"The contagiousness of childbed fever": a short history of puerperal sepsis and its treatment

Caroline M De Costa

The death of a friend solved a centuries-old, oft-fatal mystery

> *My doctrine is produced in order to banish the terror from lying-in hospitals, to preserve the wife to the husband, and the mother to the child…*
>
> Ignaz Semmelweis, 1861

TODAY, A VERY LARGE proportion of women giving birth receive antibiotics, potent and sometimes in combination, during their *accouchement*. Routine prophylaxis is widely accepted for caesarean sections, which account for 20%–25% of deliveries.[1] Of course, any pregnant woman presenting with an obvious infection will automatically receive an antibiotic. Further, so will most pregnant women with membranes ruptured for any length of time, either before or after labour begins, and any woman in labour with a raised temperature. There is also a more relaxed approach to many former midwifery routines — for example, the abandoning of masks and gowns and the admission of several support people to the delivery scene — which could diminish both younger obstetricians' and midwives' appreciation of the potentially deadly risk of puerperal infection. However, until relatively recently in developed countries, and still in many developing countries, puerperal sepsis was and is a killer.[2]

Fatal fever

Immediately postnatally, the placental site is a large open wound — easily invaded by ascending bacteria. For thousands of years, it was recognised that puerperal women were at risk of a fever that could be fatal. The Hippocratic writings contain references to childbed fever, as do some Hindu texts dating back to 1500 BC.[3] Moreover, the potential for birth attendants to initiate such infections seems to have been comprehended by some of the ancient writers, including the Greek physician Soranus, and the Hindus, since advice on hygiene for birth attendants was offered.[3,4]

Nevertheless, in ancient and medieval times, mortality from puerperal sepsis was apparently relatively low, as women generally gave birth at home.

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Triptych showing the Hôtel Dieu in Paris, about AD 1500. The comparatively well patients (on the right) were separated from the very ill (on the left). Note there were always two patients to a bed.

Peculiar to the puerperium?

The 17th century saw the establishment of "lying-in" hospitals in many European cities. While these institutions were, in some ways, an advance — in particular, by relieving obstructed labour with forceps or intrauterine manipulation — the crowding of patients, frequent vaginal examinations and the use of contaminated instruments, dressings and bedlinen spread infection in an era when there was no knowledge of antisepsis.

The first recorded epidemic of puerperal fever occurred at the Hôtel Dieu in Paris in 1646. Subsequently, maternity hospitals all over Europe and North America reported intermittent outbreaks, and even between epidemics the death rate from sepsis reached one woman in four or five of those giving birth.[5]

Numerous bizarre theories as to the cause of childbed fever were expounded — among them that it was due to a "miasma", or the labouring woman's disturbed state of mind, or mechanical pressure from the distended uterus. Certainly, childbed fever was universally regarded as a condition peculiar to women in labour.[6]

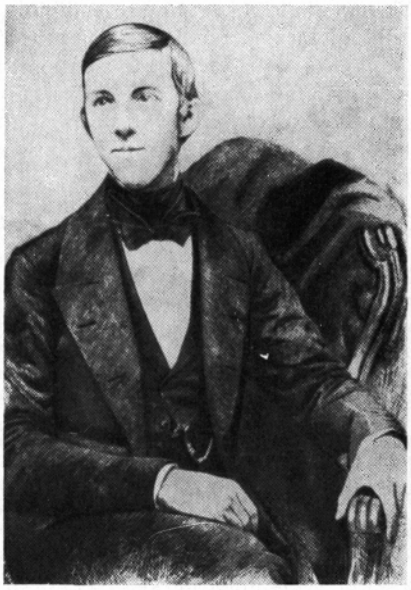
Sepsis suspected

Contagion as the basis for childbed fever was first suspected by a number of British physicians in the late 18th and early 19th centuries.[7] The name of Thomas Watson, Professor of

Medicine at King's College Hospital, London, is not well known, but in 1842 he wrote: "Wherever puerperal fever is rife, or when a practitioner has attended any one instance of it, he should use most diligent ablution." Watson recommended handwashing with chlorine solution and changes of clothing for obstetric attendants — everything, he said, "to prevent the practitioner becoming a vehicle of contagion and death between one patient and another."

