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ESMT Case Study

Dr. Semmelweis at Vienna General Hospital

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Part A

In 1846, 28-year-old German-Hungarian Dr. Ignaz Philipp Semmelweis took a job working as the assistant of professor Johann Klein at the Vienna General Hospital's maternity clinic. His job included examining expectant mothers, supervising difficult deliveries, and teaching medical students studying obstetrics.

As in other hospitals across Europe at the time, Vienna General Hospital accepted pregnant women without charge: A measure put in place to prevent infanticide of illegitimate children, making the maternity clinic attractive to underprivileged women, including many prostitutes. In return, the women were subject to the training of doctors and midwives.

At the time, women often suffered from a condition known as puerperal fever, commonly referred to as "childbed fever." The disease developed within the first three days after childbirth, caused acute symptoms (severe abdominal pains, fever, and debility), and most always ended with the death of the

mother and the newborn. Puerperal fever was understood in the context of the then-dominant theory of dyscrasia, which explains diseases as being imbalances of the basic humors in the human body (blood, black bile, yellow bile, and water). Each case of puerperal fever was thought to be unique, often the result of personal imbalances. Spreading of disease was explained through miasmas, heavy vaporous emanations, or atmospheres. The main treatment for puerperal fever was bloodletting.

Puerperal fever was a common disease in clinics across Europe. But the situation at Vienna General Hospital was special: The hospital had in fact two maternity clinics, the *Erste Abtheilung* (first clinic), dedicated to the training of doctors, and the *Zweite Abtheilung* (second clinic), dedicated to the training of midwives. Expectant women arriving at the hospital were admitted to these clinics based on a set schedule.

From	Until	Clinic
Monday 4:00 p.m.	Tuesday 4:00 p.m.	First
Tuesday 4:00 p.m.	Wednesday 4:00 p.m.	Second
Wednesday 4:00 p.m.	Thursday 4:00 p.m.	First
Thursday 4:00 p.m.	Friday 4:00 p.m.	Second
Friday 4:00 p.m.	Saturday 4:00 p.m.	First
Saturday 4:00 p.m.	Sunday 4:00 p.m.	First
Sunday 4:00 p.m.	Monday 4:00 p.m.	Second

But for women in need of assistance, it mattered a great deal as to which clinic they were admitted to, because the two were known to have differences in mortality rates. It was reported that women begged to be released from the hospital again once they realized they had been admitted to the first clinic. Others chose to have a *Gassengeburt* altogether, which meant giving birth on the streets before reporting with their newborn at the hospital, a practice that allowed women to still receive free benefits for their babies without the risk of being admitted to the first clinic.

Deeply moved by the misery caused by puerperal fever, Dr. Semmelweis – after taking charge of the first clinic – reviewed the data for the past five years.[1]

	First clinic			Second clinic		
Year	**Births**	**Deaths**	**Rate (%)**	**Births**	**Deaths**	**Rate (%)**
1841	3,036	237	7.7	2,442	86	3.5
1842	3,287	518	15.8	2,659	202	7.5
1843	3,060	274	8.9	2,739	164	5.9
1844	3,157	260	8.2	2,956	68	2.3
1845	3,492	241	6.8	3,241	66	2.03
1846	4,010	459	11.4	3,754	105	2.7
Totals	**20,042**	**1989**	**9.92**	**17,791**	**691**	**3.38**

The data confirmed that the mortality rate of the first clinic had in fact been, on average, three times higher than that of the second clinic. Even worse, the

> […] difference in mortality between the clinics was actually larger than the table suggested, because occasionally […] during times of high mortality all ill maternity patients in the first clinic were transferred to [another clinic of] the general hospital. When these patients died, they were included in the mortality figures for the general hospital but not the maternity hospital. […] In the second clinic such transfers were never undertaken.[2]

Pathological examinations after dissecting the mothers' corpses revealed large quantities of white matter in the uterus. This led to the belief that, in the absence of menstruation during pregnancy, impure body fluids – that would otherwise have been cleared out in the process of menstruation – would accumulate in the womb. Professor Klein, Semmelweis' superior, had been a supporter of this theory, relating the white matter with galactostasia: An overabundance of milk that had found its way into other body cavities. Dr. Semmelweis, however, wondered how this could sufficiently explain the differences between the two clinics in Vienna:

> What is the origin, then, of the difference in mortality between the clinics? Hyperinosis [excessive fibrin in the blood], hydremia [excessive water in the blood], plethora [an excessive quantity of blood], disturbances caused by the pregnant uterus, stagnation of the circulation, inopexia [spontaneous coagulation of the blood], […]?[3]

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Part B

Medical explanations of whatever variety, Dr. Semmelweis concluded, "are causes to which may be ascribed much or little influence to the generation of childbed fever," but they were not sufficient to explain the differences between the clinics, because "in both clinics these must be equally harmful or harmless."

