Evaluation of a Vaccine-Communication Tool for Physicians

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Objectives To evaluate a Kaiser Permanente Northern California physician training tool entitled "Effective Communication without Confrontation" aimed at improving communication with vaccine-hesitant parents, building trust, and alleviating physician stress surrounding vaccination visits.

Study design Trainings were held May to July 2015. Pre- and post-training surveys assessed physician comfort and perceived effectiveness in communicating with vaccine-hesitant parents. We measured vaccination coverage at the 2-, 4-, and 6-month well-child visits, and days undervaccinated at 9 months of age. We compared vaccination rates before and after the training.

Results Of 415 physicians who received training, 249 completed post-training surveys. Physicians reported that the training helped them feel "much more or more" comfortable talking with parents who are unsure (72.3%), want to delay (73.9%), or refuse (63.5%) vaccinations and "much more or more" effective at persuading parents who are unsure (67.5%) or want to delay vaccinations (61.4%). They reported feeling "the same or less" effective persuading parents who refuse vaccinations (66.3%). Vaccine coverage remained unchanged and high from before to after the training (95%-96%), as did parent satisfaction with his or her child's provider (4.73/5.00).

Conclusions The Effective Communication without Confrontation training did not increase vaccine coverage, but did improve physicians' comfort and perceived effectiveness communicating with most vaccine-hesitant parents and may help to ease potentially stressful vaccination visits. *(J Pediatr 2020;224:72-8)*.

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Despite persistent efforts to inform the public about the importance of vaccinations, an increasing number of parents in the US and other developed countries are refusing or delaying vaccination for their children. Resurgences of vaccine-preventable illnesses—most notably measles—have occurred as a result, with the majority of cases developing in children unvaccinated for nonmedical reasons.[1-8] In 2019, the World Health Organization designated vaccine hesitancy as 1 of the 10 top threats to global health.

There are limited but increasing data on the effectiveness of different communication strategies physicians can use with vaccine-hesitant parents. Public health officials historically advocated an approach of educating parents on the benefits of vaccines and emphasizing the risks of vaccine-preventable diseases, while attempting to correct common misconceptions, including the debunked link between vaccines and autism.[9,10] However, this approach may be ineffective and possibly counterproductive, leaving some hesitant parents even less likely to vaccinate their children.[11]

Most parents seek answers to vaccine-related questions from their child's physician and ultimately choose to vaccinate.[12-14] Physicians report that vaccination visits take significantly longer with hesitant parents, and evidence shows that physicians conducting vaccination visits face lower job satisfaction and increased burnout.[15,16]

Kaiser Permanente Northern California (KPNC) is an integrated healthcare delivery system with a complete electronic medical record and an annual membership of more than 4 million people, including approximately 900 000 members who are 18 years old or younger. Pediatric KPNC members receive primary care from a pediatrician or family doctor and all immunizations are captured in the electronic medical record. To improve communication between physicians and vaccine-hesitant parents, a team of KPNC physicians and educators developed a communication training tool entitled "Effective Communication without Confrontation" (ECC). The goals of the ECC were to improve physician comfort and effectiveness when discussing vaccinations with hesitant parents, while building trust and maintaining parent satisfaction in the child's physician. The

ECC	Effective Communication without Confrontation
KPNC	Kaiser Permanente Northern California

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ECC approach teaches nonconfrontational communication using classical rhetorical techniques and 2 persuasion strategies: motivational interviewing and KPNC's Four Habits of Effective Communication.[17,18] The ECC is based on 4 foundational principles: (a) cognitive ease, (b) the natural assumption, (c) identity strategy, and (d) advantageous terms (**Table I**; available at www.jpeds.com). Physicians are taught to begin each visit in a "presumptive" format (presuming that vaccinations will be administered) while simultaneously maintaining openness to questions and concerns.[19] Should the physician find that, despite having used these strategies, a parent firmly refuses to vaccinate, the ECC coaches the physician to acquiesce to ease tension and build trust.

