

The S.T.A.B.L.E.[®] Program

Postresuscitation/Pretransport Stabilization Care of Sick Infants

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The S.T.A.B.L.E.[®] Program is the first neonatal continuing education program to focus exclusively on the post-resuscitation/pre-transport stabilization care of sick infants. Neonatal Resuscitation Program provides the requisite education for healthcare providers to safely and systematically resuscitate neonates. However, those infants who require resuscitation also require ongoing care to decrease the risk of morbidity and mortality. The S.T.A.B.L.E. Program provides all members of the neonatal healthcare team with the knowledge needed to render necessary care to infants who are under post-resuscitation or pre-transport stabilization care. Utilizing an organized approach, the S.T.A.B.L.E. Program facilitates the care process by prompting healthcare providers to focus on specific areas of care. This article provides an overview of (1) the history of the S.T.A.B.L.E. Program, (2) the philosophy and goals of the program, (3) a course overview of individual modules, (4) acceptance and recognition of the program in the healthcare community, (5) the target audience, and (6) administration of the course.

Key words: *neonatal education, neonatal postresuscitation stabilization, neonatal pretransport stabilization, neonatal transport*

All hospitals that provide obstetric services must be prepared for the birth, resuscitation, stabilization, and treatment of premature or sick infants. Initial management is outlined in the Neonatal Resuscitation Program (NRP) that focuses on delivery room resuscitation. The NRP textbook states that approximately 90% of infants transition to extrauterine life without difficulty and about 1% need extensive resuscitative measures.¹ The NRP has become the standard

of care for immediate neonatal resuscitation. Following resuscitation, caregivers must turn to other resources to provide ongoing and supportive care to neonates. The S.T.A.B.L.E.[®] Program is the only neonatal continuing education program to focus exclusively on the postresuscitation and/or pretransport stabilization care of sick neonates. The S.T.A.B.L.E. Program is therefore considered by many experts to be the follow-up, complementary program to the American Academy of Pediatrics' NRP. The S.T.A.B.L.E. Program serves as a concise educational tool to organize the myriad of details necessary to stabilize and care for sick infants.² Ideally, it is best to transport a pregnant woman who is at high risk of delivering a preterm infant or an ill infant to a tertiary care center prior to delivery. This philosophy of regionalized care was started in the 1970s. The purpose of regionalized care was to transport a high-risk pregnant woman from a community hospital to a tertiary care center prior to delivery so mother and baby would not be separated after delivery. If a preterm or ill infant is

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born in a community hospital, the infant is transported to the tertiary care center while the mother remains in the community hospital. Maternal transport will be utilized if the mother/baby is at high risk. Mears points out the hardship on the families where infants have been separated from their parents. The parents are forced to travel to see their infants. Regionalization, centralization, and allocation of resources are controversial, and not all infants are born in facilities adequately prepared to care for them.³

In the late 1980s, the concept of regionalization changed. Community hospitals since that time are keeping and delivering high-risk pregnancies and preterm and/or ill infants are not being transported to tertiary care facilities for delivery.^{4,5} This pattern of de-regionalization is attributed to increasing numbers of neonatologists working in nontertiary care hospitals/nonacademic nurseries and neonatal intensive care units,⁶ increasingly competitive healthcare environments, and changes in provider and payment systems that dictated where patients may deliver their baby.^{7,8}

This is compounded by the assumption by consumers that all hospitals are equal in their ability to provide care.⁹ Many nurses, physicians, and other members of the healthcare team have limited experience in neonatal resuscitation and stabilization. Therefore, it is often a challenge for hospital staff to maintain knowledge and skills in this area.¹⁰ The purpose of this article is to describe the history, program goals, course components, program endorsements, target audience, and course administration of the S.T.A.B.L.E. Program.

