

Simpson, Semmelweis, and Transformational Change

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The first anesthetic for childbirth and the first recognition of the importance of hand hygiene in obstetrics coincidentally occurred within 5 months of one another in 1847. More than 150 years later, one would have thought that these milestone events would have been fully integrated into practice. However, individuals resist transformational change, which is defined as a fundamental alteration in their beliefs, attitude, and behavior, even when they are confronted with incontrovertible facts. This resistance to change may explain why, in 2005, a large percentage of health care providers still do not practice acceptable hand hygiene, and the pain of childbirth continues to be extolled by some as a necessary part of womanhood, just as pharmacologic pain relief is discouraged.

In the annals of medical science, 1847 was a remarkable year, as 2 momentous advances occurred within a 5-month span. In January, in Edinburgh, Scotland, James Young Simpson administered the first childbirth anesthetic,¹ and in

May, in Vienna, Austria, Ignaz Phillip Semmelweis first recognized the importance of hand disinfection to prevent the spread of puerperal sepsis.² Although both of these innovations were made by physicians tending to parturients, they would have broad implications far beyond the specialty of obstetrics. Indeed, these 2 developments led to a transformational change in the practice of medicine and surgery. Transformational change refers to a paradigm shift in one's fundamental beliefs, attitudes and assumptions. This transformational change has affected the lives and well-being of countless patients during the past century and a half. However, in their day, hostile reactionary opponents set in their ways battled both Simpson and Semmelweis. The story of these 2 pioneers and their contributions illustrates the slow rate of acceptance of transformational change.

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The first momentous event of 1847, childbirth anesthesia, could not have occurred without the efforts of a few daring individuals in the preceding years. The first

widely acknowledged successful public demonstration of anesthesia occurred on October 16, 1846 in Boston at the Massachusetts General Hospital. William Morton used ether to anesthetize Edward Gilbert Abbott, who underwent ligation of a congenital vascular malformation of the neck by John Collins Warren, Chief of the Surgical Service at The Massachusetts General Hospital.³

Simpson's first documented use of anesthesia for childbirth occurred in Edinburgh in January 1847 and came only 3 months after Morton's public demonstration in Boston. The first woman to receive anesthesia for childbirth in the United States was Fanny Longfellow, the wife of the poet Henry Wadsworth Longfellow, on April 7, 1847.⁴ Simpson was a leading obstetrician of his day and used the force of his personality to convince others that his innovation was meritorious. His contentious opposition focused on 2 distinct arguments: that relief of labor pain was contrary to God's law, and that the anesthesia was dangerous for the mother and baby.

The religious argument was based upon the statement in Genesis 3:16 "in sorrow thou shalt bring forth children" as punishment for women ordained by God because Eve had sinned in the Garden of Eden. Simpson, although not a theologian, argued that the interpretation of this biblical passage was in error, and that relieving childbirth pain was to be praised,

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ISSN: 0029-7844/05



not condemned. The debate raged on both sides of the Atlantic and was enjoined by many scholars. For example, in 1849, an editor of a Canadian medical journal asked Rabbi Abraham De Sola of Montreal to expound on Genesis 3:16. Using Hebrew biblical scholars as his source, Rabbi De Sola wrote that the correct interpretation of Genesis 3:16 was that with toil or labor shall women bring forth children, rather than with pain. He thus concluded physicians administering anesthesia in childbirth were not transgressing the word of God.⁵

As word of Simpson's accomplishment in Edinburgh spread, women began asking for pain relief for childbirth. Simpson's work was amplified and expanded by a renowned London physician, Dr. John Snow, who developed methods of quantifying chloroform to better control the dose administered. He administered chloroform to Queen Victoria to relieve the pain accompanying the birth of her seventh and eighth children in 1853 and 1857. The queen's consent to use chloroform provided childbirth anesthesia with a royal imprimatur, and made it much more acceptable to the general public. When her oldest daughter, Vicky, delivered her first child in 1859, the Queen remarked, "What a blessing she had chloroform. Without it I think her strength would have suffered very much."⁶

Simpson aroused considerable criticism in the United States and Europe for his advocacy of anesthesia for childbirth. In Great Britain and Europe, Simpson's personality had great effect, and most European physicians eventually accepted his arguments for childbirth anesthesia. In the early years of obstetric anesthesia, Dr. Walter Channing of Harvard was Simpson's only significant medical ally in the United States.⁶ Simpson's most formidable opponent in the United States was Charles D.

