Critically Appraised Topic (CAT): Oral Feeding for Hospitalized Patients with Bronchiolitis

Specific Care Question
For hospitalized infants ≤ 24 months of age with bronchiolitis receiving treatment with high flow nasal cannula (HFNC), does oral feeding vs. no oral feeding (nasogastric tube (NGT) feeds or intravenous (IV) fluids with no enteral feeds) impact patient outcomes?

Recommendations from the Bronchiolitis Clinical Practical Guideline (CPG) Committee Based on Current Literature (Best Evidence) Only

A conditional recommendation is made for otherwise healthy patients who were receiving oral feeds prior to admission for bronchiolitis to continue to be offered oral feeds while on high or low-flow nasal cannula, based on the GRADE Evidence to Decision instrument[a] the Summary of Findings Table[a]. The overall certainty in the evidence is very low[a]. Seven cohort studies showed that aspiration events were rare in hospitalized patients with bronchiolitis receiving treatment with HFNC (two events in 1,816 patients). The seven included studies did not use respiratory rate alone as a basis for the decision of whether to feed orally. Additional considerations should be taken for patients with history of prematurity, co-morbidities, or history of aspiration events.

When there is a lack of scientific evidence, standard work should be developed, implemented, and monitored.

Recommendations from the Bronchiolitis CPG Committee

Following a review of additional considerations using the GRADE Evidence to Decision instrument[a] (see Appendix), a conditional recommendation is made to offer oral feeds while on high or low-flow nasal cannula for otherwise healthy patients with bronchiolitis who were receiving oral feeds prior to admission based on feasibility, value, and compliance of all stakeholders.

Literature Summary

Background

Bronchiolitis is the most common lower respiratory tract infection in children aged 1 to 24 months of age and accounts for 18% of all infant hospitalizations (Fujiogi et al., 2019). Bronchiolitis is characterized by an acute inflammatory process in the bronchioles, including edema and necrosis of epithelial cells lining the airways, along with an increase in mucus production and bronchospasm. Patients with bronchiolitis may initially experience rhinitis and cough, with more severe cases developing tachypnea, wheezing, rales, nasal flaring and/or use of accessory muscles (Ralston et al., 2014).

Adequate nutritional intake is important for patients hospitalized with bronchiolitis. Decreased intake may be linked to poorer outcomes, such as hypoxia, and longer length of hospital stay (LOS) (Weisgerber et al., 2013). The current American Academy of Pediatrics Clinical Practical Guideline suggests that oral feeding may be compromised for patients with respiratory rates exceeding 60 to 70 breaths per minute, and the patient may be at increased risk for lower nutritional intake during feeds due to decreased sucking/swallowing frequencies (Pinnington et al., 2000) as well as aspiration during oral feeds (Ralston et al., 2014). The suggestion of increased risk of aspiration is based on a single study referenced by the guideline showing aspirations in 3 of 12 patients with bronchiolitis undergoing barium swallow studies (Khoshoo & Edell, 1999). There are currently no established guidelines for feeding patients with bronchiolitis. This review will summarize identified literature to answer the specific care question.

Study characteristics. The search for suitable studies was completed on December 14, 2022. The 200 studies were screened by K. Berg, MD. A. Nedved, MD and J. Hartley, DO reviewed the 82 titles and/or abstracts found in the search and identified[b] 26 single studies believed to answer the question. After an in-depth review of the single studies[c] seven answered the question(s) (Babl et al., 2020; Dadlez et al., 2019; Gray et al., 2023; Shadman et al., 2019; Sochet et al., 2017; Sochet et al., 2021; Walter et al., 2022).

Race/Ethnicity

While the literature review did not assess or review race or ethnicity, the content experts from the Bronchiolitis CPG committee on this review did not identify expected differences in importance of the problem or feasibility of the intervention for disadvantaged subgroups or different baseline conditions across disadvantaged subgroups. However, values surrounding oral feeds (specifically breastfeeding) may vary based on race or ethnicity due to existing disparities in breastfeeding rates (Chiang et al., 2021).

Question Answered. For hospitalized infants ≤ 24 months of age with bronchiolitis receiving treatment with high flow nasal cannula (HFNC), does oral feeding vs. no oral feeding (nasogastric tube (NGT) feeds or intravenous (IV) fluids with no enteral feeds)/IV impact patient outcomes?

Babl et al. (2020) completed a secondary analysis of a single arm of a randomized control trial (RCT). The RCT included infants ≥ 37 weeks gestation and < 12 months of age with bronchiolitis and evaluated the efficacy of HFNC versus standard oxygen delivered by nasal cannula. The secondary analysis included patients from the arm that received HFNC and had prospective feeding data collected (*N* = 505). In the secondary analysis, the number of occurrences of adverse events was compared in patients that received only IV hydration (*n* = 15) versus patients that received only enteral feeding (via oral feeding, NGT or a combination of oral and NGT feeding) (*n* = 360) versus patients that received a combination of IV and enteral feeding (*n* = 93).

Dadlez et al. (2019) completed a retrospective cohort study of hospitalized infants ≤ 24 months of age with bronchiolitis that required HFNC (*N* = 80). Patients that were fed (oral feeding or via NGT) while on HFNC (*n* = 66) were compared to patients that were not fed while on HFNC (*n* = 14).

Gray et al. (2023) completed a retrospective cohort study of hospitalized infants < 24 months of age with bronchiolitis receiving treatment with HFNC (*N* = 676). All patients initially received oral feeds while on HFNC, with one group continuing on oral feeds for the duration of their hospitalization (*n* = 621) and one group made nil per os (NPO) at some point during their hospitalization (*n* = 55) due to worsening respiratory status.

Shadman et al. (2019) completed a retrospective cohort study of hospitalized infants aged 1 to 24 months with bronchiolitis receiving HFNC support due to respiratory failure (*N* = 123). Patients that were fed while on HFNC (via only oral feeding or a combination of oral and NGT feeding) (*n* = 78) were compared to patients that were not fed while on HFNC (*n* = 45).

Sochet et al. (2017) completed a prospective cohort study of infants 1 month to 2 years of age with bronchiolitis admitted to the pediatric intensive care unit (PICU) and receiving both treatment with HFNC and enteral feeding (oral or NGT) (*N* = 132).

Sochet et al. (2021) completed a retrospective cohort study of hospitalized infants < 2 years of age with bronchiolitis receiving non-invasive ventilation (NIV), defined in this study as either HFNC or bilevel non-invasive positive pressure ventilation (NIPPV) (*N* = 124). Patients that were provided enteral nutrition (oral or NGT) (*n* = 85) were compared to patients that were not provided enteral nutrition (*n* = 39).

Walter et al. (2022a) completed a study with both retrospective and prospective cohorts of infants < 24 months of age with bronchiolitis that received HFNC (*N* = 176) and compared nutrition goals following a hospital's implementation of a feeding protocol for these patients. This protocol used the modified Tal score for prediction of bronchiolitis severity as a basis for deciding whether to continue oral feeds or initiate NGT feeding. Patients in the prospective cohort were fed according to hospital protocol via oral feeding or NGT (*n* = 102). Patients in the retrospective cohort were not fed per hospital protocol but did receive enteral feeding (oral or NGT) (*n* = 74).

Summary by Outcome (rationale for evidence certainty rating[a] provided for each outcome)
Aspiration Events

Seven studies (Babl et al., 2020; Dadlez et al., 2019; Gray et al., 2023; Shadman et al., 2019; Sochet et al., 2017; Sochet et al., 2021; Walter et al., 2022) measured aspiration events for patients with bronchiolitis while receiving treatment with HFNC (*N* = 1,816). Patients were separated into groups receiving oral feeds (exclusively oral feeds or in combination with NGT) (*n* = 1,428) versus patients receiving no oral feeds (no feeds or feeding via only NGT) (*n* = 388) (see Table 1). The choice of feeding modality in these studies was decided at the discretion of the clinician and based on the clinical presentation of the patient, taking into account the patient's work of breathing and oxygenation. The respiratory rates of the patients receiving oral feeds were not reported.

