

HANDLE WITH CARE

Extremely preterm infants are exquisitely sensitive to pain and stress. Even so, there is no reliable way to recognize this suffering. How, then, to know? Sunnybrook researchers are tackling this very question, with an eye to measuring and relieving discomfort in babies born much too soon

It was her first job, and she never left it.

Dr. Sharyn Gibbins began caring for preterm infants as a nurse in the 1980s. Although she knew right away that she wanted to pursue training as a researcher, and eventually completed a PhD in 2001, she also knew what population she would end up studying.

“My heart has always belonged to the tiniest, most immature, fragile babies,” says Gibbins, now a neonatal nurse practitioner and associate scientist in the women and babies research program at Sunnybrook Health Sciences Centre. Extremely preterm infants are those born at 27 weeks or

earlier, and they typically weigh less than one kilogram. The smallest fit in an open hand and weigh little more than a can of pop.

These newborns require intensive care to survive, and are subjected to a host of medical interventions. At the same time, they are the babies least able to endure such procedures without feeling pain or suffering damage. Unfortunately, although there are over 40 measures of pain in full-term babies that provide effective guidance for doctors and caregivers, there are almost no reliable

pain measures for these extremely preterm infants.

In 2007, Gibbins set out to find some, in the first study of its kind. With Dr. Elizabeth Asztalos, director of Sunnybrook Research Institute’s Centre for Mother, Infant and Child Research, and colleagues at the Hospital for Sick Children in Toronto, Gibbins videoed and analyzed 50 of these infants undergoing a painful procedure (heel lance, used to draw blood) and a nonpainful procedure (diaper change). The researchers, who are also faculty members at the University of Toronto, looked for physiological, behavioural and biochemical changes.

Results were mixed. Salivary biochemical readings of the stress hormone cortisol, and physiological monitoring of heart rate and breathing showed no differences during the two procedures. But the researchers did determine that four facial actions—brow bulge, eye squeeze, nasolabial (nose-to-lip) furrow and vertical mouth stretch, all of which are established indicators of pain—were significantly present during the heel lance.

“They’re good signs for us to recognize, and then use to determine what else we should do to return that baby to a steady state,” says Asztalos. Gibbins was also pleased with the study. “I think it is important,” she says. “It is the first paper that has critically looked at this population.” But, she adds, “It highlights that facial expression is only part of the puzzle.”



MARIE BAGG AND DR. SHARYN GIBBINS



The other part of the puzzle, Gibbins expects, is body movements. She and Asztalos are therefore launching a larger study that will look at movements in the arms, legs, hands, feet and head, along with facial expressions, to see if they will provide additional information on what these infants feel.

A big challenge in measuring pain in these babies, explains Asztalos, is that how they respond to a painful or stressful maneuver is partly dependent on their developing central nervous systems. “An infant with a very immature central nervous system may not have the capacity to demonstrate some of the behaviour that you see in more mature babies,” she says. And that state of development varies greatly in infants with a gestational age of 24 weeks compared with those at 32 weeks, or even 28. “Technically, that ability to respond to pain is not required for a 24-weeker,” says Asztalos. “They shouldn’t be out there. They should be in the uterus, which cushions the baby so that they don’t have to feel pain.”

Twenty years ago, only about 40% of those very preterm babies were “out there” at all. Today, owing to research-driven changes in care and new technologies, about 65% of babies born at 24 weeks’ gestation survive; babies born at 26 weeks or later have a survival rate above 90%.

Improvements in ventilation techniques and medications, including antenatal steroids for pregnant women at risk for

delivering a preterm baby, have been critical. Nutritional practices have also changed: it is now standard to start feeding preterm infants the day after birth, while it was once common to start on day three, by which time many infants had already entered a state of metabolic breakdown. “The whole thinking process of how we approach these babies has evolved, so we’re much more proactive supporting them,” says Asztalos.

Also, the environment of the nursery has changed. Sunnybrook’s neonatal intensive care unit (NICU) is quieter than it once was, and each incubator is shielded from harsh lighting, which research has shown can dramatically enhance infant comfort. When the women and babies program moves into its new state-of-the-art home at Sunnybrook’s Bayview campus in 2010, the entire NICU will have controlled lighting, noise-reduction features and several other design elements intended to ease stress on its tiny patients.

“I think the overall appreciation of how vulnerable these babies are has changed,” says Gibbins. “And the whole movement of pain is being driven by so many professional groups that it’s no longer okay to deny anyone’s pain, including an infant’s. It’s just not okay.” Critically, research again has shown that when babies are in stress or pain, they are more susceptible to other medical problems; hence the importance of further research, including Gibbins and Asztalos’ new study, that will show more

definitively what hurts these preterm infants and what interventions alleviate their discomfort.

That research, however, is difficult to conduct. Not many of these babies are born, even in a city as large as Toronto, which has three NICUs. The size of the infants makes getting enough recording equipment into the incubators a technical challenge and a lot of work for research personnel. And, says Gibbins, “you’re asking parents to participate at a really horrible time in their lives. I’m a bit envious of people who study healthy populations of [full] term infants.”

For all these reasons, when Gibbins proposed a study on very early babies for her PhD, her thesis committee told her, “Don’t study them. You’re not going to finish, and the goal of a PhD is to learn research and move on.” Though it ran strongly against her emotional inclinations, says Gibbins, the advice was good. It also helps explain why researchers still don’t know enough about these babies—a gap Gibbins is determined to fill. “I finished my PhD in four years, published, and since then have worked on the population I’ve always wanted to study, without the constraints of school.”

— Jim Oldfield

The Hospital for Sick Children Foundation funded Gibbins and Asztalos’ research. The Canadian Institutes of Health Research is funding the new and larger study.