Meigs, a respected obstetrician and author of *The Science and Art of Obstetrics* (1849), who maintained "that the pain of labor had never been great enough to prevent women from having more children."⁶ Interestingly, Charles D. Meigs also opposed the theory of Ignaz Semmelweis that poor hygiene among physicians was the cause of puerperal sepsis.⁶

The argument that anesthesia was dangerous for mother and baby was difficult to prove or refute in the last half of the nineteenth century, given the limited methodology for studying the issue. Even today, after 150 years of advances in obstetric anesthesia, many remain opposed to pharmacologic intervention and continue to argue that because of potential dangers, women should not be entitled to receive epidural pain relief when they want it,⁷ despite evidence to the contrary.⁸

Semmelweis was born in Buda (now Budapest), Hungary in 1818 and received his medical degree in 1844 in Vienna, Austria, one of the great medical centers of the day. Semmelweis was vexed, as were many of his contemporaries, by the inordinately high postpartum maternal mortality among women cared for by physicians, nearly 20%, and the significantly lower postpartum maternal mortality statistics among women cared for by midwives, approximately 2%. The prevailing explanation at the time was that "miasma," a bad quality of the air, was somehow responsible for the deaths.

Semmelweis thought otherwise. By observing parturients and their environment, and by dissecting a seemingly never-ending supply of cadavers, he wisely deduced that the cause of the maternal deaths was an agent that was transmitted by the physicians and medical students from the cadavers in the anatomy labs to the birth canals of the mothers. The midwives did not

visit the anatomy labs, so their patients were spared.

For Semmelweis, the confirmation of his theory came when one of his dearest friends, Jakob Kolletschka, a pathologist, accidentally cut his finger while performing an autopsy. Kolletschka died a few days later, and was autopsied. The post mortem findings were indistinguishable from those exhibited in women dying of childbed fever. Semmelweis was convinced that the same factor carried from the autopsy room to the delivery room in childbed fever was also transmitted to his friend when he cut himself.⁹ He ascribed the cause to "decomposing animal organic matter" and denied it was a contagious disease, that is, it did not spread like smallpox from patient to patient, but was transmitted from the autopsy laboratory to the parturient by an attending physician or medical student.¹⁰

Semmelweis' insight antedated the work of the pioneers of the germ theory of disease. It was not until 1865 that Joseph Lister proved the effectiveness of antiseptics in surgery, 1876 when Robert Koch defined the postulates necessary to establish the relationship of a microorganism to a given disease and 1879 when Louis Pasteur found chains of bacteria in lochia and blood of patients with puerperal sepsis. We now know that the scourge of puerperal sepsis was caused by Group A β hemolytic *Streptococcus*, the microscopic chains of bacteria observed by Pasteur.

Semmelweis immediately instituted a rigorous policy of hand washing on the obstetrics ward. Whereas previously hand washing was rather perfunctory and did not include an antiseptic, Semmelweis insisted that 4% chlorinated lime solution be used for hand washing before examining women in labor.¹⁰ His intervention rapidly yielded results. The maternal mortality rate plummeted from as high



as 30% in some months⁹ to 1.2% in 1848, the first full year after his orders were implemented.⁹

Although Semmelweis had his supporters, he also had powerful opponents. Semmelweis was as impolitic and polarizing as he was brilliant. He made the assertion that the terrible endemic at the Vienna General Hospital maternity ward was caused by the examining physicians, a charge that did not endear him to many in the obstetric community. So, despite Semmelweis' dramatic success in reducing the maternal mortality rate, the hostility that he engendered ultimately led him to abandon Vienna for his birthplace, Budapest. Semmelweis decreed a policy of mandatory hand washing and instrument cleaning with chlorinated lime in Budapest, and he duplicated the remarkable reduction in maternal mortality rates he had attained in Vienna. However, the enmity he engendered in Vienna followed him to Budapest. For example, the nursing staff resisted his compulsive orders, refusing to maintain cleanliness of patients' bedclothes.⁹

