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Discharge Practices for Infants with Bronchopulmonary Dysplasia: A Survey of National Experts

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Abstract

Objectives: To establish consensus practices among a panel of national experts for the discharge of premature infants with bronchopulmonary dysplasia (BPD) from the hospital to home.

Study design: We conducted a Delphi study that included US neonatologists and pediatric pulmonologists from the BPD Collaborative to establish consensus practices, defined as recommendations with at least 80% agreement, for infants with BPD being discharged from the hospital. Specifically, we evaluated recommendations for diagnostics to be completed around discharge, follow-up respiratory care, and family education.

Results: Thirty-one expert participants completed three rounds of surveys, with a 92/93 (99%) response rate. Consensus was established that infants with moderate-severe BPD (those who remain on respiratory support at 36 weeks) and those discharged on oxygen should be targeted

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*A complete list of study group members appears in the Appendix.

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for in-person pulmonary follow-up within 1 month of hospital discharge. Specialized neonatal follow-up is an alternative for infants with mild BPD. Those with moderate or severe BPD should have an echocardiogram performed after 36 weeks to screen for pulmonary hypertension. Infants with BPD warrant additional evaluations if they have growth restriction or poor growth, pulmonary hypertension, tachypnea, and if they are discharged home on oxygen, diuretics, or non-oral feeds.

Conclusion: This Delphi survey establishes expert consensus around best practices for follow-up respiratory management and routine evaluations for infants with BPD surrounding neonatal discharge. Areas of disagreement where consensus was not established are discussed.

Keywords

Delphi survey; chronic lung disease of prematurity; neonatal transitions of care

Introduction

Premature infants with bronchopulmonary dysplasia (BPD) have complex care needs surrounding discharge from the Neonatal Intensive Care Unit (NICU). BPD affects up to 40% of former preterm infants born at <28 weeks gestation, with up to 50,000 new cases of BPD in the United States every year.[1–3] These infants may require ongoing respiratory care, management of medications and home respiratory support, management of pulmonary hypertension, monitoring of growth and nutrition, and developmental follow-up.[4–6] Discharge from NICU to home is a high-risk transition of care, with up to 50% of infants with BPD requiring rehospitalization in the first year alone.[7] Coordinated follow-up programs may help improve outcomes and reduce rates of hospitalization in this population.[8] There are diverse follow-up and management strategies employed by outpatient BPD clinics in the United States.[9]

Though recently published guidelines establish recommendations for care of children with post-prematurity respiratory disease, these do not address which infants discharging from the NICU should be targeted for specialized follow-up for their respiratory disease, which evaluations should be routinely performed around discharge, and what family education to provide to optimize successful discharge.[10,11] Additionally, the role of telemedicine for follow-up in this population is unclear, despite an increased reliance on its use during the SARS-CoV-2 pandemic.[12,13] We conducted a Delphi study among neonatologists and pulmonologists from the BPD Collaborative to determine consensus practices in the discharge of infants <32 weeks gestational age (GA) from the NICU with BPD. We hypothesized that we would be able to establish “best practices” for identifying BPD infants who require specialized follow-up and additional evaluations around NICU discharge.

Methods

Delphi panel participants

The Delphi method aims to identify areas of consensus practices among a group of expert participants using iterative surveys.[14] For this study, consensus was defined *a priori* as ≥ 80% agreement among participants. Where consensus could not be attained an

explanation is provided as to the sources of disagreement. We recruited members of the BPD collaborative, a consortium of 25 pediatric centers with expertise in the treatment of BPD, to serve as participants on the BPD Collaborative Expert Panel on Discharge Practices. A purposeful sample was designed to include both neonatologists and pediatric pulmonologists across multiple regions of the United States. Eligible participants were informed of the study requirement, which included participation in all surveys distributed to attain a 100% response rate and to maintain confidentiality around their responses.

The study was granted a waiver of consent from the institutional review board at the coordinating center. A participant agreement form was included with the first questionnaire.

Questionnaires

Iterative questionnaires were administered recursively. Each round was designed based on previous responses until consensus was achieved among participants or reasons for disagreement were understood. Three rounds of surveys were required. The initial questionnaire was tested for content and modified based on responses by three expert non-participants. Questionnaires included four case vignettes and one question about family education and counseling. The four vignettes described preterm neonates <32 weeks GA nearing discharge with mild, moderate, and severe BPD, as well as one with severe BPD requiring supplemental oxygen at discharge. BPD severity was defined based on the 2001 National Institute of Child Health and Human Development/National Heart Lung and Blood Institute consensus definition, using respiratory support at 36 weeks post-menstrual age (PMA).[15] In the each primary vignette presentation no other diagnoses were described other than BPD, and it was explicitly stated that no medications were being used at discharge to treat their BPD.

