

# NRP

## Instructor Update

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### The “New” NRP Instructor: 2011 and Beyond

Prepare to retire your PowerPoint slides. You won't need most of them a few years from now.

The NRP Instructor Development Task Force (IDTF) has exciting plans that will allow NRP instructors to keep up with changes in practice, educational methods, and technology. But why change now?

Many of you remember the initial excitement in the late 1980s as the first edition of NRP rolled out with surgical precision. National instructors delivered standardized training to regional trainers who, in turn, trained hospital-based instructors. Instructors were provided with guidance and tools to teach NRP, and this preparation resulted in engaged and enthusiastic instructors. Realizing the importance of instructor preparation, the NRP Steering Committee continued to reassess the role of instructors and to produce innovative educational tools to ensure acquisition of content knowledge and technical skills by learners. By 2006, instructors and learners had access to not only the textbook, but the accompanying DVD-ROM, a video on DVD, a slide set, and a Presentation Builder that enabled instructors to create their own multimedia presentations.

This methodology has proven successful. Since 1987, 27,000 U.S. instructors have trained more than 2.4 million providers. The original goal set in the 1980s that “every birth should be attended by someone who has been trained in initiating a neonatal resuscitation” seems to be not only attainable, but also a reasonable standard to ensure quality care and patient safety.

However, in the 20 years since the NRP's inception, many aspects of healthcare and, specifically, healthcare education have changed.

The NRP's 20th anniversary is an appropriate occasion to define the direction the NRP should take to continue to improve care for newly-born infants in the next 20 years and beyond.

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HAVE TRAINED MORE THAN 2.4  
MILLION PROVIDERS.”

#### What has happened to spur changes in the NRP?

**Adult education theory suggests that adults benefit most from active learning.**

Adults learn best by engaging in an activity and receiving positive feedback. The 2007 national survey of NRP instructors revealed that most instructors believe that lecture is an ineffective teaching method for NRP, and yet, instructors admitted spending most of their time in NRP courses lecturing about content from the textbook.<sup>1</sup> These points suggest that it's time to shift the emphasis of the NRP instructor away from didactics and toward more interactive and clinically applicable activities.

**There is an increasing emphasis on applying an evidence-based approach to practice throughout all areas of medicine.**

As a result, instructors must be able to adapt course material to reflect new evidence as it becomes available, and as new guidelines are developed.

**Quality and safety have become a major focus of patient care.**

Obstetric and neonatal providers are feeling pressure from consumers, government regulators,

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Editor

Jane E. McGowan, MD, FAAP

Managing Editors

Sheila Lazier, MS

Wendy Marie Simon, MA, CAE

Contributor

Deborah Bullwinkel

**NRP Steering Committee**

Jay P. Goldsmith, MD, FAAP, Cochair

Tulane University

New Orleans, Louisiana

Louis P. Halamek, MD, FAAP, Cochair

Stanford University

Palo Alto, California

Marilyn Escobedo, MD, FAAP

University of Oklahoma Medical School

Oklahoma City, Oklahoma

George A. Little, MD, FAAP

Dartmouth-Hitchcock Medical Center

Lebanon, New Hampshire

Jane E. McGowan, MD, FAAP

Drexel University College of Medicine

Philadelphia, Pennsylvania

Steven Ringer, MD, PhD, FAAP

Brigham & Women's Hospital

Boston, Massachusetts

Gary M. Weiner, MD, FAAP

Saint Joseph Mercy Hospital

Ann Arbor, Michigan

Myra H. Wyckoff, MD, FAAP

University of Texas Southwestern Medical Center

Dallas, Texas

**NRP Steering Committee Liaisons**

John Gallagher, RRT-NPS

American Association for Respiratory Care

Rainbow Babies & Children's Hospital

Cleveland, Ohio

Khalid Aziz, MD, FRCPC

Canadian Paediatric Society

Royal Alexandra Hospital

Edmonton, Alberta, Canada

Praveen Kumar, MD

AAP Committee on Fetus and Newborn

Northwestern Memorial Hospital

Chicago, Illinois

Mildred Ramirez, MD, FACOG

American College of Obstetricians and Gynecologists

University of Texas Health Science Center – Houston

Houston, Texas

Barbara Nightengale, RNC, NNP

National Association of Neonatal Nurses

West Virginia University

Morgantown, West Virginia

Jeanette Zaichkin, RNC, MN

Nurse Consultant

Children's Hospital & Regional Medical Center

Seattle, Washington

**AAP Staff Liaisons**

Wendy Marie Simon, MA, CAE

Director, Life Support Programs

Thaddeus Anderson

Manager, Life Support Programs

Sheila A. Lazier, MS

Life Support Education Specialist

Eileen Schoen

Manager, Life Support Programs

Kristy Crilly

Division Coordinator

Nancy Gardner

Life Support Records Assistant

Karen Lim

Life Support Programs Assistant

Bonnie Molnar

Life Support Assistant

Tina Patel

Life Support Assistant

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Pediatrics or American Heart Association.

**Comments and questions are welcome**

**and should be directed to:**

Jane E. McGowan, MD, FAAP

Editor, *NRP Instructor Update*

141 Northwest Point Blvd., PO Box 927

Elk Grove Village, Illinois 60009-0927

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and liability insurance companies to prevent medical errors and improve patient safety. The Joint Commission has reported that up to one third of adverse outcomes are due to lapses in communication<sup>2</sup>. It is now clear that NRP must not only provide strategies for teaching cognitive knowledge and hands-on skills, but also add tools that enable instructors to teach behavioral components of resuscitation, such as teamwork and communication, and integrate each of these components into effective practice.

**What's Next for the NRP?**

To continue to make progress in the changing landscape of healthcare and, specifically, healthcare education, the NRP must develop new strategies to meet the challenges of changing healthcare delivery, address patient safety issues, and acknowledge adult education theory. In reviewing the role of the NRP instructors in this development process, the IDTF has identified several areas for improvement and further development.

