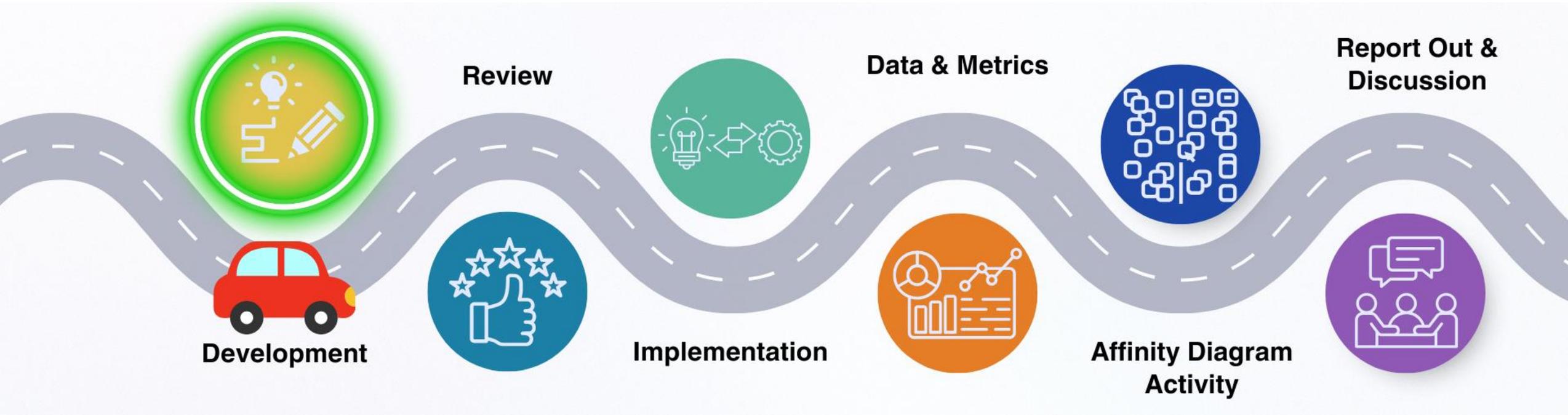
- Internal (Desktop/app)
- External (Desktop/app)
- Physician Connect app
- GEMBA
- Feedback mechanisms
 - Group email/EHR buttons

Data Analytics/Reporting Dashboards

- Qlik
- Power BI
- Scorecards



Clinical Pathway Program Roadmap – Development





Pathway Terminology Definitions

- **Pathway Development:** Multidisciplinary document creation that includes algorithm, goals, patient population and care setting. Considers institutional policies, national guidelines, existing EHR tools and patient education.
- **Peer Review:** Ensures all intended pathway users review and assess impact as it relates to their specialty workflow.
- **Development/Implementation:** Reviews feasibility of incorporating recommended practice into EHR tools.
- **Advisory Committee:** Ensures alignment and compliance with institutional standards, policies, mission, vision and values.





Initial Development Challenges



<https://media0.giphy.com/media/v1.Y2lkPTc5MGI3NjExcnQ1b3NtenRuNXFydjdsbzA3Mm5kNHh6YXcxaXMxejV3OTFrNXk3ciZlcD12MV9pbmRlcm5hbF9naWZfYnlfYWQmY3Q9Zw/L2qukNXGjccyuAYd3W/giphy.gif>





Initial Development Challenges

Know-how	Knowledge and skill for a wide range of pathway developers <ul style="list-style-type: none">⑩ Faculty development and support
Standardize	Standardize clinical pathway process during rapid growth of our program <ul style="list-style-type: none">⑩ Quality assurance with consistency throughout institution⑩ Scalable⑩ Time & Resource limitations
Impact	Make impactful pathways <ul style="list-style-type: none">⑩ Meaningful and Impactful content⑩ Metrics & Data Analytics⑩ Display & Disseminate data



- **Clinical Pathway Program (CPP) support:**
 - **Coordinators**
 - Meetings, process and format support
 - Clinical Pathway Academy
 - **Medical Director (IP, ED/UC, NICU, Surgery)**
 - Content development and oversight
 - Pathway document workflow, implementation strategy and metrics
 - **Medical Director (Data)**
 - Population, data and benchmarking design





“Academy” for Faculty & Pathway Development



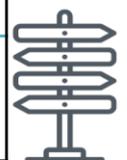
Year	Timeline	Format	Participation
2022	•5 mo.	• Concurrent lecture series and pathway development	14 •9 Physicians – PHM •2 Fellows – PHM •2 Residents •1 Physician Assistant – PHM
2023	•3.5 mo.	• Concurrent lectures and pathway development	9 4 Physicians – PHM, Primary Care 3 Nurse Practitioners – Surgery, GI 1 Physician Assistant – PHM 1 Respiratory Therapist
2024	•6.5 mo.	• Sequential lecture series and pathway development	16 7 Physicians – NICU, PICU, Endocrinology, Hematology 2 Fellows – PHM 3 Residents 2 Nurse Practitioners – Surgery 1 Physician Assistant – GI/Nutrition/Complex Care 1 Pharmacist





Academy Curriculum for Faculty Development

Sessions	Lecture Topic	Speakers
Session 1	Quality of Care via Clinical Pathways – An overview <ul style="list-style-type: none"> •Introductions •Clinical Pathways and Academic output •Clinical Pathway Development and Course Expectations 	Program Manager: Rekha Voruganti, MBOE, LSSBB Ryan Bode, MD - PHM Gerd McGwire, MD, PhD - PHM
Session 2	Creating a Safe and Equitable Clinical Pathway <ul style="list-style-type: none"> •CPP •Diagnostic Timeout •Pathway Equity 	Program Coordinators: Tahje Brown, MBA, Tara Dinh, BS, Quino Serantes, BA Mike Perry, MD - PHM Cara Texler, MD - PHM
Session 3	Combining Evidence, Consensus and Culture into Standardized Best Practice <ul style="list-style-type: none"> •PICO Questions & Evidence search •Evidence appraisal & Best practice Development 	Liz Lyman - Reference Librarian Gerd McGwire, MD, PhD - PHM
Session 4	Pathway Implementation – Science vs. Human Behavior <ul style="list-style-type: none"> •Implementation science •Behavioral Economics 	Amy Tyler, MD - PHM Jack Stevens, PhD Psychology, Behavioral Economics
Session 5	Clinical Pathways – Informatics Perspectives, Metrics and Data <ul style="list-style-type: none"> •Using Clinical Informatics to make effective pathways •Metrics & Clinical tools 	Juan Chaparro, MD – ED, Physician Informatics Laura Rust, MD – ED, Physician Informatics
Session 6	Launching the Clinical Pathway & Measuring Impact <ul style="list-style-type: none"> •Epic Implementation •Pathway use and data collection •Planning for Final Session presentations 	Nursing Informatics, Physician Informatics, Epic analyst Laura Rust, MD – ED, Physician Informatics Gerd McGwire, MD, PhD, Tara Dinh, BS
Session 7	Final Presentation	Participants IN PERSON





Clinical Pathway Academy - 2023

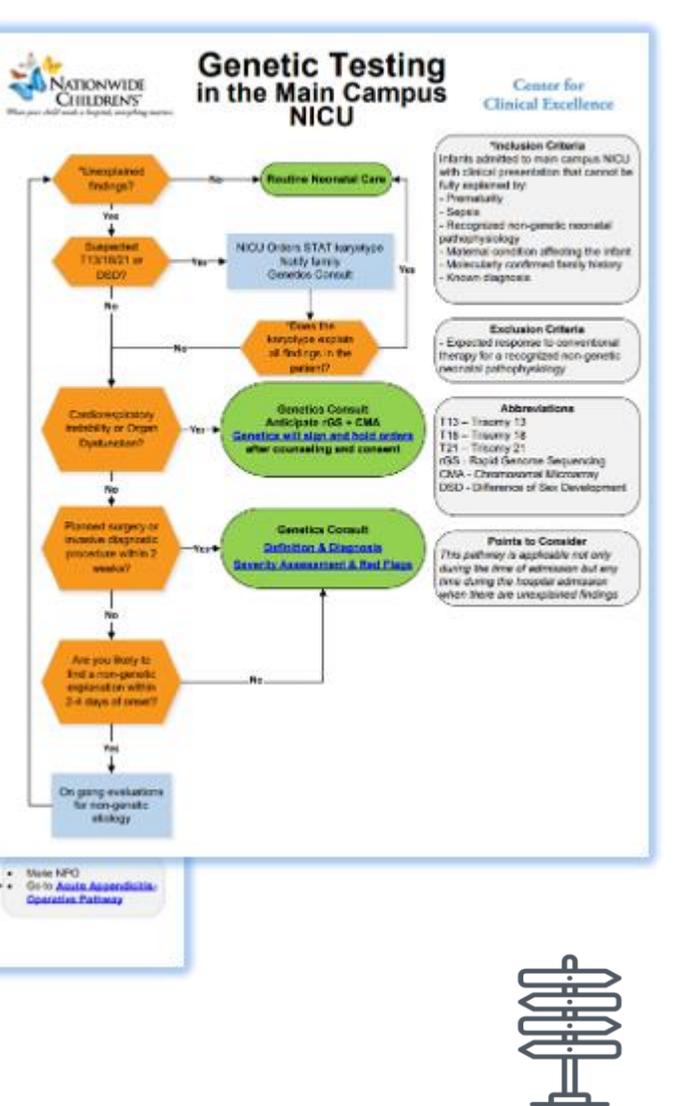
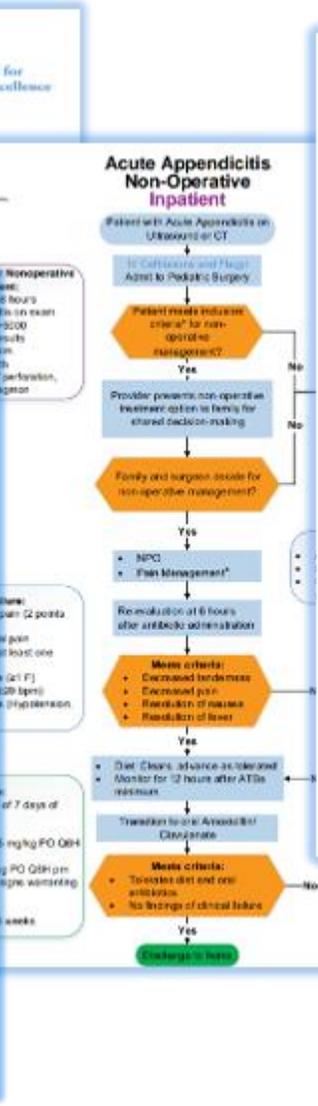
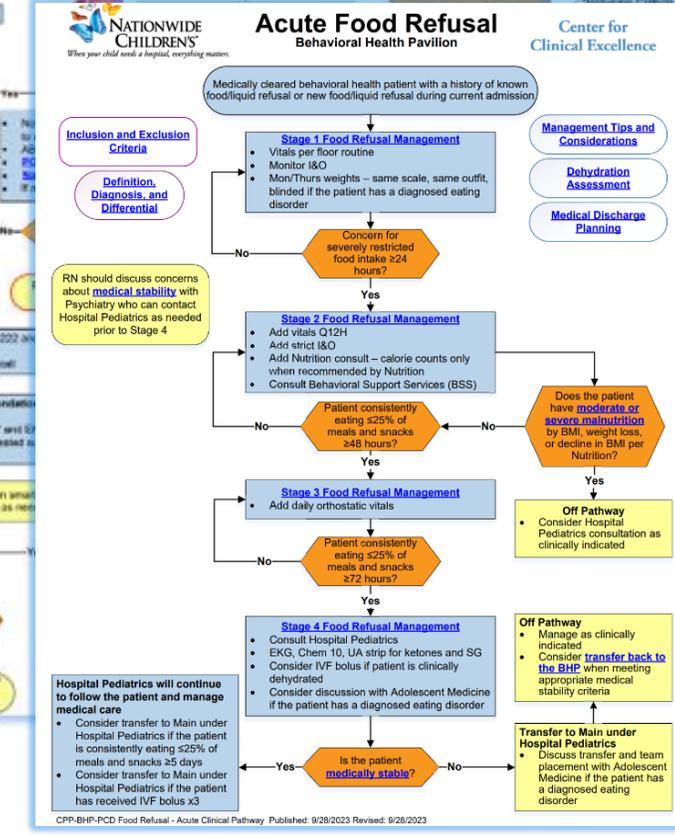
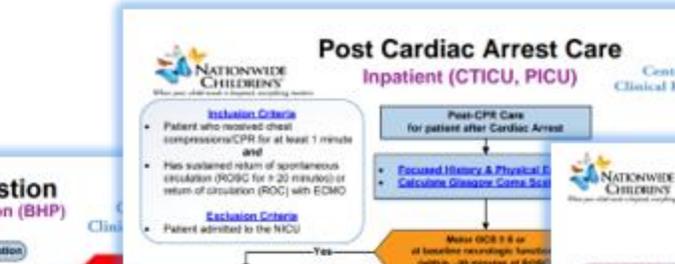