Survey methodology is outlined in Figure 1. In round one, each participant was asked open-ended questions about the patient vignettes regarding need for specialty follow-up specific to their respiratory condition, and if so, the ideal time frame and format (in person and/or telehealth). Participants were asked about other *routine* referrals or testing they would recommend for these infants before or shortly after discharge. In addition, we asked open-ended questions, with examples, about how responses might change based on the following: different gestational ages, growth issues including history of intrauterine growth restriction (IUGR) or poor postnatal growth, comorbid diagnoses or symptoms (including persistent tachypnea, a history of prolonged spells, ongoing or resolved pulmonary hypertension, a patent ductus arteriosus, atrial septal defect, nasogastric tube at discharge, resolved pneumonia, or resolved pneumothorax), and medication use (including diuretics, systemic steroids, and inhaled respiratory medications). Finally, we asked what education or counseling the participant would recommend providing to families prior to NICU discharge. For each question, we encouraged participants to explain the rationale behind their responses.

The second round summarized the open-ended responses in round one, highlighting modal responses to each question, areas of consensus, and all responses listed by at least two participants. For each vignette, we asked participants to choose responses with which they

agreed, and again encouraged open-ended responses to explain rationale for agreement or disagreement with the listed responses.

In the third and final round, we included responses that garnered agreement of at least 50% of participants from the round two survey but had not already attained consensus. Where appropriate, responses and questions were combined to create consensus recommendations. Participants were asked to agree or disagree with recommendations, and again, encouraged to describe the rationale to their decision.

Data collection

Surveys were completed using REDCap over a 2-3 week time span for each round.[16,17] Individual follow-up was used to request response when participants were late. Participant responses remained anonymous to all except the study coordinator, who had access to names if clarifications were needed.

The first two rounds, which each contained open-ended questions, were scored by two study team members (JL and CA). Any response for which there was > 10% disagreement in labeling by scorers was further reviewed. There was 85% initial agreement among scorers.

Results

Thirty-one experts from 19 centers from the BPD collaborative participated in the Delphi survey, including 14 neonatologists and 18 pediatric pulmonologists (one participant practices in both specialties) (Table 1; online). Experts represented areas across the US, with regional locations of home institutions including: Midwest 5, South 7, Northeast 8, West 11. Participants responded to 92/93 (99%) of surveys; 100% (31/31) for rounds one and two, and 97% (30/31) for round three.

Areas of Consensus and Disagreement

Expert questionnaire responses by case vignette and survey round are presented in Table 2, including the degree of consensus achieved. Educational recommendations are presented in Table 3. Consensus recommendations are summarized in Table 4.

Consensus by BPD severity—Consensus was gained that preterm infants with moderate and severe BPD should have a pulmonary consultation after NICU discharge if available (Table 2). This visit is preferred within 1-2 months of discharge, in-person if able. Experts acknowledged that where pediatric pulmonary resources are scarce neonatal follow-up may serve the role of respiratory screening and assessment, but also noting these infants are at increased risk for early and late pulmonary complications.[18] Additionally, experts recognized that in certain areas of the country BPD-focused clinics are staffed by neonatologists. In-person assessments were preferred to obtain an accurate weight and other growth measurements, and to obtain vital signs including oxygen saturation. It was suggested that telehealth may be a more acceptable alternative if those data were available by remote monitoring.

For mild BPD, there were multiple responses in round 2 that individually failed to gain consensus. Consensus was ultimately gained these infants should see neonatal follow-up with a one-time pulmonary consultation if resources allow, and more so if any symptoms/complications develop. Experts reflected that universal pulmonary follow-up may be difficult in certain areas due to limited resources, though at minimum, a respiratory assessment by a neonatal follow-up is specialist is recommended because even mild BPD is associated with early respiratory complications and later abnormalities in pulmonary function.[19–21]

For infants with moderate or severe BPD, consensus was gained that an echocardiogram should be obtained after 36 weeks PMA, prior to discharge. For severe BPD, there was near consensus about obtaining a routine chest radiograph prior to or soon after discharge, with some experts commenting that assessments should be symptom-based rather than based on BPD severity.

