



INSIGHTS

Honoring Professor Maria Delivoria-Papadopoulos

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The Neonatology community mourns the loss of Dr. Maria Delivoria-Papadopoulos, a pioneer and legend in the field of Neonatal-Perinatal Medicine. Maria passed away on September 11, 2020 and has been credited with saving thousands of neonates and improving the outcomes for thousands more. She was Emeritus Professor of Pediatrics, Obstetrics and Gynecology, and Physiology at the University of Pennsylvania School of Medicine and Professor of Pediatrics, Obstetrics and Gynecology, and Physiology at Drexel University and the Ralph J. Brenner Endowed Chair in Pediatrics at St. Christopher’s Hospital for Children.

Bertold Brecht (1898–1956) wrote: “There are men who struggle for a day and they are good. There are men who struggle for a year and they are better. There are men who struggle many years and they are better still. But there are those who struggle all their lives; These are the indispensable ones.” Without a doubt, Maria was one of the indispensable ones!

Maria Delivoria-Papadopoulos, M.D., was born in Greece. She received her undergraduate degree in Philosophy at the Sorbonne University and her medical degree at the National University, both in Greece. She came to the United States in 1959 for an internship in pediatrics at St. Francis and County Hospitals, University of Kansas. In 1960, she completed her pediatric residency training at the Jewish Hospital of Brooklyn and King’s County Hospital, Downstate University. After completing a 1-year residency in psychiatry at Colorado State Hospital and the University of Colorado Medical Center, Maria traveled with her husband Christos to pursue a postgraduate fellowship in pulmonary physiology in 1962 with the preeminent Paul Swyer at the Hospital for Sick Children in Toronto. After completion of her pulmonary fellowship in 1965, Maria returned to the University of Colorado for a fellowship in Neonatal and Fetal Physiology, working with Lula Lubchenko, Fred Battaglia, and Giacomo Meschia. She was subsequently recruited to work in the physiology laboratory of Robert Foster at the University of Pennsylvania, School of Medicine in 1967 where she was appointed to the faculty as Instructor and ultimately earned the distinction of Professor of Pediatrics and Obstetrics and Gynecology in 1976 and Professor of Physiology in 1977. In 1996, the Dean of the University of Pennsylvania School of Medicine recognized Maria’s unique abilities to attract academic colleagues from around the world, inviting them to collaborate in the neonatal research laboratory she developed and appointed her Associate Dean for International Medical Programs.

Maria’s career spanned over six decades, teaching, helping, investigating, mentoring, and touching the lives of innumerable young trainees, including medical students and residents for whom she was, simply, “Maria.”

Maria was an extraordinary woman who demonstrated for the first time that premature neonates with respiratory distress could indeed be mechanically ventilated. She received numerous prestigious awards, including the American Academy of Pediatrics Lifetime Achievement Award, the Virginia Apgar award (in 1997) (Figs. 1 and 2), the Ralph Brenner Endowed Chair in Pediatrics from the St. Christopher’s Hospital for Children in recognition of her lifetime dedication to improving the health of children (2006), the Castle Connolly National Physician of the Year Lifetime Achievement award (2007), the Trust Fund of the Alumni Association of Women’s Medical College, Phyllis Marciano, M.D., Woman in Medicine Award (2014), and the Mary Kalopothakes Award from the Hellenic Medical Society of New York. She was a member of numerous professional organizations, including the American Pediatric Society, the American Physiological Society, the Society for Pediatric Research, and the American Academy of Pediatrics. Maria was inducted into the Philadelphia Pediatric Society Hall of Fame, and was recognized and honored with the “Legends of Neonatology” Award in 2007 at an inaugural event to establish the Neonatology Hall of Fame (which recognizes outstanding individuals who have contributed to the care of the neonatal patient). She was recognized for her leadership, teaching, and status as a role model for women in medicine. She dedicated her life to “her children” and had a strong commitment to excellence (Fig. 3).

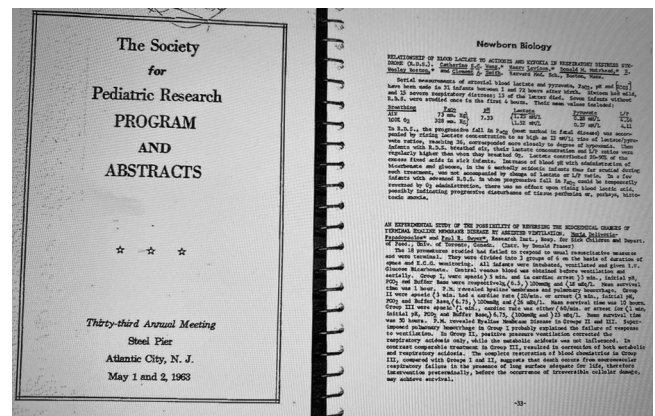


Fig. 1 Scan of the SPR 1963 Program. Abstract presented at the 33rd Annual Meeting of the Society for Pediatric Research, Atlantic City, NJ, May 1–2, 1963.

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Fig. 2 Apgar Award Ceremony 1997. Maria Delivoria Papadopoulos receiving the Apgar Award in 1997.