The primary aim of this study was to determine whether KPNC physicians' use of the ECC tool impacted their comfort level and perceived effectiveness in communicating with vaccine-hesitant parents. Secondary aims included assessing whether the ECC affected parent satisfaction with the child's physician and whether it impacted vaccination rates.

Methods

KPNC Physician ECC Training

An initial round of ECC trainings were offered at a limited number of KPNC sites between December 2013 and February 2014. Widespread official ECC trainings occurred between May and July 2015, with pediatricians and family practitioners receiving in-person training at 48 medical facilities across KPNC. Trainings included a presentation on communication techniques followed by an interactive role play session using the ECC approach in challenging hypothetical clinical scenarios. Attendance was recorded at the official trainings.

Surveys

Physician Baseline Survey. All attendees were asked to complete an anonymous paper "baseline" survey (**Appendix 1**; available at www.jpeds.com) before the official ECC training. The baseline survey inquired how often the physician discussed vaccination with parents who were unsure about, who intended to delay, or who intended to refuse vaccinations. It further assessed how comfortable and how effective each physician felt in doing so. Although some physicians initially received ECC training more than 1 year earlier, the ECC had not been widely introduced at KPNC facilities at the time of the official ECC training.

Physician Follow-up Survey. Approximately 3 months after the official ECC trainings, we requested that all attendees complete a post-training questionnaire that was sent electronically. This follow-up survey assessed physicians' perceptions regarding how the ECC tool impacted their levels of comfort and effectiveness when communicating with vaccine-hesitant parents (**Appendix 2**; available at www.jpeds.com). Attendees were emailed an initial request and 2 reminders before they were considered nonresponders.

Patient Satisfaction Survey. KPNC routinely sends satisfaction surveys to its patients after selected healthcare encounters, to assess the patients' satisfaction with all aspects of the visit. We used the 6 questions related to patient-physician interactions and computed pre- and post-training scores for ECC-trained physicians. We included physicians who had completed training sessions between May and July 2015. Among those, we only included physicians who conducted well-child visits for infants aged 6 weeks to 11 months of age during the 4 months before and the 4 months after ECC training. We compared average patient satisfaction scores before and after ECC training.

Vaccination Rates

We compared pre- and post-training well-child visits with respect to several measures: vaccine coverage (the proportion of recommended vaccines that were received), the odds of missing at least one of the recommended vaccines, and the number of child-days that were undervaccinated.[20,21] We focused on vaccines that were recommended at ages 2, 4, and 6 months: hepatitis B virus, rotavirus, diphtheria-tetanus toxin-acellular pertussis, inactivated poliovirus, *Haemophilus influenzae* B, and *Streptococcus pneumoniae* vaccination.

We calculated each of these measures for the 2-, 4-, and 6-month well-child visits between June 2014 and February 2016. We included vaccines given at or before the well-child visit, as well as those that were given within 2 weeks after each visit. We calculated vaccine coverage as: Vaccine coverage = (Number of vaccines received/Number of vaccines recommended) per 100 well-child visits. We estimated the effect of the ECC training on the odds of missing a vaccine at a visit using hierarchical logistical regression (GLMMIX in SAS 9.4; SAS Institute, Cary, North Carolina) with adjustment for calendar month of the visit and clustering among patients of the same doctor.

We calculated the average number of days undervaccinated using methods described by Luman et al and modified by Glanz et al.[20,21] The average days undervaccinated was defined as the average number of days children were late for any of the recommended 2-, 4-, and 6-month vaccines as of their 9-month birthday. A child could accumulate a total of 1064 days undervaccinated if he or she received zero vaccinations by 9 months of age. We included vaccinations administered to children from birth to 9 months of age, between June 2014 and April 30, 2016. Children were included in either the pre- or post-training groups, but not both. We compared days undervaccinated before training, with days undervaccinated after training, adjusting for clustering among patients of the same physician and for age at visit, using a hierarchical regression model (MIXED in SAS 9.4).