Discharge on home oxygen—There was agreement that infants with BPD discharged on supplemental oxygen should have pulmonary follow-up within 1-2 months (some suggested within 2 weeks) and in-person if able (although telehealth visit may be an acceptable alternative if in-person assessment is delayed). Participants cited the importance of monitoring weight gain and oxygen saturation, ascertaining comfort with home oxygen, assessing ability to wean, and troubleshooting equipment issues. Consensus was also gained on obtaining an echocardiogram after 36 weeks PMA, prior to discharge, and obtaining a routine chest radiograph prior to or soon after discharge. There was not consensus (22/30, 73%) on whether a blood gas or chemistry (for bicarbonate) should be obtained; some suggested end-tidal carbon dioxide as a non-invasive alternative.

Education and Counseling—Consensus was reached on several counseling topics with families prior to discharge (Table 3).

Special Scenarios—In the first (open-ended) round, the following diagnoses and situations for infants with BPD were included by participants: IUGR, poor postnatal growth, diuretic use, systemic corticosteroid use, bronchodilator use, history of prolonged spells, discharge with non-oral feeds, persistent tachypnea, and pulmonary hypertension (Table 5; online). Consensus was reached on:

- For BPD infants with IUGR, obtaining an echocardiogram after 36 weeks PMA to screen for pulmonary hypertension, due to increased risk
- For BPD infants with poor postnatal growth, obtaining nutrition and/or gastroenterology follow-up, a feeding evaluation and/or swallow study, and an echocardiogram
- For BPD infants requiring non-oral feeds at discharge (for example, nasogastric or gastric), obtaining a feeding evaluation and/or swallow study, if safely able to participate.
- For BPD infants with persistent tachypnea near discharge, obtaining a chest radiograph and a feeding evaluation.

- For BPD infants on diuretics at discharge or with a history of greater than 1 week of diuretic use, obtaining a blood chemistry prior to discharge.
- For BPD infants with pulmonary hypertension, obtaining a chest radiograph, along with follow-up echocardiograms as standard of care for this condition. Many would obtain overnight oximetry or a sleep study, but there was not consensus on this.
- Infants with poor postnatal growth, persistent tachypnea, pulmonary hypertension, and those on diuretics should be prioritized within one month for follow-up, per consensus.

There was no consensus if infants with a history of significant systemic corticosteroid exposure, defined as >1 course or prolonged taper, should have a cortisol level obtained. Respondents commented on a lack of evidence supporting the utility of cortisol levels in preterm infants. There was also no consensus around practices for BPD infants discharged on inhaled respiratory medications or with prolonged episodes of apnea, desaturation, or bradycardia.

Areas of Agreement by Specialty

Overall, responses were similar by specialty area. The only response that was significantly different between pulmonologists and neonatologists was oximetry for BPD infants with pulmonary hypertension; a greater proportion of pulmonologists (15/16, 94%) than neonatologists (8/14, 57%) agreed that it should be routinely performed prior to discharge.

Discussion

This Delphi study provides the first set of consensus practices for providers around NICU discharge practices for infants <32 weeks GA with BPD. The panel of 31 pulmonologists and neonatologists from 19 BPD Collaborative centers across the US identified areas of consensus on studies or evaluations to obtain prior to discharge, infants to prioritize for pulmonary follow-up, timing of follow-up, which comorbid diagnoses or circumstances should be considered, and areas of educational emphasis.

Expert panelists were in consensus that infants with moderate-severe BPD, who remain on respiratory support at 36 weeks PMA, and those discharged on oxygen should be prioritized for pediatric pulmonary follow-up, which should be within one month of neonatal discharge and in-person to allow for collection of vital signs, weight, and measurements. Infants with mild BPD should be monitored for pulmonary complications with pulmonary consultation as resources allow, as they remain at risk of symptoms, medication use, rehospitalization, and lower lung function in childhood.[18,22,23]

In addition, there was consensus that infants with moderate or severe BPD have routine screening for pulmonary hypertension by echocardiogram, which is supported by existing American Heart Association and American Thoracic Society guidelines, though there is some variation in the applicability of this practice.[24,25] A routine chest radiograph near discharge reached near consensus in infants with severe BPD and reached consensus for

infants on home oxygen. Other routine tests were suggested by some participants but did not reach consensus, such as blood gas or bicarbonate (on a serum chemistry panel), but could be considered on an individualized basis.