Final Presentation Event



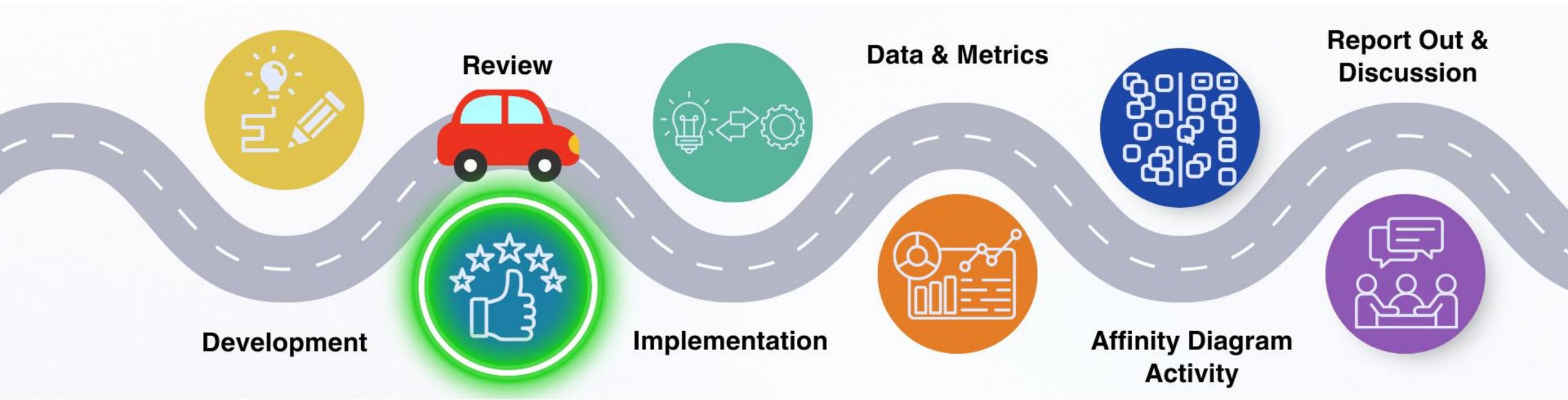
Certificates!







Clinical Pathway Program Roadmap – Pathway Review Process





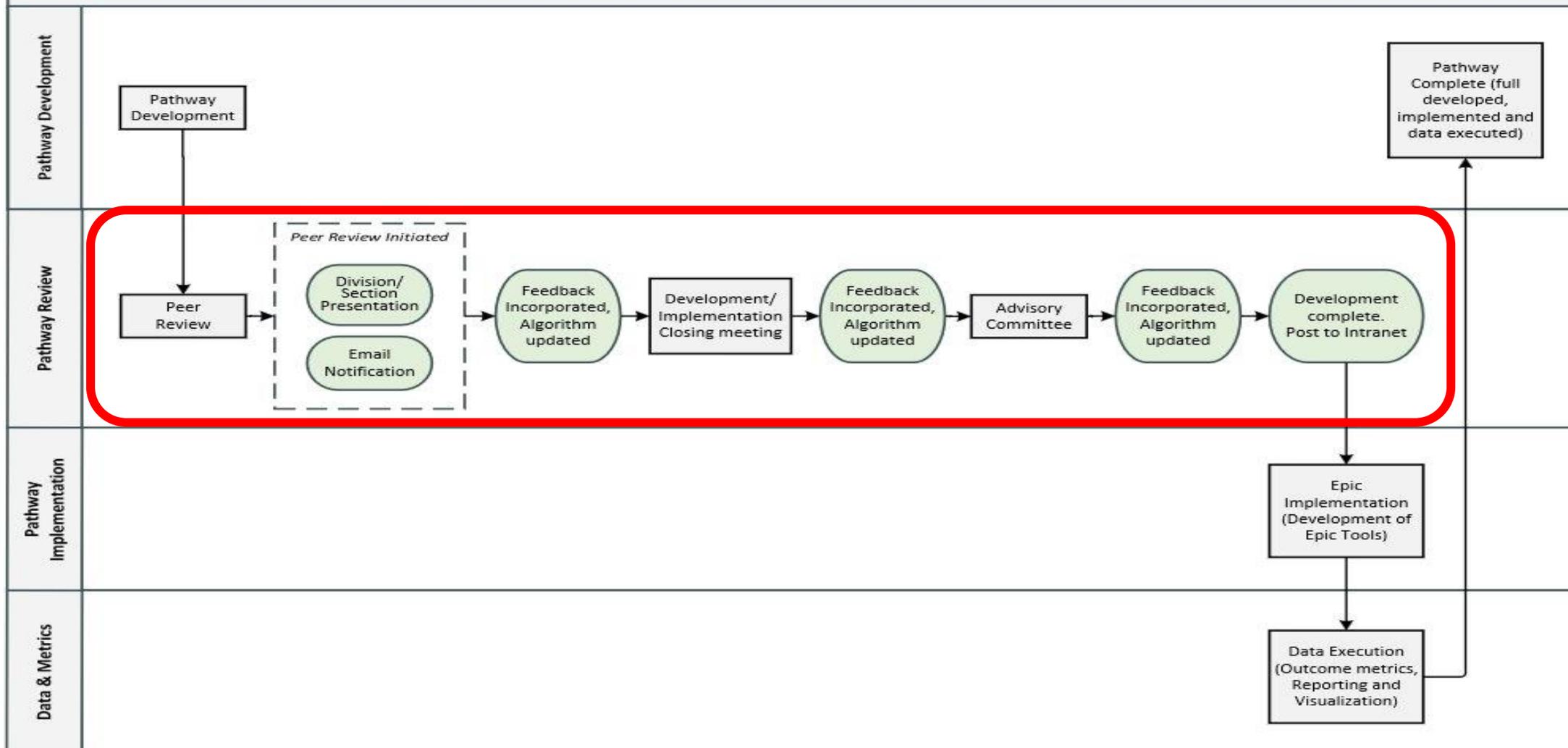
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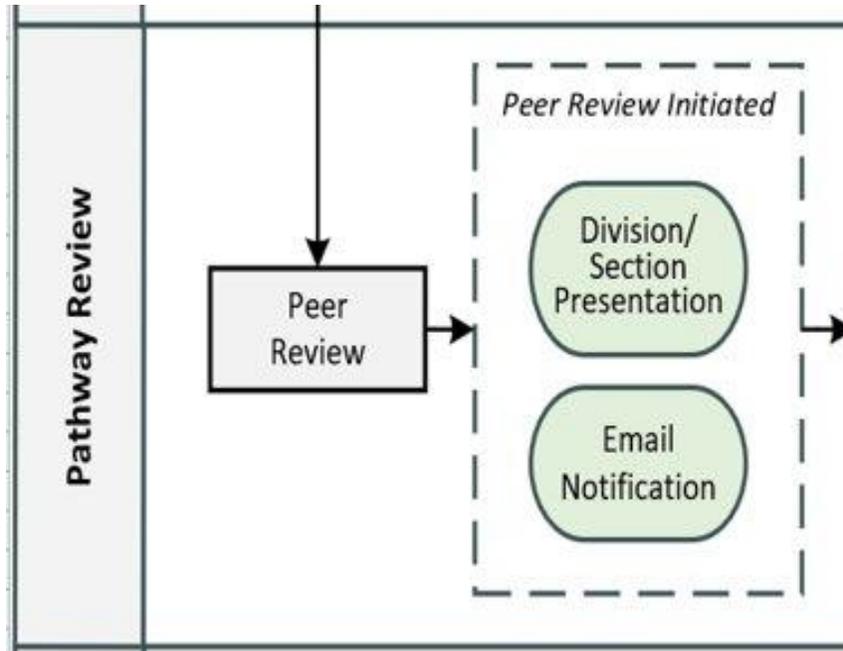
Clinical Pathways Program – Pathway Lifecycle





PEER REVIEW PROCESS-

- Division/ Section meeting
- Email communication and feedback could be solicited via email.
- Each discipline's pathway champion takes it back to their group.



- Nurse takes it to the Nursing Council, APPs, Pharmacists, Therapists back to their own groups
- Process might look different in different care settings across the hospital.
 - ICU may have a slightly different process than ED.
 - In the NICU, for example, the physician champions take it back to the 2 other physician groups.
 - ED has a standing peer review meeting.
- The key is to make sure every stakeholder group has an opportunity to review the pathway and provide feedback for accuracy and feasibility.

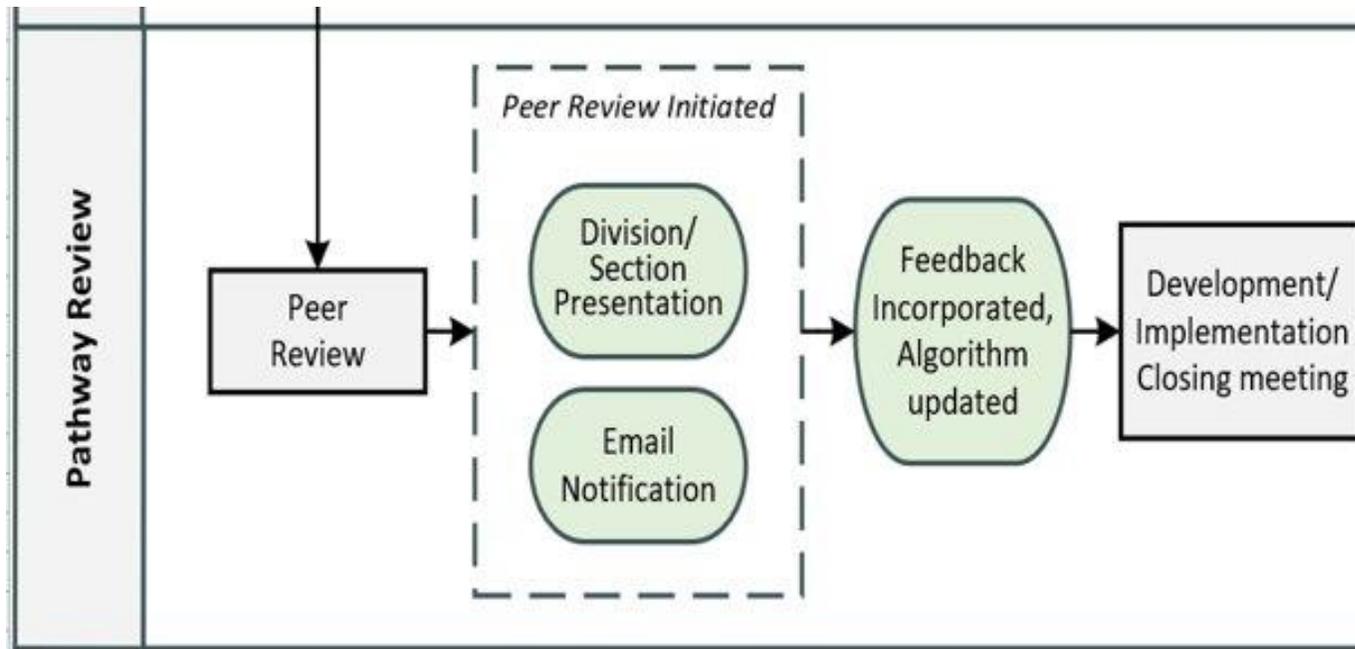


Development/Implementation Team consists of:

- Clinical Informatics
- Physician informatics
- Nursing informatics with
- Development team

Development - Informatics Collaboration:

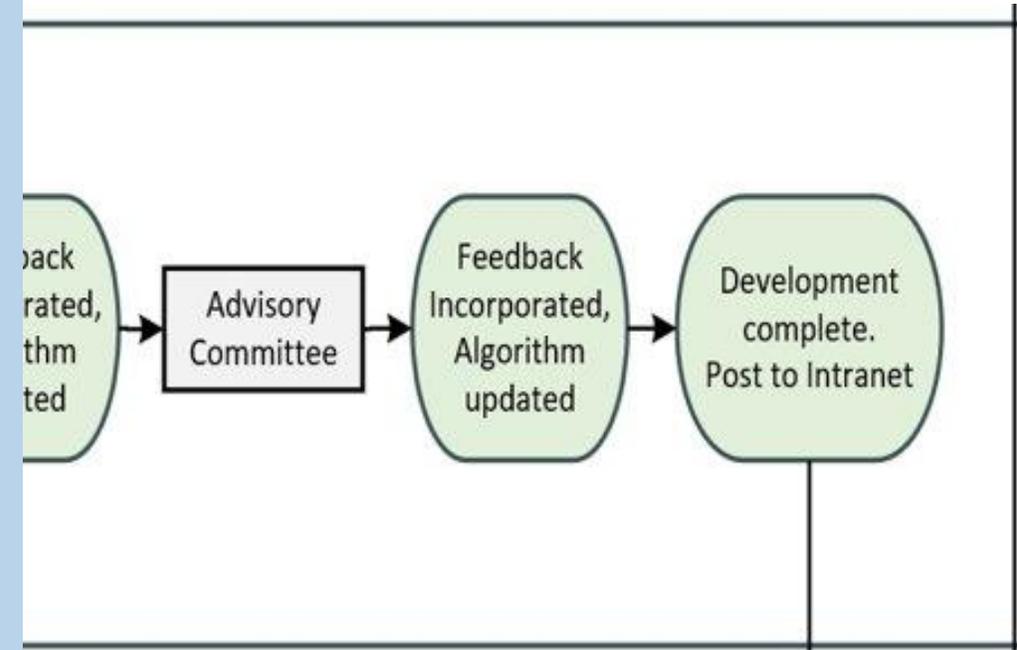
- Clarify the complex algorithm
- Branching of questions are well structured
- Appropriate EHR tools to support the pathway





Advisory Committee consists of:

- Medical directors
- Physicians
- Chief residents
- Radiology director
- Clinical value analysts
- Antimicrobial stewardship
- Lab managers
- Pharmacy
- Psychologists
- Nurse educators
- Marketing
- Informatics (CI, NI, PI)
- Other care setting specific stakeholders





Quality of Review

- Multidisciplinary team pathway development
- Multidisciplinary review process
- Frequent communications
- Alignment with hospital policy and guidelines
- Patient education/Helping Hands

User Friendliness

- Online shared document
 - Multiple people can work simultaneously
 - Minimize redundancy - Respond/see previous comments
 - Version control
- Documentation of comments provides ready reference if questions arise during implementation

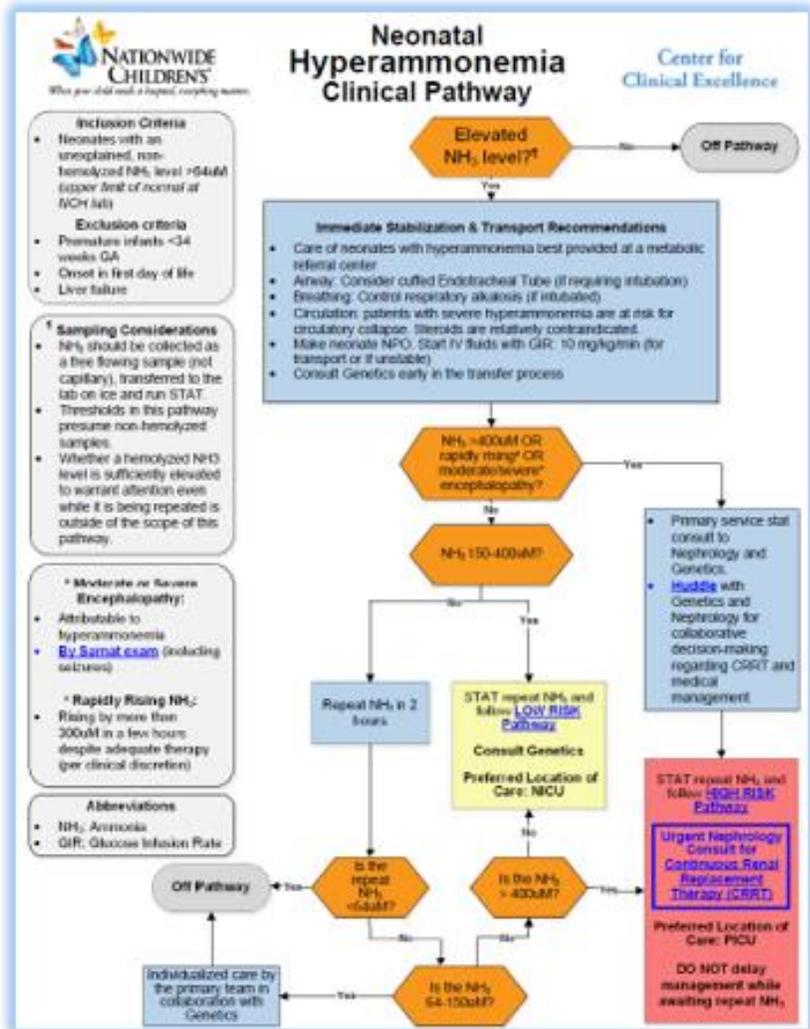
Impact

- Multidisciplinary buy-in
- 3 step review process
 - Peer Review
 - Development/Implementation closing meeting
 - Advisory Committee





Pathway Example - Hyperammonemia

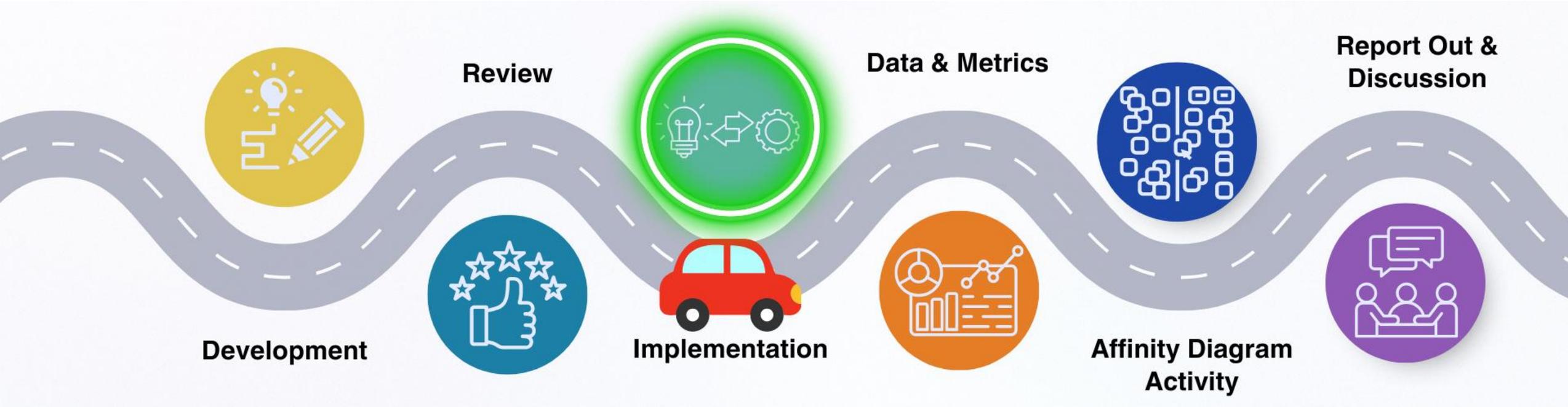


- Multiple development Teams: Neonatology, PICU, Genetics, Nephrology
- Lab: Recommendations on blood sampling considerations, High Priority labs order set
- Pharmacy: dosing and availability of medications (Ammonul, Arginine, L-Carnitine)
- Informatics Team- Reviewed feasibility of incorporating recommended practice into EHR tools





Clinical Pathway Program Roadmap – Implementation





Implementing Pathways



<https://giphy.com/gifs/cbc-schitts-creek-cJMpdj8PNu4pczZWID>





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"Implementation Science and Clinical Pathways" – Dr. Amy Tyler

- Pathways4Kids Quarterly Meeting 9/25/25



Successful pathways will include a combination of different implementation strategies:

Lower Reliability	Higher Reliability
Presence of a pathway document	Default "opt-out" order sets
Group or individual education	Best-Practice Alerts
	Longitudinal- QI





Implementation Approach

Kickoff

- Multidisciplinary
- Review pathway from an operational lens
- Assess build requirements