HISTORY

In 1990, Kris Karlsen developed the S.T.A.B.L.E. Program in response to literature reviews on neonatal mortality, chart reviews examining the pretransport stabilization activities in the community hospital, and feedback by transport team members. There were key factors associated with a higher risk of mortality in transported neonates that if not addressed, could result in mortality and significant morbidity. The program was developed to address 6 key areas of neonatal stabilization. These areas include the management of the neonate's blood Sugar, Temperature, Airway, Blood pressure, Lab work, and Emotional support for the family; thus, the S.T.A.B.L.E. mnemonic was developed (Table 1).¹¹ Mnemonics have been shown to be effective for learning new material and assisting recall (K. A. Karlsen, personal communication, e-mail September

Table 1. Mnemonic for the S.T.A.B.L.E. Program

S = Sugar and Safe care
T = Temperature
A = Airway
B = Blood pressure
L = Lab work
E = Emotional support

15, 2007),¹² and they are frequently used in emergency medicine care to standardize and organize care.¹²⁻¹⁴

The S.T.A.B.L.E. method of teaching neonatal stabilization underwent extensive dissemination and research in the early 1990s.¹⁵⁻¹⁷ In 1996, the S.T.A.B.L.E. company was formed so that outreach educators would be able to access the program materials within the United States and Canada. The S.T.A.B.L.E. Program has continued its growth and development. In addition to the program being available in the United States and Canada, international training is being provided in England, Ireland, Northern Ireland, the Bahamas, the Philippines, Thailand, Mexico, Colombia, El Salvador, Honduras, Guatemala, Argentina, Lithuania, Latvia, and Romania.¹⁸

The program has been expanded so that "S" in the mnemonic refers not only to blood Sugar stabilization but also to Safety. The inclusion of the safety component of the program is designed to reduce preventable errors. In 2006, the Program was expanded to include the recognition and stabilization of surgical emergencies. Various procedures are illustrated and explained in the program, including intravenous catheter placement, proper placement of umbilical lines and how to secure lines, needle aspiration of the chest, and chest tube placement. Information is provided regarding specific airway challenges, persistent pulmonary hypertension, interpretation of the oxygen-hemoglobin dissociation curve, continuous positive airway pressure, pain assessment and management, assessment of scalp swelling with special emphasis on subgaleal hemorrhage, group B streptococcal infection, and emotional support of families whose infant has been transported. The learner manual also contains a variety of case studies and learning activities. A self-assessment pretransport stabilization tool is provided that can be used by any facility.¹⁹ In addition to the 6 stabilization modules, a separate cardiac module and a physical examination and gestational age assessment module exist that can be used to enhance healthcare professional's knowledge in these areas.

Since 1996, over 120 000 students have completed the S.T.A.B.L.E. Program. Today there are over 2200 registered instructors in the United States and worldwide. The US Navy is in its sixth year of preparing graduating pediatric residents and expert neonatal nurses as S.T.A.B.L.E. instructors so that they can teach the program to military healthcare providers.¹⁸

PROGRAM GOAL

Hundreds of times each day, in hospitals and communities around the world, newly born infants become ill or are born with conditions that require specialized care. All hospitals that provide obstetric services must be prepared for the birth, resuscitation and stabilization, and transportation of premature or sick infants. In addition, hospitals without obstetric services should also prepare for the unexpected arrival of premature or sick infants in the emergency department. A uniform, simple, and standardized approach can improve the infant's overall stability, safety, and outcome.¹⁷

The goals of the S.T.A.B.L.E. Program are 2-fold. The first goal is to educate healthcare providers in the stabilization of preterm and ill neonates following delivery and before being transported to a tertiary care facility. The program is intended for postresuscitation care of any baby—preterm, cardiac, surgical, or medically ill infant. Providing this early transitional care improves the immediate health and long-term outcomes of high-risk infants, thus reducing infant morbidity and mortality. The program provides essential information in an organized format with a mnemonic to assist the learner in remembering the 6 key areas of care that need to be managed to stabilize a high-risk neonate before being transported. The second goal is providing patient safety. Utilization of standardized processes and approaches to care provides a framework to identify areas of potential error, thereby creating an environment in which potential clinical errors and adverse events can be avoided.^{17,19}

COURSE OVERVIEW

Each of the 6 key modules begins with specific learning objectives, learning activities, examples, and/or case studies.

Module 1: Sugar and Safe care (the “S” in the mnemonic)

This module reviews the initial IV fluid therapy for sick infants, infants at risk for hypoglycemia, and the

IV treatment of hypoglycemia. Indications for umbilical catheters and their safe use are included. Safe patient care, including the reduction of preventable errors, is stressed throughout this and all the modules.

Module 2: Temperature (the “T” in the mnemonic)

This module addresses the special thermal needs of full-term and preterm infants. A discussion of the ways infants lose body heat (conduction, convection, evaporation, and radiation), how heat loss can be minimized, the clinical consequences of hypothermia, and appropriate methods for rewarming hypothermic infants are provided. An appendix provides a case study illustrating how hypothermia results in a cascade of events that may be misinterpreted and lead to a less than desirable outcome.