**What are the issues with the current NRP education process?**

**Problem: The NRP instructor feeds information to a passive learner.**

Many NRP providers have taken a renewal course six or eight times and expect nothing more than a simple review of what they already know. Learners may arrive at an NRP course with the textbook still in its wrapper. These learners are confident that the instructor will feed them enough information to pass the written evaluation.

**Potential solution:** Learners take responsibility for learning the textbook material.

To ensure that prospective/current NRP learners are well-prepared before arriving at an NRP course, starting with the 6th edition in January 2012, all learners will self-study the didactic portion of the textbook and take the online evaluation prior to working with an NRP instructor in a face-to-face NRP course. With the time saved by the significant decrease in lecture time and the elimination of the need to administer the written tests, NRP instructors can focus on innovative active-learning activities, including skills practice and refinement and case-based resuscitation scenarios and debriefing.

**Implication for instructors:** The instructor's role will change from the "teacher" who conveys knowledge, to the "facilitator" who assists the learner in acquiring both factual information and hands-on skills.

**Problem: NRP achievement is based on doing everything perfectly.**

The NRP learner "earns" a Provider card by achieving a minimum score on the written evaluation and doing everything right during the Megacode. Mistakes cause problems for the learner, who is embarrassed, and for the instructor, who has no time for remedial activities. Therefore, the instructor assists the borderline learner through the evaluation activities to ensure successful completion of the course. The learner leaves the course with a false sense of security about personal competency during resuscitation, and may not know how to problem-solve when met with challenges during actual newborn resuscitation.

**Potential solution:** Recognize that mistakes can result in a positive learning experience.

While there will still be a requirement that each provider meet minimum skill performance standards, we will take advantage of mistakes that occur during simulation-based training and debriefing by using errors as occasions for discussion and problem-solving. Scenarios can be adapted to focus on specific skills that each group of learners needs to practice and will be designed to stretch participants into managing unfamiliar events. Debriefing will allow the members of the resuscitation team to analyze their own performance and prepare to meet the real-life challenge successfully when it next occurs. NRP participants should leave each course having learned something new.

**Implications for instructors:** Since simulation-based training will play a major role in the NRP of the future, instructors will need learning opportunities to discover their talents in writing scenarios, facilitating training, and conducting debriefings. NRP instructors will be provided with opportunities to learn how to create courses where participants will practice and demonstrate their hands-on skills, then integrate cognitive knowledge, technical skills, and behavioral skills into scenarios that reflect real-life situations.

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# NRP Steering Committee Welcome and Farewells

The NRP Steering Committee is in the midst of a very exciting transition as it tirelessly plans and develops the next generation of NRP materials. In July, the transition continued as the committee welcomed new liaisons and celebrated the achievements of those who rotated off the committee. **The NRP and AAP welcome these new members and applaud those leaving for their efforts, commitment, and dedication.**



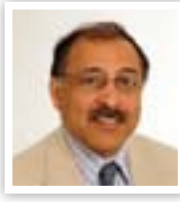
*John T Gallagher, RRT-NPS*

**John T. Gallagher, RRT-NPS**, Critical Care Coordinator, Pediatric Respiratory Care at Rainbow Babies & Children's Hospital in Cleveland, Ohio, assumed the role as liaison from the American Association of Respiratory Care (AARC). Gallagher takes over for his colleague, Timothy R. Myers, BS, RRT-NPS, who served as AARC liaison

for eight years. Tim is now serving as president-elect of the AARC and will serve as president next year.

"If I brought one thing to the table, it was a better understanding of the respiratory care profession as a whole and the technology nuances of the respiratory care equipment that are utilized in the resuscitation of newborns in the delivery room," said Myers, Director, Pediatric Respiratory Care and Procedural Units and Adjunct Assistant Professor of Pediatrics at University Hospital's Rainbow Babies & Children's Hospital in Cleveland.

One of Gallagher's primary goals is to apply his clinical practice experience as a respiratory therapist to the work of the NRP Steering Committee. "I intend on providing the respiratory care profession with the most up-to-date philosophy and guidelines established by the NRP," Gallagher said. "I also wish to increase the number of respiratory therapists currently trained as NRP instructors and promote a multi-disciplinary approach to NRP instruction that will include physicians, nurses, and respiratory care professionals collaborating in a single training session."



*Khalid Aziz, MD, MA, FRCPC, FRCPCH, FAAP*

Nalini Singhal, MD, FRCPC, Professor of Paediatrics at the University of Calgary in Alberta, Canada, also rotated off the committee. She served as the Canadian Paediatric Society (CPS) liaison for six years before **Khalid Aziz, MD, MA, FRCPC, FRCPCH, FAAP**, Associate Professor of Paediatrics and Medical Director, Royal Alexandra Hospital NICU in Edmonton, Alberta Canada, took over.

"During my time on the steering committee, I established a Scientific Committee in Canada to review the recommendations so that Canadians have input into the implementation of new guidelines," Dr. Singhal said. "I was also able to secure some research funding for NRP and established a research and education committee within the Canadian NRP committee. These committees will help in the future implementation of NRP and provide an opportunity to conduct some additional research."

"Although our healthcare systems are different, our goals are the same," Dr. Aziz said. "On top of the fact that Canadians and Americans are committed to one another, we have the advantage of a really good program in the NRP. It's a fantastic, effective committee that has a lot of goodwill. In my mind, education is not just about the physical tools, it's also about the cognitive tools. Analyzing what we did well, what we can do better, and bringing people together in a team environment is a very important learning opportunity and I'm looking forward to providing the tools instructors and learners need to do this."



*Praveen Kumar, MD, FAAP*

**Praveen Kumar, MD, FAAP**, Associate Professor of Pediatrics, Division of Neonatology, at Northwestern University Feinberg School of Medicine in Chicago, Illinois, has taken over the reins as the liaison from the AAP Committee on the Fetus and Newborn (COFN). He replaces Susan E. Denson, MD, FAAP, Professor of

Pediatrics, the University of Texas-Houston Medical School, who served a three-year term.

