Fatal injections at Maria Hospital

Synnöve Ödegård, RN, PhD

In August 1936 a medication mix-up occurred at Maria Hospital that took the lives of four people. This event was the direct reason for the present Swedish Lex Maria system.

Course of events

Thursday, August 20, 1936

At about 5pm a 25-year-old welder named Eriksson arrives at the surgical outpatient clinic at Maria Hospital because he dislocated his left thumb when he fell off his bicycle. He is examined in treatment room 1 by the doctor on duty, Dr. Olof Bertil Arnell, who is assisted by Börje Adolf Holmgren, a medical student, and Margit Folin, a student nurse, who receives the order to draw up 5 cc of 1% ethocaine solution in a syringe, which she gives to Dr. Arnell who then injects the solution. The patient does not react strangely in any way. After the thumb is reduced into the correct position, X-rayed and bandaged, Eriksson is allowed to leave the hospital.

Directly thereafter, 14-year-old errand boy Stig Bernhard Tärnholm comes in with cuts and tendon injuries of the middle and little finger of his right hand. This patient is also examined by Dr. Arnell in treatment room 1 in the presence medical student Holmgren and student nurse Margit Folin. Dr. Arnell asks Holmgren to anesthetize the fingers with ethocaine, which is drawn up from a flask in the treatment room by student nurse Margit Folin. After Dr. Arnell sutures the cuts and nurse Margit splints and bandages the patient’s fingers, he is then allowed to go home.

Later in the evening Eriksson returns to the hospital complaining of severe pain in his thumb and reports that he has vomited and had diarrhea. Upon examination it is found that the thumb is extremely swollen, but since his pulse is normal Dr. Arnell assumes that the condition is due to a broken blood vessel in the thumb and that the vomiting is due to a temporary intestinal enteritis. However, he is admitted to ward I for observation.

Friday, August 21

Dr. Johan Harald Cedermark, the doctor on duty, examines Eriksson during rounds. It is apparent from the patient's chart that he received an injection for a thumb injury and that later the same day he returned to the hospital because of vomiting and diarrhea. There is no suspicion as to the cause of this.
Mrs. Maria Viktoria Berlund comes to the outpatient clinic to have a lump removed from her right cheek. The procedure is done in treatment room 1 by Dr. Arnell in the presence of medical student Holmgren and nurse May Segerström. In accordance with Dr. Arnell's order, nurse May draws up ethocaine from the flask on the windowsill and Dr. Arnell injects the local anesthetic. The lump is then removed and the patient leaves the hospital.
On the evening of the same day, medical student Holmgren is called to ward 1 where a patient is complaining of pain in the bend of his left arm. The patient, engineer Nils Artur Nilsson, underwent surgery for an inguinal hernia on August 10, and contracted a wound infection for which he received cylohexine, which was injected into the antecubital space.

While on duty previously, Dr. Holmgren learned that if a patient who has been given cylohexine complains of pain at the injection site, the pain should be alleviated with an injection of 10 cc of ethocaine at the same site. He therefore obtains a syringe from treatment room 1 with which he asks student nurse Margit Folin to draw up the ethocaine. After the injection, Nilsson complains of burning in the bend of his arm. After a while Dr. Holmgren starts thinking about what the patient said, and he goes back to the treatment room and checks the flask that remains there. However, it is labeled 1% Ethocaine.

At about the same time, chief nurse Margit Bohman is informed that Mrs. Elsa Berglund, who visited the outpatient clinic earlier in the day, has become severely ill and her face is very swollen. Mrs. Berglund is therefore asked to return to the hospital. She arrives by ambulance at 7:30pm and is examined by Dr. Cedermark. When questioned as to whether she is hypersensitive to injections, she answers yes. Moist, warm compresses are therefore ordered and she is admitted to the hospital for observation. Dr. Cedermark now suspects that there could be something wrong with the fluid used for local anesthesia, as still another patient has returned to the hospital after treatment.

Saturday, August 22

When Dr. Cedermark makes rounds it is found that Mrs. Berglund's cheek is still extremely swollen. He now informs Dr. Nils Åkesson, Acting Hospital Director while Professor Ejnar Keys is on a leave of absence, of his suspicions. On ward 1 Dr. Arnell and medical student Holmgren learn that patient Nilsson has been very ill during the night and has had severe pain and swelling in his arm as well as vomiting and diarrhea. Since Arnell learned earlier that same morning that Mrs. Berglund had also returned to the hospital with swelling at the injection site, Arnell sees a connection and suspects that the flask with the ethocaine label does not contain that pharmaceutical. Therefore he also informs Acting Hospital Director Åkesson. Chief nurse Margit Bohman also suspects that the ethocaine has caused the cases of illness. For that reason she takes the flask with the remaining ethocaine and delivers it to the hospital pharmacy. She then checks the other bottles of ethocaine in the medication cabinet, but all of them are full and the fluid is not cloudy.