Module 3: Airway (the “A” in the mnemonic)

This module reviews the clinical evaluation of respiratory distress, airway challenges, such as choanal atresia, tracheoesophageal fistula, Pierre Robin sequence, and congenital diaphragmatic hernia, the detection and treatment of a pneumothorax, blood gas interpretation, signs of respiratory failure, and when to increase the level of respiratory support. Endotracheal tube intubation, stabilization of an oral endotracheal tube, initial ventilator settings, and basic chest radiograph evaluation are discussed. This module also reinforces NRP principles. The section on blood gas interpretation includes the use of a modified acid-base alignment nomogram and S.T.A.B.L.E. Blood Gas rules. This approach takes the learner through the blood gas interpretation step by step in parallel to the anticipated clinical presentation.

Module 4: Blood pressure (the “B” in the mnemonic)

The blood pressure module discusses the evaluation and treatment of the 3 forms of shock seen in infants: hypovolemic, cardiogenic, and septic shock. The possibility of concurrent causes of shock in the neonate is also reviewed. Dopamine, a common inotrope used in neonates to improve cardiac output, is discussed in detail including how to safely mix and administer this medication. This module also includes a discussion related to scalp swelling, the potential for blood loss secondary to subgaleal hemorrhage, and a multidisciplinary approach to difficult vacuum-assisted deliveries.

Module 5: Lab work (the “L” in the mnemonic)

This module focuses primarily on neonatal infection and includes interpretation of the complete blood cell count and the initial antibiotic treatment of suspected infection. The importance of evaluating all information available, particularly the risk factors and physical examination, is discussed. Because the presence/evidence of infection can be dynamic, a comprehensive approach is essential. For example, an infant may have significant risk factors, a normal complete blood cell count, and may appear clinically well or may have subtle and nonspecific signs and symptoms but may become ill rapidly and even die from sepsis. This module stresses that risk factors, physical examination, and laboratory work must be considered concurrently in an ongoing manner.

Module 6: Emotional support (the “E” in the mnemonic)

The module reviews the crisis surrounding the birth of a preterm or a sick infant and how to support families during this emotional and stressful period. This module offers specific suggestions for the referral and accepting hospital about how to best care for and support the parents who are separated from their infants. An appendix on relationship-based care for babies and their parents is included, which stresses the need for applying technical expertise within the context of the parent-infant-healthcare provider relationship.

There is a final section which summarizes the aforementioned concepts within the context of quality improvement. This section addresses quality improvement and stresses the professional responsibility of evaluating and improving one's practice by participating in mock codes or drills, chart reviews, and debriefings. Self-assessment questions and a pretransport stabilization self-assessment tool are included. This module discusses the chain of command when the standard of care is compromised, communication strategies to help peers improve patient care and develop as professionals, and clear suggestions for applying safety principles such as developing guidelines or protocols. The module also discusses methods of implementation of quality improvement strategies in any setting. It is expected that following completion of the program, the learner will implement what they have learned in the clinical area. This implementation can take the form of mock codes or drills, chart reviews, debriefings, etc.

The learner manual can be used as a workbook during the class and a valuable resource after the class. Most students purchase individual copies of the learner

manual. The front and back covers of the learner's manual include essential reference material such as conversion tables for weight, temperature, and laboratory values. The reference list is organized by module and includes more than 350 references.^{17,19}

An expert in neonatal nursing, medicine, or respiratory care presents the S.T.A.B.L.E. Program as an all-day didactic interactive session. The instructor utilizes an instructor manual and animated PowerPoint slide presentation to guide teaching while the student follows along in the learner manual. The program may be adapted to meet the needs of more advanced or experienced neonatal healthcare providers by virtue of the multiple slide hyperlinks that lead to in-depth information on a variety of neonatal illnesses, conditions, or procedures.^{20,21} The slide animations help all learners to understand complex concepts. Laminated quick reference bedside cards that summarize essential information contained in the learner manual are also available for purchase. A ring is attached to the cards so that they can be easily hung on a stabilization warmer or tucked into a pocket for quick, accessible reference when needed.²²