Updates

- Demo tools

Validation

- Sign-off build components

Go-live

- Education dissemination



Pathway leads' homework

Build

Proof of Concept (POC) validation

Build



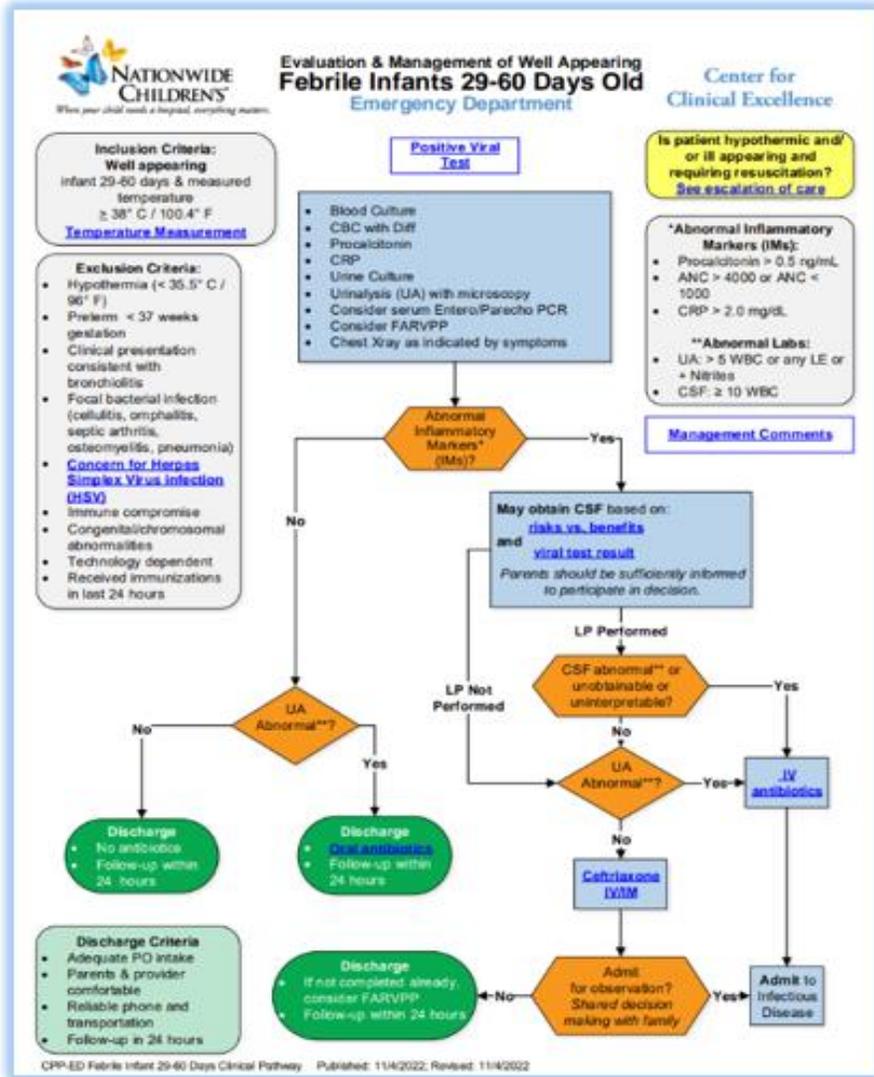
Epic build testing

[HOLD] Meeting if needed





Pathway Example – Febrile Infant 29-60 Days



ED Febrile Infant (29-60 days) Clinical Pathway

Remove Order Sets

DO NOT use this pathway if patient is hypothermic and/or ill appearing requiring resuscitation.

Inclusion: Infant 29-60 days AND measured temperature $\geq 38^{\circ}\text{C} / 100.4^{\circ}\text{F}$

Exclusion: See pathway document below for specifics. **DO NOT use this pathway if the patient is not well appearing.**

- Febrile Infant (29-60 Days) Clinical Pathway

ACTIVE CLINICAL PATHWAYS:
Febrile Infant

▼ Patient Care Parameters

▼ Procedures

- Verify with attending or fellow prior to starting antibiotics
Routine, ONCE, today at 2350, For 1 occurrence

▼ Clinical Pathway

▼ Clinical Pathway

- Febrile Infant 29-60 Days Clinical Pathway
Routine, CONTINUOUS, Starting today at 2350, Until Specified

▼ IV Therapy

▼ IV Placement and Fluids

- IV Placement
- PRE-PROCEDURE ORDERS
- IV PLACEMENT
- IV Placement
- PLACE/MAINTAIN IV
ONCE, today at 2350, For 1 occurrence, STAT

ED Febrile Infant (29-60 Days) Clinical Pathway

- Febrile Infant (29-60 days) Clinical Pathway

- CSF Studies
- Abnormal Inflammatory Markers
 - LP not indicated or normal CSF with abnormal UA
 - Abnormal CSF (WBC > 15) or LP not successful/uninterpretable
 - LP not indicated or normal CSF with normal UA
- Normal Inflammatory Markers with Abnormal UA
 - cephalexin (KEFLEX) 250 mg/5 mL oral suspension - ONCE (\$\$)
25 mg/kg, ONCE Indications: Urinary Tract Infection
 - Vancomycin
If CSF is cloudy, purulent or there is concern for Streptococcus pneumonia or Staphylococcus aureus
 - Vancomycin

Next Required





Implementation Challenges

- **Provider awareness**
 - Reaching new trainees and nurses, rotating residents
 - Pathway EHR tools
- **Dissemination of information**
 - Large number of stakeholders due to size of organization
 - Organizational culture
 - E-mail overload
- **Competing priorities**
 - EHR prioritization





Implementation Challenges & Possible Solutions



- **Provider awareness**

- Reaching new trainees and nurses, rotating residents ➡ Review during orientation, onboarding
- Pathway EHR tools ➡ Integrate into existing workflows, demonstrate use and benefits

- **Dissemination of information**

- Large number of stakeholders due to size of organization ➡ Accessibility, multidisciplinary representation, various channels
- Organizational culture ➡ Ex: Implementation of Pathway, De-implementation of Care
- E-mail overload ➡ High-yield information only, education during standing meetings

