The History of Neonatology
A Personal Reflection
BABY SPED TO BOSTON
Has Trouble Breathing; Kennedy Stands by Here
BY DOUGLAS S. CROCKET
Patrick Bouvier Kennedy—first child born to a United States President in office in 65 years—brought a puzzling new mystery to Children's Medical Center this morning.

Reports of the baby's condition and progress in his fight, were sparse, but shortly before midnight White House Press Secretary Pierre Salinger said the baby was not in critical condition.

That was the last report given out at 4 a.m. President Kennedy, who flew back to Washington, spent an anxiety-ridden evening at the White House. The President, who visited his third child shortly before its birth at Children's Medical Center, retired for the night after almost an hour with the baby in the nursery.

On his return to Washington, Mrs. Kennedy, who was still at the hospital, is expected to have her daughter transferred to the hospital in a few days.

Mrs. Kennedy's mother, Mrs. Hugh D. Auchincloss, is expected to arrive tonight.

The baby, a girl, is less than 4 months old. A former child of Mrs. Kennedy's parents, the baby was born in New York City.

President Kennedy visited the baby earlier today, just before he left for the hospital in Boston.

After visiting the baby, President Kennedy went to the hospital to see the baby's parents, who were both out of town.

The baby was transferred to Children's Medical Center in Boston for more intensive care.

Whole World Taken By Littlest Kennedy

He is only 4 months old, but Wednesday he took the heart strings of the world in his arms and made his way to the White House.

The story of Patrick Bouvier Kennedy, the baby of the Kennedys, has become one of the most captivating of the year.

The baby is a girl, as President Kennedy announced earlier today.

President Kennedy's visit was scheduled for Thursday, but was moved up because of the baby's condition.

The baby is expected to remain in Children's Medical Center for several weeks.

King Names FBI Agent
Powers to Head N.H. Sweeps
BY EUGENE W. NEWMAN
He is a Kennedy — He'll Make It

‘He’s a Kennedy — He’ll Make It’

In an effort to head off any potential difficulties, the President has named an FBI agent to head the New Hampshire sweeps.

The agent, who has been with the FBI for several years, is expected to be in New Hampshire within the next few days.

The move is seen as a precautionary measure, as some have speculated that the baby could be in danger.

The President has also ordered a full investigation into the baby's condition, including a review of all medical records.

The baby is expected to remain in Boston for several weeks before being transferred to Children's Medical Center in Washington, D.C.
Patrick Bouvier Kennedy

- Born @ 34 1/7 weeks  BW 2115 g
  - Via C/S @ Otis AFB Hospital Massachusetts
  - Developed RDS
Patrick Bouvier Kennedy

- Transferred to Boston Children’s Hospital
Patrick Bouvier Kennedy

- Boston Children’s Hospital Standard RDS Care
  - 1. Intravenous fluids or gavage feeding
  - Temperature controlled isolette
  - 100%O₂
  - Hyperbaric O₂ if no response to 100% O₂
Patrick Bouvier Kennedy

- Maria Delivoria-Papadopoulos while @ Toronto Sick Children’s Hospital had successfully treated RDS with a modified Bird-type “respirator” and offered to come to Boston to help with care.
Patrick Bouvier Kennedy

- Papadopoulos was not consulted as the Americans did not want a Canadian treating the President’s son.
- Patrick died @ 39 hours of age.
The first neonatal board exam was 1975

- The same year I entered medical school
We were soldiers once and young......
I was privileged to be a student of some of the founders of modern neonatology

- Mel Baden
- Robert DeLemos
- Lou Gluck
- Joe Butterfield
- Clemment Smith
- Millie Stahlman
- Errol Alden
The Nineteenth Century
Pierre-Constant Boudin

- French Obstetrician
  - Stressed hygiene for mothers and their babies
  - Realized Breast milk was superior to cow’s milk for babies
    - If cow’s milk was used it should be sterilized
  - Developed the “gavage tube”.

- Stressed hygiene for mothers and their babies
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Etienne Stephane Tarnier

- Understood that the premature suffered from hypothermia
- Developed the first “infant incubator”
The Twentieth Century
Abraham Flexner
Abraham Flexner

Authored the “Flexner Report” in 1910
Flexner Report

1. Reduce the number of medical schools in the US (155 in 1910!)
2. Increase science prerequisites for entering medical training
3. Train physicians to practice a science based medicine
4. Give medical schools control of clinical instruction in hospitals
5. Strengthen state regulation of medical practice
Alexander S. Wiener 1930-40

- Hematologist
- Co-Discoverer of Rh factor
- Demonstrated that sensitization to Rh factor was cause of majority of cases of Erythroblastosis Fetalis and kernicterus.
Clemment A. Smith

- “Physiology of the Newborn” 1946
Clemment A. Smith

- “Physiology of the Newborn”
- First systematic investigation into the unique physiology of the Newborn and the transition from fetal to extra-uterine life
Louis K. Diamond

