

## **The Changing Landscape of Neonatology**

Mark C. Mammel, MD

Professor of Pediatrics

University of Minnesota

Director, Neonatal Research & Education

Children's Hospitals & Clinics of Minnesota, St. Paul

How are things changing? Let me count the ways. We are in the midst of a sea change in the practice of neonatology, especially for those of us who've been around the block a time or two. By the way, that includes most of us; the latest statistics from the AAP show that the average age of practicing neonatologists is now 53 years. So though we like to think of ourselves as a young specialty, this is only true if we're looking at when the first subspecialty exam was offered.

Virtually everything has changed since the 1970s. Since change is both inevitable and necessary, let's agree from the outset that it is by definition good. This is not to suggest that all changes are good, or beneficial, or for the better, but if we look at the statistics available describing how we're doing with the vulnerable little folks we care for (as we do in our publications), it's hard to argue that things are getting worse. Survival of the 28 week 1000 gram infant in 1975 was <20%; in 2007 it was >90%. Mortality from meconium aspiration syndrome has plummeted. The introduction of artificial surfactant therapy has made death from RDS uncommon, and has changed the placement of a chest tube from an intern procedure to one fellows strive to learn. Mechanical

ventilators are all basically computers, and we have rediscovered our first effective therapy, CPAP, and cast it in an entirely new light. Trainees no longer work every other night, families are welcomed into the nursery day and night- even during rounds- and the very nurseries in which we work have private rooms instead of long, airplane hanger-like spaces stuffed with incubator after incubator. We dispense drugs by the dose, chart on computers, and try to practice using what's called "evidence-based medicine," even though there is still precious little evidence for much of what we do. Why, we've entered into a Golden Age.

Sort of. It's certainly a more complex age, and busier too. Another way of looking at the changes is to replay a day from the dim, distant past compared to one today. We are all the products- or victims- of our pasts, so I am limited to a description of the one I remember. But while the details vary, I suspect my experiences aren't so different from those of others who came up during the 1970's and 80's- a time when our specialty began to define itself, find its essence, and discover who we were trying to be.

It's a weekday in the winter of 1982 at the Children's Hospital in St. Paul, Minnesota. I am the new kid on staff, getting ready to make rounds on the 25 babies in the nursery. Rounds start at 9 am with the 2 second-year pediatric residents, our OB resident and the nurse practitioners on the service. Nurse practitioners are relatively new on the scene, though they've worked in our nursery for a few years. They have an unusual role here, functioning sort of like a pediatric resident in that they have a team of their own, directing the care of their babies as well as doing procedures, attending deliveries, and going on transport, the more recognized roles for these developing nursing professionals. I roll in about 8:00, grab a Diet Pepsi (at the cost of twenty-five cents) ,

and head to the nursery from our office, just down the hall. I'm the first one here; one of my partners is on research this month and does whatever he has cooking- projects, reading, writing, the occasional hospital committee meeting. He'll roll in around 9. My other partner should be in closer to noon if the level II nurseries he is covering treat him well. Then, he will see consults, do discharge summaries and be on the pager for the outside hospitals. Since I'm attending at Children's for the month, I was on call the previous night, and will back up the fellow tonight. During the week I will cover 2 nights, the fellow 2 nights with me as backup, and we all share the weekends, which we consider to be Friday night until Monday morning. We take call from home; on a quiet day that means home around 6 pm and possibly a good night's sleep; a busy day may mean an uncertain departure, if departure is in the cards at all.

I take the pulse of the unit, entering to a reception desk separating 2 large rooms of babies, nurses, doctors, and noisy monitors. No doors separate these spaces. The sound and feel of the nursery buzz immediately tells me whether things are still calm and quiet, or whether there's trouble brewing. Looking to the left, where a half dozen incubators line each exterior wall with a long island of sinks, charts, and equipment occupying the middle of the room, and looking to the right, where I see essentially a mirror of the other side, I look for that telltale sign of trouble- a flurry of activity around an infant. I quickly examine new patients and gather together the all-important admission paperwork so I can dictate any remaining attending admission notes, where the key data are summarized and the gestational age, diagnoses, and plan documented for eternity. At 9:00 I round up the troops and we head down a floor to the X-ray department, where we review films from the last 24 hours with one of the 2 pediatric radiologists. We usually

see the natural progression of RDS, from the early reticular-granular films to the various air leaks to the chronic films of the survivors with BPD, the scourge of the otherwise well but “tiny” 1200 gram baby. If we have any films with a particularly interesting malpositioned ET tube or umbilical catheter, it could be promoted into the ever-popular teaching file and slide show called “Boobs with Tubes.” We finish X-rays and head back to the nursery.

