neonatal care academy

NCA JOURNAL

natus newborn care

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INNOVATION FOR NCA MEMBERS – CLINICAL NEWS AND FACTS

THERMOREGULATION HEARING SCREENING BRAIN MONITORING JAUNDICE MANAGEMENT NEONATAL ACCESSORIES

EDITORIAL

PASSION!

This one word encapsulates the aims and motivation behind the **NCA JOURNAL**: our passion to serve the neonatology world with state-of-the-art technologies and education, and the passion with which neonatologists and neonatal nurses care for their newborn patients. We want the **NCA JOURNAL** to become a global forum which reflects the passion driving the world of neonatology.

There is so much to be discovered in the **NCA JOURNAL**. As a symbol of our commitment to global networking and cooperation, the **NCA JOURNAL** features educational articles, scientific papers and best practice examples, all selected to support the neonatal community as a whole.

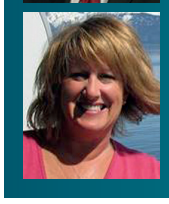
This first edition covers a stimulating range of topics including an exciting journey through the evolution of neonatology as seen by Dr Alvin A. Miller, a debate on neonatal hearing screening by Dr Judith A. Marlowe, and an examination of the current challenges in jaundice management by Dr Vinod K. Bhutani, to name just a few.

It's a two way process, and so we're also calling for your input. The **NCA JOURNAL** is your channel for reaching out to the neonatal community. We welcome your feedback, comments and ideas. Please send them to: **service@neonatalcareacademy.com.** Selected comments will be published in the next edition.

In the meantime, we invite you to enjoy this first edition of the **NEONATAL CARE ACADEMY JOURNAL.**

Yours,

PIERRE RADZIKOWSKI
International Downstream Marketing Director



TERESA BOONE
Director of Global Education

NEONATOLOGY HISTORY – AN EDUCATION

Having spent 40 years in a Neonatal Career, I have had the opportunity to review the history and progress in the care of the newborn since Pierre Budin (OB) opened the first premature station in the late 1800s in Paris.

Since then, we have progressed from a mortality of 140 deaths/1000 to 4 deaths/1000 live newborns. What made this dramatic change? Early care labeled preemies as "congenital unviable weaklings" followed by preemies on exhibit at World's Fair in 1902. Pioneers that advanced newborn care include Dafoe of Canada caring for the Dionne Quints and Julius Hess and Evelyn Lundeen opening a preemie station in Chicago in 1930. The physiology of the newborn was elucidated in 1945 by Clement Smith and later Arthur Parmalee. The 1950s saw many disagreements on the use of oxygen as well as the inadvisability of feeding prematures. The care of the newborn lacked the microtechnologic monitors, ventilators, and equipment we have today. The needs of the tiny newborn were forgotten by manufacturers of equipment. Newborn care was truly "trial by fire" and lacked evidence of the basis, dangers, or goals of therapy used to treat preemies or newborns. Starvation resulted in retarded newborns with cerebral palsy, oxygen was delivered or denied without measurement of the baby's oxygen needs. The caesarian section rate of 7% at this time led to trauma and/or hypoxic newborns.

THE 1950'S WERE THE NO YEARS! We did not have baby vents, microlabs, O2 meters, ET Tubes, gas machines, IV needs, visitors, RT Techs, and 1:1 Nursing care. These were also the years of Iatrogenesis when the approach to care was "try it and see if it helps". Care included ACTH for ROP, grey syndrome (chloromycetin), bubbly brain (phisohex), kernicterus (sulfa), phocomelia (thalidomide), CP (starvation), esophageal varices (exchange transfusions), thrombotic vessels in lower body (umbilical catheterization), and fractures and osteopenia (steroids/diuretics). There were very few double blind random studies, or evidence proven therapies, and these diseases of "progress" were the results. Interventional care of the newborn led to pneumothorax or BPD from ventilation, as well as child abuse because of "no visiting" policies by parents in nurseries.

History has given us the chance to review the past – for the instruction of the present – and the benefit of the future.

