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While SARS is increasing in prevalence throughout the world, there has not been a documented case of severe acute respiratory syndrome (SARS) in pregnancy until early 2003, when Sally* and her husband, Ken*, entered care at Holy Name Hospital in Teaneck, NJ, in March 2003.

From March through July 2003, we cared for this complex patient, which required careful planning and communication not only among staff at Holy Name Hospital but with other health care experts including staff in Sally’s obstetrician’s office and experts at the local, state and national levels. This was the first known case of SARS in pregnancy in the U.S. As such, the health care providers who cared for Sally during this time became pioneers in the development of protocols with the New Jersey Department of Health (NJDOH) and the Centers for Disease Control and Prevention (CDC).

As this patient was the only known pregnant SARS patient in the U.S., there was a critical need to balance patient privacy, confidentiality, general care needs and support with a worldwide need for knowledge about the outcomes from SARS infections.

*not their real names
Sally first entered Holy Name Hospital (HNH) on March 2, 2003, on the advice of her obstetrician via the Emergency Department (ED) complaining of an increase in “flu-like” symptoms. Sally was 20 weeks and 5 days pregnant.

Sally’s history included a recent trip to Hong Kong to visit her father. While there, she had contact with another relative who works in a health care facility that had reported a large number of cases of “unknown Chinese pneumonia.”

Upon return to New Jersey, her symptoms had worsened and she was admitted to HNH for medical treatment with a diagnosis of pneumonia. Antibiotic therapy using Timentin 3.1 gm every 6 hours and Zithromax 250 mg IV daily was initiated.

Sally was placed on contact and airborne precautions on March 4, and overnight she became increasingly dyspneic, developing rales, decreased breath sounds and poor oxygen saturation. A chest x-ray showed progressive pulmonary infiltrates and on day 3 (March 5), she was transferred to the Intensive Care Unit (ICU) with a probable diagnosis of atypical pneumonia.

Meanwhile, a discussion of suspected SARS had begun among her physicians, the infection control coordinator (ICC) and the infectious disease physician (ID). The New Jersey Department of Health and the CDC were notified on March 5 and the infectious disease physician (ID). The New Jersey Department of Health and the CDC were notified on March 5 (day 3) by the ICC and the ID prior to the confirmation of SARS. Those agencies then became involved in her ongoing care.

Because SARS is a newly recognized reportable communicable disease, little information exists regarding its effects on pregnancy. As a result, the CDC became highly interested in following Sally’s progress. While in the ICU, LDRP nursing staff assessed Sally’s status, including daily fetal heart rate monitoring. Additionally, Sally’s obstetrician and perinatologist consulted in her plan of care on a daily basis.

On day 4, Sally’s respiratory condition continued to deteriorate, as evidenced by an oxygen saturation level of 87 percent while on a 100 percent non-rebreather mask, resulting in subsequent intubation. Still, without a confirmed diagnosis, the possibility of tuberculosis and of H5 influenza were addressed with the addition of Rifampin 300 mg IV every 12 hours and Oseltamivir phosphate 75 mg by mouth twice a day for five days. Lovenox 300 mg IV every 12 hours and Prevacid 30 mg per nasogastric tube daily were added to prevent a pulmonary embolism and stress ulcers.

Sally’s nutritional assessment showed severe protein depletion with recommended supplementation. After intubation, a feeding tube was inserted to provide the nutritional support needed. Her laboratory values were monitored closely, and on March 4, three days after her ICU admission, she experienced an unexplained drop in her hemoglobin level from 11.4 to 8.6 and hematocrit from 34.3 to 25.7, necessitating a blood transfusion.

Repeated sputum cultures were obtained and showed gram-positive cocci. During the six days of intubation, her respiratory status improved. On day 7, March 13, she was extubated and was transferred from the ICU to a medical unit. At this time, isolation precautions were discontinued based on improved chest-x-ray results and negative follow-up sputum culture. Fifteen days after her hospital admission, Sally was successfully on her way to a full recovery and was discharged home.