Unfortunately, Watson's advice seems to have been largely ignored by obstetric practitioners of the time — the contagion theory is completely absent from contemporary obstetric texts.[7]

Across the Atlantic, in Boston, Dr Oliver Wendell Holmes — pathologist, physician and president of the Boston Society for Medical Improvement — developed an interest in the condition after two related cases were presented to his society. A physician and a medical student both died of septicaemia after performing an autopsy on a woman who died of puerperal fever.



Oliver Wendell Holmes

Holmes read the existing literature, and became convinced that the condition was highly contagious, and that doctors, nurses and midwives were the active agents of its spread. He began to speak and write on the subject, and in 1843 published his classic essay *The Contagiousness of Puerperal Fever*.[8-10] The essay contains eight rules for the obstetrician, which included not only handwashing and changes of clothing, but also the avoidance of autopsies if obstetric cases were being managed.

Holmes' conclusions were ridiculed by many of his prominent contemporaries. For example, Charles Meigs, a well-known obstetrician, was incensed at the suggestion he may himself be transmitting disease. "Doctors," he said, "are gentlemen, and gentlemen's hands are clean."[10]

Connection comprehended

Meanwhile, in Vienna, Dr Ignaz Semmelweis, a native of Hungary, was beginning a life-long obsession with finding the cause of, and preventing, puerperal fever. However, knowing no English, and far from North America, Semmelweis was unaware of the work of Holmes.

In 1844, Semmelweis was appointed assistant lecturer in the First Obstetric Division of the Vienna Lying-In Hospital, the division in which medical students received their training. He was appalled by the division's high mortality rate from puerperal fever — 16% of all women giving birth in the years 1841–1843. In contrast, in the Second Division, where midwives or midwifery students did the deliveries, the mortality rate from the fever was much lower, at about 2%. Semmelweis also noted that puerperal sepsis was rare in women who gave birth before arriving at the hospital.[6,11]

Over the next few years, Semmelweis studied and rejected numerous hypotheses. He did note that medical students and doctors from the First Division performed autopsies each morning on women who had died in the hospital the previous day and that midwives were not required to perform such autopsies. However, he did not immediately appreciate the connection between the two observations.[6,11]

In March 1847, Jakob Kolletschka — professor of forensic pathology, colleague and friend of Semmelweis — died of septicaemia after sustaining an accidental wound to the hand during an autopsy. On reading the report of Kolletschka's autopsy, Semmelweis was struck by the similarity of the pathological findings to those of women who had died of puerperal fever. He later wrote: "Suddenly a thought crossed my mind: childbed fever and the death of Professor Kolletschka were one and the same. His sepsis and childbed fever must originate from the same source … the fingers and hands of students and doctors, soiled by recent dissections, carry those death-dealing cadavers' poisons into the genital organs of women in childbirth …".[6,11,12]

Semmelweis began experimenting with various cleansing agents and, from May 1847, ordered that all doctors and students working in the First Division wash their hands in chlorinated lime solution before starting ward work, and later before each vaginal examination. The results were extraordinary — the mortality rate from puerperal fever in the division fell from 18% in May 1847 to less than 3% in June–November of the same year.[11]

Doctrine dismissed

Like Holmes, Semmelweis found that his conclusions did not receive immediate acclaim from his colleagues and superiors. Indeed, he was treated with scepticism and ridicule by many in the Viennese and wider European medical establishments, including his own professor, Johann Klein.

In 1849, Semmelweis' contract with the Lying-In Hospital was not renewed and he returned to Hungary, joining the University of Pest. He presented his findings to the Medical Society of Vienna in 1850. They were not well received, other opponents at that time including the famous pathologist Rudolph Virchow and the prominent obstetrician Friedrich Scanzoni.