Discovery of the RH Factor in 1942 and the treatment of jaundice due to RH iso-immunization by Diamond started an epidemic of exchange transfusions for neonatal jaundice and the fear of 20 mg/dl. causing Kernicterus. This treatment of jaundice was modified by the use of phototherapy, and "Yellow-Mania" became less of a threat to the newborn. Contributions by Mary Ellen Avery in 1958 helped the physician to understand Hyaline Membrane Disease and treatment of RDS with "surfactant". The importance of gestational age instead of the baby's weight, clarified by Lulu Lubchenko in the 1960s helped us properly evaluate newborns. Babies were AGA, SGA, LGA and understanding of their morbidity and potential outcome became clearer to the physician. The importance of environmental temperature and thermal neutrality was championed by the studies of William Silverman in 1965. The experiments in 1970 by Klauss and Kendall on surrogate mother apes made us realize the importance of parental visiting. Neonatology became a sub-specialty in 1975 and from this time forward, with caution expressed by Bill Silverman, therapies were evaluated or used only after there was evidence of their possible risk or success. Understanding the etiology of sepsis in the newborn by Benirshke, Naeye, Boyer and Gotoff led to scientific protocols for treating Group B Sepsis in 1983. In 1998 Thomas Wiswell proved to us that "look and see" into the trachea of the meconium stained newborn was not beneficial, and was a risk to the newborn. Feeding of the newborn preemie has had multiple studies the last 50 years and still today we are not certain of what, how, or when to feed the premature.

Advances and progress in Neonatology is due to the team efforts of the NICU Nurse, the respiratory tech, the obstetrician, the neonatal colleague …. and the baby! Today there is a cautious approach to therapies and intervention. History has taught us how to care for the newborn. Through misadventures, failures, diseases caused by our therapies, as well as advances, we have learned care at the cribside. In the final analysis working in NICU is the greatest education on how to care for the newborn.

ALVIN A. MILLER MD, FAAP
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Neonatologist Retired

SYSTEMS STRATEGIES TO REDUCE ADVERSE BURDEN OF NEWBORN JAUNDICE

Bilirubin, a beneficial antioxidant at low levels, can progress to neurotoxic properties at higher levels where it can impair the normal developmental maturation of the neonatal brain. As a "silent toxin", deleterious effects are exacerbated by co-morbidities such as inflammation/sepsis, oxidative stress, prematurity, and even sociocultural environmental factors. Failure to recognize or identify infants at high risk for developing extreme hyperbilirubinemia can lead to severe neurologic sequelae, which include athetoid cerebral palsy (Kernicterus) to a range of subtle cellular damage of bilirubin induced neurological dysfunction (BIND) that appear to be gestational age-related. The clinical dilemma is that the sensitivity and specificity of current measures of total bilirubin (TB) levels to discriminate the precise thresholds between safe and worrisome TB levels are not adequate. In fact, often in infants <28 wks gestational age, there is a no specific peak TB level that is clearly associated with neurologic impairments.

Pre-clinical studies have illustrated the development of neurogenic niches and of endothelial cells, together with microglia migration, that are significantly vulnerable to bilirubin neurotoxicity. In the opinions of several distinguished authors and experts the risk versus benefit of initiating interventions or withholding interventions for any infant at high risk for developing extreme hyperbilirubinemia currently rely on immaturity of the brain, TB assay and caution.

THUS, THE CURRENT APPROACH TO A NEWBORN AT RISK FOR NEWBORN JAUNDICE IS BASED ON THREE PRINCIPLES:

i) system-based screening for risk assessment that include bilirubin (TB), gestational age and hemolysis.
ii) unfettered access to effective phototherapy.
iii) surveillance for subtle bilirubin neurotoxicity for those who have reached or exceed the AAP (American Academy of Pediatrics) recommended bilirubin thresholds for intervention.

Effective phototherapy is the use of a specific wavelength and dose of light (photons) delivered to an exposed body surface area for the purpose of reducing the neurotoxic levels of bilirubin. Light needs to be prescribed as a drug. It is usually prophylactic with a goal of containing the rate-of-rise of bilirubin. The most effective phototherapy is administered using blue light in the wavelength range of 469 +/- 10nm. A recent technical report from the AAP details further evidence and operational considerations. Interference light dispersion to reach the bilirubin molecule may modulate the effectiveness of irradiance delivered.