ACCEPTANCE AND RECOGNITION

In addition to being extremely popular and user friendly, The S.T.A.B.L.E. Program has received accolades and endorsements from the March of Dimes and the American Academy of Pediatrics, Section on Transport Medicine. In 2003–2004, the March of Dimes conducted an extensive expert review of the program. Reviewers included nationally known physicians and nurses in the field of neonatal care. The experts agreed that the S.T.A.B.L.E. Program is accurate and of high quality, meets an important need, and is relevant to the March of Dimes mission and its prematurity campaign. The March of Dimes has endorsed the S.T.A.B.L.E. Program for use by neonatal healthcare givers.²³

The American Academy of Pediatrics, Section on Transport Medicine, encourages advanced education among transport staff members, and many teams require various certifications as a method of improving staff competence and ensuring a core knowledge base. The S.T.A.B.L.E. Program is identified as a program used in this manner by transport teams.²⁴ In the fall of 2006, the S.T.A.B.L.E. Program was reviewed by the American Academy of Pediatrics, Section on Transport Medicine, which concluded: “The STABLE course is the preeminent educational program for pre-NICU and transport team professionals alike on the essentials in the management of unstable neonates awaiting

transport and NICU admission" (R. Insoft, MD, Chair [RINSOFT@PARTNERS.ORG], e-mail, August 1, 2007). Critically ill infants often require resuscitative and stabilization interventions while the team is en route to the receiving facility. Neonatal and pediatric transport teams are required to deliver the same level of care on transport as the receiving facility will render upon admission.

Continued stabilization of a neonate is paramount during the interfacility transport process. Therefore, in support of the American Academy of Pediatrics, Section on Transport Medicine, R. Insoft, MD, Chair ([RINSOFT@PARTNERS.ORG], e-mail, August 1, 2007), all team members involved in neonatal or pediatric transport would benefit by participation in the S.T.A.B.L.E. Program.

TARGET AUDIENCE

The S.T.A.B.L.E. Program content is critical to the effort to reduce infant mortality and morbidity and is intended for use by all members of the healthcare team including physicians (pediatric, emergency department, and family practice physicians, including residents in all the above specialties), nurses (RNs working in labor and delivery, postpartum, nursery, emergency department, nurse midwives, and licensed practical nurses), nursing assistants, respiratory therapists, and prehospital care providers such as emergency medical technicians and paramedics. Any healthcare giver involved with postresuscitation and/or pretransport care of sick newborns would benefit from completing the S.T.A.B.L.E. Program.^{17,25,26}

Benson and Nichols cite the improved teamwork and the methodical approach their colleagues and staff members demonstrate after taking the S.T.A.B.L.E. Program (A. Benson [annebenenson@comcast.net], e-mail, August 8, 2007; L. Nichols [lnichols@caperegional.com], e-mail, August 8, 2007). Benson notes that the labor and delivery staff members have voiced a deeper appreciation of the postresuscitation needs of the infant as demonstrated by improved thermoregulation. Likewise, the nursery staff members have demonstrated a better appreciation of the delivery process and the need to monitor infants more closely after a stressful or an assisted delivery. Benson states that the quick reference bedside cards are frequently used as a reference material. When used by all healthcare providers caring for mothers and babies, the S.T.A.B.L.E. Program provides a standardized approach for care (A. Benson [annebenenson@comcast.net], e-mail, August 8, 2007). In addition, the standardized approach

may improve "handoff" communications as encouraged in the 2007 *National Patient Safety Goals*.²⁷

ADMINISTRATION

The S.T.A.B.L.E. Program involves an 8- to 9-hour interactive didactic presentation by an expert in neonatal nursing or medicine. The didactic portion may be preceded by an open- or closed-book pretest, followed by a closed-book posttest with a minimum passing score of 85% to obtain a course completion card.²⁸ Mears and Chalmers⁴ report score improvements between the pretest and the posttest, with some improvements exceeding 50%. Postcourse evaluations have shown the course to be well received, with 100% of the participants indicating they would recommend the course to their peers.⁴

Organizations and individuals who have implemented the program report have indicated that the program is very portable. The following is a statement from Hospital Corporation of America (HCA):

