

AN ABSTRACT OF THE THESIS OF

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A study of the Menninger Clinic and diabetes. The Menninger Clinic opened its doors to the public in 1919. The earliest record at the Clinic of a diabetic patient who suffered from diabetes insipidus was in the early 1920s. Menninger tried to prove that cranial damage could have caused diabetes insipidus in this patient. Diabetes mellitus was studied by the Menninger Clinic in the 1930s. The study which proved that mental health disorders are related to proper glucose control. In the 1980s the Menninger Clinic partnered with the American Diabetes Association to bring public awareness regarding diabetes and mental health issues throughout the American Midwest. The Menninger Clinic closed in 2003 to move to Houston Texas where it still operates today. This thesis will give insight into how the Menninger Clinic was the first institution to study diabetes in the realm of mental health.

Keywords: Diabetes Mellitus, Diabetes Insipidus, the Menninger Clinic, American Diabetes Association.

A History of the Menninger Clinic and Diabetes

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Introduction

Diabetes is one of the oldest diseases known to medical history. The first descriptions of the disease date back to ancient Egypt. The disease has always been noted with excessive urination and constant thirst of the people afflicted with it. People lived with the disease for many years and suffered without a true cure. Diet was the best way to combat the disease for many years, until the discovery of insulin in the 1920s changed how individuals in society dealt with the disease.

Tied into the early diagnosis of diabetes was mental illness. Psychology was a growing field by the late nineteenth century. Before this time period many doctors believed mental disorders were caused by physical issues or diseases.¹ Sigmund Freud (1856-1939) led a revolution in the field of psychology with his new technique of psychoanalysis in the late 1800s. Freud believed that the doctor must have an in-depth conversation with his patient to gain insight into the mind.² Many psychologists would follow suit, and the field of psychology would become a science that many would practice for years to come.³

Freud would serve as an inspiration to Charles Fredrick Menninger and his three sons, Karl, Edwin, and Will. Together they created the Menninger Diagnostic Clinic in 1919 in Topeka Kansas. The organization started out small and would grow into a full-fledged foundation with a sanitarium, a worldwide renowned school of psychiatry, and an

¹ Allison Foerschner, "The History of Mental Illness from Skull Drills to Happy Pills," *Inquiries Journal: Social Sciences, Arts, and Humanities*, no. 09 (2010): 1-2, accessed: March 20, 2017,

<http://www.inquiriesjournal.com/articles/283/the-history-of-mental-illness-from-skull-drills-to-happy-pills>.

² Foerschner, "The History of Mental Illness from Skull Drills to Happy Pills," *Inquiries Journal: Social Sciences, Arts, and Humanities*, 3, accessed: March 20, 2017,

<http://www.inquiriesjournal.com/articles/283/the-history-of-mental-illness-from-skull-drills-to-happy-pills>.

³ Foerschner, "The History of Mental Illness from Skull Drills to Happy Pills," *Inquiries Journal: Social Sciences, Arts, and Humanities*, 3, accessed: March 20, 2017,

<http://www.inquiriesjournal.com/articles/283/the-history-of-mental-illness-from-skull-drills-to-happy-pills>.

organization for mentally ill children. Charles Fredrick Menninger was interested in the topic of diabetes ever since working with Elliot P. Joslin, a leading diabetologist, in the early 1900s. The Menninger Clinic received a variety of patients who suffered from diabetes insipidus and diabetes mellitus. The diseases are very similar in the fact that the patient passes a large amount of urine and has a constant thirst. Charles would treat these patients' leading to new discoveries and a variety of questions that he would try to answer in the realm of psychology.

This thesis offers insight into the Menninger Clinic's findings and the treatments of diabetes insipidus and mellitus. Patient records from the Menninger Clinic allows for interesting insight into the realm of diabetes insipidus and mellitus. Secondary sources by medical historians offer a great overall history of the two diseases. The first chapter gives a brief history of the Menninger Clinic and how diabetes became a crucial topic for the Clinic. The second chapter describes the medical disorder known as diabetes insipidus and how Menninger thought it could be potentially related to diabetes mellitus and its importance in the realm of neuropsychology. The third chapter will discuss' the relationship between mental disorders and the subject of diabetes mellitus. The final chapter looks into the Menninger Clinic's partnership with the American Diabetes Association (ADA) and how they pushed for Kansas and neighboring states to focus not only on the disease itself but also on the mental wellbeing of the diabetic patient and the family of the diabetic patient. The Menninger Clinic's findings prove that proper maintenance of diabetes can lead to a better mental state. They also pioneered the idea that doctors need to focus on the mental wellbeing of their diabetic patients, since it plays a crucial role in their overall health. Too many doctors during the discovery of insulin in

the 1920s tended to focus on proper maintenance of the patient's glucose all the while ignoring the mental struggles that diabetes put on the diabetic patient. The Menninger Clinic was the first medical institute that attempted to study the mental health of those with diabetes.