EFFECTIVENESS OF PHOTOTHERAPY IS DEFINED BY:

a) Measurements of irradiance at regular intervals with an appropriate spectroradiometer to validate dose for the specific wavelength that is uniformly distributed over the light footprint.
b) Adjusting the exposed surface area to increase exposure to light source and thereby increase the "dose". Such an approach is useful if the TB continues to rise while the infant is being administered phototherapy. Additional phototherapy devices may be used to widen the exposure of the BSA.
c) Increasing the irradiance to a higher intensity setting on the device or by bringing the overhead light closer to the infant. Certain Light emitting diode light sources can be brought closer to an infant, but this cannot be done with halogen or tungsten lamps because of the danger of a burn.
d) Discontinuation of phototherapy when TB is 1 to 2 mg/dL (17-34 mmol/L) below the suggested initiation level for an infant's postmenstrual age.
e) Discontinuation of TB measurements when TB is lowered in the absence of phototherapy.

From a regional perspective, implementation of such an approach has a beneficial outcome by reducing extreme hyperbilirubinemia (Figure 1). Among individual newborns, manifestations of bilirubin neurotoxicity may be assessed by clinical signs of BIND, guage development. Overall, a systems approach among high-income communities, regions, or nations have been associated with reduced burden

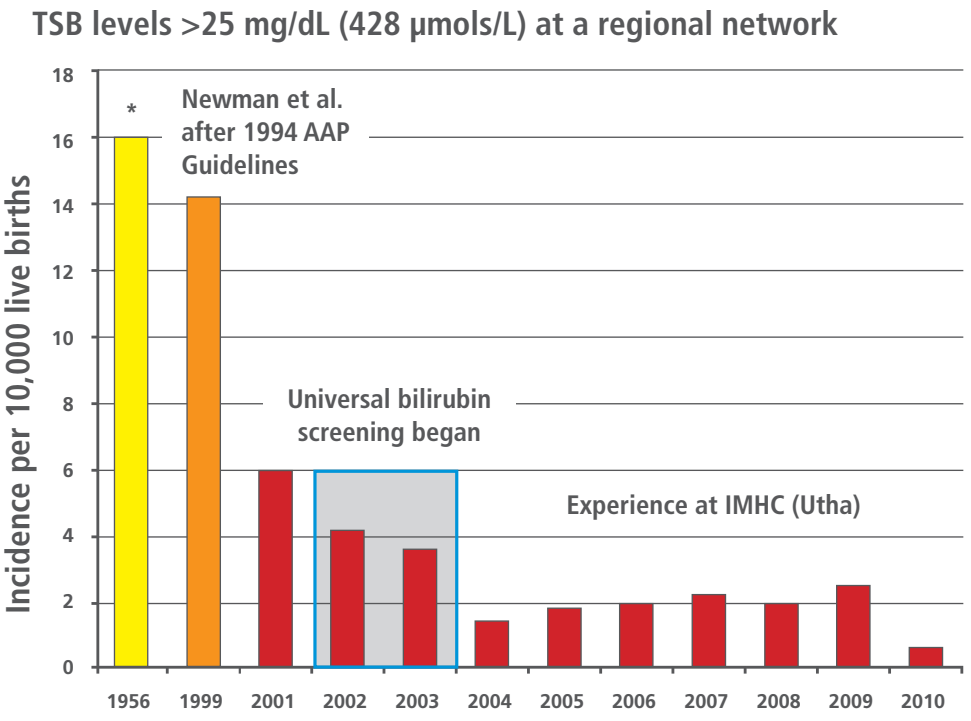

Figure 1. Systems approach implementation and its impact on the incidence of extreme hyperbilirubinemia in a regional network (red bars). (Yellow bar represent data from Collaborarive Perinatal Project; orange bar represents data from Newman et al, 1999)

The most easily preventable neonatal condition

auditory brain stem screening and (if the risk is high) by magnetic resonance imaging. Those at most risk should be followed during infancy and childhood for neuromotor and movement disorders, upward gaze abnormalities, auditory neuropathies and sensory processing disorders.

Cognitive impairments are unusual but are more likely for disordered expressive and receptive lan-

of jaundice-related adverse effects; however, global challenges remain and urgent action is needed to manage the most easily preventable neonatal condition.