Several comorbidities and specific scenarios warranted additional evaluations by consensus, including IUGR infants, infants with poor growth, infants with pulmonary hypertension, infants requiring non-oral feeds at discharge, infants on diuretics or with significant (>1 week) diuretic exposure, and infants with tachypnea.[26–28] Notably there was no clear consensus on whether infants with a history of prolonged corticosteroid exposure should have further evaluation for adrenal insufficiency, with many citing a lack of consistent data to provide normative cortisol levels in this population.[29]

Overall, this survey provides a set of best practices regarding the discharge management of infants with BPD based on expert consensus, rather than empirical evidence. The authors believe that in the absence of such evidence, these consensus recommendations are a useful alternative to guide practice. Efficacy will need to be tested in implementation studies. Additionally, topics without consensus highlight areas where further research is needed.

This survey complements recent society guidelines from the American Thoracic Society and European Respiratory Society regarding the care of infants and children with BPD and post-prematurity respiratory disease, which address medication use and the role of diagnostic testing in the outpatient setting.[10,11] These guidelines do not comment on the need for specialized follow-up for these infants, and do not formally distinguish disease severity or degree of prematurity. The results of this Delphi survey consensus portray how expert providers use disease severity to triage infants <32 weeks GA at highest priority for specialist follow-up and additional diagnostic testing around NICU discharge.

The Expert Panel on Discharge Practices queried in this study included geographically diverse neonatologists and pulmonologists recruited from the BPD Collaborative, an organization comprised of pediatric tertiary and quaternary care institutions with multidisciplinary teams dedicated to optimizing outcomes of infants and children with severe BPD. Neonatologist and pulmonologist recommendations in this study were similar. Other strengths include the high response rate (97%), anonymous responses that were given equal weight in analysis, and identification of rationale where there were areas of disagreement.

All panel participants, while considered experts, also practice in academic centers providing this subspecialized care; there may be resource limitations in implementing these consensus findings in diverse practice settings. Other limitations include that we asked only about infants <32 weeks GA with BPD based on the 2001 consensus definition. Recommendations for infants with BPD ≥32 weeks or alternative BPD definitions were not queried in this survey.[30,31] However, the updated definition published by the Jensen et al. with the Neonatal Research Network can be applied to the case scenarios described in the survey, notably: the mild BPD case is equivalent to no BPD (Jensen), the moderate BPD case is equivalent to Grade 1 BPD, severe BPD case (in this scenario, on non-invasive support) is

equivalent to Grade 2 BPD. Grade 3 BPD was not included in the survey, as there are likely distinct considerations for infants' still mechanically ventilated at 36 weeks' PMA.

In summary, despite a lack of evidence to guide discharge of infants with BPD from the NICU, an expert panel of specialists reached consensus on a wide range of practices around discharge, including how to follow infants <32 weeks GA for their respiratory needs, which routine evaluations and studies should be performed around discharge, and identifying certain comorbidities with higher risk for long-term complications. The importance of family education was highlighted as a key to successful transition to home. Where consensus was not reached, resource limitations and lack of evidence were the most commonly cited rationales.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Abbreviations

BPD	Bronchopulmonary dysplasia
GA	Gestational Age
IUGR	Intrauterine Growth Restriction
NICU	Neonatal Intensive Care Unit
PMA	Post-menstrual age

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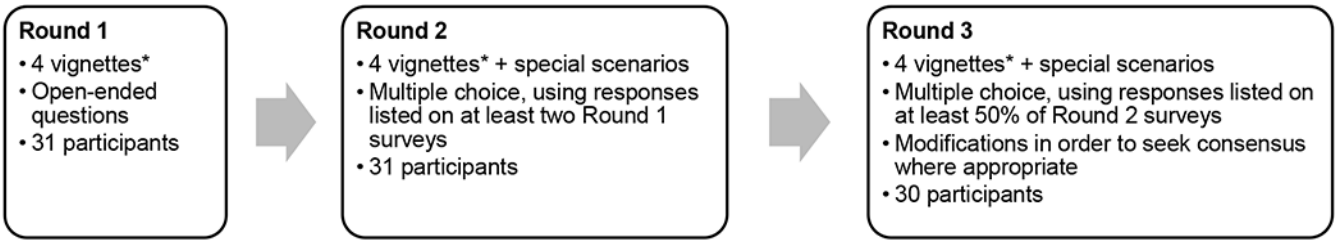

Figure 1. Description of Delphi Survey Rounds

*The four vignettes included in the survey were preterm infants <32 weeks gestation with mild, moderate, and severe BPD by 2001 NHLBI criteria, plus one with severe BPD discharge on home oxygen.