Dr. Semmelweis looked for other factors that could explain the differences in mortality rates between the two clinics:

- He examined medical procedures and techniques, but he found that both clinics used the same ones.
- He examined the layouts of the clinics and whether distances, routes, ventilation, or being subject to chilling could be factors; no difference could be established.
- He studied overcrowding in the first clinic, but a relationship between the number of admitted persons and mortality rates could not be determined.
- He looked into the effects of religious practices but found no difference.
- Could the high mortality rate in the first clinic be explained by the fear the women had (an early description of the idea of a self-fulfilling prophecy)? Semmelweis concluded that this was not the case, as it could not explain why an equal number of newborns – who typically suffered the same fates as their mothers – also died; "infants would not, in all probability, fear the evil reputation of the first clinic."
- The same argument demonstrated that the differences could not be sufficiently explained by the violated sense of prudence that women felt while having to deliver their babies in the presence of men – a hypothesis that also seemed far-fetched, given the profession of many of the women seeking free help at the Vienna General Hospital.

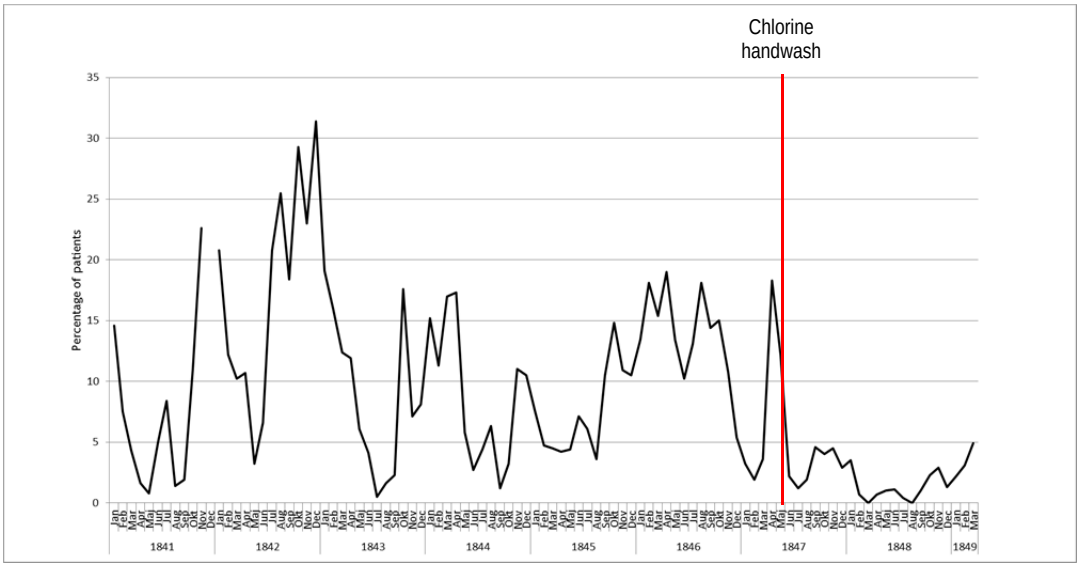
Semmelweis could not identify a differentiating factor between the clinics that would explain the dramatic differences in mortality. Even more puzzling was his new finding, that women who had given birth on the street seemed to be the least likely to develop childbed fever. When in March 1847 he heard of the sudden death of his friend and colleague professor Jakob Kolletschka, Semmelweis had the decisive observation that would later make him known as "the savior of mothers." Kolletschka had died just a few days after an accident that had happened while he was teaching students in anatomical studies. A medical student had, by accident, cut Kolletschka's finger with a knife that had just been used during an autopsy. Kolletschka developed a feverish condition with symptoms much like the ones observed with puerperal fever. Could it be that "cadaverous particles" transmitted by doctors to mothers caused the high death rates in the first clinic? This would explain

why student midwives in the second clinic, who were not engaged in autopsies, saw much lower mortality rates.

Semmelweis stipulated that all medical personnel of the first clinic had to clean their hands with *chlorine liquida* in addition to washing their hands with soap before examining the women. In June, July, and August of 1847, mortality rates dropped to 2.2 percent, 1.2 percent, and 1.9 percent, respectively. In October 1847 there were 12 women who died from childbed fever after a woman with "discharging medullary carcinoma" was admitted to the clinic. Semmelweis concluded that "it is necessary to clean the hands with chlorine water, not only when one has been handling cadavers but also after examinations in which hands have become contaminated with ichor." In 1848, mortality rates in the first clinic fell to an average of just 1.3 percent.

Dr. Semmelweis had understood the importance of hand hygiene, he had identified an effective measure, and he had the evidence to prove it.

Puerperal fever monthly mortality rates for birth giving women 1841–1849[4]



Yet, in March 1849, Dr. Semmelweis was asked to leave Vienna General Hospital. Semmelweis' findings and conclusions were rejected by the medical community, as many doctors were offended at the suggestion that they should wash their hands. It took years – and additional tens of thousands of dead mothers and newborns – before Semmelweis' practice was widely adopted. Semmelweis received recognition for his work only after his death.