A Positive SARS Diagnosis

The diagnosis of SARS was confirmed on April 4, by the CDC (after her discharge). The CDC informed the state epidemiologist who then notified the infectious disease specialist who was caring for this patient. The infection control coordinator in conjunction with the CDC and State DOH contacted all health care workers who had been exposed to Sally and asked them to participate in a surveillance investigation by the CDC for transmission of SARS to health care workers. Thankfully, no one tested positive for sero-conversion among HNH health care employees who cared for Sally.

Upon discharge, Sally continued to be followed by her obstetrician, and in May 2003, it was determined she had developed gestational diabetes as confirmed by an abnormal glucose tolerance test. Placenta previa was also identified, which would necessitate a surgical delivery.

Sally again came to HNH on May 14, 2003, for diabetes education and nutritional counseling. She was in her 32nd
week of gestation, with an estimated date of confinement (EDC) of July 14, 2003. Her pregnancy was considered high risk because of the placenta previa and was further complicated by the presence of gestational diabetes.

On May 28, she was referred back to the perinatologist for reassessment of fetal growth and placenta previa. An ultrasound showed that fetal growth was not compromised but did confirm a placenta previa. A caesarean surgery was scheduled for July 1, 2003.

Sally’s anxiety seemed high. Her concerns included pain during and after the surgery, being able to have her mother with her, and her ability to breastfeed as soon as possible after the birth. Sally was referred to the parent educator because she expressed concerns regarding cesarean delivery. Holy Name Hospital’s policy allows for a partner or relative to “room-in,” so having her mother stay to care for her and the baby was not a problem for the hospital. However, at the time, the CDC had imposed a two-week in-house quarantine for all visitors into the U.S. from the “hot spots” in China and Hong Kong. The infection control practitioner called the CDC to obtain permission for the patient’s mother to visit the hospital and was informed that the quarantine had been lifted.

It’s common and very important in Asian culture that grandmothers provide care for both the mother and baby. For Sally’s mother, this meant ensuring that her hospital room would be kept warm, that only warm foods would be offered to Sally, that bathing would be avoided for two weeks to prevent chilling and that Sally would be served ethnic soups that she would prepare to enhance healing and promote her milk supply.

Sally’s education included a tour of the maternity unit, a quick glimpse into the cesarean operating room (OR) and a short video on cesarean delivery. The goal of education was to help make this birth experience as normal as possible.

Sally continued to exhibit a high level of anxiety. The childbirth educator shared this information with the primary obstetrician (OB). Her anxiety was thought to be due in large part to her recent, life-threatening illness and subsequent hospitalization. Sally also expressed grief over the recent death of her father, which had occurred while she was at the most critical point in the ICU. Her concerns were also for the baby because she was 16 weeks pregnant when she became infected with SARS and received a large number of antibiotics and antiviral drugs. Ultrasounds indicated that the baby was thriving, but she was anxious to actually see and hold the baby, and to be reassured that the baby was not harmed by the virus or the drugs.

Inter-Agency Collaboration

In light of this patient’s history and the need for staff education, her case was presented to the director of Women’s, Children’s and Outpatient Services, the LDRP nurse manager and the maternal child health educator (MCHE). The CDC guidelines on SARS and HNH policy were presented by the MCHE to the entire hospital community. The ICC contacted the CDC

Box 1.

Sally’s Care Team in Developing the SARS in Pregnancy Protocols

Attendees at the teleconference included representation from the following disciplines.

**Nursing:**
- Nurse manager
- Maternal child educator
- Primary care nurses
- Infection control practitioner
- Lactation consultant
- Diabetic educator

**Medicine:**
- Obstetrics
- Pediatrics
- Neonatology
- Anesthesiology

**Other disciplines:**
- Respiratory therapy
- Laboratory
- Environmental services
- Maintenance
to determine the type of precautions that would be necessary during the surgery and postpartum stay. The lactation consultant also requested consultation on the safety of breastmilk.

To facilitate collaboration in her care, all key care workers were asked to participate in a conference call with the CDC and NJDOH on June 26, 2003 (see Box 1). This gave staff the chance to have questions answered by physicians at the CDC. The teleconference included a history of Sally’s illness and pregnancy complications including gestational diabetes and placenta previa.