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THE HEWITT FAMILY SUCCESS STORY

We are the Hewitt family from Wyoming. Our oldest, Dallie, was born in February 2000, with no hearing problems. Ruger was born in March 2002, and brought into our lives things we never imagined. After referring on the newborn hearing screening several times we were sent to Primary Children's Medical Center in Salt Lake City, Utah.

After 3 ABR's and visits to several ENT's, at two months of age he was diagnosed with profound bilateral hearing loss. It was a huge shock, because there is no hearing loss diagnosed in either of our families. It was also very scary, because it was such an unknown to us. With very little past experience with deaf/hard of hearing (D/HH) we began learning about our options and a lot of sign. Ruger was fitted with aids at three months; hearing aids are an adventure in themselves. At three months Ruger began Early Intervention with our local Child Development Center. His Speech/Language Pathologist/Family Coordinator started 1-2 home visits per week, teaching us sign language, how to use the hearing aids, how to teach him to turn to sound, etc. She attended several audiology appointments with us. The CDC offered us the opportunity to attend conferences and trainings to help us better understand hearing loss and how we could help our children.

His loss was caused by the Connexin 26 gene

Wyoming Department of Education offered sign classes and support for our family too. The D/HH Library in Casper had many books and videos we could use. We wanted to give Ruger access to a lot of language so we used Total Communication. Ruger did well with the hearing aids. He

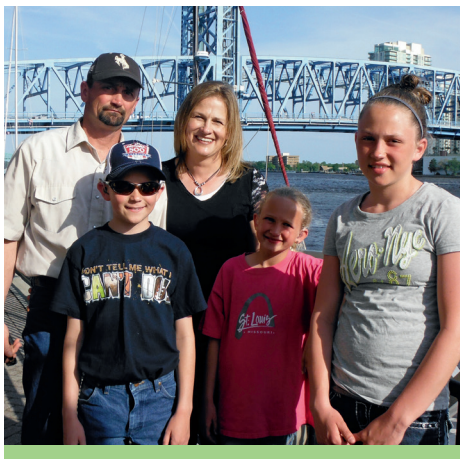
We are grateful for the Newborn Hearing Screen

turned to many sounds, and made several sounds. It was amazing how well he learned sign language. To stay with aids or pusue a cochlear implant was a hard decision for us. Ruger was implanted in October on Halloween day in 2003, by a wonderful surgeon in Salt Lake and his implant was activated 5 weeks later.

When Ruger was 9 months it was determined that his loss was caused by the Connexin 26 gene. Kassidy was born in June 2004. Because Ruger's loss was genetic we knew there was a chance Kassidy could have it also and she did. At 2 months she was diagnosed with a profound bilateral hearing loss. She was fitted for hearing aids at 2 ½ months. Kassidy started in Early Invention shortly after the diagnosis.

Kassidy never responded well to her hearing aids. It was hard to get her to wear them after she was old enough to pull them out. The decision for an implant was much easier this time. Kassidy was implanted in August of 2005 at about 14 months of age, and her implant was activated 5 weeks later.

We are grateful for the Newborn Hearing Screen and the technology that allowed us to catch their hearing loss at birth, enabling us to get hearing aids and to begin Early Intervention at before 6 months of age.



Today at ages 13 & 10, Ruger and Kassidy are both at grade level and above for speech, hearing, and all school subjects.

UNIVERSAL NEWBORN HEARING SCREENING: CHANGING LIVES ONE BABY AT A TIME

Although the first calls for newborn hearing screening originated more than a half century ago, the journey from experiments and pilot programs to the present day standard of care was an arduous one. Early advocates Wedenberg (1956) and Froding (1960) in Sweden attempted to test neonates for hearing using reflexive eyelid opening or closing in response to loud sound, but poor reliability precluded adoption of this technique. Nevertheless, their recommendations for "obligatory" examination of newborn hearing began a movement that spread worldwide thanks to the efforts of such pioneers as Marion Downs who launched the first organized effort to screen newborns. In her 1964 project in Denver, Colorado, trained volunteers screened every newborn (17,000) using a device that emitted an abrupt 90dB SPL noise band to elicit a startle response. Once again, the unreliability of behavioral response and reliance upon examiners' subjective judgments meant that no acceptable protocol for newborn hearing screening could be developed. Alternative methods to identify infants for selective screening using risk factors emerged as a promising alternative until it became apparent that this strategy would detect only about 50% of infants with significant hearing loss.