There were two aspiration events found across all seven studies. One aspiration witnessed by providers and confirmed by radiographic evidence occurred in a patient receiving NGT feeding (Sochet et al., 2017). One provider-documented and radiographically confirmed aspiration occurred in a patient receiving enteral feeding, though it was not clear from the study whether the patient was exclusively fed orally or by a combination of NGT and oral feeds (Shadman et al., 2019). The occurrence of aspiration events was rare (0.11%).

A meta-analysis was not completed due to no aspiration events occurring in four of the six included studies.

Table 1

Type of Feeding/Hydration and Aspiration Events

Study	***N***	**Oral** (*n* = 451)	**NG tube** (*n* = 182)	**Oral + NG tube** (*n* = 171)	**IV + Enteral** (*n* = 93)	**IV only** (*n* = 113)	**Aspiration events** (n %)
Babl et al. (2020)	505*	32	157	171	93	15	0
Dadlez et al. (2019)	80	65	1	0	0	14	0
Gray et al. (2023)	676	676	0	0	0	0	0
Shadman et al. (2019)	123	50	0	28	0	45	1 (0.8)†
Sochet et al. (2017)	132	128	4	0	0	0	1 (0.8)‡
Sochet et al. (2021)	124	65	20	0	0	39	0
Walter et al. (2022)	176	176	0	0	0	0	0

**Hydration method unknown for 37 patients*

†Occurred in patient receiving enteral feeding (unclear whether oral only or oral with NG tube)

‡Occurred in patient receiving NG tube feeding

Certainty Of The Evidence For Aspiration Events. The certainty of the body of evidence was very low. The body of evidence was assessed to not have serious inconsistency, however serious risk of bias, serious indirectness and serious imprecision were assessed. Risk of bias was serious due to lack of controlling for confounders (gestational age, gender, severity of illness, or comorbidities). Serious indirectness was assessed due to the inclusion of all types of enteral feeding, not just oral feeding and inclusion of non-invasive ventilation other than HFNC. Imprecision was serious due to the low number of events and the uneven number of participants in the comparator groups across the six studies.

Length of Stay (LOS)

Three studies (Gray et al., 2023; Shadman et al., 2019; Sochet et al., 2021) measured LOS for hospitalized infants with bronchiolitis receiving treatment of noninvasive ventilation and oral feeding.

Gray et al. (2023) compared LOS for patients receiving only oral feeds while on HFNC (*n* = 621) versus patients that initially received oral feeds and were made NPO due to worsening respiratory distress (*n* = 55). They found that patients receiving only oral feeds while on HFNC had a shorter mean LOS in hours (60.7 ± 34.7) than the group made NPO (103.6 ± 42.2), *p* = <.001.

Shadman et al. (2019) compared LOS as time to discharge following HFNC completion for patients that received exclusively oral feeding (*n* = 50) versus no feeding or a combination of oral feeding and tube feeding (*n* = 73). The *aHR* was determined by adjusting for the confounders of age, unit of HFNC initiation, highest respiratory support required before HFNC initiation, and HFNC duration. They found a shorter LOS in the group that received exclusively oral feeding compared to the groups that were not fed or received a combination of oral feeding and tube feeding, *HR* = 1.57, 95% CI [1.04, 2.38], *aHR* = 2.13, CI [1.31, 3.45]. Similar results were found when evaluating LOS from time of HFNC initiation for oral feeding compared to no feeding or a combination of oral and tube feeding, *HR* = 0.89, 95% CI [0.59, 1.34], *aHR* = 1.95, 95% CI [1.19, 3.18].

Sochet et al. (2021) compared LOS for patients receiving treatment with HFNC that received oral feeds (*n* = 65) to patients receiving feeding via NGT (*n* = 20). They found a shorter LOS in the group receiving oral feeds, median (IQR) 3.8 (2.6 – 5.9) days, versus the group receiving feeding by NGT, 7.1 (5.9 – 9) days, *p* = <.05.

> **Certainty Of The Evidence For Length of Stay.** The certainty of the body of evidence was very low. The body of evidence was assessed to have serious risk of bias, serious indirectness, and serious imprecision. Risk of bias was serious due to lack of controlling for all confounders (gestational age, gender, severity of illness, or comorbidities). Serious indirectness was assessed due to the inclusion of all types of enteral feeding, not just oral feeding. Imprecision was serious due to the low number of events and the uneven number of participants in the comparator groups across the three studies. While each study (Gray et al., 2023; Shadman et al., 2019; Sochet et al., 2021) addressed the question, the studies were analyzed separately, and consistency could not be assessed.

Identification of Studies
Search Strategy and Results (see Figure 1)
6) NOT ('animal experiment'/de OR 'animal model'/de OR 'case report'/de OR 'human cell'/de OR 'human tissue'/de OR 'nonhuman'/de OR 'ovine model'/de)
5) #4 AND (2012:py OR 2013:py OR 2014:py OR 2015:py OR 2016:py OR 2017:py OR 2018:py OR 2019:py OR 2020:py OR 2021:py OR 2022:py OR 2023:py) AND ('article'/it OR 'article in press'/it)
4) #1 AND #2 AND #3
3) 'infant'/exp OR infant:ti,ab,kw OR 'infant disease'/exp OR 'toddler'/exp OR 'preschool child'/exp OR 'preschooler'/exp OR [infant]/lim OR [newborn]/lim OR [preschool]/lim OR [child]/lim
2)'enteric feeding'/exp OR 'feeding'/exp OR 'nose feeding'/exp OR 'caloric intake'/exp OR 'oral intake'/exp OR 'feeding tube'/exp OR 'nasogastric tube'/exp OR 'digestive tract intubation'/exp OR 'oral feeding'/exp OR 'enteric feeding':ti,ab,kw OR feeding:ti,ab,kw OR 'enteral hydration':ti,ab,kw OR 'caloric intake':ti,ab,kw OR 'oral intake':ti,ab,kw OR 'nasogastric hydration':ti,ab,kw OR 'oral hydration':ti,ab,kw OR 'feeding tube':ti,ab,kw OR 'nasogastric tube':ti,ab,kw OR 'gastrointestinal intubation':ti,ab,kw OR 'oral feeding':ti,ab,kw OR 'enteral nutrition':ti,ab,kw
1)'bronchiolitis'/exp OR bronchiolitis:ti,ab,kw

Search Dates: 2012-Current
Records identified through database searching *n* = 200
Additional records identified through other sources *n* = 0

Studies Included in this Review

Citation	Study Type
Babl et al. (2020)	Secondary analysis of single arm of RCT
Dadlez et al. (2019)	Retrospective cohort
Gray et al. (2023)	Retrospecitive cohort
Shadman et al. (2019)	Retrospective cohort
Sochet et al. (2017)	Prospective cohort
Sochet et al. (2021)	Retrospective cohort
Walter et al. (2022)	Prospective and Retrospective cohort

Studies Not Included in this Review with Exclusion Rationale

Citation	Reason for exclusion
Cahill and Cohen (2018)	Narrative review
Ghaffar et al. (2013)	Does not include adverse events as an outcome
Gill et al. (2021)	Does not include oral feeding as a comparator
Halvorson et al. (2013)	Does not include oral feeding as a comparator
Khan (2022)	Narrative review
Kugelman et al. (2013)	Does not include oral feeding
Leroue et al. (2017)	Does not include adverse events from oral feeding as an outcome
Maffey et al. (2013)	Swallowing study measuring aspiration events in oral feeds
Nascimento et al. (2020)	Does not compare feeding types
Ng et al. (2020)	Does not include adverse events as an outcome
Oakley et al. (2013)	Does not include oral feeding
Oakley et al. (2016)	Does not include oral feeding
Oakley et al. (2017)	Does not include oral feeding as a comparator
Parlar-Chun et al. (2022)	Does not include oral feeding
Serrano-Llop et al. (2017)	Full text is not available in English
Sochet et al. (2021)	Duplicate
Slain et al. (2017)	Does not compare feeding types
Su and Chang (2014)	Narrative review
Valla et al. (2019)	Provider practice survey
Weisgerber et al. (2013)	Does not include adverse events

Methods Used for Appraisal and Synthesis

[a]The GRADEpro Guideline Development Tool (GDT) is the tool used to create the Summary of Findings (SOF) table(s) for this analysis. Using the GDT, the author of this CAT rates the certainty of the evidence based on four factors: *within-study risk of bias*, *consistency among studies, directness of evidence*, and *precision of effect estimates*. Each factor is subjectively judged against the author's confidence of the estimated treatment effect. Confidence is assessed as not serious, serious, or very serious. If the attribute of serious or very serious is assessed, the author will provide an explanation.