- “Father of Pediatric Hematology
- Delineated the cause of Erythroblastosis Fetalis
- Co-Identified the Rh factor and Rh sensitization as the leading cause of allo-immune hemolytic anemia
Louis K. Diamond

- Performed the first exchange transfusion via the umbilical vein in 1946.
The History Of Neonatology

- Henry Ford Hospital Center for Weaklings (1946)
- 1. Admit to center
- 2. Place in 100% O₂; heated incubator
- 3. If alive at 12 hours begin dropper feedings via gavage with mother’s milk 2 drops hourly increasing by 2 drops every hour to 50 drops per hour.
Lula Lubchenco 1950-52

- Demonstrated the role of excess oxygen in the development of retinopathy of prematurity (ROP)
Lula Lubchenco 1960

- Published the first of the “Lulagrams” which showed the relationship of birth weight to gestational age.
  - Before this most babies that were low birth weight were considered premature.
  - Established the terms SGA, AGA, LGA.
Virginia Apgar

- Devised a scoring system that described the success of intrauterine to extra-uterine transition. (1954)
Virginia Apgar

- Now known as the APGAR scoring system
Robert Usher 1957-1963

- Demonstrated that intravenous glucose infusions and judicious use of NaHCO\(_3\) reduced mortality of premature infants
Robert Usher

- Pioneered regionalization of Neonatology in Canada
Richard Cremer 1958

- Published first report outlining the use of phototherapy for jaundice
Mary Ellen Avery

- Realized that “Hyaline Membrane Disease” was not caused by the membranes seen on microscopy of pathologic specimens.
Mary Ellen Avery
Mary Ellen Avery

- Avery compared the lungs of babies who died of respiratory distress syndrome (Also called Hyaline Membrane disease) with normal animal lung and realized the “membranes” were not the cause of the condition.

- The hyaline membranes were a marker of the condition called RDS
Mary Ellen Avery

- Premature lungs lacked a soapy material that came to be known as surfactant.
Louis Gluck

- Established the “first” NICU in New Haven CT (1960)
- Developed the L/S ratio
Reported success in ventilating infants with RDS 1963-64
Maria Delivoria Papadopoulus

- Modified an existing “Bird” adult respirator
Success was noted when PPV was instituted earlier.
John Gorman / Vincent Freda
1968

- First demonstration of anti-human globulin in Rh-sentization: RhoGam
Graham Liggins / Ross Howie
National Women’s Hospital, Aukland, NZ  1969-72

- First randomized controlled trial demonstrating antenatal glucocorticoids in threatened preterm labor significantly reduced the incidence of RDS in the subsequently born babies.
William H. Tooley / George Gregory 1971

- First successful use of Continuous Positive Airway Pressure (CPAP)
  - Reduced mortality due to RDS by 50%
Forrest Bird 1957
Forest Bird 1969
L. Joseph Butterfield

- Pioneered the concept of “regionalization” in peri-natal and neonatal care.
- Established the first NICU in Colorado 1965.
L. Joseph Butterfield

- Along with Fred Batagglia and James Shira established the “Aspen Conference”
William Oh 1968-73

- Standardized the understanding of fluid & electrolyte therapy in the neonate
Marshall Klaus / Avory Fanaroff 1974

- First edition of the book: “Care of the High Risk Neonate”
Wilford Hall USAF Hospital
1968-1980
Wilford Hall USAF Hospital

- Remarkable production under Bob deLemos
Bob deLemos @ Wilford Hall USAF Hospital

- First practical infant ventilator (1967)
  - Continuous bias flow
  - Ability to provide PEEP
  - Became the impetus for the Baby Bird
First use of doppler ultrasound to indirectly measure blood pressure in infants (1971)
Bob deLemos / Wilford Hall USAF Hospital

- First practical HFOV (1980)
- Became the prototype for the Sensormedics HFOV ventilator
Bob deLemos / Wilford Hall USAF Hospital 1973-78

- Designed, tested and implemented the first self-contained transport isolette system
Bob deLemos / Mel Baden

- Established the first airborne neonatal transport capability
Technological developments in the 1970’s

- Imaging
  - Echocardiography
  - Ultrasonography
- Pulse oximetry
- Miniaturization of lab testing
- Refinement of vascular access
Tetsuro Fujiwara (1978-92)

- Developed the first successful surfactant replacement therapy for premature babies with RDS
- First FDA approved treatment in 1986
Jesse Roberts / Warren Zapol
1992

- Reported the first successful use of inhaled nitric oxide (NO) for the treatment of PPHN
Advances

Revolutionary
- Ventilation and CPAP
- RhoGam
- Antenatal Corticosteroids
- Surfactant replacement
- Inhaled NO

Evolutionary
- With each “revolutionary” advance smaller and more medically complicated babies required care.
  - Better Fluid & electrolyte
  - Better nutrition
  - Better developmental care