Table 1.

Sampling table of expert participants

		Region of United States			
		Northeast	**South**	**West**	**Midwest**
Specialization	**Neonatologist**	5*	3	3	3
	Pediatric Pulmonologist	4*	4	8	2

* Note that one participant practices as a neonatologist and pulmonologist

Table 2.

Responses to case vignettes by survey round

Discharge recommendation	*Mild BPD*			*Moderate BPD*			*Severe BPD*			*BPD Discharge on Oxygen*		
	Round 1 n=31	**Round 2 n=31**	**Round 3 n=30**	**Round 1 n=31**	**Round 2 n=31**	**Round 3 n=30**	**Round 1 n=31**	**Round 2 n=31**	**Round 3 n=30**	**Round 1 n=31**	**Round 2 n=31**	**Round 3 n=30**
Specialty Follow-up												
Pulmonary follow-up	22 (71%)	22 (71%)	***28 (93%) ****	23 (74%)	***26 (83%)***		***26 (84%)***	***28 (90%)***		***27 (87%)***	***28 (90%)***	
Neonatal follow-up	8 (26%)	10 (32%)		7 (23%)	7 (23%)		6 (19%)	5 (16%)		6 (19%)	4 (31%)	
No specialty follow-up	7 (22%)	5 (16%)		4 (13%)	1 (3%)		1 (3%)	0 (0%)		0 (0%)	0 (0%)	
Timing of Initial Follow-up												
1-2 months	***17/21 (81%)***	***25/26 (96%)***		***19/23 (83%)***	***29/30 (97%)***		***23/26 (88%)***	***29 (94%)***		***27/27 (100%)***	***31 (100%)***	
3-6 months	3/21 (14%)	1/26 (4%)		4/23 (17%)	1/30 (3%)		3/26 (12%)	2 (6%)		0/27 (0%)	0 (0%)	
Location of Visit (initial)												
In-person	***19/21 (90%)***	***25/26 (96%)***		***19/23 (83%)***	***29/30 (97%)***		***21/24 (88%)***	***30 (97%)***		***22/23 (96%)***	***29 (94%)***	
Virtual/Telehealth	8/21 (38%)	5/26 (19%)		7/23 (30%)	3/30 (10%)		9/24 (38%)	3 (10%)		2 (9%)	0 (0%)	
Seasonally dependent	1/21 (5%)	1/26 (4%)		1/23 (4%)	1/30 (3%)		1/24 (4%)	1 (3%)		1 (4%)	2 (6%)	
Routine referrals												
Development	***29 (94%)***			***26 (84%)***			***26 (84%)***			***25 (81%)***		
Nutrition	8 (26%)	15 (48%)		11 (35%)	15 (48%)		11 (35%)	20 (65%)		11 (35%)	23 (74%)	
Cardiology	1 (3%)			2 (6%)	2 (6%)		2 (6%)	4 (12%)		7 (23%)	5 (16%)	
Routine testing												
Echocardiogram	14 (45%)	22 (71%)	14 (47%)	21 (68%)	***27 (87%)***		***25 (81%)***			***27 (87%)***		
Chest radiograph	10 (32%)	16 (59%)	12 (41%)	9 (29%)	19 (61%)	18 (60%)	11 (35%)	19 (61%)	23 (77%)	16 (52%)	23 (74%)	***25 (83%)***
Blood gas or chemistry	11 (35%)	12 (39%)		11 (35%)	13 (42%)		12 (39%)	13 (42%)		16 (52%)	19 (61%)	22 (73%)
Feeding evaluation	7 (23%)	13 (42%)		5 (16%)	12 (39%)		3 (10%)	11 (35%)		5 (16%)	14 (45%)	
Oximetry or sleep study	3 (10%)	5 (16%)		4 (13%)	8 (26%)		5 (16%)	10 (32%)		10 (32%)	11 (35%)	
Vit D, Calcium Level	4 (13%)	5 (16%)		3 (10%)	4 (13%)		3 (10%)	5 (16%)		4 (13%)	7 (23%)	

> 80% agreement
70-80% agreement
60-70% agreement
50-60% agreement
< 50% agreement

* Indicates agreement around consensus statement modified from round 2 responses (see text).