[b]Rayyan is a web-based software used for the initial screening of titles and / or abstracts for this analysis (Ouzzani, Hammady, Fedorowicz & Elmagarmid, 2017).

[c]Review Manager (Higgins & Green, 2011) is a Cochrane Collaborative computer program used to assess the study characteristics as well as the risk of bias and create the forest plots found in this analysis.

[d]The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram depicts the process in which literature is searched, screened, and eligibility criteria is applied (Page et al., 2021).

References to Appraisal and Synthesis Methods

[a]GRADEpro GDT: GRADEpro Guideline Development Tool (2015). McMaster University, (developed by Evidence Prime, Inc.). [Software]. Available from gradepro.org.

[b]Ouzzani, M., Hammady, H., Fedorowicz, Z., & Elmagarmid, A. (2016). Rayyan-a web and mobile app for systematic reviews. *Systematic Reviews, 5*(1), 210. Doi:10.1186/s13643-016-0384-4

[c]Higgins, J. P. T., & Green, S. e. (2011). *Cochrane Handbook for Systematic Reviews of Interventions [updated March 2011]* (Version 5.1.0 ed.): The Cochrane Collaboration, 2011.

[d]Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., … & Moher, D. (2021). The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. International journal of surgery, 88, 105906. **For more information, visit www.prisma-statement.org.**

Question Originator

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Findings from this review were presented with the question originator and the Bronchiolitis CPG Committee.

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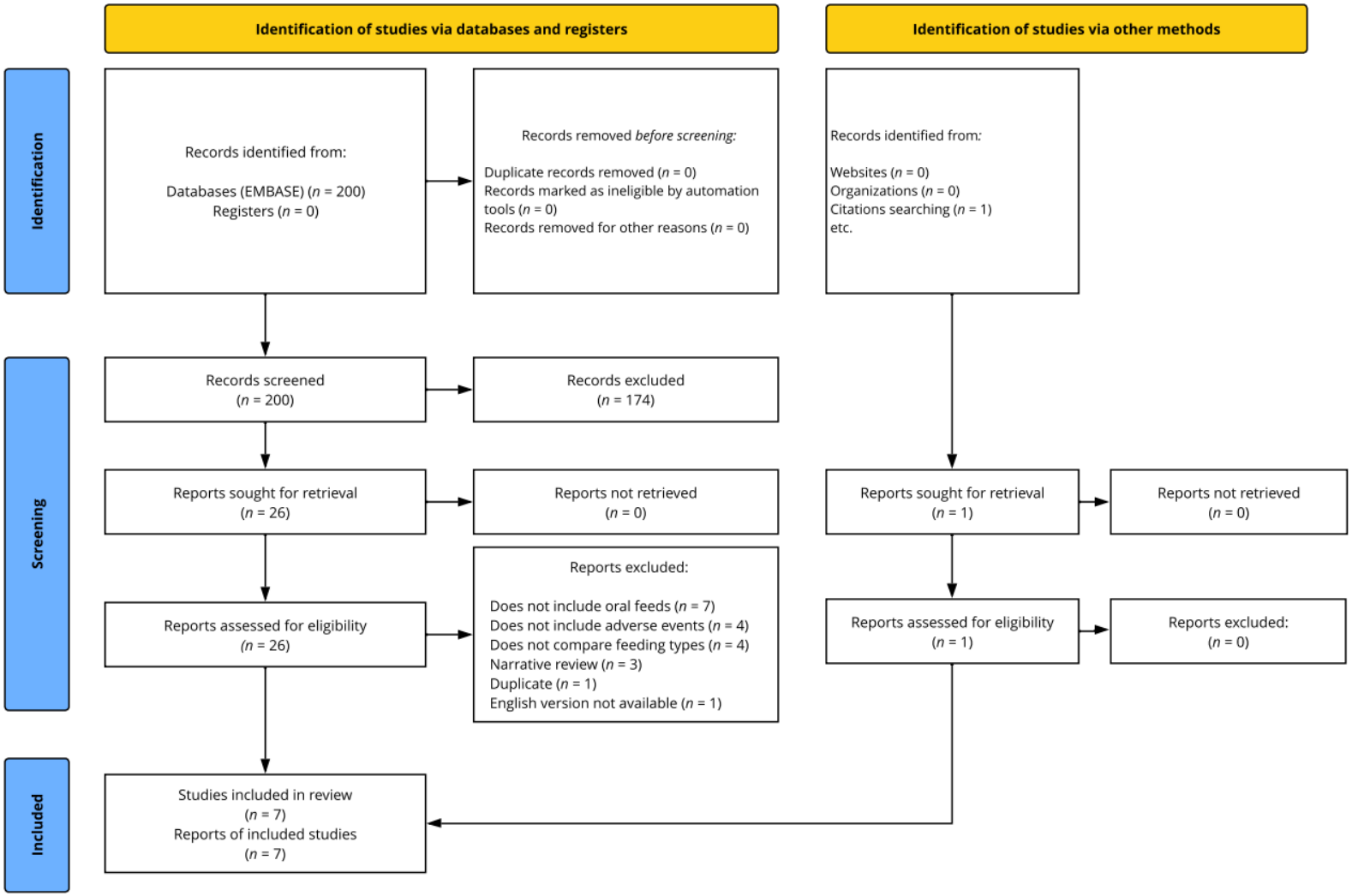
Acronyms Used in this Document

Acronym	Explanation
CAT	Critically Appraised Topic
EBP	Evidence Based Practice
HFNC	High flow nasal cannula
NGT	Nasogastric tube
NIPPV	Non-invasive positive pressure ventilation
NIV	Non-invasive ventilation
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses

Statistical Acronyms Used in this Document

Statistical Acronym	Explanation
aHR	Adjusted Hazard (or Harm) Ratio
CI	Confidence Interval
HR	Hazard (or Harm) Ratio
M or $\bar{X}$	Mean
Mdn	Median
n	Number of cases in a subsample
N	Total number in sample
RCT	Randomized controlled trial

Figure 1
Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRIMSA)[d]



Characteristics of Intervention Studies
Babl et al. (2020)