Chapter 1: A History of the Menninger Clinic: Kansas's Premier Psychiatric Hospital

The Menninger family of Topeka became one of the most influential families of Kansas and psychiatric history. Charles Fredrick Menninger was born in 1862 to August and Katrina Menninger in Tell City, Indiana. Charles' parents wanted him to go into local law practice, but Charles was offered a job in Holton, Kansas at the recently opened Campbell College. Charles accepted the position despite his parents' wishes. Charles would not visit Tell City often after this point in his life. While in Kansas, Charles met Flo Vesta Kinsley. They were married in 1885. Charles and Flo had three children named Karl, Edwin, and Will. These children, along with their father, would help create the Menninger Clinic established in 1919 in Topeka, Kansas.¹

The Early Lives of the Menninger Children

Karl Augustus Menninger was born on July 22, 1893. Flo Menninger had a special relationship with her first-born son. She saw aspects of herself in her son, in particular her stubbornness and thoughtfulness to others. Growing up, Karl stated in his memoirs that, "I was the oldest. Like my mother, I was given a feeling of responsibility for my brothers, which she had for her brothers and sisters in large numbers."² Karl went on to argue that he even believed he was a "problem child" due to his mother's high expectations of him. Karl grew up with these issues, and it would torment him for the rest of his life.

Edwin Menninger was born in March of 1896 as the second child to Charles and Flo. Flo stated her thoughts on Edwin as, "We were looking for a girl, but we were happy

¹ Lawrence J. Friedman, *Menninger: The Family and the Clinic* (Lawrence, KS: University Press of Kansas, 1990), 5-8.

² Friedman, *Menninger: The Family and the Clinic*, 13.

to have this chubby, strong, ten-pound boy.”³ Edwin was a very happy child growing up. Edwin was the polar opposite of his older brother Karl who tended to get into trouble. The stark differences between the children led to major issues between the two of them. Karl would often punch Edwin when he felt that Edwin was drawing attention from their mother.⁴ Edwin would never be a central part of either Charles or Flo’s life, which bothered him until the day he died.

William Claire Menninger was born in October 1899. Originally to be named Clara Louise, Flo had to rename him William because he was not the girl she had hoped for.⁵ While visiting a local priest, Flo made the comment that she had hoped that Will would have been a girl in which he promptly replied, “No, I don’t want to be a girl.”⁶ Karl viewed Will with as much animosity as he did Edwin. Will would pull attention away from his growing relationship with his mother Flo. Karl’s constant need of attention from his mother caused major issues between Karl and Will.

Flo was an essential person in the children’s lives. They all looked up to her as the main parent in their lives. Their father tried to be a major part of all their lives as well. Charles would ask for the boys to come along with him to house calls to visit and learn about his patients in the early 1900s. This sparked their initial interests in medicine. Will got the most attention out of the three children, which greatly troubled Karl because he believed that Will would be the first choice to take over their fathers practice.⁷ Charles Fredrick Menninger retells how the Clinic started in a memoir.

³ Friedman, *Menninger: The Family and the Clinic*, 14.

⁴ Friedman, *Menninger: The Family and the Clinic*, 14-15.

⁵ Friedman, *Menninger: The Family and the Clinic*, 15.

⁶ Friedman, *Menninger: The Family and the Clinic*, 15.

⁷ Friedman, *Menninger: The Family and the Clinic*, 16-17.

“How We Started”: The Beginning Years of the Menninger Clinic

The beginning of the Menninger Clinic was retold by Charles Fredrick Menninger in his work titled, “How We Started.” This document was not officially dated by Charles, but it can be placed around the timeframe of 1950. He starts the article off with the following statement, “In my sixty years of practice in medicine I have seen a lot of changes in theory and practice.”⁸ The first office that he ever ran was a small office in Topeka, Kansas around 1890. Here he states, “Doctors had no X-rays, no knowledge of blood analysis, no labs, few serums and vaccines (I practiced to make a living), no insulin, no penicillin, and no biopsies.”⁹ When he started out, people with diabetes would not receive insulin at all, but instead be put on a strict diet that would lead to massive emaciation and ultimately death. Worth noting as well is the fact that doctors by the 1890s were still looked upon with skepticism.