This study was approved by the KPNC Institutional Review Board.

Results

Physician Baseline Survey (May-July 2015)

Of 415 physicians who attended the official ECC trainings, 408 (98%) completed and handed in the baseline survey before receiving the training. Most physicians reported that they discussed vaccination fairly often or very often with parents who are unsure about (80.1%) or want to delay (76.4%) vaccinations, and slightly more than one-half (51.3%) reported they rarely discussed vaccination with parents who refuse them. Most physicians reported that they felt fairly or very comfortable discussing vaccination with parents who were unsure about (89.3%) or want to delay (86.9%) vaccination. Most also felt fairly or very comfortable discussing vaccination with parents who refuse (67.2%) (Figure 1, A); however, they simultaneously reported feeling either somewhat or not at all effective at persuading these same parents (68.9%) (Figure 1, B).

Physician Follow-up Survey (September 2015)

A total of 249 physician follow-up surveys were completed and included in the final analysis, including 25 from physicians who led the ECC training and 21 from those who reported attending training despite us having no record of their attendance. Most physicians responded that the ECC trainings helped them feel to much more or more comfortable discussing vaccination with parents who were unsure about (72.3%), want to delay (73.9%), or who refuse (63.5%) vaccinations (Figure 2, A). Most physicians also reported that the ECC training helped them to feel much more or more effective in persuading parents who were unsure about