Semmelweis' life had a tragic end. The victim of a psychiatric disorder, he was committed by his wife to a mental hospital in Vienna, and he died there on August 13, 1865 at the age of 47, under uncertain circumstances. After reviewing the Semmelweis autopsy data of the state-run insane asylum in Vienna, Dr. Sherwin Nuland concluded that there was evidence of multiple injuries sustained after his admission 2 weeks before, as a result of forcible restraints and beatings in attempts to control his erratic behavior. Nuland suggests that Semmelweis probably had what would now be called Alzheimer's presenile dementia.⁹

Although the antiseptic practices of Semmelweis were ultimately adopted by the medical community throughout the world, he was

never given the recognition during his lifetime that he so richly deserved. Only posthumously was Semmelweis honored for his enormous contributions. The medical school in Budapest, Hungary is now called The Semmelweis University of Medicine, and the Maternity Hospital in Vienna is named in his memory.

James Young Simpson was treated more kindly by his peers, and he was knighted for his contributions. On his bust at Westminster Abbey in London, the burial place of many kings and distinguished citizens of Great Britain, are the words: "To whose genius and benevolence derived from the use of chloroform for the relief of suffering."

That these 2 great advances in obstetrics—the first childbirth anesthetic and the first recognition of the importance of antisepsis—occurred within a few months of each other is a fascinating coincidence. The response of the medical community to Simpson and Semmelweis was quite similar. Both were met with skepticism, disbelief and even contempt. In this respect, the response to these innovations was typical of reactions to other history-altering discoveries.

Simpson and Semmelweis were both agents of transformational change. While change itself is difficult, transformational change, which challenges one's fundamental beliefs and underlying assumptions, is even more difficult to accept. There are many examples of the slowness of transformational change in the realm of science, where trailblazers have encountered similar difficulties in having the merit of their discoveries recognized. Copernicus (1473–1543) was condemned by the Inquisition after his death because he proposed the sun rather than the earth was the center of the solar system. Galileo (1564–1642) subscribed to Copernicus' heliocentric theory but was

forced to recant his support of it before the Inquisition. He was essentially consigned to house arrest for the rest of his life. Charles Darwin (1809–1882) formulated a concept of evolution in his *On the Origin of Species* that continues to be a source of passionate debate in some circles to this day. Examples of the difficulties inherent in transformational change are not limited to the sciences. The Gregorian calendar began to replace the Julian calendar in 1582, but it was not until 341 years later, in 1923, that Greece became the last country to officially accept the change.

The paradigm shift initiated by Simpson and Semmelweis in the mid 19th century had far-reaching effect on the practice of obstetrics, surgery, and medicine. However, the process of transformational change that they began has not yet been embraced by all. Many persist in denying women pain relief for childbirth, and many still do not practice proper hand hygiene.

Since Simpson's first anesthetic, the art and science of obstetric anesthesia has evolved considerably. Anesthetic gases such as ether and chloroform, and later, injected agents such as morphine and scopolamine (which when given together produced a state known as "twilight sleep"), resulted in an unconscious and amnesic mother. Local anesthetics, introduced in 1884, eventually supplanted systemic analgesics as the favored pharmacologic agent to provide labor analgesia. When administered using an epidural or spinal approach or both, they render the lower abdomen, reproductive tract and perineum insensate, while not clouding the mother's sensorium. Thus, today's obstetric anesthesia is quite different from the anesthesia that Simpson practiced, as the parturient is now awake, alert, and comfortable so that she can fully participate in the birth of her neonate. The anesthetic risk to the



mother and fetus, when the parturient is attended by a qualified anesthesiologist, is very low.

Despite Simpson's revolutionary advance more than 150 years ago, today there remain many vociferous opponents of pharmacologic analgesia for childbirth. Some of these individuals cause undue fear and may render women reluctant to reap the benefits of anesthesia. These modern-day opponents of pharmacologic childbirth analgesia argue that it is preferable for the parturient to birth "naturally," as her forebears have since time immemorial. Women are subjected to a double standard during childbirth. What man would be asked to submit to a 20-minute appendectomy without anesthesia? But women going through hours of labor are often encouraged that they should forego pain relief, since childbirth is a natural process—as if "natural" pain is any less intense than the pain induced by a surgeon's scalpel. And they are often made to feel guilty for asking for pain relief.