Through the use of patient cards it is determined at the outpatient clinic that in addition to the two patients already admitted to the hospital because of poisoning, there is also a boy named Tärnholm who received an injection of ethocaine. The parents are contacted and it is learned that he is bed-ridden and has diarrhea. Dr. Axel Linde contacts them immediately and says that Tärnholm must come to the hospital.

At approximately the same time Acting Hospital Director Åkesson informs Gösta Nilsson, manager of Bävern Pharmacy, that cases of poisoning have occurred at the hospital that are indicative of mercury poisoning. Nilsson is requested to examine two flasks of solution that are assumed to have caused the poisoning, one marked "Sol.hydrargyri oxicyanid 25/1000" and the other "Ethocaine 1%". The flasks contain mercuric oxycyanide solution, which is immediately reported to Acting Hospital Director Åkesson. The same day pharmacist Nilsson instructs a pharmacist student to prepare 1000 ml of 1% Ethocaine, which is to be sent without cost to Maria Hospital.

Acting medical advisor Byttner receives a preliminary report from Dr. Åkesson about the cases of poisoning. Director Söderberg of the Pharmacy Bureau of the Board of Medical Affairs is informed by Laboratory Director Nilsson. Both go to Maria Hospital the same day for an inspection. The Bävern Pharmacy is also

inspected. It is not possible to obtain a clear picture at these inspections as to how the cases of poisoning could have occurred.

Sunday, August 23

Dr. Åkesson, together with nurse Dagmar Sand and pharmacy manager Gösta Nilsson, try to reconstruct how these events could have taken place.

Monday, August 24

Acting Hospital Director Åkesson announces that ethocaine is not to be used in the outpatient clinic before being examined at the Bävern Pharmacy. When definite information is received later the same day that the injection fluid used is not ethocaine but mercuric oxycyanide, General Director J. Axel Höjer of the Board of Medical Affairs, who has just returned from a business trip, is informed. All three bottles of ethocaine are sent to the pharmacy for analysis. Only one of the bottles comes back, however, which is explained by the pharmacy as being due to the fact that the content of the third bottle is too old.

Tuesday, August 25

Since the cause of and blame for what has happened cannot be clarified, it is decided at a meeting of the Board of Medical Affairs that the board of directors at the hospital should be requested to immediately submit a report to the police. However, this is not possible as the Council members in question are busy at meetings, so that the manager of the Bävern Pharmacy is instead instructed to request a police investigation.

August 27, early morning

Twenty-five-year-old Eriksson and 14-year-old Tärnholm die.

Friday, August 28

A written report is received by the Board of Medical Affairs concerning the cases of poisoning. The Director of the Hospital Bureau of the Board of Medical Affairs is now ordered by General Director Höjer to inspect the pharmacy supplies at the outpatient clinics at all hospitals in Stockholm.

Saturday, August 29

Engineer Nilsson and Mrs. Berglund die.

A number of nurses noticed the cloudy solution

It was found that when refilling a flask on Wednesday, August 19, nurse May Segerström noticed that the fluid was cloudy. She therefore checked that the bottle had the right label, and then took the flask to the sterilization room, boiled the flask in the usual way, and put it in its regular place in the examination room. She had planned to inform one of the chief nurses that she had found that the ethocaine was cloudy, but had not seen any of them at that time. When she met chief nurse Margit Bohman later that day, she learned that she, too, had discovered a flask with cloudy ethocaine and that she had therefore emptied it. However, May Segerström did not mention that she had also discovered cloudy solution. When she was going to fill the flask again the next morning she again noticed that the fluid was cloudy and therefore checked still another time that she had taken the right pharmaceutical. Now she showed the flask to chief nurse Margit Bohman and they went in to Dr. Linde who, however, could not explain why the fluid was cloudy, but stated that it had happened before and that it did not mean anything. Since he did not give any directives about what they should do, nurse May sterilized the flask and placed it in examination room 1. On her daily inspection of the treatment rooms nurse Dagmar Sand had also noticed that the flask with ethocaine did not have its usual appearance, but was cloudy. As she was about to empty the flask she met chief nurse Margit Bohman and showed her the flask. She learned that earlier in the day nurse Margit had been told by Dr. Linde that the ethocaine could be used, whereupon nurse Dagmar chose to place the ethocaine flask back in the treatment room.