"I was very excited to be appointed because COFN and the NRP Steering Committee are two very important committees that are committed to neonatal care not only in the United States, but also in developing countries," Dr. Kumar said. "Both committees are focused on neonatology, and my primary job is to make sure we are working together and supporting each other. You have to aim high to make progress. In fact, they've already put me to work on Lessons 7 and 8 (for the 6th edition textbook)."

# Simply NRP

The American Academy of Pediatrics (AAP) Neonatal Resuscitation Program (NRP) has always been a few steps ahead of the times. Technology and teaching strategies are ever-changing, and the NRP goes to great lengths to provide the best learning tools for instructors and learners.

One such learning tool is *Simply NRP™*, slated for release in Spring 2009. *Simply NRP* was unveiled in a sneak preview in October during the NRP Current Issues Seminar held in conjunction with the 2008 American Academy of Pediatrics National Conference and Exposition (NCE) in Boston, Massachusetts.

*Simply NRP*, developed by the AAP and Laerdal Medical, is a self-directed, low-fidelity educational tool that teaches hands-on resuscitation skills found in the first four lessons of the *Textbook of Neonatal Resuscitation*. This kit is an adapted version of *Infant CPR Anytime™* and is ideally used by skilled healthcare professionals who have already passed the NRP online evaluation.

"Simply NRP is intended to serve as a supplement to the 5th edition textbook, but it definitely doesn't replace the instructor's guidance, especially for new NRP learners. This is for self-directed learning and review and is designed to be used by an individual, not by an instructor in a classroom setting," explained Jeanette Zaichkin, RNC, MN, co-author of *Simply NRP* and editor of the *Instructor's Manual for Neonatal Resuscitation, 4th Edition*. "Learners really need to understand the material in the textbook before they can understand the 'when and how' of the hands-on skills of resuscitation. *Simply NRP* is all about hands-on skills." Gary Weiner, MD, FAAP, member of the NRP Steering Committee, served as co-author of *Simply NRP* with Zaichkin.

## "THE GREAT THING ABOUT SIMPLY NRP IS THAT LEARNERS CAN DO THIS AT THEIR OWN PACE"

In addition to an inflatable mannequin equipped with an audible chest clicker device that allows the user to determine the correct compression positioning and depth, *Simply NRP* provides all equipment and educational materials necessary to facilitate the learning experience.

Some of the key kit components include a simulated equipment panel with dials and buttons that allow the user to turn on the radiant warmer, adjust the oxygen flowmeter, set the oxygen blender, test the wall suction, and activate a help button. A 40-minute DVD instructs the learner through the equipment check, initial steps, positive-pressure ventilation, and chest compressions.



The idea of developing *Simply NRP* began in early 2007 during a meeting with members of the NRP Steering Committee and Laerdal. When the team realized it was possible to successfully bag-and-mask ventilate the inflatable mannequin in the *Infant CPR Anytime kit*, Zaichkin suggested the development of a training kit, complete with a DVD, inflatable mannequin, equipment, and other educational materials. "I said, 'Why not use this concept to teach the first four lessons on DVD?'" Zaichkin said. "And it's been on the fast track ever since."

In partnership with Dr. Weiner, Zaichkin wrote the first draft of a script that was used to create a beta version of the DVD in November 2007. A focus group was conducted the following April at Saint Joseph Mercy Hospital in Ann Arbor, Michigan to evaluate the effectiveness and usability of *Simply NRP*. The evaluation was completed over a three-day period with the help of 12 volunteers, including a neonatal nurse practitioner, respiratory therapist, NICU nurses, labor and delivery nurses, a mother-baby nurse, pediatrician, and neonatologist.

Volunteers were asked to read the first four lessons in the 5th edition textbook, take a written exam, use the *Simply NRP* DVD and equipment (while being videotaped), and complete a basic megacode using the SimNewB™ Neonatal Simulator.

"Overall, we thought the evaluation went very well," said Karin Menghini, MSN, RNC, NNP-BC, Neonatal Nurse Practitioner and a colleague of Dr. Weiner's at Saint Joseph Mercy Hospital in Ann Arbor, Michigan. Menghini, an NRP Instructor, managed the *Simply NRP* beta testing and product trial. "It was great to see everyone succeed. Even the mother-baby nurse who had never done anything like this before did a fantastic job on the megacode. For me, that was very revealing – the product did what it was intended to do and even more."

The *Simply NRP* DVD feedback was positive, including comments that it was easy to follow the DVD while performing skills; the DVD moved at the correct pace; and the DVD instructor clearly explained skills.

In regard to the *Simply NRP* inflatable mannequin and equipment, comments included: that the mannequin was easy to inflate, and to compress; that ventilating the mannequin closely resembled a real newborn; that the chest clicker device was a helpful learning tool; the equipment instrument panel was easy to use and that the product included all equipment necessary to complete Lessons 1-4.

Dr. Weiner administered the megacode, receiving favorable feedback as well. Eight participants said *Simply NRP* adequately prepared them for the megacode. The same megacode scenario was given to each participant, and nine people passed the megacode on the first attempt. Three people who initially failed the megacode passed after a debrief session and additional practice with the instructor. Overall, 10 people said they would recommend *Simply NRP* to other students.

Although the evaluation went well, there was still room for improvement. The mannequin's face had to be further restructured in order to support a self-inflating bag. On the DVD, more emphasis had to be placed on the learner's positioning for proper bag-and-mask ventilation. "Standing at the baby's head is the ideal place to be for airway management, and we didn't point this out in the beta version of the DVD," explained Zaichkin. "Standing on the side of the baby isn't wrong, but it's not the ideal position."

In July, the DVD was re-filmed with a revised script to reflect the feedback from focus group participants. "The great thing about *Simply NRP* is that learners can do this at their own pace – they are in total control of their learning needs and can practice their skills in the comfort of their home or office. From an adult learning perspective, I think this is a much better way to learn skills," Menghini said.

"After practicing basic skills with the *Simply NRP* DVD, the learner should have less need for time-consuming intensive instructor guidance at the NRP course and should be more likely to pass the skills evaluation. We hope *Simply NRP* will be a welcome addition to the many formats already available to NRP learners for developing resuscitation skills," Zaichkin added.