Part C

Semmelweis' observations conflicted with established scientific theories of the time. And Semmelweis had no alternative explanation: *How* exactly would "cadaverous particles" and "ichor contamination" work to cause puerperal fever? Many colleagues thought of Semmelweis' ideas and measures as pure nonsense and took them as proof of his lack of knowledge. Some were not prepared to accept that his simple treatment worked; consequently, they did not even consider trying it.

Even worse, Semmelweis' findings pointed to doctors as being the sources of disease, misery, and death, whereas doctors believed they were helping, healing, and saving lives. Was Semmelweis suggesting that doctors were responsible for causing and spreading puerperal fever? Was he suggesting that they were working sloppily, that they were negligent and unclean?

Semmelweis' motives were questioned, and he was presumed to be aiming at discrediting and besmearing the practice of obstetrics; a young discipline striving for acceptance as a stand-alone field of study. At Vienna General Hospital, he was accused of denouncing the hospital with his reports on bedside fever.

In 1848, revolutionary movements were gaining hold in many European countries. In Vienna they were fueled by the ambitions of Bohemia and Hungary for independence from imperial Austria. When these movements were repelled in October 1848, Semmelweis, despite the lack of any evidence in this matter, was suspected of having sympathized with those revolutionary ideas. And wasn't he a Hungarian in the first place?

The conclusion for Semmelweis' superiors at Vienna General Hospital was clear: It was demanded that Ignaz Philipp Semmelweis leave for the well-being of the institution. He had become a *persona non grata*. Not only did he have to leave the hospital, but all attempts to find employment in Vienna were to no avail, and thus he was forced to go back to his native Budapest.

A few doctors supported his ideas. In Vienna, pathologist Carl Rokitansky, dermatologist Joseph Skoda, and internist Ferdinand Hebra commended his work, but the obstetrics community in Vienna saw this as an offense against their own discipline. Obstetrician James Young Simpson from Edinburgh pointed to the fact that proper hand-cleansing was a well-established practice among British pediatricians and attacked Semmelweis for not being familiar with the relevant English literature. Others challenged him to publish his findings in order to prove them to a larger community. Yet, it took Semmelweis a decade to publish his book *Etiology, concept and prophylaxis of childbed fever,* which was both a research compendium and a combat tool to be used against the resistant establishment in obstetrics.

Semmelweis was ridiculed and his book was rejected as "naïve" and labeled "the Koran of puerperal theology." In his book he had complained: "In published medical works my teachings are either ignored or attacked."

But Semmelweis would not stop arguing his case and wrote open letters to opponents of his ideas. In 1862 he published a letter that he had written to Joseph Späth of the University of Vienna:

> Herr Professor, you have convinced me that the Puerperal Sun which arose in Vienna in the year 1847 has not enlightened your mind, even though it shone so near to you. […] This arrogant ignoring of my doctrine, this arrogant boasting about errors, demands that I make the following declaration: within myself, I bear the knowledge that since the year 1847 thousands and thousands of puerperal women and infants who have died would not have died had I not kept silent, instead of providing the necessary correction to every error which has been spread about puerperal fever. […] And you, Herr Professor, have been partner in this massacre. The murder must cease, and in order that the murder cases, I will keep watch, and anyone who dares to propagate dangerous errors about childbed fever will find me an eager adversary.[5]

To Friedrich Scanzoni, one of the most influential obstetricians at the time, he wrote in that same year:

> You have, Herr Hofrath, sent out a significant contingent of unwitting murderers into Germany […] I declare before God and the world that you are a murderer and the 'History of Childbed Fever' would not be unjust to you if it memorialized you as a medical Nero […].[6]

Source: Canzi, A. (1857). *Portrait of Ignaz Philipp Semmelweis*. Aquarelle.

Endnotes

[1] Wikipedia, the free encyclopedia. Historical mortality rates of puerperal fever. Yearly mortality rates for birthgiving women 1833–1858 for first and second clinics. https://en.wikipedia.org/wiki/Historical_mortality_rates_of_puerperal_fever. (accessed January 13, 2016).

[2] Excerpted from Ignaz Semmelweis (1983). *The Etiology, concept, and prophylaxis of childbed fever*, 46. The University of Wisconsin Press.

[3] Excerpted from Ignaz Semmelweis (1983). *The Etiology, concept, and prophylaxis of childbed fever*, 47. The University of Wisconsin Press.

[4] Wikipedia, the free encyclopedia. Historical mortality rates of puerperal fever. Monthly mortality rates for birthgiving women 1841–1849. https://en.wikipedia.org/wiki/Historical_mortality_rates_of_puerperal_fever#/media/File:Monthly_mortality_rates_1841-1849.png (accessed January 13, 2016).

[5] Nuland, S.B. (2004). *The doctor's plague*. New York: Penguin.

[6] Nuland, S.B. (2004). *The doctor's plague*. New York: Penguin.