- **Competing priorities**

- EHR prioritization



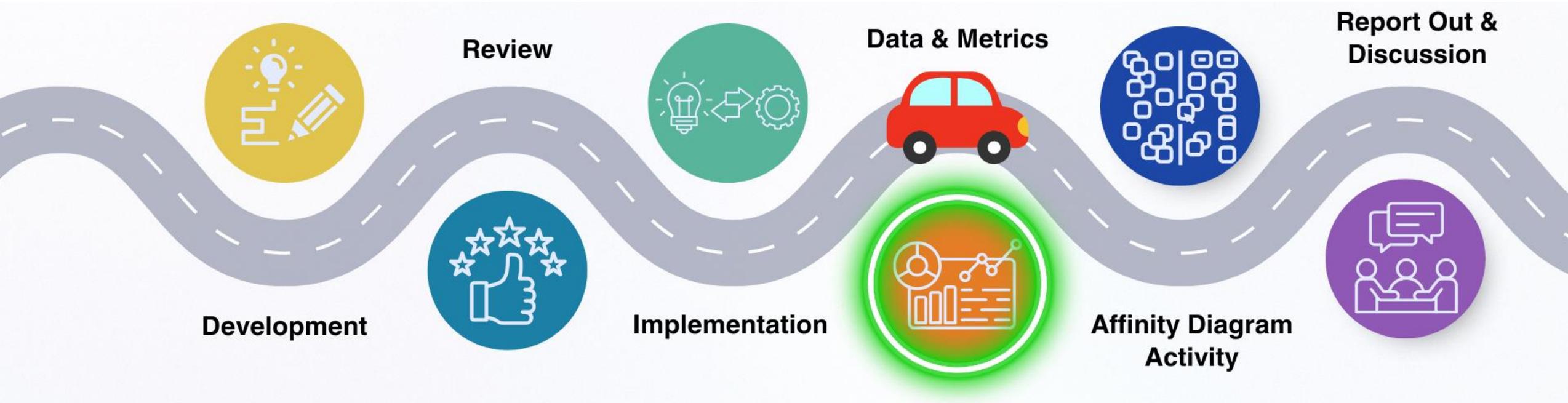
- **Pathway Simulation**

- Hi-fidelity simulation
- Tabletop simulation
- Walk-through, talk-through



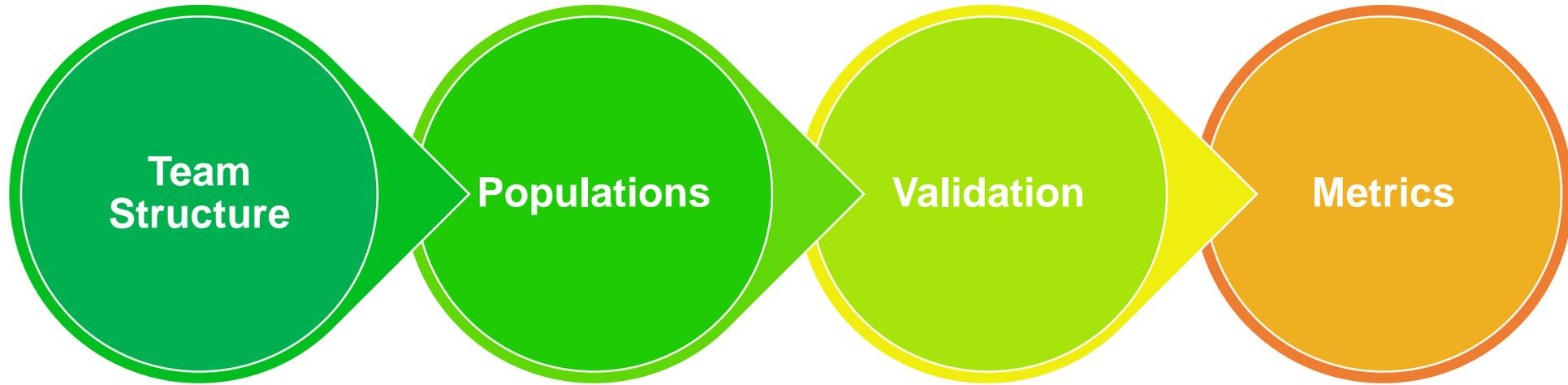


Clinical Pathway Program Roadmap – Data & Metrics



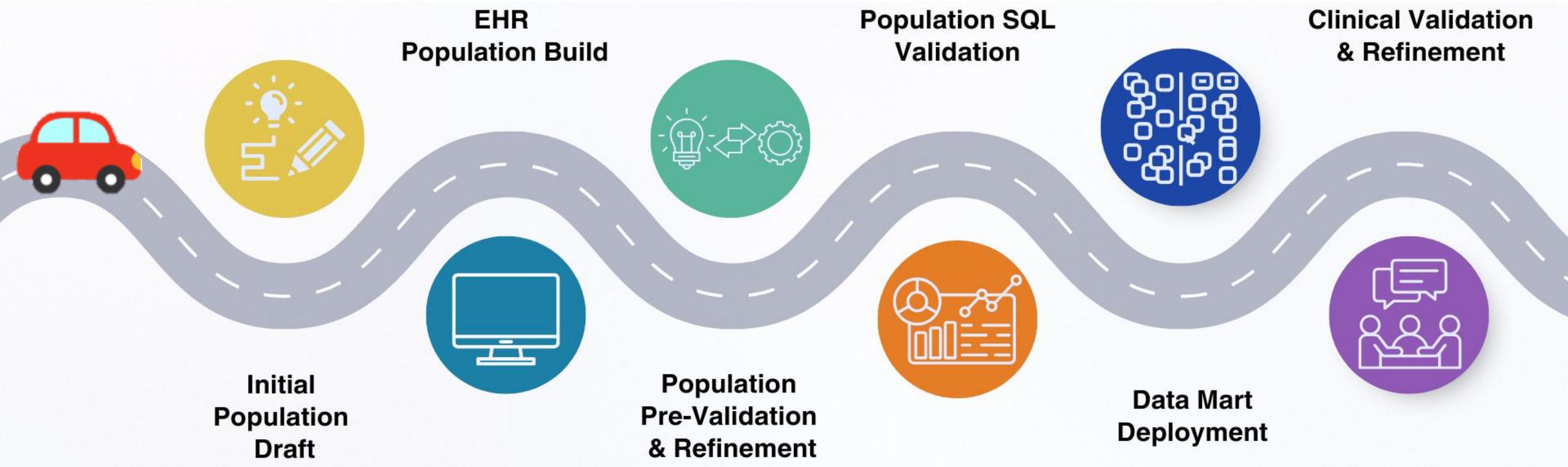


Populations & Metrics



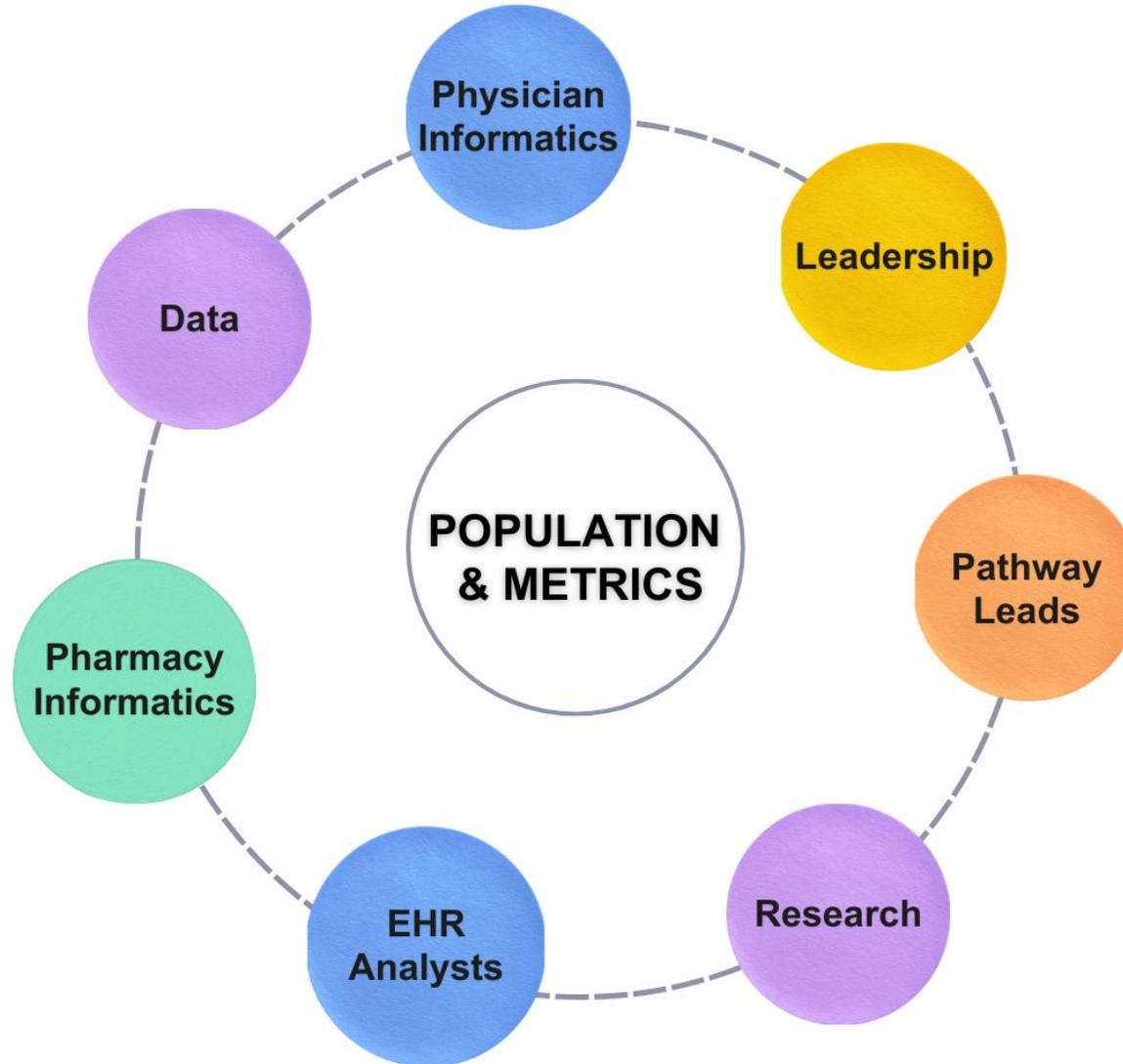


Population Data Roadmap



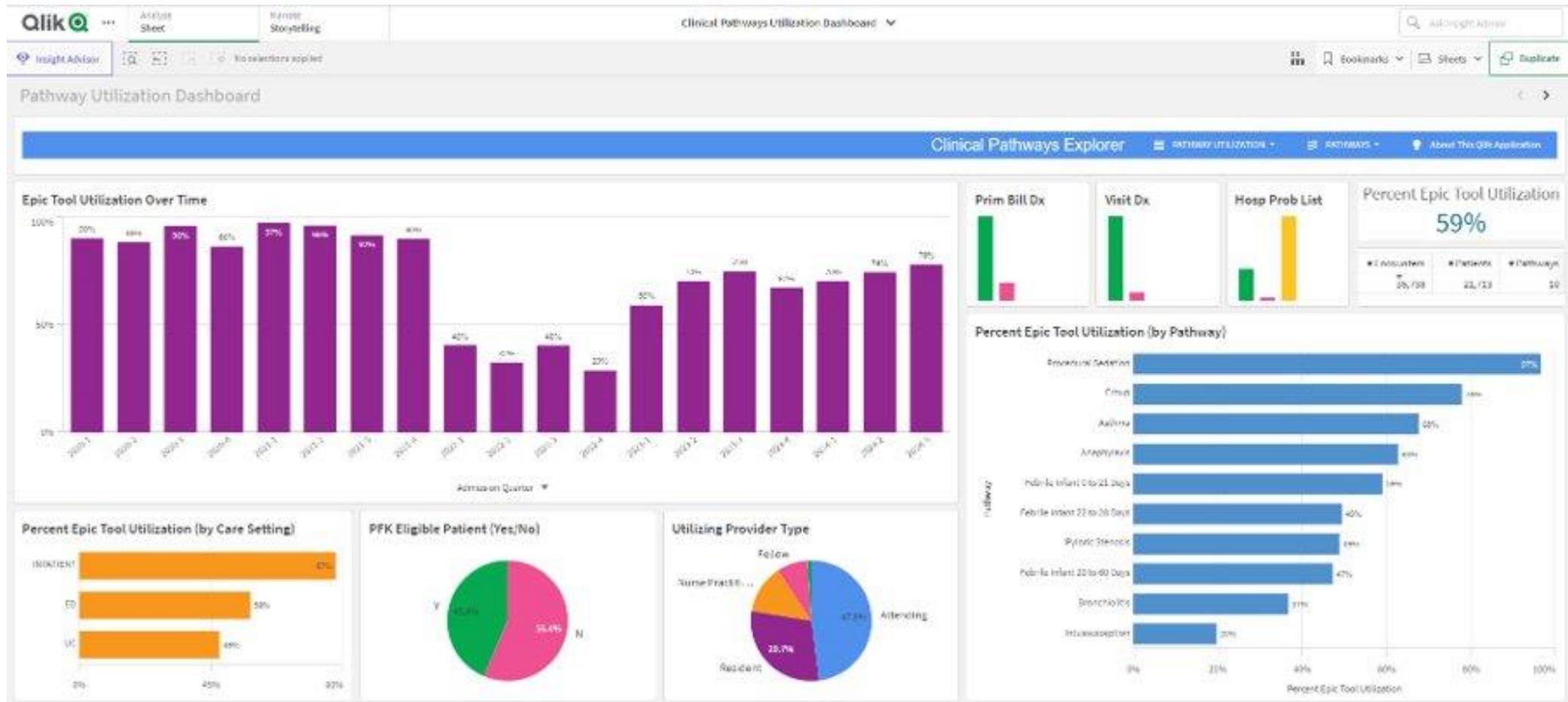


Team





Everyone Wants to Jump to This....





But we need to start here...



CLINICAL PATHWAYS PROGRAM POPULATION SUMMARY

ED BRUE	
Clinical Pathway Document Inclusion Criteria	Well-appearing infants < 12 months old with a brief resolved event characterized by one or more of the following: • Cyanosis or pallor • Absent, decreased, or irregular breathing pattern • Marked change in tone (hyper- or hypotonia) • Altered responsiveness
Clinical Pathway Document Exclusion Criteria	• Age greater than or equal to 12 months • Temperature greater than or equal to 100.4F or hypothermia (<35.5 • History of any significant diagnosis such as cardiac, neurologic, or m • Ongoing symptoms or ill-appearing
Age Parameters	Less than 12 months
Diagnoses & Search Field for Diagnosis Inclusion: ICD10 Codes	ED Visit Diagnoses: EDG CONCEPT BRIEF RESOLVED UNEXPECTED EVENT (BRUE) IC • See VCG113610 Summary and VCG2113610_EDG_Records Tabs
Inclusion Logic	"AND" logic - Must meet both criteria
Diagnoses & Search Field for Diagnosis Exclusion: ICD10 Codes & SNOMED	Population Inclusion Criteria Encounter & Patient Level - Hospital Problem List, Problem List, C History Present Prior to Encounter: EDG CONCEPT CONGENITAL HEART DISEASE NCH [100608] - SN EDG ICD CODES NEUROLOGIC AND NEUROMUSCULAR COMPLEX EDG ICD CODES OVERALL METABOLIC COMPLEX CHRONIC CON EDG ICD CODES CONGENITAL AND GENETIC DEFECTS NCH [1171
Flowsheet Documentation Other	Any temperature greater than or equal to 100.4F or less than 96F dur Patients directly admitted from the ED to the ICU (H02B, H08B, H04B, "OR" logic - Any of the above criteria would exclude a patient.
Exclusion Logic	Population Exclusion Criteria
Population Comments	
<ul style="list-style-type: none"> • Evaluation timeframe 10/17/23-10/17/2025 in Rel Support • 334 encounters meeting ED inclusion criteria (ED Visit Dx) vs 201 meeting IP inclusion criteria (Primary Billing) • There were 309/334 (93%) that were admitted from the ED with an ED Visit Dx of BRUE • There were 105/309 (34%) admitted patients from the ED who did not have a primary billing diagnosis of BRUE - 3 still had BRUE as a primary billing diagnosis, and had ALTE as a secondary billing diagnosis - nearly all of these had BRUE as a Visit Dx - Do we want to search all billing diagnoses for inclusion for the inpatient population? <ul style="list-style-type: none"> • 53/90 had a diagnosis of GER (mostly primary), 7/90 had bronchiolitis, a few others had 'unspecified apnea of newborn' • There were 34/201 (17%) patients who had a primary billing diagnosis of BRUE but NOT an ED Visit Dx, all the ED visit dx describe BRUE like activity but weren't called a BRUE 	
Dates of Note	
Clinical Pathway Version Population Based On (Published/Revised Dates)	Published 7/5/2017, Revised 4/22/2024
Pathway Implementation Date	4/29/2025
Initial Population Go-Live Date	9/3/2025
Population Revision History	
CPP Team	Gerd McGwire, Katie Stone, Laura Rust

Build Details

Rule

Rule criteria:

1. General Properties » Age: Visit, exact, configurable^a >= 1 then quit
^a Unit for Return Value = Years [3]; Use Fallback? = No [0]; Use Preterm Correction? = No [0]
2. General Properties » Diagnosis Grouper Search^a = 1 then quit
^a Diagnosis Grouper = EDG CONCEPT CONGENITAL HEART DISEASE NCH [100608]; Always Search as Admitted? = Yes [1]
3. General Properties » Diagnosis Grouper Search^a = 1 then quit
^a Diagnosis Grouper = EDG ICD CODES NEUROLOGIC AND NEUROMUSCULAR COMPLEX CONDITIONS NCH [117163]; Always Search as Admitted? = Yes [1]
4. General Properties » Diagnosis Grouper Search^a = 1 then quit
^a Diagnosis Grouper = EDG ICD CODES OVERALL METABOLIC COMPLEX CHRONIC CONDITIONS (MODIFIED) NCH [122097]; Always Search as Admitted? = Yes [1]
5. General Properties » Diagnosis Grouper Search^a = 1 then quit
^a Diagnosis Grouper = EDG ICD CODES CONGENITAL AND GENETIC DEFECTS NCH [117650]; Always Search as Admitted? = Yes [1]
6. General Properties » Medical History Present Prior to Encounter^a = Exists in history [1] then quit
^a Diagnosis grouper = EDG CONCEPT CONGENITAL HEART DISEASE NCH [100608]
7. General Properties » Medical History Present Prior to Encounter^a = Exists in history [1] then quit
^a Diagnosis grouper = EDG ICD CODES NEUROLOGIC AND NEUROMUSCULAR COMPLEX CONDITIONS NCH [117163]
8. General Properties » Medical History Present Prior to Encounter^a = Exists in history [1] then quit
^a Diagnosis grouper = EDG ICD CODES OVERALL METABOLIC COMPLEX CHRONIC CONDITIONS NCH [117496]
9. General Properties » Medical History Present Prior to Encounter^a = Exists in history [1] then quit
^a Diagnosis grouper = EDG ICD CODES CONGENITAL AND GENETIC DEFECTS NCH [117650]
10. General Properties » Evaluate Rule^a = 1 then quit
^a Rule = ED Fever Patient Context Test LR [527583]
11. General Properties » Evaluate Rule^a = 1 then quit
^a Rule = ED Hypothermia Patient Context Test LR [527586]
12. General Properties » Evaluate Rule^a = 1 then quit
^a Rule = RM CPP ED TO ICU TRANSFER (ED ADMISSION TO ICU) NCH [529560]
13. General Properties » Evaluate Rule^a = 1 then result is Yes [1]
^a Rule = Is ED Diagnosis EPT 18465 in Visit Diagnosis EPT 18400 - BRUE (Brief, Resolved, Unexplained Event) [529069]
14. Constant » Always One = 1 then result is No [2]

Criteria relationship: First true line

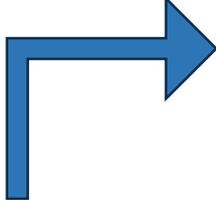
Description

This rule is used to define the Clinical Pathway Program for ED BRUE population for pathway utilization.