For more information about *Simply NRP*, contact the AAP Life Support staff at [lifesupport@aap.org](mailto:lifesupport@aap.org).

#### Simply NRP Equipment List:

- inflatable mannequin
- equipment panel
- feeding tube
- 20ml syringe
- stethoscope
- bulb syringe
- oxygen tubing
- self-inflating bag-and-mask
- blanket
- picture board of additional equipment used for complex resuscitation
- personal inflation tube if kit is to be used by multiple users

#### Accompanying Materials for Simply NRP:

- equipment checklist
- NRP flow-diagram
- 40-minute Instructional DVD



## 2009 NRP Research Grant and Young Investigator Award Program

The American Academy of Pediatrics (AAP) Neonatal Resuscitation Program (NRP) Steering Committee and the Section on Perinatal Pediatrics are pleased to announce the upcoming availability of the 2009 NRP Research Grant and Young Investigator Awards. The awards are designed to support basic science, clinical, or epidemiological research pertaining to the broad area of neonatal resuscitation.

Physicians in training or individuals within four years of completing fellowship training are eligible to apply for up to \$10,000 through the NRP Young Investigator Award. Any health care professional with an interest in neonatal resuscitation can submit a proposal for up to \$25,000 through the NRP Research Grant Program.

Grants are currently available to fund research projects in the United States and Canada. The NRP Steering Committee is particularly interested in the following research and pilot programs:

- The effect of NRP on neonatal outcomes
- Research in the basic science of resuscitation
- Educational research pertaining to neonatal resuscitation, education methodologies, and simulation technologies
- Research that will result in a higher level of evidence for existing NRP treatment recommendations

The NRP Research Grant and Young Investigator Award Program Guidelines and Intent for Application will be available in January 2009. To obtain a copy of the guidelines, a list of potential research topics, or a list of previously funded studies, please contact the Life Support staff at 800/433-9016 ext. 4798, or go to the NRP website at [www.aap.org/nrp](http://www.aap.org/nrp) and select the "Science" tab.

# ILCOR Update

Members of the International Liaison Committee on Resuscitation (ILCOR) Neonatal Delegation are racking up frequent flyer miles these days, attending meetings across the United States and overseas to research and analyze scientific data related to neonatal resuscitation. All of this behind-the-scenes activity is preparation for the release of the NRP's 6th Edition materials in 2011.

In recent months, ILCOR delegates and sub-committees have met with international counterparts in Ghent, Belgium and domestically in Honolulu, Hawaii; New Orleans, Louisiana; and Washington, DC to present worksheets based on a number of neonatal resuscitation issues. At the helm is Jeffrey Perlman, MB, ChB, NRP ILCOR Science Director and former co-chair of the NRP Steering Committee, who is running a pretty tight ship.

"This is a tricky process with a lot to accomplish in a fairly short amount of time," said Dr. Perlman. "We are holding several smaller meetings (via sub-committees) in order to involve as many people as possible from the field. If you want to involve everyone, you have to do this in such a way that allows the process to move forward and to be completed in a timely manner. Time certainly doesn't wait for anybody, and you have to move forward and move fast."

The ILCOR Neonatal Delegation continues to draw new organizations into the fold to help shape the future of the NRP. To date, the following groups have joined the ILCOR Neonatal Delegation:

- Australian Resuscitation Council (ARC)
- Council of Latin America for Resuscitation (CLAR)
- European Resuscitation Council (ERC)
- Heart and Stroke Foundation of Canada (HSFC)
- Italian Society of Pediatrics
- Japanese Resuscitation Council
- New Zealand Resuscitation Council
- Resuscitation Council of South Africa (RCSA)
- World Health Organization (WHO)
- American Academy of Pediatrics/American Heart Association NRP Steering Committee



"In theory, if we do our work correctly now, it will be much easier later on when we convene in Dallas in 2010 to present the 30 worksheets that will affect any potential changes," said Dr. Perlman. "By then, we will need to have our worksheets at the stage where each has at least two authors and is based on the latest science. The goal is to be ready for the evidence evaluation in 2010."

## "THE ILCOR NEONATAL DELEGATION CONTINUES TO DRAW NEW ORGANIZATIONS INTO THE FOLD TO HELP SHAPE THE FUTURE OF THE NRP. "

A "hot" topic the group is spending a significant amount of time analyzing pertains to education issues, particularly identifying the most effective way to teach neonatal resuscitation and how team debriefings in a hospital setting impact team performance. "We are tackling this issue for the very first time," Dr. Perlman said. "Education is an important topic, and how you teach resuscitation, retain the knowledge, maintain and achieve competency, and how you work as a team are all areas of intense debate. This is an extremely exciting process."

Another familiar issue is the use of oxygen versus room air in resuscitation. "This continues to be a hot issue and the international community is certainly looking to the ILCOR Neonatal Delegation for direction," Dr. Perlman added.

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**Problem: Some NRP Instructors take a “free ride”.**

Although they are in the minority, we all know NRP instructors who do not exemplify NRP standards of excellence. We all know NRP instructors who show up at a course to correct a few written tests or simply enjoy the refreshments and are still included on the Course Roster as assistant instructors. While most NRP instructors are committed to the program, some individuals may become instructors because it means they never have to take the NRP course again. Others have never had delivery room experience or have moved on to other areas of practice, yet continue to function as instructors. These inequities result in a quality assurance issue for some Neonatal Resuscitation Programs, and diminish appreciation for the extraordinary dedication and effort displayed by the majority of instructors.

**Potential solution:** Revamp the requirements for becoming an NRP instructor and for maintaining instructor status.

**Implications for instructors:**

The NRP instructor of the future will be expected to demonstrate active participation in a continuing education process that includes both specific NRP practice work as well as training in adult education theory and practice. Instructors will keep skills current and demonstrate competence at refresher or update courses for instructors. NRP instructors may eventually be required to take a specific instructor evaluation.