Methods	**Prospective secondary analysis of a single arm of a RCT**
Participants	**Participants:** Infants < 12 months of age with bronchiolitis in emergency departments and general pediatric inpatient units receiving high-flow oxygen therapy (2L/kg/min) between October 2013 through August 2016 **Setting:** Seventeen tertiary and regional hospitals in Australia and New Zealand (12 non-tertiary regional/metropolitan and 5 tertiary centers) **Number enrolled into study:** *N* = 505 • **Group 1, IV hydration only:** *n* = 15 • **Group 2, Enteral hydration only**: *n* = 360 ○ Oral only; *n* = 32 ○ NGT (Hmar et al.) and oral; *n* = 171 ○ NGT only; *n* = 157 • **Group 3, Enteral and IV hydration:** *n* = 93 • **Group 4, Hydration method unknown**: *n* = 37 **Gender, males (Only given for all total of analyzed participants, *N* = 505):** • **All participants:** *n* = 319 (63%) **Race/ethnicity (as defined by researchers):** **Ethnicity** — ***N* (%)** Caucasian — 216 (42.8) Aboriginal/Torres Strait Islander — 15 (3.0) Maori/Pacific Islander — 176 (34.9) Other/Unknown — 98 (19.4) **Age, mean in months (SD) (Only given for total of all analyzed participants, *N* = 505):** • **All participants:** 5.8 (± 3.6) **Inclusion Criteria:** • Infants < 12 months of age • Clinical signs of bronchiolitis with an oxygen requirement (< 92% saturation for tertiary centers and < 94% saturation for metropolitan and regional centers) **Exclusion Criteria:** • Infants requiring immediate need for respiratory support and intensive care • Infants with: ○ Cyanotic heart disease

	○ Apneas ○ Basal skull fracture ○ Upper airway obstruction ○ Craniofacial malformations • Infants receiving home oxygen therapy
Interventions	**All groups:** Received treatment with HFNC • **Group 1**: Received hydration with IV fluids only • **Group 2:** Received enteral hydration only (oral, NGT or combination of oral/NGT) • **Group 3:** Received hydration with both IV fluids and enteral fluids • **Group 4:** Hydration method unknown
Outcomes	**Primary outcome(s):** • Adverse events (serious adverse event were described as fatal, life-threatening, permanently disabling, resulting in incapacitation, or prolonging the hospital stay) for the secondary analysis* **Secondary outcome(s):** • Not reported **Safety outcome(s):** • Not reported *Outcomes of interest to the CMH CPG or CAT development team
Notes	**Results:** • None of the infants receiving oral or NGT hydration on HFNC sustained serious adverse events, pulmonary aspiration, emergency intubation, cardiac arrest, or respiratory arrest • One infant (0.2%, enteral at any time subgroup analyzed) had a pneumothorax which was reportedly unrelated to NGT insertion and did not require a chest tube • Seven episodes of apnea were reported as adverse events (n = 1, NGT only; n = 1, IV only; n = 5, enteral at any time) **Limitations:** • Information as to whether the flow rate was reduced during enteral hydration was not collected • Information was not available as to whether parents may have fed the infants in the nurses' absence • Need for secondary analysis of hydration data was realized after infants had already been enrolled in the trial, no formal protocol was provided pertaining to hydration • Length of time various hydration methods occurred were not recorded for infants receiving more than one modality • Difficult to determine the predominant hydration modality used during HFNC • Rationale for why clinicians chose a particular method of hydration was not obtained • Information regarding type of enteral fluid used was not collected

Dadlez et al. (2019)

Methods	Cohort, retrospective
Participants	**Participants:** Children ≤ 24 months of age with bronchiolitis requiring HFNC admitted to the general pediatric infant and toddler unit between April 1, 2013, and March 31, 2015 **Setting:** Pediatric unit within Children's Hospital at Montefiore, a 132-bed academic tertiary care children's hospital in the Bronx, New York **Number enrolled into study:** *N* = 80 • **Group 1, Fed while on HFNC** *n* = 66 ○ Regular oral, *n* = 52 ○ Clears only, *n* = 13 ○ NGT only, *n* = 1 • **Group 2, Not fed while on HFNC** *n* = 14 **Gender, males, n (%):** • Reported based on participant total: *n* = 44 (55%) **Race/ethnicity (as defined by researchers):** **Race** — ***N* (%)** Hispanic — 33 (41.2) Black — 29 (36.2) White — 3 (3.8) Other/Unknown — 15 (18.8) **Age, median in months (IQR):** • Reported based on participant total, *N* = 80: 4.6 (2–0 - 10.4) **Inclusion Criteria:** • Children ≤ 24 months of age • ICD-9 discharge diagnosis: ○ Acute bronchiolitis ○ Acute bronchiolitis due to respiratory syncytial virus ○ Acute bronchiolitis due to other infectious organism or a primary diagnosis of acute respiratory failure with a secondary diagnosis of bronchiolitis • Received HFNC **Exclusion Criteria:** • Children who did not receive HFNC • Children admitted directly to the pediatric intensive care unit • Children diagnosed with: ○ Concomitant bacterial pneumonia

	○ Cardiac co-morbidities ○ Pulmonary co-morbidities ○ Neurologic co-morbidities ○ Metabolic co-morbidities ○ Craniofacial co-morbidities **Covariates identified:** • None reported
Interventions	**Both:** HFNC was initiated at 4 or 6 L/min based on the age of the patient, and adjusted base on the clinical response • **Group 1:** Children were fed orally at the discretion of the primary provider and based on clinical reasoning which included factors such as the patient's respiratory rate, accessory muscle use, and oxygenation • **Group 2:** Children were not fed while receiving HFNC
Outcomes	**Primary outcome(s):** • HFNC measures ○ Maximum and minimum flow ○ Maximum FiO2 used ○ Duration of time on HFNC **Secondary outcome(s):** • Not reported **Safety outcome(s):** • Need for transfer to the PICU • Escalation to higher level of respiratory support (CPAP, noninvasive ventilation, bilevel positive airway pressure, or intubation) • Clinically important pneumothorax • Aspiration* • Death *Outcomes of interest to the CMH CPG or CAT development team
Notes	**Results:** • The median (IQR) inpatient stay was 6.1 (5–2 - 7.9) days from time of emergency department triage until discharge • The median (IQR) minimum flow was 3 –3 - 5) L/min • The median (IQR) maximum flow for all children was 8 –6 - 8) L/Min ○ Among children who stayed on the pediatric floor, the median (IQR) maximum flow was 7 –6 - 8) L/min ○ Among children transferred to the pediatric ICU, the median (IQR) maximum flow was 8 –8 - 10) L/min • The median (IQR) maximum FiO2 was 0.40 (0.–0 - 0.50) • Among children staying on the pediatric floor, the median (IQR) time spent on HFNC was 3.0 (2–0 - 4.2) days • Among children transferring to the ICU, 30 (91%) required transfer within the first 24h after initiation of HFNC and 58% required escalation to higher levels of respiratory support after transfer • The majority (82.5%) of children receiving HFNC were fed. Oral feeds (98.5%) was the primary modality. One child (1.5%) was fed via a nasogastric tube. • Of the children who were fed, 78.8% received a full oral diet (breast milk, formula, and/or purees) and 19.7% received clear diet only • Of the 14 subjects who were not fed, 100% required transfer to the PICU

Safety outcomes for patients receiving HFNC treatment outside of ICU:

Outcome	*n* (%)
Transfer to ICU	33 (41)
Higher level of respiratory support required	19 (24)
Intubation	0 (0)
Pneumothorax	0 (0)
Aspiration event	0 (0)

Limitations:

- The study was a retrospective chart review at a single institution
- Setting was an urban tertiary care center with an on-site pediatric ICU and respiratory therapist available which is not comparable to all facilities
- Results were focused on children with bronchiolitis without other complicating factors
- The study focused on clinically important aspiration events, not micro aspiration events that may be detected by providers

Gray et al. (2023)