The guidelines for care were developed in consensus with all participants and were based on the evidence of prolonged shedding of SARS-CoV in the stool of convalescing patients. However, no evidence of transmission has been seen from asymptomatic patients convalescing or otherwise. There is no evidence to date for perinatal transmission, and it is unknown whether the shedding of SARS-CoV in human birth products occurs. What is known is that certain animal corona viruses are associated with fetal infection and demise. It’s unknown whether birth products present an infection control risk in this circumstance.

Previous deliveries in SARS-infected pregnant patients in Hong Kong had been performed using infection control precautions. The guidelines developed for Sally’s care included (see Box 2 for sources for additional resources):

- a private room for Sally throughout hospitalization
- rooming in with her infant following birth
- breastfeeding would begin as soon as possible; it was decided that the benefits of breastfeeding would outweigh any of the possible risks
- the number of health care workers coming in contact with Sally and her baby was limited
- a negative pressure room was determined unnecessary pre- and postdelivery because Sally was asymptotic
- a negative pressure environment was preferred for the cesarean surgery
- contact and respiratory precautions were recommended using a fit tested N-95 respirator mask due to the possibility of aerosolization of blood and body fluids
- steps were taken to reduce the risk of aerosolizing blood/body fluid during suctioning of surgical field, such as prohibiting using suction devices with open side/finger control, turning off suction when not in use, limiting suctioning to the removal of large volumes of fluid from the field while keeping suction tip immersed in fluid, and so on

The CDC had specific requests regarding samples of cord blood, amniotic fluid, placental tissue and breastmilk to help provide additional information regarding the transmission of SARS. At delivery, maternal serum, cord blood and breastmilk all tested positive for corona virus. Blood EDTA, nasal pharyngeal swab, placental tissue and amniotic fluid all tested negative.

A written plan of care based on the teleconference was made available on the nursing unit prior to the patient being admitted on July 01, 2003. A primary nurse was selected early for Sally’s surgery and postpartum stay based on her expert clinical experience in labor and delivery and mother/baby nursing, a strong desire to provide thorough patient education, and her ability to provide exceptional emotional support.

All units and staff were alerted on a need-to-know basis about Sally’s condition. The planning also included a list of all staff to be called if the baby were to be delivered on a weekend. This was done to provide Sally comfort and continuity of care with the preselected care team.

The Birth of Sally’s Baby

The morning of surgery, Sally was accompanied by her husband and mother and was admitted to the LDRP unit. Although she had attended a cesarean preparation class and department tour just a few days earlier, she was still very frightened. She was greeted by her designated primary nurse,
who explained that she would be providing her care and would be with her through the surgery.

Sally was surprised that her primary nurse already knew her, exclaiming, “You know my name!” The nurse explained that she had been one of the nurses who visited her while she was very ill to listen to her baby’s heartbeat.

The nurse explained that everyone providing care for her would be wearing gowns and gloves, as requested by the CDC. She stated, “I just want to be normal. I am very afraid for my baby. The last time I came to the hospital for the flu and woke up many days later. I almost died.”

Using quiet conversation and gentle touch, the nurse completed admission procedures and preparation for surgery. As she worked, the nurse explained the rationale for each procedure. Applying the fetal monitor, she pointed out normal fetal heart rate (FHR) reactivity, leaving the volume audible, as she observed for any abnormal FHR patterns or contractions.

Sally properly performed self-blood glucose monitoring, and the nurse and lactation consultant worked diligently to make this a “normal” experience while maintaining and following the infection control recommendations.

All routine procedures and rationale for the use of personal protective equipment were explained to Sally and her family. Requests for various cultures both pre- and postdelivery were discussed with her primary obstetrician and nurse.

Her husband and mother were her family support, and all participated in the education and guideline review. Sally seemed well prepared for the child birth experience despite her anxiety, having attended prenatal classes prior to admission to HNH.

During admission, Sally informed the nurse that she had decided to bank cord blood for potential future use. Upon questioning, it was discovered that Sally had neglected to report her history of SARS to the private lab she had contacted the previous evening. After consultation, the lab decided to obtain a specimen at delivery of the placenta and maintain it in isolation for six months or until it learned the results of specimens collected for the CDC.