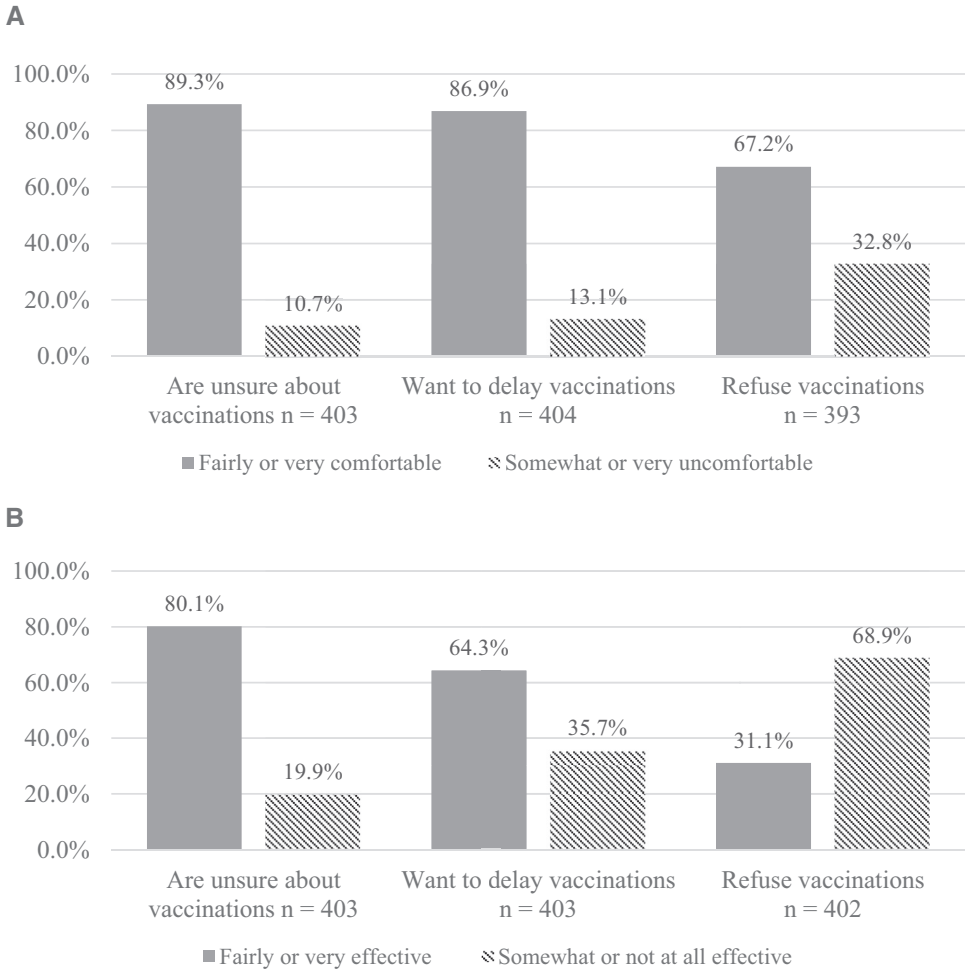

Figure 1. Physician self-reported comfort and perceived effectiveness when discussing vaccination with hesitant parents before ECC training. Baseline survey physician responses to the questions: **A,** How comfortable do you feel now discussing vaccinations with parents who: are unsure about vaccinations, want to delay vaccinations, and refuse vaccinations; and **B,** How effective do you feel now persuading parents about vaccinations who: are unsure about vaccinations, want to delay vaccinations, and refuse vaccinations. Total number for each group across the x-axes differs owing to unanswered responses.