Patients on Pathway

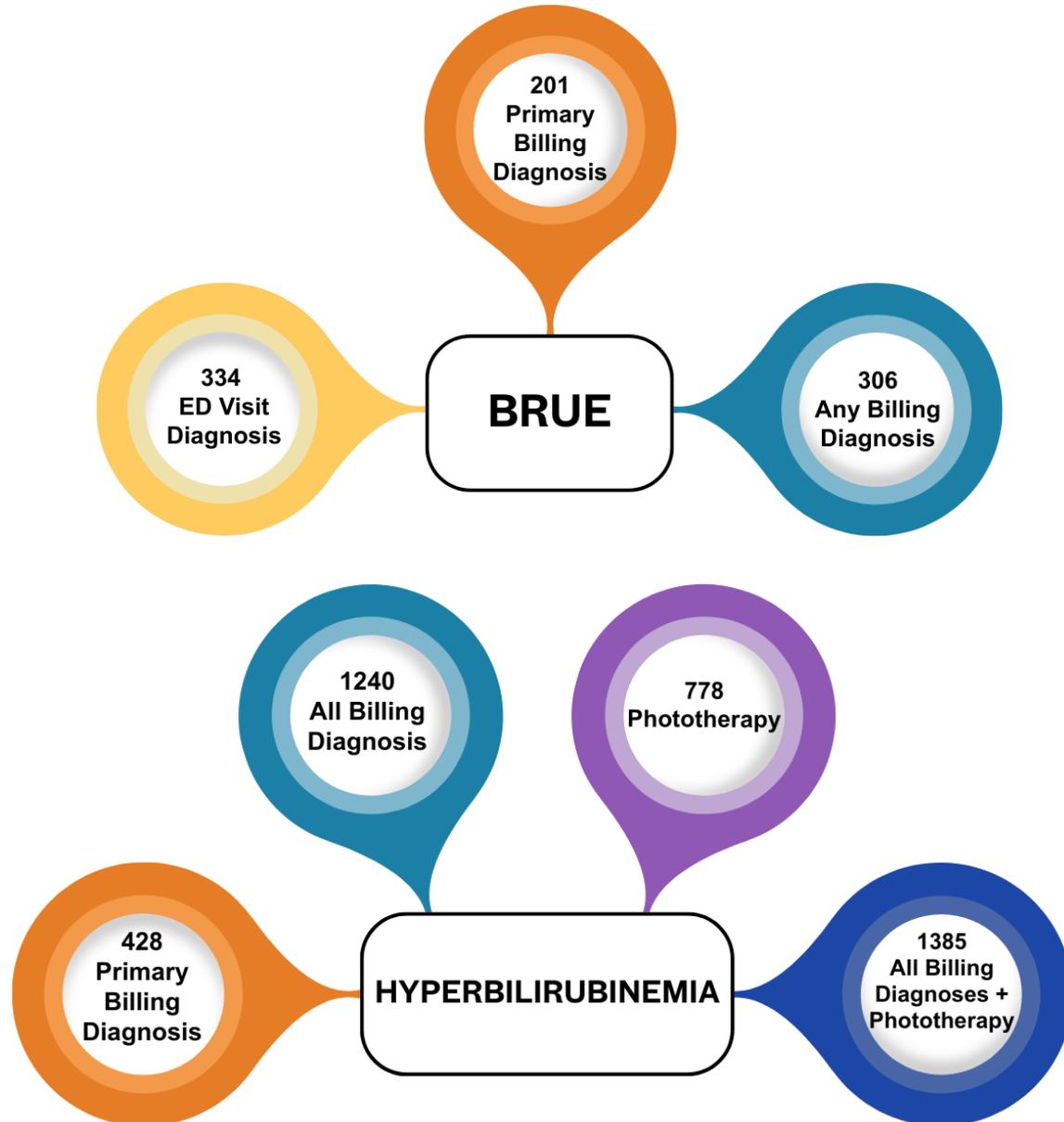


Pathway-eligible Patients

- Population definitions determine who is in the denominator
- They shape **every outcome and process measure**
- Inaccurate definitions → misleading results

Getting this right builds trust, clarity, and actionable insights.





Content AND Approach Matter

Both affect your denominator and metrics (i.e. Order Set Utilization, LOS, and Bounceback Rate).





Decision Point: EHR-based vs External to EHR

• EHR-based Pros:

- ✓ **Direct visibility + transparency for clinical teams**
- ✓ **Best for operational alignment and reduced drift between “operational” and “analytic” definitions**
 - CDS, Research, Slicer Dicer/Cosmos
- ✓ **Reusable across products**
- ✓ **Real-time results**
- ✓ **Governance + scalability**

• EHR-based Cons:

✗ **Build constraints**

- EHR logic editors are powerful but not limitless. Complex modeling (e.g., multi-encounter variables, time-series) may not be feasible.

✗ **Longer build + testing cycles**

- Changes require analysts, migration, pre-validation, and governance reviews.

✗ **Harder to iterate rapidly**

- If you are experimenting with edge cases or revising inclusion/exclusion, the build cycle can slow innovation.

✗ **Dependency on structured documentation**





• External to EHR Pros:

- ✓ **More flexibility**
- ✓ **Faster iteration and experimentation**
 - You can quickly test alternate inclusion/exclusion criteria, visualize distributions, and explore “what if” scenarios before formalizing a definition.
- ✓ **Ideal for early concept and research**
 - Before operationalizing a pathway, external logic supports discovery, feasibility analysis, and preparing analytic foundations.

• External to EHR Cons:

- ✗ **Risk of analytic-operational drift**
 - If the analytic definition doesn't match the EHR definition used for CDS or pathway workflow, performance metrics can lose credibility.
- ✗ **More maintenance**
- ✗ **Harder for clinicians to see and trust**
- ✗ **Not real-time**





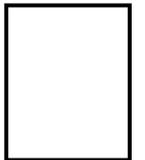
Which should I choose? Both!

- **Use EHR-Based Definitions When:**

- You need organizational **consistency, transparency, and governance.**
- The pathway directly drives **clinical decision support or multiple downstream EHR tools (registries, alerting, flowsheets dashboards)**

- **Use External Definitions When:**

- You are in **early development**, trying to understand the “true” population.
- You need rapid iteration or exploratory work.
- You’re validating accuracy before committing to EHR build.



Best practice:

External Build for Discovery + EHR Build for Production





Start with the Purpose

What improvement question are we trying to answer?

What outcome(s) do we need to track?

What decisions will this population support?

Are there national standards or benchmarks we can use as a starting point?

A population definition is not a diagnosis – it is a fit-for-purpose cohort aligned to the improvement question. Encourage teams to define these during pathway content development.





Inclusion/Exclusion Criteria

- Prefer structured data: diagnoses*, orders, labs, flowsheets
- Avoid free text unless robust NLP-enabled
- When pursuing a diagnosis-based approach, prioritize standardization
 - This often involves enterprise-wide cleanup. For example, we have defined asthma 84 different ways.

ASTHMA CONTROLLER MEDS
ASTHMA EXACERBATION
ASTHMA-RELATED DIAGNOSES/SYMPTOMS
ASTHMA RESCUE MEDS
EDG CONCEPT OR PATIENT HAS ASTHMA
EDG CONCEPT PERINED DIAGNOSES: ASTHMA
EDG ICD-10 CMS-HCC V28 2024 279: SEVERE PERSISTENT ASTHMA
EDG ICD-10 CMS-HCC V28 2025 279: SEVERE PERSISTENT ASTHMA
EDG ICD-10 HHS-HCC V07 2022 161_1 AGE < 18: SEVERE ASTHMA
EDG ICD-10 HHS-HCC V07 2022 161_1: SEVERE ASTHMA
EDG ICD-10 HHS-HCC V07 2022 161_1: SEVERE ASTHMA
EDG ICD-10 HHS-HCC V07 2023 161_1 AGE < 18: SEVERE ASTHMA
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EDG ICD-10 HHS-HCC V07 2025 161_1 AGE < 18: SEVERE ASTHMA
EDG ICD-10 HHS-HCC V07 2025 161_1: SEVERE ASTHMA

ED RX ASTHMA STEROIDS
EDG ASTHMA RISK SCORE GROUPER
EDG CONCEPT ASTHMA-CCP REGISTRY NCH
EDG CONCEPT ASTHMA CPP NCH
EDG CONCEPT ASTHMA EXCLUSIONS NCH
EDG CONCEPT ASTHMA REGISTRY NCH
EDG CONCEPT ASTHMA WELLNESS NCH
EDG CONCEPT COVID-19 ASTHMA,COPD,OR CHRONIC LUNG DISEASE
EDG CONCEPT MOD AND SEVERE ASTHMA DIAGNOSES NCH
EDG GENERAL MU A_C100 ASTHMA PERSISTENT
EDG ICD-10 CMS TFU ASTHMA RELATED CODE 2024-03-25
EDG ICD-10 CMS TFU ASTHMA SUFFICIENT CODE 2024-03-25
EDG ICD-10 HHS-HCC V07 2022 161_2: ASTHMA, EXCEPT SEVERE
EDG ICD-10 HHS-HCC V07 2023 161_2: ASTHMA, EXCEPT SEVERE
EDG ICD-10 HHS-HCC V07 2024 161_2: ASTHMA, EXCEPT SEVERE
EDG ICD-10 HHS-HCC V07 2025 161_2: ASTHMA, EXCEPT SEVERE
EDG ICD CODES ASTHMA CPP NCH
EDG ICD HHS-HCC 161_2-ASTHMA EXCEPT SEVERE

ERX RXAMB ASTHMA COMPLIANCE MONTELEUKAST
HEDIS ASTHMA 2022-03-31
HEDIS ASTHMA 2023-03-31
HEDIS ASTHMA 2024-04-01
HEDIS ASTHMA DIAGNOSIS 2022-03-31
HEDIS ASTHMA DIAGNOSIS 2023-03-31
HEDIS ASTHMA DIAGNOSIS 2024-04-01
HEDIS MEDS ASTHMA CONTROLLER AND RELIEVER MEDICATIONS 2025-01-15
HEDIS MEDS ASTHMA EXCLUSIONS MEDICATIONS 2022-03-31
HEDIS MEDS ASTHMA EXCLUSIONS MEDICATIONS 2023-03-31
HEDIS MEDS ASTHMA EXCLUSIONS MEDICATIONS 2024-04-01
HEDIS RESPIRATORY DISEASES WITH DIFFERENT TREATMENT APPROACHES THAN ASTHMA 2024-04-01
HMT SCHOOL BASED ASTHMA THERAPY
PRL CONCEPT ASTHMA CPP NCH
QM-ASTHMA MANAGEMENT PLAN
QM-PREFERRED ASTHMA THERAPY
RETIRED ERX SPECIALTY MEDICATIONS-ASTHMA NCH
RSH GENERAL JCCM CHILD ASTHMA CARE CLINICAL TRIAL





Use a Standardized Framework

- Consistent inclusion/exclusion categories
 - Standardized diagnosis cohorts: Feudtner
- Standard naming conventions
- Document *everything*: source, rationale, limitations
 - Population Worksheets
 - EHR Metadata
 - Sharepoint
- Enables a “fast-pass” validation workflow

Encourage teams to define these during pathway content development.