Responses may total >100% as multiple-choice elections were permitted for certain questions. Total assumed to be all participants, other than where explicitly listed (due to branching responses). Only responses with at least 2 respondents in round 1 are listed. BPD definitions and severity among infants <32 weeks gestation based on 2001 NIH consensus criteria

Table 3.

Counseling and education prior to discharge

Topic	Agreement, no. (%) n= 31
Topics with consensus	
Cardiopulmonary resuscitation training	***25 (81%)*** *
Avoiding infectious exposures	***25 (81%)*** *
Observing/monitoring work of breathing	***80 (90%)***
Importance of palivizumab prophylaxis (if applicable) and influenza vaccination	***27 (87%)***
Equipment and medication teaching (if applicable)	***31 (100%)***
Safe sleep	***29 (94%)***
Symptoms of feeding difficulties and aspiration	***25 (81%)***
Avoidance of secondhand smoke exposure	***30 (97%)***
Hand hygiene	***29 (94%)***
Topics not reaching consensus	
Long-term respiratory outcomes of prematurity	23 (74%)
Consultation prior to air travel	14 (45%)

≥ 80% agreement

70-80% agreement

60-70% agreement

50-60% agreement

< 50% agreement

*Consensus was achieved in round 1; otherwise agreement numbers and percent listed are from round 2 of the Delphi survey.

Table 4.

Summary of Consensus Discharge Practices for BPD Infants <32 Weeks Gestation

Mild BPD
1. Preterm infants with mild BPD should see neonatal follow-up with at least a one-time pulmonary consultation if resources allow, and more so if any symptoms/complications develop. This visit is preferred within 1-2 months of discharge, in-person if able. 2. They should also have specialized neonatal developmental follow-up.
Moderate BPD
1. Preterm infants with moderate BPD should have pulmonary follow-up after NICU discharge if available. This visit is preferred within 1-2 months of discharge, in-person if able. 2. They should also have specialized neonatal developmental follow-up. 3. A routine echocardiogram should be obtained after 36 weeks post menstrual age to screen for pulmonary hypertension.
Severe BPD
1. Preterm infants with severe BPD should have pulmonary follow-up after NICU discharge. This visit is preferred within 1-2 months of discharge, in-person if able. 2. They should also have specialized neonatal developmental follow-up. 3. A routine echocardiogram should be obtained after 36 weeks post menstrual age to screen for pulmonary hypertension.
Severe BPD discharged on home oxygen 1. Preterm infants with BPD discharged on oxygen should have pulmonary follow-up after NICU discharge. This visit is preferred within 1-2 months of discharge (within 2 weeks may be preferred), in-person if able (although telehealth visit may be an acceptable alternative if the in-person assessment is delayed). 2. They should also have specialized neonatal developmental follow-up. 3. A routine echocardiogram should be obtained after 36 weeks post menstrual age to screen for pulmonary hypertension. 4. A baseline chest radiograph should be obtained near discharge or soon after discharge.
Special scenarios for BPD infants
1. **Intrauterine growth restricted** infants should have a routine echocardiogram performed after 36 weeks post menstrual age to screen for pulmonary hypertension. 2. **Poor postnatal growth** infants should have: a. A routine echocardiogram performed after 36 weeks post menstrual age to screen for pulmonary hypertension. b. A formal feeding evaluation. c. Nutrition and/or Gastroenterology follow-up in addition to above follow-up. 3. **Discharged on diuretics or with history of prolonged (>1 week) diuretic use** should have a chemistry obtained prior to discharge. 4. **Discharged on non-oral feeds (for example, nasograstic or gastric)** should have a formal feeding evaluation, if safely able. 5. **Discharged with ongoing tachypnea** should have sooner follow-up for respiratory care, as well as a chest radiograph and a formal feeding evaluation performed around discharge. 6. **Diagnosed with ongoing pulmonary hypertension** should have, in addition to echocardiography and specialized follow-up, a chest radiograph and sooner follow-up for respiratory care.
Teaching 1. For infants with BPD, the following topics should be covered around neonatal discharge: a. CPR training b. Avoiding infectious exposures c. Observing and monitoring for work of breathing d. Importance of RSV prophylaxis (if applicable) and influenza vaccination e. Avoiding group childcare if able f. Equipment and medication teaching, as appropriate g. Safe sleep h. Monitoring for signs of feeding difficulties and aspiration i. Avoidance of secondhand smoke exposure j. Hand Hygiene

Bronchopulmonary Dysplasia (BPD) definitions and severity based on 2001 NIH consensus criteria. Consensus was defined as agreement >80%.