Methods	Retrospective Cohort
Participants	**Participants:** Children less than 24 months old admitted to an inpatient hospital medicine service with a primary diagnosis of bronchiolitis receiving HFNC **Setting:** University-affiliated, tertiary care, freestanding Children's Hospital from March 2017 to May 2020 **Number enrolled into study:** *N* = 676 • **Group 1, Orally fed while on HFNC for duration of hospitalization:** *n* = 621 • **Group 2, Initially orally fed, then made NPO while on HFNC:** *n* = 55 **Gender, males:** • *n* = 425 (62.9%) **Race/ethnicity (as defined by researchers):** **Race/Ethnicity** — ***n* (%)** White, non-Hispanic — 187 (27.7) Hispanic — 325 (48.1) Black, non-Hispanic — 41 (6.1) Asian — 43 (6.4) Other, non-Hispanic — 76 (11.2) Unknown/declined — 4 (0.6) **Age, mean in months (SD):** • **Group 1:** 9.6 ± 6.3 • **Group 2:** 6.4 ± 5.5 **Inclusion Criteria:** • Admitted to pediatric ward • Less than 24 months of age • Receiving HFNC • Primary diagnosis of bronchiolitis (International Classification of Diseases, Tenth Edition code J21) ○ If patients had another unrelated admission to the hospital for bronchiolitis during the study period, only the initial bronchiolitis admission requiring HFNC was included **Exclusion Criteria:** • Chronic medical condition (hypotonia, craniofacial anomalies, genetic disorders, metabolic disease, neuromuscular disease, or gastrostomy tube dependence) • Chronic lung disease • Congenital heart disease • Bacterial pneumonia • Weight less than 4 kg

	• Patients with initial respiratory support of nasal continuous positive airway pressure (nCPAP) or who transferred to the PICU before their first feed • Patients with incomplete documentation of feeding variables such as missing route or intake volume in nursing flowsheets **Covariates Identified (as defined by researchers):** • Patient demographics (date of birth, race, ethnicity, insurance status), weight, problem list diagnoses, viral testing results, maximum oxygen flow rate, baseline RR, gestational age, smoke exposure, worsening distress after feeding **Confounders Identified (as defined by researchers):** • Patients with underlying comorbitities (excluded)

Interventions	**Both:** HFNC was initiated per institutional HFNC bronchiolitis clinical practice guideline. In total, 55 children were made NPO at some point during their stay due to concerns for worsening respiratory status. All patients returned to full oral feeding by discharge.
	• **Group 1:** Orally fed ad-lib while on HFNC
	  ○ Feeding routes included: breastfed, bottle, combination breast and bottle, and solids
	  ○ No patients had nasogastric tubes
	• **Group 2:** Made NPO while on HFNC

Outcomes	**Primary outcome(s):** • Incidence of aspiration pneumonia* defined as clinical documentation of this diagnosis in electronic medical record notes or occupational therapy (OT) assessment, treatment of pneumonia because of aspiration of feeds, or radiographic evidence of aspiration pneumonia. • Incidence of adverse feeding events* defined as documented choking or gagging with feeds, aspiration event during feed, or feed(s) held because of worsening respiratory distress while feeding. **Secondary outcome(s):** • LOS* in hours **Safety outcome(s):** • See primary outcomes *Outcomes of interest to the CMH CPG or CAT development team

Notes	**Results:**
	• No patients were diagnosed with or treated for aspiration pneumonia, and no patients were readmitted for aspiration pneumonia
	• Eleven patients experienced adverse feeding events, but only four were made NPO due to the event:
	  ○ One patient experienced a 10 second self-resolving episode of choking/coughing with no color change or desaturation. Patient was NPO for 4 hours while OT was consulted, and modifications were made to nipple size and pacing.
	  ○ Two patients experienced worsening respiratory distress with a feed, were made NPO, and required escalation to nCPAP.
	  ○ One patient experienced worsening respiratory distress with a feed and medical team had concerns for aspiration or microaspiration. Patient was made NPO for the remainder of time on HFNC and resumed oral feeding after HFNC was discontinued.

- Among patients on HFNC, those who were made NPO were younger (6.4 months vs 9.7 months, P < 0,001), had higher maximum respiratory rates (67 vs 62, P < 0.001), and had longer LOS (104 hrs vs 61 hrs, P < 0.001) than those who were not made NPO

Adverse Feeding Events	***n* (%)**
Aspiration pneumonia	0 (0)
Choking, gagging, or coughing with feeds	4 (0.6)
Concern for possible aspiration or microaspiration	3 (0.4)
Worsening of respiratory distress with feed	5 (0.7)

Limitations:

- Single-center
- Retrospective cohort
- Study center had a robust pediatric ward with an established clinical practice guideline and respiratory therapy protocol, which may not be generalizable to institutions with limited support for higher acuity patients.
- Results may also not be generalizable to flow rates >12 LPM (maximum for this study)
- Patients were otherwise healthy so results would not be generalizable to those with significant comorbidities

Shadman et al. (2019)

Methods	**Retrospective Cohort**

Participants	**Participants:** Inpatients aged 1-24 months receiving HFNC support for respiratory failure due to bronchiolitis
	Setting: USA, Academic Children's Hospital from January 1, 2015, to March 1, 2017
	Number enrolled into study: *N* = 123
	• **Group 1, fed:** *n* = 78
	  ○ Oral and tube: *n* = 28
	  ○ Exclusive oral feeding: *n* = 50
	• **Group 2, not fed**: *n* = 45
	Gender, females (as defined by researchers):
	• **Group 1:** *n* = 28 (36%)
	• **Group 2:** *n* = 16 (36%)
	
	Race/ethnicity (as defined by researchers):
	Ethnicity / **Group 1 *n* (%)** / **Group 2 *n* (%)**
	White, non-Hispanic: 48 (63) / 33 (73)
	Black, non-Hispanic: 9 (12) / 1 (2)
	Hispanic: 7 (9) / 2 (4)
	Other: 5 (7) / 4 (9)
	Unknown/Declined: 7 (9) / 5 (11)
	
	Age, mean in months (SD):
	• **Group 1:** 6.3 (6.1)
	• **Group 2:** 9.4 (8.6)
	Inclusion Criteria:
	• Patients aged 1 to 24 months receiving HFNC support for respiratory failure due to bronchiolitis
	• Did not exclude patients with comorbid conditions of prematurity (<35 weeks), cardiopulmonary, neuromuscular, and genetic disease
	Exclusion Criteria:
	• Patients with preexisting dysphagia (defined as ongoing outpatient speech therapy for swallowing concerns)
	• An admission diagnosis of aspiration pneumonia or on home respiratory support
	• Patients requiring more than one period of HFNC during admission

Interventions	**Both:** Received treatment with HFNC during their inpatient stay • **Group 1:** In group 1, all patients were provided some form of feeding. They were divided into exclusively oral fed and mixed feeding (oral and tube).

	• **Group 2:** Not fed
Outcomes	**Primary outcome(s):** • Time to discharge after HFNC cessation **Secondary outcome(s):** • Aspiration* • Intubation after HFNC • 7-day readmission **Safety outcome(s):** • Not reported *Outcomes of interest to the CMH CPG or CAT development team
Notes	**Results:** • Of 123 children treated with HFNC, 45 were never fed. A total of 78 children were fed; 50 were exclusively orally fed and 28 had mixed feeding. • Median (IQR) time to discharge after HFNC was 29.5 (23.5 – 47.9) hours in the fed group (both mixed and exclusive oral) and 39.8 (26.4 – 61.5) hours in the not fed group. Time to discharge from HFNC initiation was shorter for exclusive oral feeding versus not feeding groups, *HR* = 1.97; 95% CI [1.13, 3.43]. • Adverse events: one intubation occurred in the unfed group, one aspiration pneumonia occurred in the fed group, and one readmission within 7 days occurred in the fed group. • Adverse events related to feeding were rare regardless of the feeding method. • Exclusively oral feeds were associated with the shortest time to discharge. **Limitations:** • Assessment of feeding exposure did not account for quantity and duration.