Open



Original Investigation | Pediatrics

Pediatric Complex Chronic Condition System Version 3

James A. Feinstein, MD, MPH; Matt Hall, PhD; Amber Davidson, RHIA, CCS, CCS-P; Chris Feudtner, MD, PhD, MPH

Abstract

IMPORTANCE Since implementation of the *International Statistical Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM)* in the US, thousands of new or related codes have been added to represent clinical conditions. The widely used pediatric complex chronic condition (CCC) system required a major update from version 2 (V2) to version 3 (V3) to capture the range of clinical conditions represented in the *ICD-10-CM*.

OBJECTIVE To update the CCC V3 system, creating V3, with new, missing, or retired codes; to reconceptualize the system's use of technology codes; and to compare CCC V3 with V2.

DESIGN, SETTING, AND PARTICIPANTS This repeated cross-sectional study examined US hospitalization data from the Pediatric Health Information System (PHIS) and the Medicaid Merative MarketScan Research Databases from January 1, 2009, to December 31, 2019, for all patients aged 0 to 18 years. Data were analyzed from March 1, 2023, to April 1, 2024.

EXPOSURES The CCCs were identified in both data sources using the CCC V2 and V3 systems.

MAIN OUTCOMES AND MEASURES The (1) percentage of pediatric hospitalizations associated with a CCC, (2) numbers of CCC body-system categories per patient, and (3) explanatory power for hospital length of stay and in-hospital mortality were compared over time for V3 vs V2.

RESULTS Among 7 186 019 hospitalizations within PHIS, 54.3% patients were male, the median age was 4 years (IQR, 1-11 years), and 51.2% were aged 0 to 4 years. The CCC V2 identified 2 878 476 (40.1%) patients as having any CCC compared with 2 753 412 (38.3%) identified by V3. In addition, V2 identified 100 065 (1.4%) patients with transplant status compared with 146 683 (2.0%) by V3, and V2 identified 914 835 (12.7%) as having technology codes compared with 805 585 (11.2%) by V3. The 2 systems were similar in accounting for the number of CCC body-system categories per patient and in explaining variation in hospital length of stay and in-hospital mortality. For both V2 and V3, 10.0% of the variance in hospital length of stay and 12.0% of the variance in in-hospital mortality was explained by the presence of a CCC. Similar patterns were observed when analyzing the 2 999 420 Medicaid Merative MarketScan Research Databases' hospitalizations (52.3% of patients were male, the median age was 1 year [IQR, 0-12 years], and 62.0% were 0 to 4 years old), except that the percentages of identified CCCs were all lower: V2 identified 758 110 hospitalizations (25.3%) with any CCC compared with 718 100 (23.9%) identified by V3.

CONCLUSIONS AND RELEVANCE These results suggest that, moving forward, V3 should be used to identify CCCs, and ongoing, frequent updates to V3, using a transparent, structured process, will enable V3 to accurately reflect the evolving spectrum of clinical conditions represented in the *ICD-10-CM*.

Key Points

Question How does the updated version of the pediatric complex chronic condition (CCC) system (version 3 [V3]) compare with version 2 (V2) in capturing the range of clinical conditions represented in the *International Statistical Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM)*?

Findings In this cross-sectional study of 7 186 019 hospitalizations within the Pediatric Health Information System from 2009 to 2019, V3 identified 38.3% of hospitalizations with a CCC compared with 40.1% identified by V2. The systems were similar in accounting for the number of CCC body-system categories per patient and in explaining variation in length of stay and mortality, and similar patterns were observed in the 2 999 420 hospitalizations from the Medicaid Merative MarketScan Research Databases.

Meaning The findings of this study suggest that the CCC V3 reflects the evolving *ICD-10-CM* system and should be used to identify CCCs.

+ Invited Commentary

+ Supplemental content

Author affiliations and article information are listed at the end of this article.

JAMA Network Open. 2024;7(7):e2420579. doi:10.1001/jamanetworkopen.2024.20579



Versioning & Metadata

- Just as you track pathway versions, track population versions as well
- Maintain a change log with rationale for changes
- Allow historic populations for trend comparisons
- Leverage Metadata



You can't evaluate improvement if the denominator keeps changing silently.





Validation

- Needs to be completed 'at scale' and with individual chart reviews
 - Ideal if this is completed by someone with a clinical and EHR/data background
- Iterate and refine – look for false positives and false negatives
- Document known limitations
- Ensure team agreement before finalizing



***Validation should be collaborative –
physician informatics + clinicians + EHR Analysts + data analysts***





Pre-Validation Tips – The Devil is in the Details

- Globally review if patients seem to fall into the expected age cutoffs
- Compare populations across the care continuum if applicable (ED → IP), ***especially for diagnosis-based populations***



- Investigate discrepancies when you expect a mostly 1:1 relationship (e.g. Appendicitis, DKA)
- Validate exclusion category impact (e.g. Feudtner & Hyperbilirubinemia)

Pre-validation saves downstream work and builds trust and transparency.



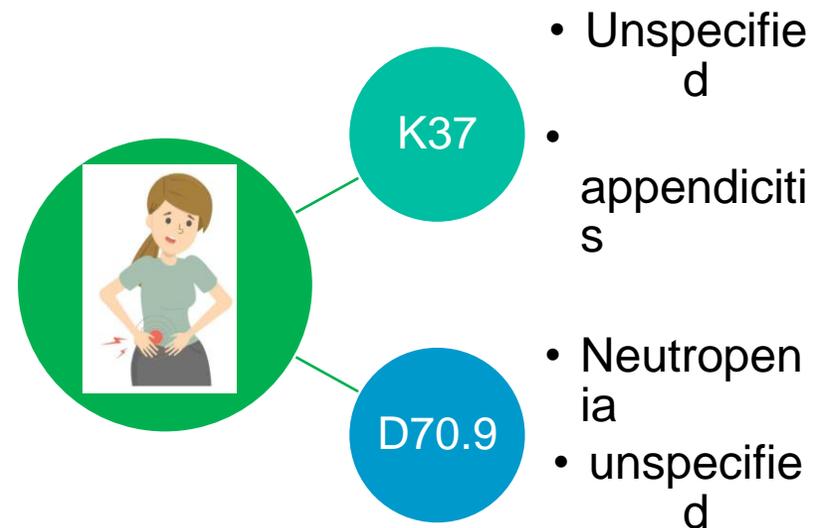
- **Intelligent Medical Objects (IMO)**

- IMO is a third-party vendor that provides clinical terminology databases to bridge the gap between clinicians' language and administrative coding systems. Many hospitals contract with IMO.
- It can save organizations tremendous amounts of time with providing the mappings, but these sometimes need interpreted with caution.

- **When Appendicitis ≠ Appendicitis**

- 19 ICD 10 Codes for Appendicitis → ~197 Diagnosis Codes

ID	Name	ICD-9 Codes	ICD-10 Codes	Specific/Generic
171392	Neutropenic typhlitis	542	K37, D70.9	Both Specific and Generic





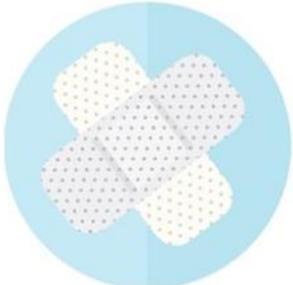
Caution: CMS Billing Rules



• CMS has rules around charges that will impact your data when using billing diagnoses:

- 72-hour Rule (see below)
- Inpatient stays within 30 days
- Same day visits

UC Visit



Clinical Impressions

◆ Acute bacterial conjunctivitis of both eyes

Final Diagnoses (ICD-10-CM)	
Code	Description
J21.1 [P]	Acute bronchiolitis due to human metapneumovirus
J96.01	Acute respiratory failure with hypoxia
B37.0	Candidal stomatitis
E86.0	Dehydration
H66.91	Otitis media, unspecified, right ear
R00.0	Tachycardia, unspecified
Z79.899	Other long term (current) drug therapy
Z53.21	Procedure and treatment not carried out due to patient leaving prior to being seen by health care provider
H66.92	Otitis media, unspecified, left ear

Hospital Visit (2 Days Later)



Final Diagnoses (ICD-10-CM)	
Code	Description
J21.1 [P]	Acute bronchiolitis due to human metapneumovirus
J96.01	Acute respiratory failure with hypoxia
B37.0	Candidal stomatitis
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H66.91	Otitis media, unspecified, right ear
R00.0	Tachycardia, unspecified
Z79.899	Other long term (current) drug therapy
Z53.21	Procedure and treatment not carried out due to patient leaving prior to being seen by health care provider
H66.92	Otitis media, unspecified, left ear





Shared Metrics – Develop a Set for Each Care Setting



ED

Total ED Encounters
Average ED Roomed Time to Provider Disposition (hours)
Average ED Roomed Time (hours)
Average Time from First Provider Assignment to Provider Disposition Time (hours)
Average ED LOS (hours)
Percentage of ED Encounters That Were Admitted
For Encounters Where the Patient was Admitted, What Percentage of Those Were Admitted to an ICU
Percentage of Encounters where the Patient was Admitted to a Non-ICU Setting the Same Day or Within 6 hours of Admission
Percentage of ED Encounters with a Return Visit to the ED/UC within 24hrs (all cause)
Percentage of ED Encounters with a Return Visit to the ED/UC within 72hrs (all cause)
Percentage of Encounters with a Return Visit to the ED/UC within 7 days (all cause)
Percentage of ED Encounters with an ED/UC Visit within the Prior 72 hours (all cause)
Percentage of Return Visit Encounters That Were Admitted
For Return Visit Encounters Where the Patient was Admitted, Percentage Directly Admitted from the ED to ICU

Collaborate with pathway teams to select the clinically relevant metrics.