**How can you evolve into this new and improved NRP instructor?**

The NRP Steering Committee has begun work on tools and strategies to help NRP instructors make this transition over the next 5-10 years and beyond. The IDTF is continuing its review and discussion of ways we can all contribute to

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maintaining the level of excellence that exemplifies the NRP. As changes are implemented, you can look forward to workshops, teleconferences, web conferences, on-line materials, and topic-specific training opportunities, including sessions on developing skills to conduct courses that include simulation and debriefing.

Every instructor will not need to be an expert in each program component. As the NRP of the future becomes a reality, instructors will have opportunities to determine how and by whom each component of the course will be presented. This

flexibility will allow instructors to take the lead in conducting activities in their areas of expertise.

The NRP Steering Committee knows that the future success of the program depends on the enthusiasm, commitment, and preparation of NRP instructors. By implementing these proposed changes, the IDTF, along with the entire NRP Steering Committee and the AAP Life Support staff, seek to create an NRP that is more learner-focused, closer to actual clinical practice, and that allows instructors to grow and change with the program. Most of all, the goal is the same as it was 20 years ago – to improve outcomes for newly-born infants throughout the United States and the world.

**Jeanette Zaichkin, RNC, MN**

Co-chair, Instructor Development Task Force  
Neonatal Outreach Coordinator  
Seattle Children’s Hospital

**Jane E. McGowan, MD, FAAP**

Co-chair, Instructor Development Task Force  
Professor of Pediatrics  
Drexel University College of Medicine

<sup>1</sup> **Weiner G.** *NRP 2007: What It Is and Isn’t, What Works and Doesn’t.* Presented at American Academy of Pediatrics National Conference and Exhibition. Available at: <http://www.aap.org/nrp/pdf/NRPToday.pdf>

<sup>2</sup> **The Joint Commission.** Preventing infant death and injury during delivery. *Sentinel Event Alert.* 2004;30. Available at: [http://www.jointcommission.org/SentinelEvents/SentinelEventAlert/sea\\_30.htm](http://www.jointcommission.org/SentinelEvents/SentinelEventAlert/sea_30.htm)



# PEEP and CPAP: How are They Different and What are Their Roles in NRP?

Administration of Continuous Positive Airway Pressure (CPAP) in the delivery room has been advocated by many experts for several years - both as an adjunct to facilitate resuscitation and as a measure to help stabilize the lungs of babies born preterm. Increasing evidence is emerging in support of this technique, although it is not yet a part of the NRP standard recommendations. Dr. Steven Ringer is a member of the NRP Steering Committee and is participating in the evidence evaluation process for the next NRP edition, scheduled for release in 2011. The following is Dr. Ringer's personal interpretation of how CPAP and PEEP should be used in the immediate neonatal period.

In the course of resuscitation, some respiratory support is often required. The potential options include Continuous Positive Airway Pressure (CPAP), or positive-pressure ventilation (PPV), consisting of breaths administered by a bag-and-mask or T-piece resuscitator. These breaths are administered according to three major criteria: a) the rate or number of breaths per minute; b) the PIP or Peak Inspiratory Pressure, which is the maximum pressure delivered at the peak of the breath; and c) the PEEP or Positive End-Expiratory Pressure, the constant low level of pressure that is maintained between breaths. Caregivers often ask about the differences and similarities of PEEP and CPAP, and when it makes sense to employ one or the other during resuscitation.

Both CPAP and PEEP refer to the maintenance of some non-zero pressure during expiration. This pressure may be low (2-3 cm H<sub>2</sub>O), medium (4-7 cm H<sub>2</sub>O) or high ( $\geq$  8 cm H<sub>2</sub>O). PEEP is the delivery of such pressure during mechanical ventilation (be it by bag, T-piece resuscitator, or ventilator) as part of administered breaths. This means that part of the respiratory cycle includes a period of inspiration during which the pressure is increased to the PIP to create a breath, but during the inter-breath period, the pressure is maintained at the PEEP level. CPAP is the delivery of such inter-breath pressure to the spontaneously breathing infant without intervening mechanical breaths; thus, during a breath, the baby herself generates an inspiratory effort and expiratory phase, but the CPAP maintains airway pressure at a set minimum.

Both PEEP and CPAP stabilize lung volume and aid in recruiting alveoli. Depending on the level of pressure employed and the underlying lung disease, both will help improve lung compliance (although at higher levels they may actually decrease compliance). All of these mechanisms contribute to improving ventilation-perfusion matching or balance within the lung.

When providing mechanical ventilation in newborns during resuscitation (by any of the three PPV modalities), some level of PEEP is recommended. Normally, spontaneous breathing mechanics in a baby result in a low level of end-expiratory pressure (EEP) of approximately 2-3 cm H<sub>2</sub>O. It is necessary to maintain this pressure when the normal mechanics are replaced by bag-and-mask or T-piece and mask, especially in conditions associated with atelectasis. When these mechanics are further bypassed by ventilation through an endotracheal tube, EEP drops to zero and, without the use of PEEP, the lungs are likely to collapse. In addition, the presence of an endotracheal tube significantly reduces the diameter of the airway and thus dramatically increases airway

resistance (since the resistance is inversely proportional to the fourth power of the radius). Without added PEEP, air flow would be reduced and the maintenance of lung volumes would be compromised.

The chosen level of PEEP or CPAP should be one that maintains adequate lung volumes, without overdistending the lung. Lower levels (2-3 cm H<sub>2</sub>O) are infrequently used because they are usually too low to maintain lung volume. They may be appropriate for extremely premature babies, especially when using certain ventilator modes, e.g., assist/control. Medium levels (4-7 cm H<sub>2</sub>O) are most commonly used, because they are usually effective in recruiting alveoli (and thus additional lung volume) in Respiratory Distress Syndrome (RDS). When used on babies with normal lung compliance, even these moderate levels of pressure may cause overdistension. High levels ( $\geq$  8 cm H<sub>2</sub>O) are infrequently used, except in severe cases of surfactant deficiency. They are more likely to result in lung overdistension or air leak syndromes (pneumothorax, pneumomediastinum, pneumopericardium or systemic air embolus), especially when used in babies with normal or near normal lung compliance. Overdistension may result in decreased venous blood return to the heart, with resultant hypotension.