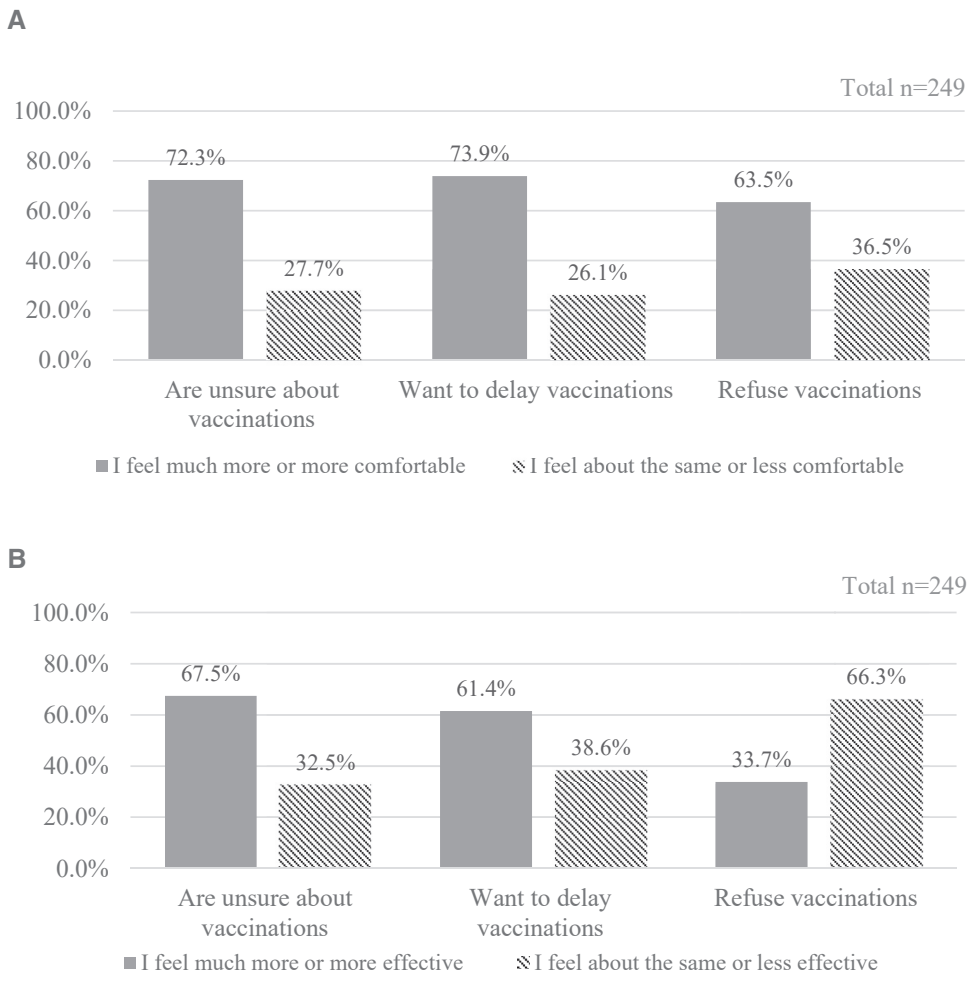

Figure 2. Physicians' self-reported change in their comfort and perceived effectiveness when discussing vaccination with hesitant parents after ECC training. Physician responses to the follow-up survey questions: **A,** How did the training affect your comfort level in discussing vaccinations with parents who: are unsure about vaccinations, want to delay vaccinations, and refuse vaccinations and **B,** How did the training affect your ability to persuade parents to immunize their child when discussing with parents who: are unsure about vaccinations, want to delay vaccinations, and refuse vaccinations.

(67.5%) or want to delay (61.4%) vaccinations. Conversely, most physicians reported that the ECC training made them feel about the same or less effective at persuading parents who refuse vaccinations (66.3%) (**Figure 2**, B).

Patient Satisfaction Survey

Parents completed 456 satisfaction surveys for visits that occurred during the 4 months before training and 330 surveys for visits that occurred in the 4 months after training. The overall average satisfaction score for providers remained high and unchanged from before to after the training (4.73/5.00).

Vaccination Rates before and after the Training

Vaccination Coverage. Vaccine coverage for infants at 2, 4, and 6 months was high (95%-96%) before the training and remained so after training (**Table II**). In the post-training period, the adjusted odds of missing at least 1 of the visit's recommended vaccines were 1.14, 1.17, and 1.18 at the 2-, 4-, and 6-month visits, respectively. Overall (after further adjusting for age) they increased—from the pretraining period to the post-training period—by 15% (95% CI, 6%-25%). The increase in the odds of missing a vaccine was consistent with the increase in the proportion of infants receiving no vaccines, and the decrease in the proportion of infants receiving all the recommended vaccines by the 6-month visit (**Table III**), although neither of these findings was statistically significant.

Days Undervaccinated. The average number of days undervaccinated increased from 65.9 days (6.2% of total possible undervaccinated days) in the pretraining period to

Table II. Vaccine coverage at 2-, 4-, and 6-month visits, comparing pre- and post-ECC training, June 2014 through February 2016

Ages at visit (months)	Before training period			After training period			Estimated effect of training on missing a vaccine*
	No. of visits	No. of vaccines	Coverage (%)	No. of visits	No. of vaccines	Coverage (%)	OR (95% CI)
2†	12 298	71 110	96.4	9489	54 664	96.0	1.14 (1.01-1.29)
4‡	9107	52 511	96.1	8951	51 542	96.0	1.17 (1.02-1.35)
6§	6004	28 581	95.2	7421	35 237	95.0	1.18 (0.99-1.41)
Total	27 409	152 202	95.9	25 861	141 443	95.6	1.15 (1.06-1.25)

*The effect of the training on the odds of missing a vaccine at a visit, is estimated by hierarchical logistic regression adjusting for seasonality and clustering among patients of the same physician. The overall increase (including adjusting for age at visit) in the odds of missing one vaccine at a visit was 15%.
†Two-month range: 50-70 days of age.
‡Four-month range: 110-130 days of age.
§Six-month range: 170-190 days of age.

75.5 days (7.1% of total possible undervaccinated days) in the post-training period. After adjusting for the age at visit and clustering among patients of the same physician, the adjusted estimate of the increase in days undervaccinated from the pre-to post-training period was 8.8 days (95% CI, −2.2 to 15.2).

Discussion

The ECC trainings improved physician comfort and perceived effectiveness in persuading parents who are unsure about or want to delay vaccinations. The improved comfort level reported by physicians after the ECC training suggests that this approach might help physicians to better navigate potentially fraught discussions with vaccine-hesitant parents. The ECC also caused physicians to feel the same or less effective at persuading parents who refuse vaccinations. This result was somewhat unsurprising because a basic premise of the ECC training is to acquiesce in favor of easing tension and building trust when parents firmly refuse to vaccinate.