Handling of pharmaceuticals

Provision of pharmaceuticals to Maria Hospital was done by the Bävern Pharmacy. The owner was pharmacist A.J. Shillberg, but the pharmacy was managed by pharmacist Gösta Nilsson. Pharmacist Bengt Arvid Hackzell and student pharmacist Yngve Birger Brinne also worked at the pharmacy. Pharmaceuticals were ordered by the manager of the hospital pharmacy based on the number of empty bottles sent down from the respective wards. The requisitions, which were written in special books, were signed by the doctors concerned. The empty bottles and the requisition books were picked up each

morning by an assistant from the Bävern Pharmacy. Licensed personnel at the pharmacy checked that the requisitions were in agreement with the bottles that had been brought down, and the bottles were then washed. New labels were written and placed in the requisition books. Preparation of pharmaceutical products was done by licensed personnel. When the pharmaceutical had been prepared, the bottle was corked and a special top was put on. Thereafter the label taken from the requisition book was signed by the person who prepared the pharmaceutical, after which it was delivered to the hospital pharmacy. There it was placed in one of the pharmacy's medicine cabinets. "Poisonous" pharmaceuticals were to be marked with a poison label. However, four nurses at the hospital certified at the police inquiry that they had never seen that mercuric oxycyanide had a poison label. The delivery on August 20 contained a bottle of mercuric oxycyanide. However, because the manager had a dentist appointment, the pharmaceutical products were not placed in the pharmacy's supply cabinets until the following day.

Storage of pharmaceuticals at the hospital

Every afternoon the ward staff picked up the pharmaceuticals and placed them in the ward's medication cabinets. At the outpatient clinic at Maria Hospital both toxic and nontoxic pharmaceuticals were kept in the same cabinet in the bandaging room, with the key hanging next to it. The nurses had received verbal instructions as to how the pharmaceuticals were to be placed in the medication cabinet. For example, mercuric oxycyanide was to be stored on the bottom shelf, while distilled water, rose-water, menthol spirits and ethocaine were to be placed on the fourth shelf. The year before the tragic poisoning, however, the Board of Medical Affairs had sent out a circular letter due to a number of incidents that had occurred throughout the country. In accordance with the letter, toxic pharmaceuticals were to be stored in a special, locked cabinet separate from nontoxic agents. Ejnar Key, Hospital Director and doctor in charge at Maria Hospital, thought, however, that in practice it would be impossible to fulfill this directive and felt that placing mercuric oxycyanide on a separate shelf would be sufficient. Ethocaine was stored in large bottles but was poured into smaller glass bottles, so-called flasks, which had a chain and a metal sign labeled Ethocaine 1%. After sterilization the flasks were placed in the examination rooms where the injection solution was drawn up in syringes when local anesthesia was to be given. The flasks were refilled in the treatment room, where dilution of mercuric oxycyanide was also done.

During the time the mix-up occurred, student nurse Brita Högberg was instructed to pick up the pharmaceuticals and place them in the medication cabinet at the outpatient clinic. On two occasions, the 17th and the 19th of August, she had also mixed disinfectant, i.e. diluted mercuric oxycyanide with water. She recalled that she had been interrupted while doing this on August 17 due to an urgent errand. During the inquiry she had difficulty remembering on which shelf she had placed the mercuric oxycyanide when she had put it back into the cabinet.

During the inquiry it also emerged that a student pharmacist, employed at the pharmacy during the period from June 1 to August 22, 1936, had been instructed on August 20 to prepare and dispense a bottle of mercuric oxycyanide for Maria Hospital. He reported at the inquiry that he had forgotten to put a poison label on the bottle.

The issue of blame

The blame for what had happened was thought to lie with the hospital staff and was not thought to be the result of a mistake in dispensing at the Bävern Pharmacy. The mix-up was considered to be due to the fact that after student nurse Brita Högberg diluted the mercuric oxycyanide, she then replaced the bottle on the shelf in the medication cabinet where the ethocaine bottles were usually kept.