Part of the CDC’s recommendations for care of this patient included collecting a variety of fluid and tissue samples for follow-up testing. During her third trimester, Sally had declined requests to obtain additional blood samples. Sally’s physician explained the rationale for obtaining samples to determine whether or not she and her baby harbored any residual infection. In addition, the information obtained would help future individuals who might develop SARS. By providing gentle support, the nurse encouraged Sally to discuss this request with her husband and mother. She eventually agreed to permit collection of samples and signed the consent forms.

A room located near the nursing station, yet off the central corridors, was chosen to provide a private, supportive environment for the family and yet permit setup of isolation equipment required by the CDC. Postoperatively, Sally would initially require much assistance in caring for herself and her newborn. In addition, the newborn would require glucose monitoring to ensure normal adaptation to life outside the uterus postcesarean.

The nursing plan of care focused on Orem, Taylor, and Renpenning’s (2001) self-care deficits and teaching optional self-care:

- Providing a safe, supportive environment that would promote Sally’s ability to care for herself and her baby
- Promoting a sense of normalcy for this family
- Integrating the family’s sociocultural beliefs into her daily care
- Including the grandmother in all aspects of care
- Encouraging participation of Sally’s spouse and older daughter
- Maintaining privacy and confidentiality

Sally was transported to the unit operating room that had been converted to a negative pressure environment in anticipation of her surgery. All necessary equipment and medications were readily available related to the potential for hemorrhage intraoperatively (because of the placenta previa). Appropriate tubes and specimen containers were obtained from the lab. The pathologist met with Sally’s nurse before her surgery to clarify the proper procedure for the collection of specimens for the CDC.

Once Sally received spinal anesthesia, her husband was accompanied to the OR to participate with his wife in the birth of their second daughter. A healthy baby girl weighing 6 lbs. 15 oz. with Apgar scores of 9 and 9 was delivered. During the cesarean, Sally experienced heavier than normal blood loss related to her placenta previa, which was quickly brought under control with the administration of oxytocin.

As each of the rooms in the LDRP unit is a self-contained birthing suite, Sally was transported back to her own room for recovery. The baby was assessed in the normal newborn nursery. A blood glucose level was done. As soon as the baby was evaluated and all tests deemed normal, the baby was brought to her mother for the first time. The baby was positioned in a way that would eliminate any pressure on the abdomen. To the delight of her mother, and the lactation consultant, she latched on to the breast and began to nurse vigorously. As she cooed and sang softly to her baby, Sally said, “I’m so happy my baby is healthy.”

The baby remained in the patient’s room for the remainder of the day. A few hours postdelivery, Ken brought their other daughter in to see her new sister. Sally’s mother participated fully in the care of her daughter and granddaughters.

By day 2, Sally was ambulatory and relatively comfortable and continued to recover without incident. The 10 ml of
breastmilk requested by the CDC were collected prior to her discharge from the hospital. The lactation consultant and her primary nurse visited with Sally each day of her stay to reinforce her breastfeeding technique, to provide follow-up information and to provide the phone numbers for questions that might arise after discharge.

Sally’s anxiety level regarding the birth seemed to be replaced by the normal concerns of a new mother with a 3-year-old and a newborn to care for. She also expressed some delayed grief regarding her father’s death, and she shared her belief that her father interceded and helped her survive her near fatal illness.

The diabetes nurse educator made a postpartum visit to Sally three days after delivery. The baby was seen breastfeeding contentedly, and Sally said that the baby did not experience any complications. She was happy to hear that breastfeeding may protect her baby against having diabetes.

Sally confirmed that she would continue diabetes self-management with glucose tolerance testing in six to eight weeks, and indicated that she planned to keep herself healthy by continuing with meal planning and daily exercise. She affirmed that adherence to her diabetes regimen would help lower her risk for a later onset of type 2 diabetes.

Sally’s blood glucose levels remained in the normal range, and she looked forward to taking her infant home. Sally was scheduled for a three-month follow-up interview.

Throughout Sally’s hospital stay, each nurse who cared for her carried out a family-centered, self-directed plan of care. This family wanted desperately to be a “normal, healthy family” in the face of a previous SARS infection. By focusing on all normal aspects of care, the staff provided a safe, nurturing environment, while maintaining effective isolation techniques required by the CDC. Mother and baby were discharged to home in excellent health.

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