Table III. Vaccine coverage showing proportional changes by vaccine count, comparing pre- and post-ECC training, June 2014 through February 2016

Count of vaccinations given at the 6-month well-child visit	Patients		Change to proportions		
	Before training (n = 6004), n (%)	After training (n = 7421), n (%)	Difference (%)	Lower 95% CI (%)	Upper 95% CI (%)
Zero vaccinations	191 (3.18)	265 (3.57)	0.39	−0.22	1.00
1	30 (0.50)	34 (0.46)	−0.04	−0.28	0.19
2	48 (0.80)	55 (0.74)	−0.06	−0.36	0.24
3	70 (1.17)	61 (0.82)	−0.35	−0.68	0.00
4	80 (1.33)	120 (1.62)	0.29	−0.12	0.69
5	5585 (93.02)	6886 (92.79)	−0.23	−1.10	0.64

No RotaRix given at 6 months,

Parent satisfaction with the child's physician did not change during the study period, remaining high from the pre-to post-training periods. In a previous study, Opel et al examined the effect of physician communication techniques on parental visit experience and revealed that conducting visits in a presumptive format increased vaccination rates but decreased parent satisfaction.[22] In contrast, our results suggest that incorporating patient-centered, trust-building practices while using the presumptive approach might help to maintain parent satisfaction.

We found that the ECC approach minimally impacted vaccine coverage, which remained at 95% or higher throughout the study. We observed, however, that after the ECC training, there was a 15% increase in the odds of missing at least 1 recommended vaccine during a well-child visit. We also noted that the days undervaccinated increased by 8.8, although this was not statistically significant and represented less than 1% of the total possible days undervaccinated. Because the ECC approach advocates that providers bend to parents who firmly refuse vaccination in order to build trust and preserve a positive relationship, it is possible that for this subset of parents, the ECC tool may decrease vaccination rates (at least in the short term). Overall vaccination coverage at KPNC is very high and it is possible that a small increase in days undervaccinated or increased odds of missing a vaccine may be attributable to factors other than the ECC training, such as a child's concurrent illness or an increase in medical exemptions. Contemporaneous events such as vaccine-preventable disease outbreaks or changes in legislation may also affect public perception of vaccination and vaccination rates.

Numerous studies have examined how different communication strategies inform and affect a parent's decision to vaccinate their child, but few have examined how the communication strategies affect the physicians applying them. One study examined the effect of an evidence-based video tutorial called "VaxChat" on obstetricians' confidence in addressing vaccines with pregnant patients.[23] Our study investigated how the communication strategies taught in

the ECC training specifically affected the pediatricians and family doctors conducting vaccination visits.

An important strength of our study was that, in addition to collecting qualitative physician survey response data, we simultaneously assessed vaccine coverage for patients of ECC-trained physicians, allowing us to infer how the ECC communication strategies impacted subsequent immunization during the first year of life.

Our study had several limitations. Because we collected survey responses in aggregate and evaluated an overall picture of provider perceptions and change over time, we could not detect changes for individual physicians. Similarly, we were unable to compare the results of physicians who had attended both the initial and the official trainings with those who had attended official trainings only. In addition, all survey results were subject to self-reporting bias. Furthermore, our findings may also not be generalizable to different healthcare settings because this study was conducted within an integrated healthcare delivery system. Last, because KPNC has high baseline vaccine coverage, we were unable to detect whether the ECC approach significantly impacted vaccination rates. To measure vaccine-specific outcomes with adequate power, evaluating the ECC approach using a randomized controlled trial is warranted, ideally in a healthcare setting with lower vaccination rates than KPNC.