Rounds start on the intensive care side of the nursery. The rounding team consists of the fellow, the residents, the charge nurse, an NNP, the bedside nurse (unless the inviolable break schedule gets in the way), maybe a parent (as we have always had the policy that parents, when they choose, can be present during rounds), and me. A couple of days a week we add a dietician and a pharmacist. The resident or NNP presents the patient, the fellow and I listen to any necessary murmurs or seek bowel sounds in the silent abdomen, we discuss the problems, do some teaching, and move on to the next one in line. Another NNP is roaming the nursery, attending to the details of the morning as we work to maintain the illusion of control. Occasionally the fellow may be called to assist with an intubation. (This may provide one of those rite of passage moments for a new fellow, when the NNP has missed the first attempt and says “I’d like Dr. Mammel to intubate this patient.” I know this means that she doesn’t yet trust the fellow, so of course I turn to him and say “Pat, go intubate the patient with Bonnie.” He does, establishes some credibility in the unit, and we press on.) There are just 5 babies on ventilators- mostly BP-200s, basic pressure-preset IMV machines. One baby with aspiration syndrome is on an old Bourns LS-104-150 volume ventilator, complete with slide rule to calculate delivered volume- a guess at best, and a fairly primitive machine,

but when you have one stuck in 100% O<sub>2</sub>, you do what you can. I might try a new kind of device, a jet ventilator, if I really feel against the wall, but we have just started to think about this, after talking to Ivan Franz in Boston and after a visit to Miroslav Klain in Pittsburgh. Our smallest baby is a 26 week 800 grammer. On the vent, he probably will get a week of Decadron when he's still stuck at 10-14 days. Most of the time, we wrap things up about 10:30. The residents and NNPs write hyperals, and I mentally list the families I need to see, the issues I need to discuss with the social worker, and the referring doctors that need a phone call. I check with the charge nurse about any deliveries which are hanging fire but still may be imminent. The fellow and I divvy up the tasks, and agree on a time to meet for lunch.

Lunch is in the Doctor's dining room, shared with the adult specialists from the contiguous adult facility. The hospitals are connected at the perinatal center, with the nursery across the hall from Labor & Delivery. We usually have a large table, with any of my partners who are in the hospital, a very entertaining pediatric forensic pathologist, the occasional GI doc or ped surgeon. Movie reviews frequently play a role in the discussion, and a couple of days a week we have fabulous home-made whole wheat chocolate chip cookies, which sometimes are lunch all by themselves.

The afternoon is made up of finishing the things left from morning, as well as seeing new patients, reading journals (you remember, those printed and bound articles), talking with consultants, and checking in with my partners. We have just started dictating short rounding notes, which our secretary types on sticky-backed paper for the charts. With just the three of us, we can all descend into someone's office spontaneously and sort out whatever issues any of us have on our minds- should we increase our activity

at the level II nurseries around town, would this be a good idea for a clinical study, what about the meeting coming up. As the afternoon heads towards evening, I get ready to take the beeper and go home. The residents share every third night call, and the OB resident always has an NNP on with him or her. We are working to staff every night with NNPs since it's become obvious that the way we were trained- left alone for the night, regardless of experience or interest, with the expectation from our staff that we would be able to rise to the occasion if procedures needed to be done, IVs started, and so on- left a lot to be desired in regards to patient safety. We sometimes stop for a beer at the University Club, just up the hill from the hospital. One of my partners is married, none of us have kids, we're all between 30 (me) and 41 (the senior guy).

Flash forward a quarter century. It's today. I'm attending on the same intensive care service, usually 30-35 babies. The Convo (convalescing) team has the other 15 or 20. We now attend in 2 week blocks; a month was killing us. It's about 7 am. I stop in the office, on the 5<sup>th</sup> floor of the Garden View building. The name reflects the beautiful garden below, in front of the main hospital entrance, which is about to be sacrificed for a larger ER, more surgery space, and general expansion. My 6 partners and I have offices here, as well as a call room for our now completely in-house call. One of my other partners is attending on the Convo team. Another is rounding at the 4 outside hospitals with level II nurseries. The rest are doing night call, on vacation or at conferences, attending meetings at all the hospitals where we cover, or, yes, trying to do some research. We are now on call about once in 3.5 days, with the in-house person based at Children's but covering the system. I check in with the person on the previous night (it's a fellow 2 nights a week on first call; I'll find out the more if that's the case!). Sign-outs

are quick, high points only, since most of the 50 or so babies are stable. I hear about the new admits, pick up my copies of my notes from yesterday as well as the admission dictations for the new babies, grab a portable phone, which I can use for dictation, and so on, and head for the unit.