Semmelweis did not publish his observations until 1861; again, they were greeted dismissively. Embittered, Semmelweis wrote a series of "open letters" to his former professors, accusing them — rightly, as it turned out — of being "medical Neros" and "murderers".[11,12]

Sadly, his last years were affected by depression and mental disturbance. In July 1865, he was committed to a psychiatric

institution in Vienna, and died there two weeks later — ironically, probably from septicaemia following a cut to a finger.[3,6]

Acceptance of antisepsis

Paradoxically, within a few years of his death, Semmelweis' doctrine began to be accepted by the wider medical community. In 1874, Billroth demonstrated streptococci in pus from wound infections, and in 1879 Louis Pasteur identified the haemolytic streptococcus in the blood of a woman with puerperal sepsis.[3] Joseph Lister, learning of Pasteur's work and germ theory, began to apply antiseptic principles to the practice of surgery, with a dramatic fall in postoperative deaths from infection. As with Semmelweis', Lister's ideas were also greeted with scepticism and it took nearly 30 years for "Listerism" to be universally accepted by medical practitioners.[13]

Ignaz Semmelweis

By the end of the 19th century, the need for obstetric asepsis was well appreciated. An authoritative text of 1905 gives detailed instructions for the personal hygiene of physicians and nurses attending confinements and instructions on the performance of internal examinations. The importance of "inculcating in the student the principles of obstetrical cleanliness, mechanical and chemical" is emphasised. The need for meticulous antiseptic care during operative vaginal deliveries and manipulations — more frequent then than now — is reiterated.[14]

Australian medical practitioners were apparently quick to follow the lead of their overseas colleagues in the application of hygienic measures in obstetrics, and of self-regulation when puerperal fever occurred in their practices. Most stopped attending midwifery cases for a time after one or two deaths among their patients.[15]

Surprisingly though, despite the new understanding of the importance of antisepsis, puerperal sepsis still occurred frequently in developed countries in which figures were kept. It appears the principles of antisepsis were not universally applied.

In England and Wales, in the period 1870 to 1890, the maternal death rate in hospital births was around 1 : 20, of which about 40% were due to infection. In the United States, in the 1890s, 20000 women a year died in childbirth.[14,16,17] In New South Wales, in 1894–1896, among confinements of married women, both at home and in hospital, the government statistician found a death rate of 1 : 148, and he commented on the negligence of medical men in filling the certificates required by law. Up to that point, causes of death had been supposedly accurately recorded for more than 40 years, but, in fact, the puerperal nature of fatal infections in women was frequently omitted.[14,15]

Globally, the most common and most feared infecting organism at the time was the Group A haemolytic streptococcus, whose virulence appears to have diminished in recent years, possibly due to improved socioeconomic conditions and the use of antibiotics. Normally found on the skin, in the nose and throat, and in the vagina, as well as in skin lesions, the streptococcus was introduced into the genital tract during examinations and deliveries. Lacerations, blood loss and exhaustion from prolonged labour increased the possibility of postpartum infection. Staphylococci, gonococci, coliforms and other bowel flora, as well as anaerobes, were less likely culprits, but have assumed greater importance in recent years, as have Group B streptococci.[3,7,15]

Debating deliveries

In Australia overall, as elsewhere overseas, the maternal mortality rate (MMR) actually remained steady from 1900 until the late 1930s (5.95 per 1000 women delivered in 1903; 5.13 in 1933). Among developed nations, the United States had the highest MMR and the Netherlands and Scandinavia the lowest, although there were some individual hospitals with remarkably low rates, including the Rotunda in Dublin, Ireland, and Crown Street Women's Hospital in Sydney, Australia.[15,17]

Causes of the continuing fatal role of puerperal sepsis were widely debated. The medical profession tended to blame untrained midwives, and moved towards their training and registration, which was achieved by the 1930s. Some attributed the rates of sepsis to high levels of interference in labour and delivery, especially forceps deliveries.