She was prosecuted for neglecting to check that she had placed the mercuric oxycyanide bottle back in its usual place. Thereafter it was thought that nurse May Segerström had used the mercuric oxycyanide bottle when she refilled the ethocaine flasks. She was therefore blamed for not checking the label on the bottle from which she refilled the flasks with ethocaine. The issue also had to do with whether nurses Dagmar Sand and Margit Bohman showed a lack of conscientiousness and caution in that they did not supervise Brita Högberg more closely in how she handled the flasks. Both nurses were also held responsible for not having stored and handled the pharmaceutical agent in a satisfactory manner. The action against Hospital Director Ejnar Key concerned his failure to observe current regulations and that he had allowed a student, Brita Högberg, to mix the mercuric oxycyanide herself, without supervision. Both doctors, second assistant physician Axel Linde and medical student Börje Holmgren, were mentioned in the police report but were not prosecuted.

The cases of poisoning at Maria Hospital resulted in extensive press coverage during the different phases of the trial, and the public was informed in large headlines about where suspicions were directed at the moment. All the suspects were named, which probably contributed to the fact that one of the prosecuted nurses had a mental breakdown and the charges against her were dropped at an early stage. The charges against the student nurse were also dropped during the trial.

The verdict of the police court was delivered on March 24, 1937, with acquittals on all counts for all the accused.

The aim of the whole process concerning the Maria tragedy was to find a guilty party. The police explained that the reason they could not clarify how the mixup had occurred was that the report from the hospital came in too late and that the hospital had forestalled the investigation. This contributed to the demands that were then made to establish requirements as soon as possible for hospitals to report serious events to the police. The main aim was for evidence to be determined, and the disciplinary aspect was considered the most essential. The original proclamation went into effect on 15 January 1936, only four months after the event.

Analysis

The need to improve patient safety in health care arises increasingly often both in Sweden and in other countries. The concepts of active and latent errors are used in safety research. Active errors can be described as was done by Gerda Höijer in 1936: “If we have ever had any doubts, through these proceedings we nurses have been properly warned that the hand that carries out the action, the person who does the checking, is the one who is responsible for any possible mistake.” (Swedish Journal of Nursing (in Swedish) 1937;4:132-3). The tendency still exists for the doctor or the nurse who is last in a long chain of events triggering the event to be the one held responsible for deficiencies that he or she has not had any possibility of influencing.

Afterwards it can seem remarkable that a medication that clearly differed in terms of its usual appearance was nevertheless injected. The analysis showed, however, that in addition to the fact that a number of unfortunate circumstances coincided, there were also obvious organizational deficiencies that might have contributed to the course of events. These deficiencies can be defined as latent

errors which, when they coincide with other factors, can result in a serious event. In the case at Maria Hospital the following deficiencies can be identified.

- Medication was drawn up in the same room as preparation of the toxic disinfectant solution.
- Preparation of mercuric oxycyanide solution was delegated to a student without the supervision of licensed personnel.
- Both toxic and non-toxic pharmaceuticals were stored in the same cabinet.
- Written instructions on how the pharmaceuticals should be stored were lacking, which should have been considered of particular importance since the regulations of the Board of Medical Affairs were not being followed.
- It was well known that the manager of the hospital's pharmacy supply room had insufficient knowledge about pharmaceutical preparations.
- At the pharmacy, ethocaine was prepared at the same time and in the same room as mercuric oxycyanide.
- Non-licensed personnel were allowed to prepare and dispense pharmaceuticals alone.
- Uncertainty as to whether mercuric oxycyanide was always marked with a poison label at the pharmacy.

There was also discussion in the press about so-called system errors. The following appeared in Aftonbladet on September 10: *"Nothing was done knowingly, but the episode comes as a consequence of a system which is obviously not up to standard, nor was it strictly based on directives that had been issued. The episode focuses attention directly on a series of circumstances which should be thoroughly investigated, not only at the hospital in question but also at other hospitals, and likewise, the provision of pharmaceuticals to hospital pharmacies should be examined. Work conditions in the hospitals will naturally come up, just like a good many other things. Irrespective of the results reached by Stockholm's police court in its impending examination of the tragic affair, they will provide subject matter for a great deal of work for both national and municipal health care authorities."*

Although the Lex Maria regulations have changed over the course of the years, and prevention is nowadays intended to be a guide in the investigation, there is still a risk of punishment for the person who reports an incident. The risk for underreporting is therefore obvious. The question is whether the Lex Maria legislation constitutes an obstacle to the development of effective work with

safety within health care. The Lex Maria system is 73 years old in 2009, and perhaps it is time for retirement.