Though the nursery is in the same location as it was in 1982, it's been completely rebuilt and enlarged. We now have 49 patient rooms, with one of them set up for triplets and 2 pairs of adjoining rooms for twins. The unit is huge, and the most immediately noticeable change is the silence. No beeping monitors, no yelling nurses, no clanging and thumping. The old nursery was blanketed in a general din, which we didn't recognize until we started over, and it wasn't there anymore. I walk past the reception desk, spritz my hands with some soap foam, and enter the patient care area through double doors. Still quiet. I walk past the 4 charge nurses- the 2 from nights and the 2 coming on for the day shift- and say hi. They will be on me if there's trouble, or if we're at capacity, or if we have too many sick calls and staffing problems. I walk by, unscathed. I head for the work room, where the night team is signing out to the day crew. Stuffed with computers, a special X-ray computerized access system, tables, and chairs, the NNPs, residents, and the fellow are usually here, though some will be seeing their patients, gathering numbers, and so on. The 2 or 3 NNPs who are always in-house are signing out. I check for fires needing attention, find the fellow, compare notes, and quickly grab a cup of coffee- a double Americano from the machine in the Professional Staff lounge (Starbucks- change for the better). The rounding team consists of 2 second year pediatric residents, the NNPs, the charge nurse for the IC team, a dedicated unit PharmD, and the bedside nurses (unless the inviolable break schedule gets in the way- some things don't change). The

residents, an NNP, the fellow, the charge nurse and I go to X-ray at 8:15 to review the now-digital films with the radiologist. We've seen them in the nursery since no hard copies exist anymore, but it's still time well spent to find out what we were supposed to have seen. We head to the unit.

Rounds are different every day because of the residents' schedules and the work-hour requirements. The residents have a continuity clinic one day a week, and are on call every fourth night, so most days we do the resident patients first. This means we hop around the nursery, making it hard for nurses and parents to predict our arrival. It's a problem, but so far we just have to live with it. We still do both level II and III care in the unit, but the acuity is higher, and we always have a group of less than 700 gram babies. There are 15 or so babies on ventilators, conventional and high frequency; though we use DR CPAP preferentially for babies 26 weeks or older, and we always have some convalescing small ones on high flow. Residents and NNPs still present the patients, but we have computers on rounds, review labs and X-rays on the fly, write orders, and I dictate a daily progress note before we move on. Since I use a hand-held phone, I can usually finish my note by the time the orders are written. When parents are at the bedside, I spend a few more minutes translating our rounds discussion; 5 or 10 minutes on rounds saves 30 minutes later. Two NNPs are circulating in the nursery putting out fires; the fellow also goes to the hot spots during rounds, and attends deliveries of the little guys or known complex babies who deliver while we're rounding.

With luck, organization, limited crises and cooperation, we finish rounds around noon or 1 pm. Usually still time for lunch. Since my partners are either rounding, working night call, or recovering, lunch is a quick affair. We still try to gather a group,

now more likely to include the intensivists, pulmonologists, and occasional radiologist. There are no more home-made cookies, and lunch these days is mostly about fuel.

We then head back- the fellow goes to the unit, I go to the post-partum floors, the office, or to family conferences. Still some referring docs to call, notes to proof on the computer, labs and X-rays to follow on my screen. Before I know it, it's 4 pm, the night person arrives, and I sign out. Unlike before, the ICU attending is never on call during the week, and always gets home at a reasonable time. We still have long weekends. I'm on the middle weekend of my rotation, and I will be on call in the house from early Saturday morning through rounds Sunday, generally out by 12 or 1 pm. We don't hang out as much after work; now, our ages range from 33 - 60, we all have kids, we all seem to have less time.

With 7 doctors, we now have monthly meetings since we can never count on seeing each other in the office. While the job hasn't turned into a "shift-work" position, it's closer than it used to be. We have databases, computers, lots of staff, more and smaller babies, more and better ventilators, and lots of the same questions. My mentor, Steve Boros, talked about the difference between the early '70s and the early '90s: where it used to be like flying a biplane, with goggles, no instruments, unreliable equipment and that seat-of-the-pants excitement that sometimes resulted in serious disaster, it has become more like flying a 747, with computers and staff, data, and reliability. Still possible to crash, but not so likely. Maybe not as exciting either?

I'm not so sure. The adrenaline rush is muted, I think, and that's a good thing. The biggest change is that we look beyond survival and extubation. We think in terms of a life, not an event. We are asking more and better questions, informally using our

databases, and formally in randomized controlled trials. We take less for granted. As our nursery and hospital have grown, some of the familiarity and “small town” vibe of the past is gone. But we are better at our jobs. We expect more. We certainly do more!

Things are different. But, there are things that don't change. We must remember that as physicians, our job includes reminding the administrators and accountants why they have jobs. We are caregivers but also the conscience of our organizations. We all need to be reminded of this now and again, especially with so many new trainees entering jobs as employed physicians, part of a prestigious university or a large, sometimes national staff. It's easy to feel too small to challenge the organizational behemoth! Yes, we are part of complex systems. But while we work with many important and indispensable colleagues, as doctors, we still have a unique responsibility that can be ignored or denied, but can never be transferred. We are trained to filter the data, decide the treatments, and protect our patients. That may mean there are times we have to jump the chain of command, ignore the committee structure, and just do the right thing. That will not change.