By the 1980's, Auditory Brainstem Response and, later, Otoacoustic Emissions renewed interest in universal screening, but it was the 1985 introduction of ALGO® AABR® that, for the first time, made screening every baby feasible through automation and machine intelligence for statistical response detection while rigorously maintaining the accuracy and effective performance of conventional ABR using highly skilled clinicians.

Implementation of universal newborn hearing screening rapidly escalated only after the technology required for this unique application became available and sufficiently widespread to win public health support. Today in the United States and many other countries, more than 97% of newborns are screened for hearing loss. Congenital hearing impairment is now understood to be a developmental emergency because unstimulated auditory neurons are recruited and "re-wired" by other areas of the cortex resulting in loss of future auditory potential once this re-organization has occurred. Since more than 96% of infants with hearing impairment are born to two hearing parents who expect to communicate with their baby through spoken language, there is an urgent need to support this bonding process and the typical sequence of child development.

Evidence demonstrating the true benefit of early detection is now emerging as long term research is underway. The Longitudinal Outcomes of Children with Hearing Impairment (LOCHI) project (www.outcomes.nal.gov.au) a population-based, prospective study directly comparing outcomes of early identified children with hearing loss to later identified children is a prime example. Differing UNHS implementation stages between 2002 and 2007 in Australia created natural cohorts identified by nursery screening vs. by subsequent standard health care. Since all children received the same free, follow-up services of Australian Hearing their results can be compared fairly in this unique study. LOCHI provides the world's first population-based evidence that hearing-aid fitting by 6 months of age or cochlear implantation by 12 months accompanied by intervention for language development are the key variables in predicting outcome and that targeted intervention for development of pre-reading skills is essential for children with hearing loss to receive the full benefit of early detection.

Hearing impairment – a developmental emergency

The true goal of newborn hearing screening, optimal outcomes for children born with permanent congenital hearing loss, cannot be achieved, however, unless babies who are referred for further evaluation receive diagnostic audiology evaluation, access to sound through hearing aids or cochlear implants along with effective intervention as soon as possible and that is the greatest challenge faced today in many locales. Despite successful coverage of nearly every birth in many regions, loss to follow-up and loss to documentation mean that as many as 40% of infants who are identified by screening are lost to the early detection system. Improved parent/provider communication, greater use of data management and tracking systems, increased pediatric audiology resources, and such innovations as tele-practice in underserved regions are among the solutions proposed to ensure the efficiency and effectiveness of newborn hearing programs. Clearly, the significance of early hearing detection and the potential for lifelong consequences when babies and their families miss this opportunity cannot be overstated and will continue to demand our full attention.

The social and economic benefits of early hearing detection for individual families, communities, and nations create an exciting opportunity and a true identification imperative. **Universal newborn hearing screening has proven to be the essential first step towards achieving previously impossible outcomes and changing lives - one baby at a time.**

JUDITH A. MARLOWE, PHD, FAAA, CCC-A
Executive Director, Audiology & Professional Relations
Natus Medical Incorporated

WELCOME TO THE NEONATAL CARE ACADEMY

The Neonatal Care Academy – **NCA** – is a neonatal education platform, designed to support neonatologists, nurses, and newborn caregivers all over the world by helping them stay at the forefront of their profession.

Here at Natus we believe that sharing is the key to success. That's why we provide NCA members with news of the latest developments in neonatology and scientific breakthroughs, as well as access to documented experiences and examples of positive practice, all to help neonatal practitioners improve the level of care they offer to their patients.

The gateway to the NCA is its website – www.neonatalcareacademy.com. Here you'll find access to everything the NCA has to offer, including practical aids such as conference listings, clinical case studies, DVDs, an international biomedical publication search engine, and the latest edition of the NCA's own Journal. It's also the first port of call for tips & tricks on getting the most out of all Natus newborn equipment, with videos and clips offering advice and training.

ONLINE LEARNING

Natus is constantly developing and improving medical devices for newborn care. But we all know that any device can only be as effective as the person using it; in the healthcare arena this means a direct correlation between user competence and patient outcomes.