Similarly, health care providers continue to ignore proper hand washing technique more than a century and a half after Semmelweis unequivocally demonstrated its efficacy in saving lives. Nosocomial infections still constitute one of medicine's greatest challenges. Despite compelling evidence that proper hand washing can reduce the transmission of pathogens to patients and the spread of microbial resistance, the adherence of health care workers to recommended hand-hygiene practices has remained unacceptably low, for example 40% in 1 study.¹¹ Recognizing that inadequate hand

washing is one of the prime contributors to the 2 million health-care-associated infections and 90,000 related deaths annually in the United States, the American College of Surgeons recently issued guidelines for hand hygiene^{12–15} years after Dr. Semmelweis alerted us to this fact. At Brigham and Women's Hospital in Boston the introduction of alcohol gel for hand disinfection and rigorous enforcement techniques improved the compliance rate for proper hand hygiene from approximately 40% to 70%—a substantial improvement, but indicating that 30% of staff remained remiss. A surgeon at that hospital poignantly bemoaned the fact that a patient's death from a nosocomial infection was preventable and caused by improper compliance with hygienic procedures.¹³

In 1847 the world was gifted with 2 great medical triumphs: the twin victories over labor pain and puerperal sepsis. But sadly, more than one and one-half centuries later, these advances have not yet been fully embraced. In some quarters, labor pains are still extolled as an integral part of motherhood that should not be abolished by anesthetics. And there is ample evidence that many physicians, even in major academic medical centers, ignore proper hand hygiene. The reticence to accept these 2 innovations after more than 150 years speaks to the exceedingly slow pace at which transformational change occurs. We can only hope that it will not take an additional 150 years before both will have been thoroughly accepted, so that labor pain and nosocomial infections will be known only through accounts in history books.

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In Reply:

We are pleased that our article is encouraging debate over prophylactic oophorectomy at the time of hysterectomy for benign disease. Drs. Dandolu and Hernandez correctly state that the Nurse's Health Study was observational. Nevertheless, it followed 121,700 women over 6 years and remains the largest database available.¹ The findings of the Women's Health Initiative stated in their letter are incorrect; the estrogen-only arm found no evidence of increased risk of coronary heart disease (hazard ratio = 0.91, confidence interval 0.75-1.12).²

The effect of testosterone on lipids is a surrogate outcome. Instead, we used coronary heart disease mortality as a reliable outcome measure. No morbidity data could be found in quantitative form. The study by Pell et al³ used only 10 women to assess quality-of-life parameters. Surgical mortality is extremely low, and including reoperation rates would not influence our results. Also not included are significant morbidities from nonfatal heart disease, crippling hip fracture, or quality-of-life concerns following abrupt surgical menopause.

It is unlikely that a randomized trial will be ever performed to answer the questions raised by our article. It would not be feasible to randomize women for oophorectomy/ovarian conservation if the outcome was the long-term mortality rate.

Dr. Wallach suggests that statins and bisphosphonates be given to treat heart disease and osteoporosis caused by oophorectomy. However, these drugs (also estrogen) are taken by less than 25% of patients for whom they are prescribed, making these strategies a poor substitute for ovarian conservation.^{4,5}

We hope that women and their physicians will discuss the long-term implications of oophorectomy and that many physicians will recommend ovar-

ian conservation for women at average risk of developing ovarian cancer.

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Simpson, Semmelweis, and Transformational Change

To the Editor:

We would like to address Grant et al's¹ assertion that labor pain is like surgical pain and that laboring women are urged to forego pain relief. The pain of

surgery is inherently different from the pain of labor. Endorphins may ameliorate the experience of labor pain, although this effect may be hindered by exogenous anesthesia as well as stress, fear, and other negative stimuli. On the other hand, stress, fear, and other negative reactions can be precipitated or ameliorated by the attitudes and behaviors of childbirth attendants. Women in the United States are probably more likely to be urged to accept analgesia than encouraged to do without it.

Labor is a physical challenge, more like a marathon than an appendectomy. Like a marathon, it can be prepared for, and in most cases, successfully mastered. Mastery requires birth attendants familiar with the techniques the woman has learned and an optimistic and caring atmosphere. Childbirth without anesthesia offers a mother a sense of mastery and the knowledge that she has done the safest thing for her baby. While the risks of obstetrical anesthesia are low, they are not zero. Many nonpharmacologic pain management techniques have no demonstrable risks and may improve obstetrical outcomes.² We have never heard anyone describe the experience of surgical pain in a positive light, whereas countless women have voluntarily experienced unmedicated labor as empowering, fulfilling, even exhilarating.^{3,4} Both of us chose to give birth without any pharmacologic pain relief and would choose to do the same again.