Sochet et al. (2017)

Methods	**Prospective Cohort**

Participants	**Participants:** Children 1 month to 2 years of age diagnosed with bronchiolitis
	Setting: USA, 313 bed tertiary medical center, January to December 2015
	Number enrolled into study: *N* = 132
	• **Group 1, Nutrition interruption**: *n* = 12
	• **Group 2, No nutrition interruption**: *n* = 120
	•
	Gender, males (%):
	• **Group 1:** *n* = 10 (83%)
	• **Group 2:** *n* = 72 (60%)
	Race/ethnicity (as defined by researchers):
	• Not reported
	Age, median in months (IQR):
	• **Group 1:** 7 (4.5 - 14.5)
	• **Group 2:** 8 (4.5 - 15)
	Inclusion Criteria:
	• Children 1 month to 2 years diagnosed with bronchiolitis
	• Receiving HFNC therapy
	• Receiving enteral nutrition
	• Admission to the PICU
	Exclusion Criteria:
	• Comorbid bacterial pneumonia
	• Prematurity (gestational age <37 weeks)
	• Patient intubated upon admission to unit
	• Patients with other noninvasive ventilation modalities
	  ○ Bilevel positive airway pressure
	  ○ Nasal continuous positive airway pressure
	  ○ Ramanathan cannula
	• Chronic medical conditions
	  ○ Craniofacial and airway anomalies
	  ○ Congenital heart disease
	  ○ Gastroesophageal reflux disease
	  ○ Neuromuscular disease
	  ○ Metabolic disease
	Covariates Identified:
	• Age
	• Patient weight
	• Day of illness

	• Route of nutrition
Interventions	**Both:** All patients received treatment with HFNC with concurrent administration of enteral feeding
Outcomes	**Primary outcome(s):** • Incidence of aspiration-related respiratory failure* • Nutrition interruptions **Secondary outcome(s):** • Duration of HFNC • LOS • Nutrition characteristics **Safety outcome(s):** • Not reported *Outcomes of interest to the CMH CPG or CAT development team

Notes	**Results:**
	• **Incidence of aspiration-related respiratory failure**
	  ○ Group 1: 1 (0.8%)
	  ○ Group 2: 0 (0%)
	• **Nutrition interruptions (study reported nutrition started on admission vs nutrition initiation delay)**
	  ○ Group 1:
	  ▪ Nutrition started on admission, n (%): 3 (25)
	  ▪ Nutrition initiation delay, n (IQR): 9.1 (5.2 - 10)
	  ○ Group 2:
	  ▪ Nutrition started on admission, n (%): 26 (22)
	  ▪ Nutrition initiation delay, n (IQR): 11 (6.9 - 16.2)
	• **Duration of HFNC, days (IQR)**
	  ○ Group 1: 2.6 (1.9 - 4.6)
	  ○ Group 2: 1.6 (1.1 - 2.2)
	• **LOS, days (IQR)**
	  ○ Group 1: 4.8 (2.7 - 6.1)
	  ○ Group 2: 2.3 (1.7 - 3.1)
	• **Nutrition characteristics**
	  ○ Group 1: n (%)
	  ▪ NGT fed: 1 (8.3)
	  ▪ Bottle-fed: 10 (83)
	  ▪ Breastfed: 1 (8.3)
	  ○ Group 2: n (%)
	  ▪ NGT fed:3 (2.5)
	  ▪ Bottle-fed: 104 (87)
	  ▪ Breastfed: 13 (11)
	
	Limitations:

	• Lower rate of mechanical ventilation following HFNC therapy compared to other studies, likely due to this study's strict inclusion criteria • Unable to apply findings to patients with bronchiolitis plus comorbid conditions, concurrent bacterial infection, or prematurity • Patients excluded for not receiving enteral nutrition may be at higher risk of aspiration • Weight-based HFNC rates are lower compared to other studies, indicating possible bias due to patients with milder illness • No bronchiolitis severity-of-illness scores used due to high subjectivity of assessing work of breathing • Unable to determine whether initiation of nutrition resulted in reduction of respiratory support, patient agitation or respiratory rate and whether this could have affected the weight-based HFNC rates • Determining the cause of feeding interruptions was not possible due to low incidence, and thus cannot be excluded as a possible covariate • This data may not be generalizable due to HFNC, and enteral feeding practices may vary widely across institutions

Sochet et al. (2021)

Methods	**Retrospective Cohort**

Participants	**Participants:** Children < 2 years of age hospitalized for bronchiolitis and receiving noninvasive ventilation (NIV) between November 2017 and May 2019
	Setting: Single center children's hospital, USA
	Number enrolled into study: *N* = 124
	• **Group 1, Provided enteral nutrition (EN):** *n* = 85
	• **Group 2, Provided no EN:** *n* = 39
	Gender, ratio male/female:
	• **Group 1:** 2.4 : 1
	• **Group 2:** 1.8 : 1
	Race/ethnicity (as defined by researchers):
	• Not reported
	Age, mean in months (IQR):
	• **Group 1:** 5.3 (2.1 - 11.9)
	• **Group 2:** 11.5 (3.5 - 17)
	Inclusion Criteria:
	• < 2 years of age
	• Diagnosis of acute bronchiolitis
	• Received NIV (either bilevel noninvasive positive pressure ventilation (NIPPV) or humidified HFNC)
	• Provided enteral nutrition
	Exclusion Criteria:
	• Cystic fibrosis
	• Congenital airway anomalies
	• Interstitial lung disease
	• Pulmonary hypertension
	• Critical congenital heart disease
	• Neuromuscular disease
	• Children receiving chronic outpatient NIV
	• Parenteral nutrition dependence
	• Incomplete vital sign documentation
	• Not provided enteral nutrition
	Covariates Identified:
	• EN status during NIV
	• Among those receiving EN:
	  ○ Type of NIV
	  ○ Route of EN
	  ○ Percentage change in the respiratory rate

<table>
<tr><td></td><td></td></tr>
<tr><td>Interventions</td><td>Both: Receiving treatment with NIV
Group 1: Provided EN
Group 2: Not provided EN</td></tr>
<tr><td>Outcomes</td><td>Primary outcome(s):
Heart rate (HR) and respiratory rate (RR) within 1 hour of EN initiation
Secondary outcome(s):
NIV duration*
LOS*
Nonresponse rates
Mortality
Extracorporeal life support rates
Nutrition data
Safety outcome(s):
Not reported
*Outcomes of interest to the CMH CPG or CAT development team</td></tr>
<tr><td>Notes</td><td>Results:
Notable reduction in the RR after EN initiation from 44 (IQR: 37 to 57) to 33 (IQR: 32 to 50), accounting for median percent change of - 11% ($p < .01$)
Children who did not receive EN were older, and a decreased proportion achieved goal nutrition by hospital discharge compared with peers provided EN during NIV
No episodes of aspiration-related respiratory failure were observed
Children who were provided EN during NIV achieved greater nutrition goals (volume, caloric and protein) (70.1%) than those who were not provided EN (51.2%)
In a subgroup analysis of children receiving EN: Compared with children fed by mouth, children fed by enteral tubes had a longer LOS and duration of NIV support
Comparison of outcomes for children on NIV<table><tr><th>Outcome</th><th>Fed on NIPPV</th><th>Fed on HFNC</th></tr><tr><td>Duration of NIV support, days, mean (SD)</td><td>3.7 (± 1.6)</td><td>2.3 (± 1.7)</td></tr><tr><td>Hospital LOS, days, median (IQR)</td><td>7 (4.6 – 8.2)</td><td>4.4 (2.8 – 6.7)</td></tr></table>Limitations:
Study only included patients admitted to PICU
This study was performed at a single quaternary pediatric referral center and outcomes may not be generalizable to other centers as they cannot account for regional variation in disease severity or clinical practice variation
Physiometric data not recorded throughout patients' NIV exposure, only after initial EN provision</td></tr>
</table>

Walter et al. (2022)