Like all types of therapeutic respiratory support, these modes are tools that are used to support the baby. In choosing a wrench, a mechanic needs to know what type of nut needs turning, and how big it is. In choosing a clinical tool, it makes sense to first consider what is the type and extent of the underlying problem or pathophysiology that one is attempting to correct. The choice of CPAP alone or PEEP as part of supported respiration depends in part on the type of breathing disorder and the size/gestational age of the baby.

While CPAP and PEEP can be delivered using a variety of devices, it is important to note that CPAP (i.e., end-expiratory pressure in a spontaneously-breathing baby) cannot be administered with a self-inflating bag. If this is the device normally used for resuscitation, additional equipment will be needed.

## **1. Breathing for the apneic baby or one whose own respirations are inadequate to support a normal heart rate**

A non-breathing or inadequately breathing baby requires positive-pressure ventilation to support respiration. This is certainly the case for babies with neonatal depression and secondary apnea. Not only does the PIP result in adequate ventilation, but the PEEP also facilitates maintenance of lung volumes. There is little or no value to CPAP in a non-breathing infant. The level of PEEP should

*continued on page 10*

# NRP Online Evaluation Tips

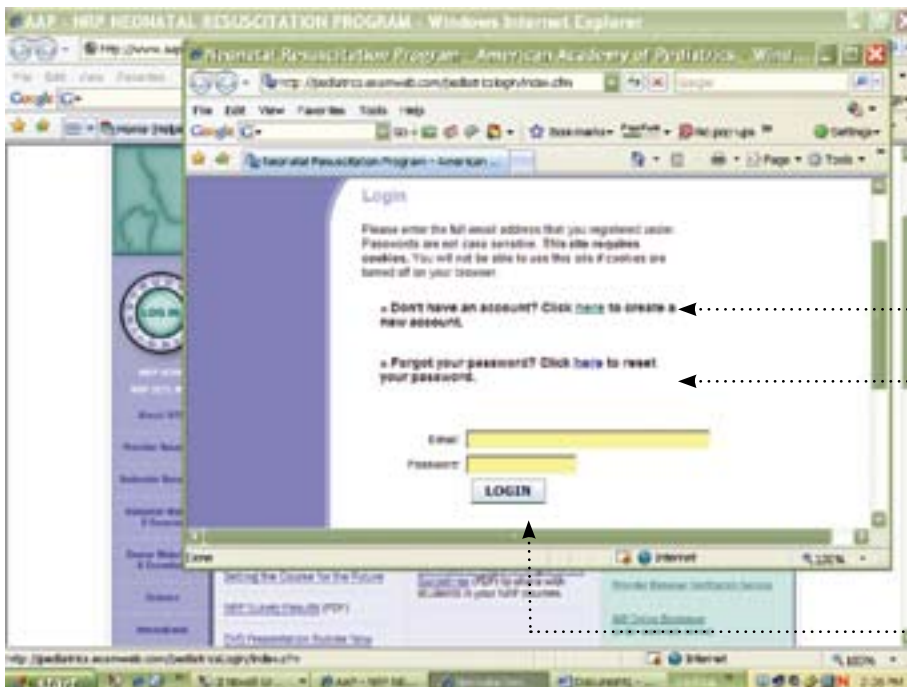
Here are some easy-to-follow instructions for the use of access codes and the NRP Online Evaluation. Please note that institutional purchases using the on-line order form require a minimum purchase of 10 access codes. If purchasing fewer

than that, individual subscriptions must be purchased. If you need further assistance, feel free to contact Karen at 800-433-9016, ext. 7088 or e-mail her: [klim@aap.org](mailto:klim@aap.org).



Click here to purchase an initial subscription, redeem your access code (PIN) or to log into your account.

Click here to get to the multiple access code order form.



Click here if you have an NRP Access Code (PIN) that you have NEVER used, wish to purchase a subscription, or for first time log-in.

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If you have purchased a subscription, already have an account, or have already redeemed your access code (PIN), you can log in here. *You must log-in with the original e-mail address and password that you entered.*

be adjusted according to the clinical situation and the baby's needs. Small babies with depression and some degree of surfactant deficiency may need levels at the high end of the medium range (5-7 cm H<sub>2</sub>O) to help recruit and stabilize the lung. Larger term or late-preterm babies are more likely to have normally compliant lungs, and thus levels at the lower end of the medium range (4-5 cm H<sub>2</sub>O) are appropriate to prevent overdistension.

Apnea may occur as part of the presentation of RDS in the premature infant, as a result of generalized atelectasis in the surfactant deficient lung. While CPAP is a valuable modality in the treatment of RDS, there is currently no evidence of any value for this therapy in an apneic baby, and these babies should receive positive-pressure ventilation with PEEP. A possible exception to this, currently under investigation, may be to provide a short (15-20 second) period of "sustained inflation" with a transient high level of CPAP to establish functional residual capacity and facilitate breathing in very immature infants during the first few minutes after birth, without giving a positive pressure breath.

## 2. Respiratory Distress in a Premature Infant

The most likely diagnosis for respiratory distress in a premature infant is RDS, which includes a partial or severe degree of surfactant deficiency. The pathophysiology of the lung disease includes atelectasis and a partial or complete inability to open alveoli and maintain alveolar patency. This results in ventilation-perfusion mismatching and a diminution in oxygenation and ventilation. If the baby is spontaneously breathing well enough to maintain adequate heart rate, but with distress (manifested by some combination of grunting, flaring and retracting), mechanical ventilation with PEEP may be indicated. Rather than immediately employing mechanical ventilation, many neonatologists will strongly consider the use of CPAP in this setting, usually at a medium level of pressure. CPAP is very effective at maintaining lung volumes (preventing atelectasis) between spontaneous breaths, and in the recruitment and maintenance of additional lung volume as part of these breaths. The use of CPAP follows the establishment of spontaneous respirations, either by the resuscitation team or the baby herself.