We agree with the authors that anesthesia should be available to all laboring women, and providers should not make women "feel guilty" about asking for pain medication. However, we disagree that our goal should be to make labor pains "known only through history books." Rather, we should strive to improve the birth experience of all women through optimal childbirth preparation.

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In Reply:

We thank Drs. Stotland for their interest in our work,¹ although we feel compelled to respectfully disagree with their analogy of labor to running a marathon. Marathon runners make up a tiny fraction of superbly conditioned athletes who train for years. Even among highly motivated laboring patients, there are clear and measurable indices of intense pain, whether assessed objectively by stress hormone concentrations or by subjective pain scores.

Indeed, it is an established fact that the physiological response to labor pain is no different from that evoked by a surgical incision, myocardial infarction, renal stone, or a bowel obstruction. Moreover, this response may not be in the best interest of the fetus because the resultant outpouring of catecholamines and hyperventilation-induced alkalosis can reduce uteroplacental blood flow. In fact, the increase in circulating catecholamines that accompanies labor pain is reversed by regional analgesia,² resulting in increased placental blood flow,³ which increases oxygen delivery to the fetus. Therefore, we must also respectfully disagree with Drs. Stotland's assertion that childbirth without anesthesia offers a mother the knowledge "that she has done the safest thing for her baby." Indeed, there are also maternal risks of not utilizing epidural analgesia. For example, if a parturient does not have an epidural catheter in situ during labor, there is an increased likelihood that she will receive general anesthesia should an emergency cesarean delivery be required. Also, there is evidence that unrelieved pain during labor may contribute to the development of serious postpartum psychological sequelae such as postpartum depression.⁴ Thus, it is not at all clear that childbirth

without anesthesia is the safest approach for mother or baby.

As physicians, we are as committed as our predecessors have always been to the conquest of pain. We have progressed considerably since Dr. Simpson first used ether for childbirth anesthesia. Today, regional analgesia is widely acknowledged to be the most effective means of relieving the pain of childbirth, pain that is rated by most women as the most severe they experience in their lives. We believe that the decision of whether or not to use regional analgesia ultimately rests with each woman. However, a truly informed decision requires that women have access to all relevant, objective, current, and unbiased information. Let's not turn the clock back to 1847.

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Diagnosis of Anal Sphincter Tears to Prevent Fecal Incontinence: A Randomized Controlled Trial

To the Editor:

Faltin et al¹ should be congratulated on their randomized study demonstrating that postpartum endoanal ultrasonography (EUS) improves the diagnosis of obstetric anal sphincter injuries (OASIS).

By contrast, 2 studies^{2,3} have demonstrated improved detection rates of OASIS by having an independent assessor repeat the clinical examination. Groom et al² found that 40% of all OASIS would have been missed. Andrews et al² prospectively re-examined 254 primiparous women immediately after delivery and also performed EUS that was repeated 6 weeks postpartum. The prevalence of OASIS was 25%, and all clinically recognizable tears were identified on EUS. Of the 59 OASIS, there was only one sonographic defect of the external sphincter that was not identified clinically, and no de novo defects were seen at 6 weeks. This study clearly demonstrated that, when the perineum was re-examined by an experienced person who has had additional focused training, the detection rate dramatically improved. The additional use of EUS did not significantly improve detection of OASIS.

We therefore believe that postpartum EUS is an invasive and expensive alternative to improved clinical training of doctors and midwives. Furthermore, EUS is a technique that requires specific expertise, particularly in the immediate postpartum period when the anal canal is lax (even more with an epidural). Ultimately, the diagnosis rests on clinical assessment and a rectal examination because, even if a defect is seen on EUS, it has to be clinically apparent in order for repair to be carried out. As Faltin et al have demonstrated that when EUS was used as the gold standard, then 5 women had unnecessary intervention as the defect was not visible despite exploration of the anal sphincter. As a result of this unnecessary exploration based on EUS, 20% developed severe fecal incontinence.

Given the limitations of postpartum