This study provides evidence that the communication strategies taught in the ECC approach increased physician comfort when discussing vaccines with parents who are unsure about, want to delay, or refuse vaccinations. It also enhanced physicians' perceived effectiveness when discussing vaccines with parents who are unsure about or want to delay vaccinations. The ECC approach did not increase vaccine coverage, but overall vaccine coverage remained high, as did parent satisfaction with his or her child's physician. Additional research-based communication techniques are necessary to diffuse physician stress, increase parental trust, decrease hesitancy, and increase vaccination rates. Strategies that balance the presumptive approach with trust-building practices may prove effective. ■

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50 Years Ago in *THE JOURNAL OF PEDIATRICS*

When the Newborn Remains Blue

Lees MH. Cyanosis of the newborn infant. Recognition and clinical evaluation. J Pediatr 1970;3:484-98.

It has been almost 100 years since Lundsgaard et al described that clinical cyanosis is dependent on the absolute concentration of reduced hemoglobin in the blood, as well as on the difference between central and peripheral cyanosis. It was recognized that organs such as the tongue with a high blood flow and a small arteriovenous oxygen difference might not appear cyanotic as readily as organs with a low blood flow and a large arteriovenous oxygen difference, such as skin of cool hands and feet. This was the background of the concept of central and peripheral cyanosis.[1]

Fifty years ago, Martin H. Lees published this comprehensive and critical review of cyanosis. He criticized the then-current dogma in medical textbooks that a 5-g reduction of hemoglobin in arterial blood is required before central cyanosis becomes visibly detectable. He argued that if this were the case, then an infant with a total hemoglobin content of 15 g per 100 mL of blood would be visibly cyanotic only at an arterial oxygen saturation of ≤67%, and pointed out that central cyanosis is detectable by inspection of the tongue and mucous membranes at an arterial saturation of 75%-88% at a 3-g decrease of hemoglobin in arterial blood. He disputed the absolute distinction of central and peripheral cyanosis and noted that newborns with high fetal hemoglobin concentration may need a serious reduction in oxygen tension before central cyanosis is clinically apparent. The article reviews the relationship of cyanosis, oxygen saturation, and PaO_2; discusses the clinical spectrum and how to diagnose central cyanosis; and systematically summarizes 11 major causes of cyanosis in the newborn.

This review is fascinating reading because it provides insight into how our present knowledge in this field is based on meticulous studies by previous colleagues. It reminds us how privileged we are today when we can simply screen all newborn babies for cyanosis with a pulse oximeter. Lees' article 50 years ago still contains valuable clinical information and can still be recommended as a perspective on newborn cyanosis.

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Table I. Rhetorical tools taught in the ECC training, along with their explanations

Tools	Explanation
Cognitive ease	The "cognitive ease" technique puts the parent in a comfortable receptive state. Parents are most likely to be receptive to persuasion if conversation is simple, with minimal complexity, and the parent is not confronted with a *difficult* choice. A parent who feels uncomfortable or who faces a tough choice tends to enter a higher cognitive state, which can lead to resistance. To ensure cognitive ease, the provider should appear unhurried, calm, confident, friendly, and supportive.
The natural assumption	The provider presents vaccination as the default option: "It's time for your child to get his/her shots." The assumption is that the outcome will be the normal full round of immunizations. The natural assumption technique favors vaccination due to the "risk fallacy" phenomenon in which people are more likely to choose inaction as the "safer" option. By making vaccination the default, inaction or "going with the flow" leads to the medically sound outcome.
Identity strategy	For parents who are hesitant about vaccination, the provider can appeal to the parent's identification as an excellent mother or father who is making the right choice for the child—with the provider's guidance. The provider can also use identity to persuade parents who are resisting vaccination. Many vaccine delayers identify with a strong peer group that has a belief system resistant to any scientific or medical evidence. In this case, arguing facts is counterproductive. The provider can make headway, however, if she can first forge a common identity with the parents by finding common values and beliefs. A parent's beliefs and self-identity are intertwined. Although it is hard to change beliefs, you can appeal to someone's identity to persuade him.
Advantageous terms	Use careful word choice to frame the discussion appropriately and to reinforce the above strategies. Advantageous terms get stronger as they are repeated. Repetition helps to create belief, and belief leads to trust.