When CPAP is given, an accurate pressure monitoring device should be used. Manometers built into disposable ventilation bags are usually not adequate for this purpose, and bedside manometers are often not well calibrated. The use of a calibrated T-piece respirator is an excellent way to accurately deliver CPAP by either tight-fitting mask or nasal prongs. In addition to providing constant, accurate levels of pressure more simply than when using a bag and manometer it ensures that these can be maintained during transport from the delivery room to the nursery or NICU.

The bigger the babies, and the closer to term, the less likely they are to need immediate support for RDS other than some supplemental oxygen. The use of CPAP in these babies with nearly normal compliance carries increased risks of overdistension and the creation of air leak syndromes. If CPAP is employed, the chosen pressure level

is usually lower than that used in small preterm infants, and careful monitoring of pressure and clinical status is mandatory.

## 3. Transient Tachypnea of the Newborn (retained fetal lung fluid)

This disorder is usually mild and self-limited and does not require additional therapy. Fetal lung fluid that has not been absorbed or expelled remains in the lungs after birth and generally results in a mild degree of lung hyperexpansion and tachypnea, with normal or near-normal compliance. Most of these babies improve quickly and therapy such as CPAP is rarely considered or warranted in the context of resuscitation. For some, CPAP or positive pressure ventilation may be necessary later if the degree of distress worsens after birth.

Providing CPAP to a vigorous baby whose lungs are already distended and in whom compliance may be near normal is not without the risks of further lung over-distension and resultant air-leak syndromes. These risks should be carefully weighed against what is likely to be a small benefit at best. Pressure levels should be kept low to ensure that the risks of complications are minimized.

## 4. Aspiration Syndromes (meconium, amniotic fluid)

Babies born through meconium-stained amniotic fluid should receive initial care that is modulated by whether they are vigorous (in which case their care is the same as other babies) or non-vigorous (in which case, initial intubation and suctioning of the trachea are indicated). If they are apneic after these initial steps, positive-pressure ventilation, including PEEP, should be given to establish lung volumes and respiration. The mechanics of aspiration syndromes include the risk of air-trapping due to a ball-valve effect from meconium or amniotic fluid in the airways. In addition, as initially non-vigorous babies recover in the minutes after birth and resuscitation, the strength and frequency of their own spontaneous breaths increases, and they may generate inspiratory pressures as they attempt to fully open their lungs. If CPAP is given, it will increase the risk of overdistension and subsequent air leak syndromes. The infant should be monitored closely both clinically and via radiographs. Therapy should be adjusted as the baby's own respiratory effort increases, and the lowest effective level of CPAP should be used. If the need for support increases significantly, it is worth considering positive-pressure ventilation rather than CPAP alone even in the spontaneously breathing infant, as it may allow more complete control of respirations and thereby decrease the likelihood of inadvertent overdistension of the lungs.

CPAP and PEEP are important therapeutic tools for the management of babies after birth. While the initiation may occur in the delivery room, the use of these modalities and the teaching and training necessary both extend beyond initial resuscitation and are not the responsibility of NRP instructors. The initial choice of how they are employed depends on the clinical situation, including gestational age and underlying diagnosis. As with all respiratory support, use requires careful monitoring and adjustment as the baby's condition demands.

## How to Administer CPAP

A more complete discussion of administration and monitoring is available in any of several sources, but a brief primer on the use

of CPAP may be helpful. The use of CPAP beyond a short period introduces complexities of care beyond the basics of resuscitation, and one should strongly consider having a respiratory therapist as part of the care team.

If CPAP is chosen for use right after delivery, there are several methods by which it can be administered, including via face mask or nasal prongs, and with the use of a bag or T-piece resuscitator. The CPAP is administered via nasal prongs or a face-mask, with the prongs offering the advantage of good seal and more certain administration, and the disadvantage of requiring a more complex method of securing them. The use of a facemask makes it more difficult to control leaks, but the ease and simplicity of it may make it more desirable in certain circumstances.

The use of a T-piece resuscitator allows the exact pressure to be easily set and maintained at a desired CPAP level, as long as the delivery device (prongs or mask) is properly set-up.

CPAP administration using a bag and mask requires the inclusion of

a pressure gauge or manometer in the circuit. It is important to note that CPAP (i.e., end-expiratory pressure in a spontaneously-breathing baby) cannot be administered with a self-inflating bag, as when there is a tight seal on the baby's face no flow reaches the baby unless the bag is being squeezed.

With a flow-inflating bag, CPAP is initially adjusted, prior to placing on the baby, by temporarily occluding outflow from the bag by pressing the mask into the operator's palm, partially closing the expiratory valve, and adjusting the flow and expiratory valve until the desired CPAP level is reached.

Independent of the device or system that is used, it is particularly important to ensure that the gas flow in the circuit is adequate to prevent rebreathing of expired gas. This flow should be adjusted according to a number of factors, including the size and vigor of the baby and the underlying disorder.

*Steven A. Ringer, MD, PhD, FAAP, Chief, Division of Newborn Medicine, Brigham and Women's Hospital  
Reviewed by John T. Gallagher, RRT-NPS, American Association of Respiratory Care, liaison to the NRP Steering Committee*

## Dr. Kattwinkel Receives Virginia Apgar Award



*Dr. John Kattwinkel  
MD, FAAP*

There are accolades, and then there are accolades. At the very top of the list of honors for neonatologists is the Virginia Apgar Award in Perinatal Pediatrics, which is presented annually to an individual who has had a great influence on the health and well-being of infants.

In October, during the Section on Perinatal Pediatrics meeting held in conjunction with the American Academy of Pediatrics National Conference and Exhibition in Boston, Massachusetts, John Kattwinkel, MD, FAAP accepted the 2008 award with a great sense of gratitude in the presence of many friends and colleagues.