Methods	**Prospective/Retrospective Cohort**

Participants	**Participants:** Patients ≤ 24 months of age with bronchiolitis who received HFNC
	Setting: Tertiary, freestanding academic children's hospital with a pediatric residency program
	Number enrolled into study: *N* = 176
	• **Group 1, Patients fed per protocol (prospective and concurrent cohort):** *n* = 102
	• **Group 2, Patients not fed per protocol (retrospective cohort):** *n* = 74
	Gender, males (as defined by researchers):
	• **Group 1:** *n* = 60 (Prospective cohort: *n* = 47 (60%); Concurrent cohort: *n* = 13 (54%))
	• **Group 2:** *n* = 27 (36%)
	Race/ethnicity (as defined by researchers):
	• Not reported
	Age, mean in months (SD):
	• **Group 1:** Prospective cohort: 5 (2-12); Concurrent cohort: 4 (2-10)
	• **Group 2:** 3 (1-7)
	Inclusion Criteria:
	• ≤ 24 months of age
	• Received HFNC as primary therapy for viral bronchiolitis
	• Fed in accordance with institution's feeding protocol
	• Group 2 (retrospective cohort) was admitted during 2017-2018 respiratory season
	Exclusion Criteria:
	• Group 1:
	  ○ History of prematurity with a gestational age <32 weeks
	  ○ Congenital heart disease
	  ○ Gastrointestinal pathology that would preclude the administration of enteral nutrition (EN), or administration of EN
	  ○ Neuromuscular disorders
	  ○ Treated with HFNC with escalation to invasive ventilation or NIV before meeting the criteria for feed initiation
	• Group 2:
	  ○ Could not be fed secondary to gastrointestinal pathology that prevented feeds
	  ○ History of congenital heart disease
	  ○ History of prematurity with a gestational age <32 weeks
	  ○ Were never fed or had pertinent data that were missing
	Covariates Identified:
	• Not reported

Interventions	**Both:** Receiving HFNC • **Group 1:** Patients fed per institution feeding protocol (prospective cohort) along with patients with were not fed per protocol (concurrent cohort). • **Group 2:** Patients not fed per protocol
Outcomes	**Primary outcome(s):** • Hospital LOS*

	• Length of PICU stay* **Secondary outcome(s):** • Feeding interruptions* • Adverse events* **Safety outcome(s):** • Not reported *Outcomes of interest to the CMH CPG or CAT development team
Notes	**Results:** • Hospital LOS: prospective cohort: 6 (4 - 7); concurrent cohort: 5 (4 - 7); retrospective cohort: 7 (5 - 9) • PICU LOS: prospective cohort: 3.5 (1 - 4); concurrent cohort: 1.1 (1 - 4); retrospective cohort: 3 (2 - 4) • Feeding interruptions (prospective cohort only): 18 (23%) • Aspiration events (prospective cohort only): 0 **Limitations:** • Single institution • Occurring over a single viral season • Small sample size • Results solely to oral feeds limited • Limited data for breast-fed infants • Calculations impacted due to measurement by calendar days and not hours

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Appendix

Evidence to Decision Assessment for Oral Feeding for Hospitalized Patients with Bronchiolitis

For hospitalized infants ≤ 24 months of age with bronchiolitis receiving treatment with high flow nasal cannula (HFNC), does oral feeding vs. no oral feeding (nasogastric tube (NGT) feeds or intravenous (IV) fluids with no enteral feeds) impact patient outcomes?	
POPULATION:	Hospitalized patients with bronchiolitis
INTERVENTION:	Oral feeding
COMPARISON:	No oral feeding (NGT/IV)
MAIN OUTCOMES:	Aspiration; Length of Stay

ASSESSMENT

Problem Is the problem a priority?		
JUDGEMENT	**RESEARCH EVIDENCE**	**ADDITIONAL CONSIDERATIONS**
○ No ○ Probably no ○ Probably yes ● Yes ○ Varies ○ Don't know	Bronchiolitis is the most frequent cause for hospitalization of infants and children aged 1 to 24 months. There are currently no guidelines for feeding hospitalized patients with bronchiolitis. The most recent American Academy of Pediatrics Clinical Practical Guideline suggests that feeding may be compromised for patients with respiratory rates exceeding 60 to 70 breaths per minute and the patient may be at risk for aspiration during oral feeds (Ralston et al., 2014), but this suggestion is based upon a single study by Khoshoo & Edell (1999).	
Desirable Effects How substantial are the desirable anticipated effects?		
JUDGEMENT	**RESEARCH EVIDENCE**	**ADDITIONAL CONSIDERATIONS**
○ Trivial ○ Small ○ Moderate ● Large ○ Varies	***Length of stay.*** Three studies (Gray et al., 2023; Shadman et al., 2019; Sochet et al., 2021) measured LOS for hospitalized infants with bronchiolitis receiving treatment of noninvasive ventilation and oral feeding.	The desirable effects of oral feeding include optimal nutrition and protein intake, which are important for illness recovery; comfort for parent/child, decreased interruption in

○ Don't know	Shadman et al. (2019) compared LOS as time to discharge following HFNC completion for patients that received exclusively oral feeding (*n* = 50) versus no feeding or a combination of oral feeding and tube feeding (*n* = 73). The *aHR* was determined by adjusting for the confounders of age, unit of HFNC initiation, highest respiratory support required before HFNC initiation, and HFNC duration. They found a shorter LOS in the group that received exclusively oral feeding compared to the groups that were not fed or received a combination of oral feeding and tube feeding, *HR* = 1.57, 95% CI [1.04, 2.38], *aHR* = 2.13, CI [1.31, 3.45. Similar results were found when evaluating LOS from time of HFNC initiation for oral feeding compared to no feeding or a combination of oral and tube feeding, *HR* = 0.89, 95% CI [0.59, 1.34], *aHR* = 1.95, 95% CI [1.19, 3.18]. Sochet et al. (2021) compared LOS for patients receiving treatment with HFNC that received oral feeds (*n* = 65) to patients receiving feeding via NGT (*n* = 20). They found a shorter LOS in the group receiving oral feeds, median (IQR) 3.8 (2.6 – 5.9) days, versus the group receiving feeding by NGT, 7.1 (5.9 – 9) days, *p* = <.05. Gray et al. (2023) compared LOS for patients receiving only oral feeds while on HFNC (*n* = 621) versus patients that initially received oral feeds and were made NPO due to worsening respiratory distress (*n* = 55). They found that patients receiving only oral feeds while on HFNC had a shorter mean LOS in hours (60.7 ± 34.7) than the group made NPO (103.6 ± 42.2), p = <.001.	breastfeeding, decreased phsychological effect/stress for parent. Avoiding use of PIV decreases risk of peripheral line infections, pain with venipuncture, IV infiltrates and electrolyte imbalance. Avoiding use of NGT may decrease discomfort to the patient and/or radiation exposure if x-ray is needed in association with NGT placement.
Undesirable Effects How substantial are the undesirable anticipated effects?		
JUDGEMENT	**RESEARCH EVIDENCE**	**ADDITIONAL CONSIDERATIONS**
○ Large ○ Moderate ● Small ○ Trivial ○ Varies ○ Don't know	***Aspiration events.*** Seven studies (Babl et al., 2020; Dadlez et al., 2019; Gray et al., 2023; Shadman et al., 2019; Sochet et al., 2017; Sochet et al., 2021; Walter et al., 2022) measured aspiration events for patients with bronchiolitis while receiving treatment with HFNC (*N* = 1,816). Patients were separated into groups receiving exclusively oral feeds (exclusively oral feeds or in combination with NGT) (*n* = 1,428) versus patients receiving no oral feeds (no feeds or feeding via only NGT) (*n* = 388) (see Table 1). The choice of feeding modality in these studies was decided at the discretion of the clinician and based on the clinical presentation of the patient, considering the patient's work of breathing and oxygenation. The respiratory rates of the patients receiving oral feeds was not reported.	Aspiration events can range from momentary choking to aspiration pneumonia. This wide variation in severity of events makes it challenging in determining the clinical impact.