In Australia, the "lodge" system of practice — whereby families purchased medical services through lodge or friendly society membership — was held to blame. Busy general practitioners contracted under this system were allegedly likely to try to conduct confinements hurriedly.[15-17] There were moves both to increase instruction in obstetrics for general practitioners and to encourage specialist obstetricians to do deliveries.[15]

Antibiotic arsenal

After 1935, the situation improved rapidly in developed countries. Early that year "a startling therapeutic success" was announced by Domagk in Germany — the prevention of septicaemia in mice experimentally infected with streptococci after the administration of prontosil, a sulfonamide dye.[18]

In June 1936, Colebrook and Kenny, in a landmark paper, reported their success in treating established puerperal sepsis in women using prontosil — the death rate in apparently similar cases dropped from around 27% to 8%. Colebrook and Kenny wrote (cautiously): ". . . the very low death rate, taken together with the spectacular remission of fever and symptoms observed in so many of the cases, does suggest that the drug has exerted a beneficial effect".[18] History was to prove them correct, and in 1939 Domagk was awarded the Nobel Prize in Medicine and Physiology for his work.

Prontosil and other sulfonamides were followed by penicillin, to which streptococci causing puerperal sepsis still remain sensitive, and the arsenal of antibiotics used for all other forms of postpartum fever today.[3,19]

Today, in Australia, deaths from puerperal sepsis are extraordinarily rare (the MMR is currently about 0.1 per 1000 births).[2] However, infection and fever are not rare, and the microbes causing them are omnipresent. In caring for pregnant women, especially the many who have some intervention in labour or delivery, we would be wise to reflect that it is only the use of increasingly complex antibiotic regimens which prevents a return to "the terror of the lying-in hospitals".

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CHRISTMAS OFFERING

The Polaris principle

As the United States' unsettling rise to hegemony illustrates, the world becomes a more dangerous place when the balance of power is altered. What is true for geopolitics is true for medicine.

I have a simple proposal for restoring the balance of power between the junior medical staff and their consultants and registrars. It relies on the well-proven theory of deterrence. It is the intern's equivalent of a submarine filled with nuclear missiles cruising off the coastal shelf of the registrar's continent.

The system works this way. At the welcome and orientation to the hospital for the new interns, the last presentation is by a well-respected intern from the previous year. Ten shiny laminated cards are handed to the shiny new interns and they are instructed in their use. They are admonished to hoard these resources, to use them sparingly and effectively.

A few weeks later the morning ward round is drawing to a close. Twenty-five patients have been seen, and seven consultations, two MRIs, a bone scan and a partridge in a pear tree have been generated for the unfortunate but uncomplaining intern. However, at last a line is crossed. A patient who had surgery the night before is rolling around in bed complaining about pain in his knee. He has a urinary catheter because he suffers from prostatism and has produced 20 mL of urine an hour from his generously sized ex-meat packer frame. One can easily see from the foot of the bed that he is as dry as a chip. The two drains appearing from under his bandages are full.

The orthopaedic registrar looks at the pulse oximeter and notes a mild tachycardia. The terrible words are uttered: "We'd better get a cardiology consult . . ." (at least his expression is hangdog).

This is the time to act. The intern pulls out his wallet and deals the "*Get your own damn consult!*" card. The registrar accepts it with consternation. He is compelled by the laws of decency and tradition to proceed. Dutifully, he calls the cardiology registrar between cases. He is greeted with the derision such an unnecessary consultation deserves. A hefty dose of humble pie is consumed.

A couple of weeks later the temptation arises for another dodgy consultation; this time, some minor basal atelectasis. Noting the oxygen saturation of 94%, the registrar turns to his intern and starts to open his mouth. The intern reaches for his wallet; the mouth is shut; the submarine descends from launch depth and the balance of power is restored.

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