That's why the NCA offers a series of online courses in neonatal brain injury, thermoregulation, neonatal jaundice management, and hearing screening. The courses are free, can be accessed via the NCA website, and completed according to the user's own timetable.

GLOBAL NETWORKING

The NCA is both global and local. Special NCA Days held around the world give local members the chance to meet in person, swap experiences, and attend neonatal courses covering specific clinical topics. The NCA also hosts lounges at neonatal conferences and meetings, providing a meeting point for members to come together and maximize the value of their attendance.

Register online at www.neonatalcareacademy.com

A VIBRANT COMMUNITY

As an international company with a global reach, Natus is privileged to work together with medical professionals from around the globe. Their input helps us develop the cutting-edge medical devices that neonatal professionals rely on.

The NCA is our way of saying thank you. Run by Natus, the NCA is intended to serve the interests of the neonatal community as a whole, by building up a vibrant neonatal network. Active involvement benefits everyone. Therefore we invite you to go to the NCA website and join up. Membership is free, and open to everyone with an interest in neonatal care, whether a Natus customer or not.

The NCA thrives on your input and ideas. Please feel free to submit your comments, tell us about topics you want to see covered at clinical meetings, or subjects for educational courses, etc.

Is there a particular area of training you're interested in? Do you have information you feel should be shared with your peers? Please let us know. We always love to hear from you.
service@neonatalcareacademy.com

SHARING THE GIFT OF CARING…

The NCA Journal team think clinicians who care for babies are pretty special - smart, talented, understanding…the list goes on and on. You are especially unique as you blend your scientific knowledge with your compassion for your tiniest patients while bonding with families, sometimes for months at a time.

Many of us have a heartfelt story about a baby or family that has impacted our lives in a special way. I remember my first year as a NICU nurse driving to my 7 pm - 7 am overnight shift on Christmas Eve. As I looked around at all of the beautifully decorated houses and watched people moving about for their family celebrations with presents in hand, I couldn't help but feel both happy and sad. While I drove I listened to National Public Radio recount The Night Before Christmas and my eyes welled up with tears as I realized I wouldn't be with my family on Christmas Eve for the first time in my life. I have to say, I felt incredibly sorry for myself.

That night I was assigned to work in the Special Care Level II Unit. The unit was full and there was a lot of activity as the night shift got underway. As the families trickled out around 9:00 pm, I looked over to one of my babies and saw mom leaning forward, with her palms flat against the walls her baby's incubator, crying deeply, her body shaking with each sob. I went over and asked what was wrong and she said she just felt awful leaving her baby in the hospital, as this was the first time in her life her family would not all be together on Christmas Eve. Wow. Here I was upset because I would miss an eggnog and few hugs and kisses while this mom had to leave her critically ill baby in the hospital so she could be home caring for her other children. She was so torn, her sadness was palpable. I was immediately ashamed of myself for being so self-centered during my pity party drive into work. I hugged her until her tears (and mine) resided and she went home.

The real gift was in giving

Later that night, after all of the families had gone home, I couldn't get that mom, and all moms with children in the hospital out of my mind. A thought suddenly came to me, almost like a gift. I was going to surprise all of the babies' families with a gift FROM their baby. We had a Polaroid camera and each of the nurses in my cove took pictures of the babies in our care. During our lunch breaks we made a Christmas card from each baby to their family. We added footprints as the signature and drew holiday pictures, using cotton balls for Santa's beard and stickers for tree ornaments. We hung the cards from the incubators so they would be seen right away. The nurses who participated in this gift, me included, were SO EXCITED and hoped the families would receive them with smiles. We didn't have the opportunity to see the reaction of the families. We didn't need to. The real gift was in giving.

I am not a hero, not even close, but that experience really taught me a lot! We at the NCA Journal know there are many, many amazing nurses, practitioners, doctors, respiratory therapists, unit clerks – people who have gone above and beyond their expected duty to touch babies and families in a positive way. We'd like to hear these stories and share them with you in our next NCA Journal edition. If you have an incredible experience you'd like to share, then email us at service@neonatalcareacademy.com.
If your story is chosen for publication, your hospital or clinic will receive a $500 unrestricted education grant. On behalf of the entire NCA Journal team, we'd like to say a profound thank you for all you do to enhance the lives of those you serve and we look forward to sharing your stories!

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