"There's probably no greater honor than to be recognized by your colleagues. I consider this to be a huge event in my career and certainly appreciate it. I'm very humbled," said Dr. Kattwinkel, editor of the *Textbook of Neonatal Resuscitation, 5th Edition* and Professor of Pediatrics at the University of Virginia in Charlottesville. "It's nice that the awards ceremony took place in Boston," Dr. Kattwinkel said proudly, "because that's where I grew up."

It would be very hard for Dr. Kattwinkel's career contributions in neonatology to go unnoticed. Among his many achievements, Dr. Kattwinkel served on the first NRP Steering Committee, including a stint as co-chair from 1993-1997. He has logged many long hours with his NRP counterparts to create the 4th and 5th editions of the *Textbook of Neonatal Resuscitation* (serving as editor of both editions) and is hard at work on the 6th edition materials set to launch in 2011. Dr. Kattwinkel has also shared his expertise across international borders, conducting NRP training in Romania and Egypt.

As if this wasn't enough, Dr. Kattwinkel is considered to be a pioneer for his work related to Sudden Infant Death Syndrome (SIDS), serving as Chair of the AAP Task Force that developed the Academy's first policy statement on SIDS. This policy urges parents and guardians to put infants to sleep on their backs to prevent SIDS and ultimately led to the Academy's very successful *Back to Sleep* national public education campaign.

"I've known John for a number of years before his work on the NRP Steering Committee and have great respect for him. He's very goal-oriented and is always ready to get down to the nitty gritty when committee meetings go late into the night," said Jay P. Goldsmith, MD, FAAP, Cochair of the NRP Steering Committee and one of many colleagues who nominated Dr. Kattwinkel for the 2008 Virginia Apgar Award. "For these and so many other reasons, that's why I feel the tag 'Solomon' would probably fit him very well. To compare him to Solomon would not be a far reach – he's a neonatal Solomon."

The Virginia Apgar Award in Perinatal Pediatrics is named after Virginia Apgar, MD, a noted American anesthesiologist who worked in obstetric anesthesia and developed a scoring system for assessing newborns. Today, the Apgar score continues to provide a convenient shorthand for reporting the status of the newborn infant.

In addition, Dr. Kattwinkel founded the Perinatal Continuing Education Program (PCEP), and was among the first to describe the use of nasal continuous positive airway pressure for treatment of respiratory distress syndrome and apnea of prematurity.

**Congratulations, Dr Kattwinkel!**

# China NRP Task Force Update

*Freedom of Breath, Fountain of Life*, a five-year Chinese neonatal resuscitation training initiative established by the Chinese Ministry of Health (MOH) in July 2004, has continued to provide education and technical support in its effort to reduce infant mortality in China. Members of the China NRP Task Force are seeing to it that their goal of ensuring that at least one healthcare provider trained in neonatal resuscitation is present at every delivery becomes a reality by 2010.



system (China MOH) is that the provincial level will be responsible for gathering the data,” explained Dr. Niermeyer. “Instructors are beginning to ask questions and seek answers.”

To date, more than 27,000 providers throughout China have successfully completed NRP training, including pediatricians, midwives, and nurses. “In China, the focus has been on ventilation as the key to effective neonatal resuscitation. We’re finding we need to focus on that strategy during our training and outreach,” Dr. Niermeyer said.

The data collection process will involve an evaluation of local hospitals, as well as measuring the skill level of healthcare staff and reviewing available neonatal mortality reports. The task force has already collected data regarding the rate of birth asphyxia at delivery (1.65%). The rate of mortality caused by asphyxia at delivery has declined by 1.4 per 1000. The ongoing process will take things one step further by collecting additional data regarding the mortality rate within one week after resuscitation.

“The current undertaking by the China NRP Task Force is to evaluate the percentage of coverage we’ve achieved to date in delivery services in China, and to establish hospital-based instructors trained in neonatal resuscitation at each delivery,” explained Susan Niermeyer, MD, FAAP, of the University of Colorado Health Sciences Center, Division of Neonatology in Denver. “We began our work by focusing on 20 provinces in China where the need for neonatal resuscitation training was the greatest and where mortality rates were the highest. Although the program has always been informally available to the entire country, the task force has recently expanded the initiative to cover all 30 provinces in China.”

Dr. Niermeyer represents the American Academy of Pediatrics on the China NRP Task Force with William Keenan, MD, FAAP, Professor of Pediatrics and Director, Neonatal-Perinatal Medicine, St. Louis University in Missouri.

The China NRP Task Force is comprised of the following organizations: The American Academy of Pediatrics, China Ministry of Health, National Center for Women and Children’s Health (China CDC), Chinese Society of Perinatal Medicine, Chinese Nursing Association, Chinese Preventative Medicine Association, and the Johnson and Johnson Pediatric Institute.

During a planning meeting in June, the task force initiated the development of an evaluation instrument to be used in their grassroots outreach and data collection efforts throughout China. “The advantage of having the support of a highly structured health

“I think we are all realizing that we’ll probably be able to accomplish data collection down to the city level, but when we get to the rural and township level, that will take a little more time,” Dr. Niermeyer said. “This program is maturing very rapidly, and the task force is making good strides in developing its own research and honing a system for long-term sustainability and preserving quality.”

“The people of China view this as a healthy population issue, as a workforce issue, and they want to take responsibility,” Dr. Niermeyer said. “They have done a marvelous job in meeting the challenge of making this program their own. I think we’ll eventually have data that shows we have moved asphyxia-related deaths downward, but we also know that the burden is in rural grassroots delivery services, and we anticipate we can move mortality rates in those areas further downward now that the program has reached new levels.”

The China NRP initiative is made possible through an unrestricted educational grant from the Johnson and Johnson Pediatric Institute. The Institute has generously offered to continue its support of *Freedom of Breath, Fountain of Life* beyond the initial five-year commitment.

For more information about NRP China, please contact Eileen Schoen in the Division of Life Support Programs at [eschoen@aap.org](mailto:eschoen@aap.org). To read more about NRP international activities, visit the NRP Web site at [www.aap.org/nrp](http://www.aap.org/nrp). Click on the International link on the homepage and select Instructor Update International Articles.