In 2005, HCA's Perinatal Advisory Board recommended the S.T.A.B.L.E. Learner Course for HCA clinicians involved in the care of newborns. The goal is to have all staff responsible for stabilization of a newborn attend the course, beginning with the NICU staff, followed by NBN then L&D and Post-Partum, as appropriate. Recently, many of our (HCA) Level III NICUs have extended the recommendation to Respiratory Therapists involved in the care of neonates. This recommendation was reinforced at the October 2007 Ad hoc Neonatal and Clinical Workgroup meeting. After receiving feedback from perinatal leaders within HCA, it is apparent clinicians who have completed the STABLE Course have an increased comfort and competency level in the care of a newborn and family, thus improving patient safety. As clinical leaders in perinatal healthcare, we (HCA) have embraced the S.T.A.B.L.E. Program as part of our clinical education. (D. Wright [wright@hcahealthcare.com], e-mail, November 16, 2007)

In addition, there are reports of improved stabilization activities and healthcare provider performance following the completion of the S.T.A.B.L.E. Program.^{17,29} The success of the program may be associated with the principles of adult learning that are incorporated into the program. Theories or principles associated with adult learning suggest that in order for learning to occur, the content must be relevant and transfer to the learner's day-to-day experiences. The learning environment should build on the learner's prior experiences, and the learner must be internally motivated to gain new knowledge and skills.²⁹⁻³¹ The S.T.A.B.L.E. Program addresses all of these learning principles.

Program evaluation results from participants ($n = 53$) who completed a recent S.T.A.B.L.E. Program offered by a large regional transport program in Maryland were very positive. Participants *agreed* or *strongly agreed* the didactic learning setting, rather than no instructor/lecture (80%) and format (92%) was the best method to learn the material (87%). The participants *agreed* or *strongly agreed* that the S.T.A.B.L.E. Program was appropriate for their level of expertise (75%). Seasoned neonatal intensive care nurses *agreed* or *strongly agreed* that they learned new information (100%) and the information would help with future stabilization activities (98%). Participants *agreed* or *strongly agreed* that they had gained confidence in their ability to care for infants during the pretransport stabilization period (89%). All participants (100%) indicated that the S.T.A.B.L.E. Program learner's manual would be a useful resource in the future and that the S.T.A.B.L.E. Program learner course was a good use of their time (91%). With time being the most precious commodity in our professional and personal life, the S.T.A.B.L.E. Program is considered effective and efficient.

The S.T.A.B.L.E. Program is a program that should be implemented by all regional transport programs. It is the most requested outreach education offering provided by the Maryland Regional Neonatal Transport Program to the more than 40 referral hospitals it serves. The requests, in addition to nurses and physicians in mother-baby/nursery areas, include pediatric transport, emergency department, respiratory therapy staff, and prehospital care providers. The S.T.A.B.L.E. Program is taught 1 to 2 times each month, somewhere in the state of Maryland. It is rapidly becoming a mandatory educational program in level I, II, and III nurseries throughout the state. To maintain certification by the S.T.A.B.L.E. Program, one must complete a learner course every 2 years. By maintaining certifica-

tion, healthcare providers can enhance retention of the material and become knowledgeable about program updates. The material is updated approximately every 5 years, and then scrutinized by a 35+-member multidisciplinary content review board. Both the pretest and posttest are regularly evaluated on the basis of psychometric principles. The majority of the items offer scenario-type questions to promote critical thinking, application, and synthesis of information. Instructor courses are offered throughout the year to prepare lead instructors for course presentation.

SUMMARY

To provide focused care to critically ill neonates, healthcare providers must possess a core body of knowledge. This core body of knowledge is related to the physiologic, laboratory, and social factor parameters that can decrease morbidity and mortality in infants who are under postresuscitation or pretransport stabilization care. The S.T.A.B.L.E. Program is the first program to present such knowledge to the healthcare community in such a concise manner. Through the use of a mnemonic, the program provides healthcare workers with the systematic tools necessary to organize essential data. Professional organizations such as the March of Dimes and the American Academy of Pediatrics, Section on Transport Medicine, have readily endorsed the program as relevant in ensuring the acquisition and retention of the necessary didactic information and skill sets (R. Insoft, MD, Chair [RINSOFT@PARTNERS.ORG], e-mail, August 1, 2007).^{23,24} With more than 100 000 students and 2200 registered instructors in the United States and around the world,¹⁸ the S.T.A.B.L.E. Program offers the healthcare community a foundation for safer care in the future. Any healthcare provider involved in the care of newborns would benefit from the S.T.A.B.L.E. Program.

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