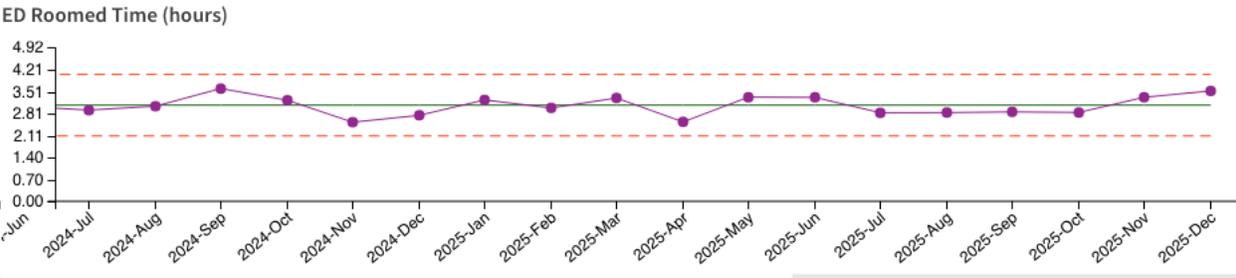
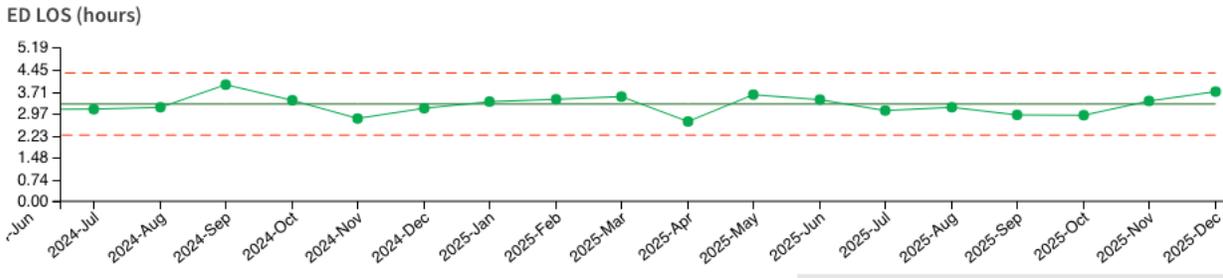
Pathway-Specific Metrics

- Not all pathways will have relevant shared metrics and instead need those specific to the pathway
- Will require a work-effort similar to population development (if not more)
- Difficult for a pathway program to manage 3-6 global metrics per pathway and 3 or more specialty metrics – ownership needs to be shared
 - Try to leverage division-specific QI/data teams



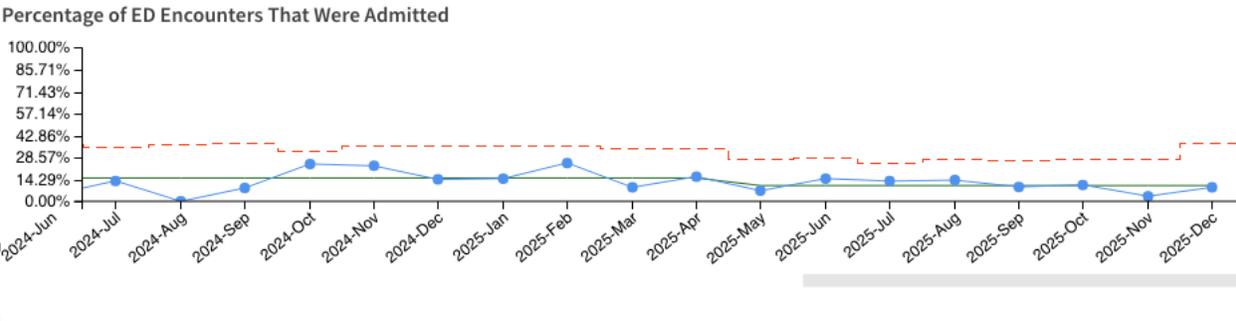
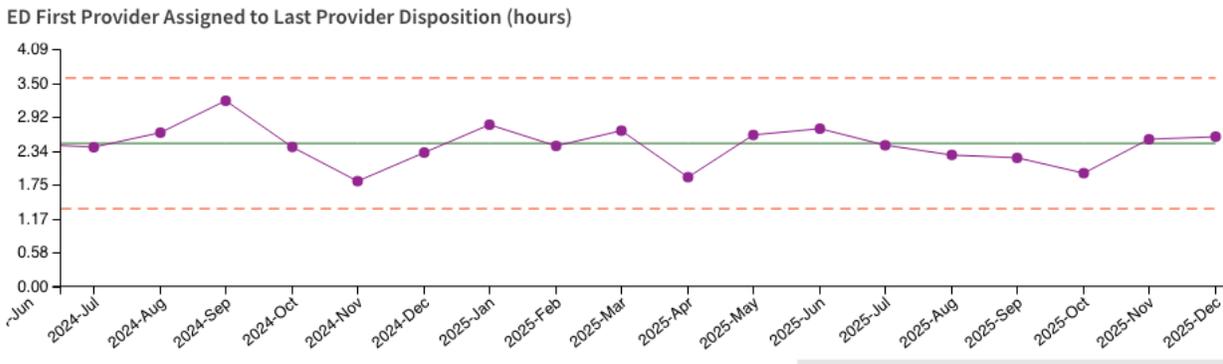


Save time and resources by automatically displaying in control chart format!



Raw Data

Raw Data





Pathway Data Dashboard

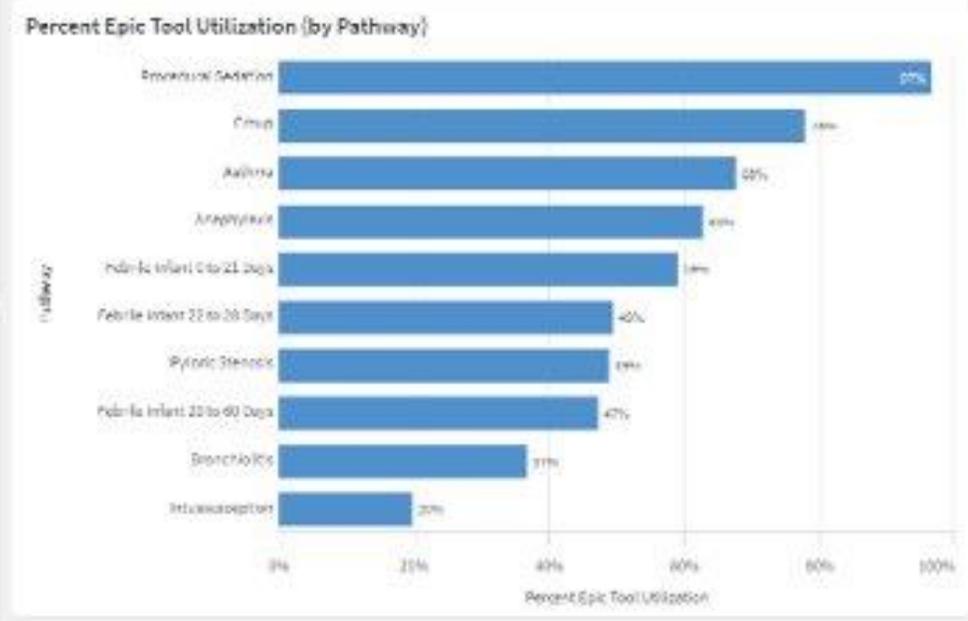
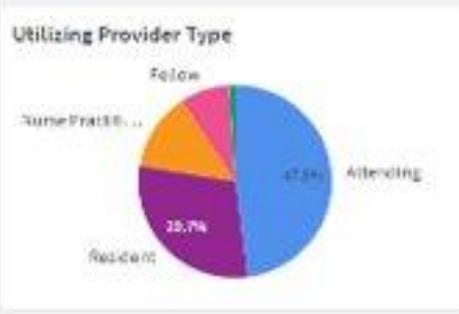
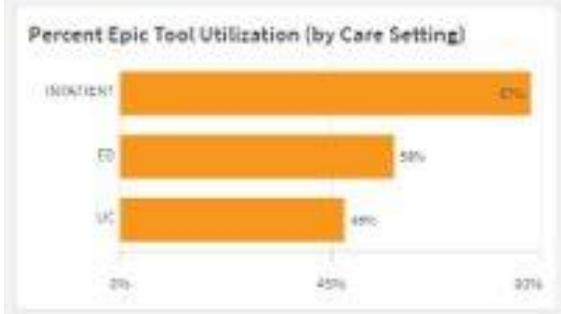
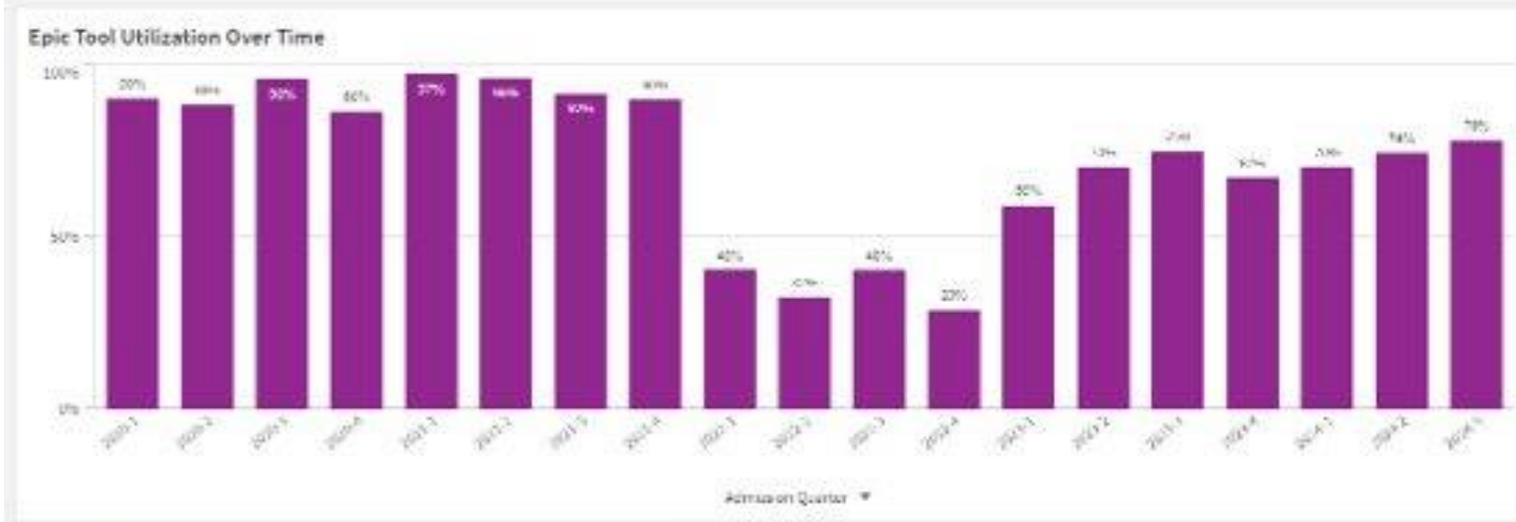


Qlik Insight Advisor Clinical Pathways Utilization Dashboard

Insight Advisor | 10 selections applied | Bookmarks | Sheets | Duplicate

Pathway Utilization Dashboard

Clinical Pathways Explorer | PATHWAY UTILIZATION | PATHWAYS | About This Qlik Application





Goal: Learning Health System



Systematically gather and create evidence.

Apply the most promising evidence to improve care.





Clinical Pathway Program Roadmap – Activity Time!



Affinity Diagram Activity	20 mins
Report Out & Discussion	10 mins
Closing Remarks	5 mins





Affinity Diagram Activity – 20 mins

- **4 stations:**
 - Pathway Development/Program Support
 - Pathway Review Process
 - Pathway Implementation
 - Populations and Data
- **At each station post at least one sticky note:**
 - A successful process/solution you developed **or** challenge you are currently facing





- **4 stations:**
 - Pathway Development/Program Support
 - Pathway Review Process
 - Pathway Implementation
 - Populations and Data





Closing Remarks

- Next Steps
 - Activity report
 - Workshop handout
- Questions? Connect with us at:
ClinicalPathwaysProgram@NationwideChildrens.org



Check out our **Clinical Pathways** on the internet!