Fig. 3 Apgar Award received by Dr. Delivoria-Papadopoulos in 1997. Picture of her award hanging on her office.

Maria's concern for the health of sick neonates and her quest for scientific advancement to improve survival for those who she had watched helplessly succumb to hyaline membrane disease was the driving force that propelled her to investigate the therapeutic efficacy of assisted ventilation. In 1962, in collaboration with Paul Swyer at the Hospital for Sick Children, Maria was the first clinician to pioneer the treatment for hyaline membrane disease using mechanical ventilation in premature neonates (Figs. 4–13). In fact, Maria was contacted by the White House in 1963 when Patrick



Fig. 4 Friendship. Postcard for Maria from Dr. Paul Swyer.



Fig. 5 Picture from the past. Sick Kids in Toronto (c. 1962).

Kennedy was born prematurely and developed respiratory distress syndrome with the hope of ventilating the neonate. Unfortunately, she only had one ventilator and it was being used on another neonate at the time.

Although Maria respected the lung and its intricate functions, she became fascinated with blood as an oxygen-carrying tissue. In collaboration with Frank Oski in 1976 at the University of Pennsylvania, she investigated the use of exchange transfusion with adult blood to improve tissue oxygenation and survival in critically ill premature neonates suffering with hyaline membrane

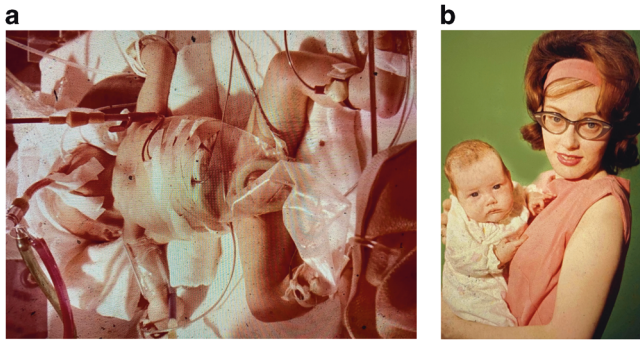


Fig. 6 Picture of one of Maria's babies. **a** Baby L (Toronto)—January 9, 1963. **b** Baby L (Toronto)—February 1963.



Fig. 7 Celebrating with patients. Maria Delivoria-Papadopoulos, MD, former Chief of Neonatal Care, St. Christopher's Hospital for Children, Philadelphia, attends Dr. Swyer's retirement dinner in 1986 and hugs the first ventilator survivor—who she cared for as a fellow in the early 1960s (Reproduced with permission from: Reese, C.N., Reese, J. Reflections on the early years of neonatology. Paul R. Swyer: the beginnings of Canadian neonatology at The Hospital for Sick Children in Toronto and insights into his early career. *J. Perinatol.* **38**, 297–305 (2018). <https://doi.org/10.1038/s41372-017-0015>) Reproduced with permission.

disease to further enhance survival. To this day, a number of neonatology fellows, pediatric residents, and former medical students can recall the experience they had at the Hospital of the University of Pennsylvania in the "Premie Nursery" when they assisted in the exchange transfusion of the critically ill premature neonate. How glorious it was to witness the struggling dusky neonate miraculously change color to pink; how awesome it was to see, in vivo, the work of breathing decrease as the mechanical



Fig. 8 Technology in the 1960's. Negative Pressure Ventilator—Toronto (1965).

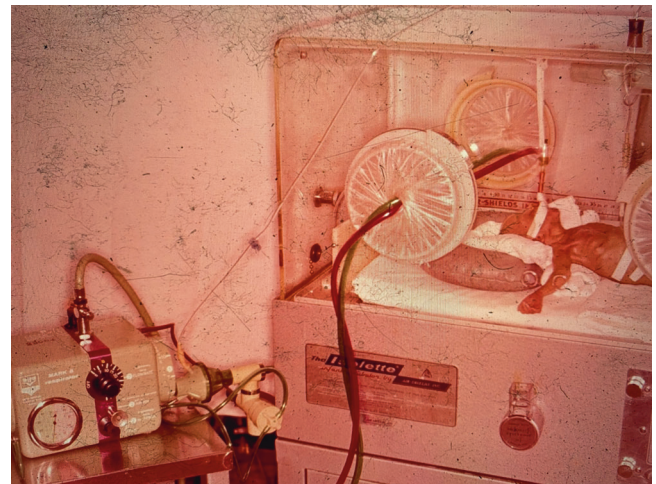


Fig. 9 Technology in the 1960's. Bird Mark VIII respirator with home-made infant circuit.



Fig. 10 Maria at work. Pictures from Sick Kids in Toronto (given to the authors by Dr. Delivoria-Papadopoulos).

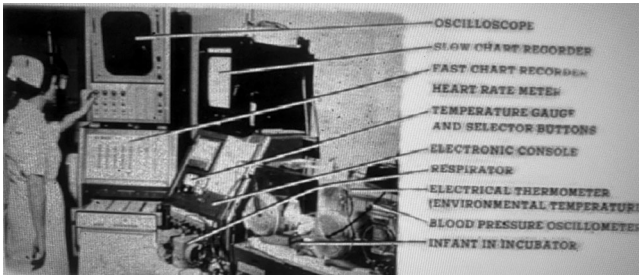


Fig. 11 Maria at work. Pictures from Sick Kids in Toronto (given to the authors by Dr. Delivoria-Papadopoulos).