Table 5:

Delphi responses for rounds 2 and 3 for special scenarios

Special scenario **Discharge Recommendation**	**Round 2 n=31**	**Round 3 n= 30**
Intrauterine growth restriction		
Echocardiogram	22 (71%)	***28 (93%)***
Poor growth		
Nutrition/gastroenterology referral	***29 (94%)***	
Feeding and/or swallow evaluation	***25 (81%)***	
Echocardiogram after 36 weeks PMA	18 (58%)	***28 (93%)***
Expedited follow-up within 1 month of discharge	18 (58%)	***24 (80%)***
Overnight oximetry or sleep study	15 (48%)	
Chest radiograph	13 (42%)	
Vitamin D, Calcium Level	10 (32%)	
Chemistry	9 (29%)	
Non-oral feeds at discharge (e.g. nasogastric or gastric feeds)		
Feeding evaluation	***25 (81%)***	
Expedited follow-up within 1 month of discharge	11 (35%)	
ENT and/or aerodigestive referral	9 (29%)	
Chest radiograph	6 (19%)	
Overnight oximetry and/or sleep study	3 (10%)	
Persistent tachypnea		
Expedited follow-up within 1 month of discharge	***26 (84%)***	
Chest radiograph	22 (71%)	***26 (87%)***
Feeding and/or swallow evaluation	19 (61%)	***26 (87%)***
Overnight oximetry and/or sleep study	15 (48%)	
ENT and/or aerodigestive referral	11 (35%)	
Diuretic use at discharge		
Chemistry	***25 (81%)***	
Expedited follow-up within 1 month of discharge	19 (61%)	***24 (80%)***
Echocardiogram after 36 weeks PMA	10 (32%)	
Chest radiograph	10 (32%)	
Blood gas	9 (29%)	
Renal Ultrasound	7 (23%)	
History of significant diuretic use (>1 week)		
Chemistry	17 (55%)	***25 (83%)***
Renal Ultrasound	10 (32%)	
Blood gas	9 (29%)	
Expedited follow-up within 1 month of discharge	9 (29%)	
Chest radiograph	8 (26%)	

Special scenario **Discharge Recommendation**	**Round 2** **n=31**	**Round 3** **n= 30**
Echocardiogram after 36 weeks PMA	7 (23%)	
Significant corticosteroid exposure (>1 course or prolonged taper)		
Cortisol	16 (52%)	13 (43%)
Expedited follow-up within 1 month of discharge	11 (35%)	
Chest radiograph	11 (35%)	
Echocardiogram after 36 weeks PMA	10 (32%)	
Blood gas	8 (26%)	
Chemistry	6 (19%)	
Pulmonary hypertension ongoing		
Expedited follow-up within 1 month of discharge	23 (74%)	***25 (83%)***
Chest radiograph	17 (55%)	***28 (93%)***
Overnight oximetry and/or sleep study	20 (65%)	23 (77%)
Feeding and/or swallow evaluation	14 (45%)	
ENT and/or aerodigestive referral	2 (6%)	
Inhaled bronchodilators or steroid		
Expedited follow-up within 1 month of discharge	18 (58%)	20 (67%)
Chest radiograph	13 (42%)	
Echocardiogram after 36 weeks PMA	9 (29%)	
Blood gas	8 (25%)	
Chemistry	5 (16%)	
Cortisol	3 (10%)	
Prolonged history of spells		
Expedited follow-up within 1 month of discharge	17 (55%)	23 (77%)
Feeding and/or swallow evaluation	14 (45%)	
Chest radiograph	12 (39%)	
Overnight oximetry and/or sleep study	12 (39%)	
Otorhinolaryngology and/or aerodigestive referral	8 (26%)	

≥ 80% agreement

70-80% agreement

60-70% agreement

50-60% agreement

< 50% agreement

Responses may total > 100% as multiple-choice elections were permitted for certain questions. Total assumed to be all participants, other than where explicitly listed (due to branching responses). Only responses with at least 2 respondents in round 2 are listed. Expedited follow-up indicates priority for follow-up under 1 month of NICU discharge. BPD definitions and severity among infants <32 weeks gestation based on 2001 NIH consensus criteria. Note round 1 responses were open-ended to describe special scenarios and thus responses were not included in this table.