	There were two aspiration events found across all seven studies. One aspiration witnessed by providers and confirmed by radiographic evidence occurred in a patient receiving NG tube feeding (Sochet et al., 2017). One provider-documented and radiographically confirmed aspiration occurred in a patient receiving enteral feeding, though it was not clear from the study whether the patient was exclusively fed orally or by a combination of NGT and oral feeds (Shadman et al., 2019). The occurrence of aspiration events was rare (0.11%).	
Certainty of evidence What is the overall certainty of the evidence of effects?		
JUDGEMENT	**RESEARCH EVIDENCE**	**ADDITIONAL CONSIDERATIONS**
● Very low ○ Low ○ Moderate ○ High ○ No included studies	***Certainty of evidence for aspiration events.*** The certainty of the body of evidence was very low. The body of evidence was assessed to not have serious inconsistency, however serious risk of bias, serious indirectness and serious imprecision were assessed. Risk of bias was serious due to lack of controlling for confounders (gestational age, gender, severity of illness, or comorbidities). Serious indirectness was assessed due to the inclusion of all types of enteral feeding, not just oral feeding and inclusion of non-invasive ventilation other than HFNC. Imprecision was serious due to the low number of events and the uneven number of participants in the comparator groups across the six studies. ***Certainty of evidence for length of stay.*** The certainty of the body of evidence was very low. The body of evidence was assessed to have serious risk of bias, serious indirectness, and serious imprecision. Risk of bias was serious due to lack of controlling for all confounders (gestational age, gender, severity of illness, or comorbidities). Serious indirectness was assessed due to the inclusion of all types of enteral feeding, not just oral feeding. Imprecision was serious due to the low number of events and the uneven number of participants in the comparator groups across the two studies. While each study (Gray et al., 2023; Shadman et al., 2019; Sochet et al., 2021) addressed the question, the studies were analyzed separately, and consistency could not be assessed.	
Values		

Is there important uncertainty about or variability in how much people value the main outcomes?		
JUDGEMENT	**RESEARCH EVIDENCE**	**ADDITIONAL CONSIDERATIONS**
○ Important uncertainty or variability ● Possibly important uncertainty or variability ○ Probably no important uncertainty or variability ○ No important uncertainty or variability		Value is placed on potentially shorter length of stay for patients. Fear of aspiration events may be important to CMH staff. Value may be placed on continuation of oral feeding and no interruption to breastfeeding by parents.

Balance of effects Does the balance between desirable and undesirable effects favor the intervention or the comparison?		
JUDGEMENT	**RESEARCH EVIDENCE**	**ADDITIONAL CONSIDERATIONS**
○ Favors the comparison ○ Probably favors the comparison ○ Does not favor either the intervention or the comparison ○ Probably favors the intervention ● Favors the intervention ○ Varies ○ Don't know	Minimal evidence exists on length of stay related to oral feeding with bronchiolitis. Two cohort studies (above) report this outcome, and both reported shorter LOS in the groups receiving oral feeds. However, this may be related to the severity of illness impacting the decision to feed orally vs. IV. While six studies report on the outcome of aspiration, the number of aspiration events across all studies is very low for patients fed orally, with nasogastric tube, or patients that were not fed (see above) with only two total aspirations.	
Resources required How large are the resource requirements (costs)?		
JUDGEMENT	**RESEARCH EVIDENCE**	**ADDITIONAL CONSIDERATIONS**
○ Large costs ○ Moderate costs ○ Negligible costs and savings ● Moderate savings ○ Large savings ○ Varies ○ Don't know		More supplies are required for NGT/IV along with increased nursing time. X-ray is sometimes required for NGT placement. Adverse effects associated with IV (line infection, infiltrates, electrolyte abnormalities) along with inadequate nutrition may prolong patient stay, requiring additional resources.

Certainty of evidence of required resources What is the certainty of the evidence of resource requirements (costs)?		
JUDGEMENT	**RESEARCH EVIDENCE**	**ADDITIONAL CONSIDERATIONS**
○ Very low ○ Low ○ Moderate ○ High ● No included studies	In 2016, the geometric mean of direct cost of hospitalization in the US was $3724, 95% CI [3572, 3876] for patients with primary diagnosis of bronchiolitis without other complex chronic conditions. The source of this data was the Healthcare Cost and Utilization Project's (HCUP) Kids' Inpatient Database (KID). The median (IQR) LOS in days for patients with primary diagnosis of bronchiolitis without other complex chronic conditions was 2 (2-4) (Fujiogi et al., 2019).	
Cost effectiveness Does the cost-effectiveness of the intervention favor the intervention or the comparison?		
JUDGEMENT	**RESEARCH EVIDENCE**	**ADDITIONAL CONSIDERATIONS**
○ Favors the comparison ○ Probably favors the comparison ○ Does not favor either the intervention or the comparison ● Probably favors the intervention ○ Favors the intervention ○ Varies ○ No included studies		Oral feeding may result in shorter length of stay and fewer resources needed and therefore incur less cost.

Equity What would be the impact on health equity?		
JUDGEMENT	**RESEARCH EVIDENCE**	**ADDITIONAL CONSIDERATIONS**
○ Reduced ○ Probably reduced ○ Probably no impact ○ Probably increased ○ Increased ○ Varies ● Don't know	Disparities exist in the U.S. for rates of breastfeeding based on race and ethnicity, with lower rates in Black and American Indian/Alaska Native groups (Chiang et al., 2021). This may result in less value placed on breastfeeding for these groups.	Values surrounding oral feeds (specifically breastfeeding) may vary based on race/ethnicity. Increased length of stay will have a disproportionate effect on those facing challenges with transportation, access to care, health literacy, and other social determinants of health.
Acceptability Is the intervention acceptable to key stakeholders?		
JUDGEMENT	**RESEARCH EVIDENCE**	**ADDITIONAL CONSIDERATIONS**
○ No ○ Probably no ● Probably yes ○ Yes ○ Varies ○ Don't know		Acceptability may be influenced by current practice to discontinue oral feeding if the patient's respiration rate exceeds 60 respirations/minute. Following education and presentation of data acceptability is expected increase.
Feasibility Is the intervention feasible to implement?		
JUDGEMENT	**RESEARCH EVIDENCE**	**ADDITIONAL CONSIDERATIONS**
○ No ○ Probably no ○ Probably yes ● Yes ○ Varies ○ Don't know		

SUMMARY OF JUDGEMENTS

	JUDGEMENT						
PROBLEM	No	Probably no	Probably yes	**Yes**		Varies	Don't know
DESIRABLE EFFECTS	Trivial	Small	Moderate	**Large**		Varies	Don't know
UNDESIRABLE EFFECTS	Large	Moderate	**Small**	Trivial		Varies	Don't know
CERTAINTY OF EVIDENCE	**Very low**	Low	Moderate	High			No included studies
VALUES	Important uncertainty or variability	**Possibly important uncertainty or variability**	Probably no important uncertainty or variability	No important uncertainty or variability			
BALANCE OF EFFECTS	Favors the comparison	Probably favors the comparison	Does not favor either the intervention or the comparison	Probably favors the intervention	**Favors the intervention**	Varies	Don't know
RESOURCES REQUIRED	Large costs	Moderate costs	Negligible costs and savings	**Moderate savings**	Large savings	Varies	Don't know
CERTAINTY OF EVIDENCE OF REQUIRED RESOURCES	Very low	Low	Moderate	High			**No included studies**
COST EFFECTIVENESS	Favors the comparison	Probably favors the comparison	Does not favor either the intervention or the comparison	**Probably favors the intervention**	Favors the intervention	Varies	No included studies
EQUITY	Reduced	Probably reduced	Probably no impact	Probably increased	Increased	Varies	**Don't know**
ACCEPTABILITY	No	Probably no	**Probably yes**	Yes		Varies	Don't know

	JUDGEMENT						
FEASIBILITY	No	Probably no	Probably yes	**Yes**		Varies	Don't know

TYPE OF RECOMMENDATION

Strong recommendation against the intervention	Conditional recommendation against the intervention	Conditional recommendation for either the intervention or the comparison	**Conditional recommendation for the intervention**	Strong recommendation for the intervention
○	○	○	●	○