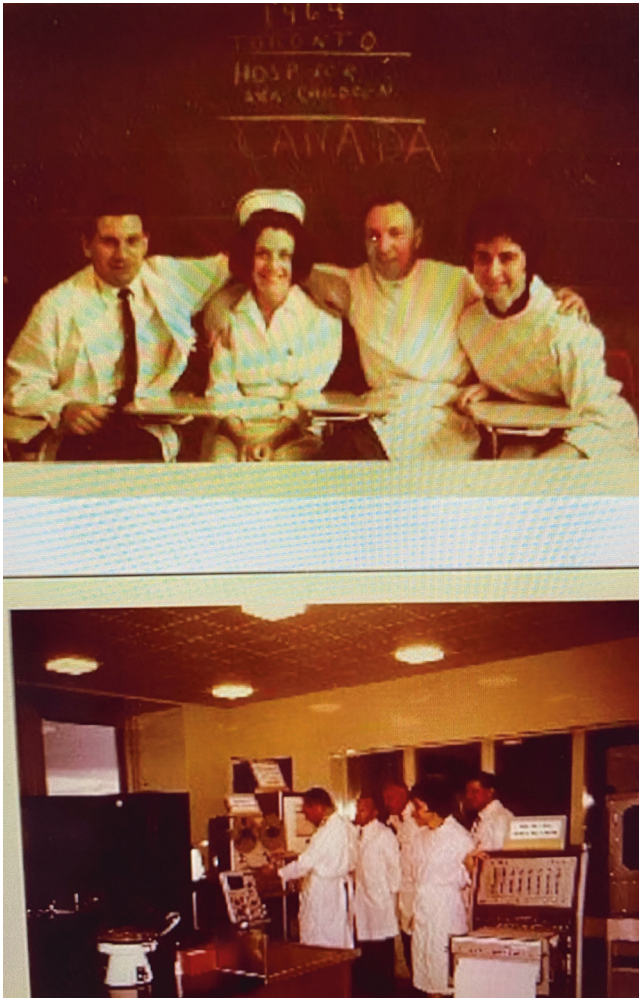


Fig. 12 Maria at work. Pictures from Sick Kids in Toronto (given to the authors by Dr. Delivoria-Papadopoulos).

removal of neonatal blood, substituted with fresh adult blood (oftentimes with Maria's own blood), gave them a second chance at life! All the while, Maria was standing at the bedside, teaching, encouraging, giving credit to the young trainee that what he/she did was helping to make the neonate better. By the end of the night, everyone, including the exhausted house officer, was able to sit down and sequentially reconstruct the oxygen-hemoglobin equilibrium curve from memory as it shifted to the right, for every few aliquots of blood exchanged!

She has been known to state that, "We don't always know the answers, but we should never stop asking the questions. In each case we have taken steps toward the answer.



Fig. 13 Maria at work. Pictures from Sick Kids in Toronto (given to the authors by Dr. Delivoria-Papadopoulos).



Fig. 14 Maria relaxing. Fishing trip in native Greece, 2019.

Each investigator builds on the steps taken before, sometimes with new tools, and occasionally with the special insight which leads to a leap in understanding. What we do not now understand, we will."

What would you say to a young student?

If you want so much to do something, pursue it and do it. There will be difficulties, you have to work them out... You

have to have persuasion, persistence and faith in what you do.
And things don't come very easy; you really have to work hard.
Don't back up

First be sure that the babies are well taken care of!

We will remember Maria as one of the few women among the first pediatricians who established neonatology as a subspecialty. She overcame not only the disadvantage of being a woman but also the difficulties of being an immigrant. As a scientist, she continually evolved. She started out in sheep physiology and adapted to molecular biology submitting her last paper for publication in August less than a month before her death. But she was not all work and no play: she loved to fish and regularly delighted in fishing trips to the mountain west and her native Greece (Fig. 14).

In many of her lectures, Maria would quote Robert Frost (*The Road Less Traveled*):

I shall be telling this with a sigh
Somewhere ages and ages hence:
Two roads diverged in a wood, and I –
I took the one less traveled by,

And that has made all the difference.

Thanks Maria for choosing the less traveled road! You were not only the mother of Neonatology—you were (and will be) the mother of many neonatologists!!

Please read excerpts of Dr. Delivoria-Papadopoulos interview for the Section of Neonatal-Perinatal Medicine of the AAP, done by Dr. Sergio Golombek on 21 March, 2017, in the Supplementary Material.

ADDITIONAL INFORMATION

The online version of this article (<https://doi.org/10.1038/s41390-020-01282-9>) contains supplementary material, which is available to authorized users.

Competing interests: The authors declare no competing interests.

Patient consent: Patient consent was not required. The pictures were given to the authors by Dr. Delivoria-Papadopoulos.

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