During this time, preventive medicine included quinine, morphine, digitalis, calomel, and salts.¹⁰ These were the tools that Menninger had to use as a doctor, which by the medical standards of today are very limited. Doctors still believed in purging and sweating as ways to cure diseases when he entered medicine.¹¹ Menninger brought up an interesting fact regarding being a medical doctor during this time. He believed that doctors felt very lonely and would yearn for help, since they ultimately worked alone in their practice.¹² This expresses a deep sadness that ultimately Menninger must have felt during the earliest years of his practice. He mentions the fact that he went to a variety of

⁸ “How We Started,” Box 107-09-05-04, C.F. Menninger Manuscripts, Kansas State Historical Society, Topeka, KS.

⁹ “How We Started,” C.F. Manuscripts.

¹⁰ “How We Started,” C.F. Manuscripts.

¹¹ “How We Started,” C.F. Manuscripts.

¹² “How We Started,” C.F. Manuscripts.

medical meetings and post-graduate courses where he could talk with his peers, but these discussions tended to be brief. In 1908, he attended a meeting of the Interstate Medical Society at the Mayo Clinic. It was here that he met Dr. Will Mayo, and he became fascinated with the idea of medicine being practiced in a group instead of by a single doctor.¹³ The Mayo Clinic was truly a role model for Menninger and he desired to emulate it the best he could.

At breakfast one morning, Charles announced to his wife, Flo, and their three children that they would establish a Mayo-style clinic in Topeka. Karl was only fourteen years old at the time, Edwin was eleven years old, and Bill (Will) was eight years old.¹⁴ Charles discussed each of the children's post-secondary school pursuits. He notes that Karl went on to get a medical degree from Harvard, while Bill went to Cornell, where he helped establish a team of doctors. Edwin, though, did not receive very much attention in Charles Fredrick Menninger's memoirs. It is stated that he went on to get a journalism degree from Washburn University, and his story ends there.¹⁵ It is obvious that Charles had big plans for his children. If they did not fit into his wants or desires, as with Edwin, they were not to play a pertinent role in his future clinic.

Once Karl returned from Boston, he wanted to focus on mental illness and the need for a better understanding of it. He also believed that there were a great number of forgotten, neglected, and suffering individuals outside the fold of general medicine who needed help.¹⁶ Karl realized that the field of psychiatry was blossoming with the findings of Freud and would soon be an important field of study. Psychiatry by the early 1900s

¹³ "How We Started," C.F. Manuscripts.

¹⁴ "How We Started," C.F. Manuscripts.

¹⁵ "How We Started," C.F. Manuscripts.

¹⁶ "How We Started," C.F. Manuscripts.

was not considered to be a real field of study in the scientific and medical community. People suffering from mental disorders felt like outcasts in normal society, and this needed to be corrected in Karl's opinion. Charles's dream of working with two of his children was becoming a reality.

Charles and Karl discussed how they would treat their patients and what their goals would be. They decided that they would practice neurology (the scientific study of the brain) and psychology within medicine, not outside of it.¹⁷ This expressed the idea that Menninger wanted to study psychology and neurology in a medical sense, not in a mental sense alone. He goes on to discuss how every patient was given a thorough exam physically, neurologically, mentally, and with laboratory work (for they had their own lab and technician).¹⁸ This proves why the Menninger Clinic was able to detect diabetes insipidus and mellitus early on with the appropriate blood and urine tests.

Mental disorders, according to Charles, were caused by a failure to adapt to one's surroundings. Mental disorders could be caused by an organism as well as the environment in which one is put.¹⁹ This gives interesting insight into how Type 2 diabetes could possibly develop. The environment in which one lives (e.g., poor diet) could give rise to the development of diabetes and the mental strains that come with the disease. The paper wraps up with the statement, "Every case was reviewed and studied together. It would help make a better kind of medicine and world."²⁰ He valued his family and truly believed that he and his sons were going to make a better world for those

¹⁷ "How We Started," C.F. Manuscripts.

¹⁸ "How We Started," C.F. Manuscripts.

¹⁹ "How We Started," C.F. Manuscripts.

²⁰ "How We Started," C.F. Manuscripts.

who suffered from mental disorders, and they attempted to get rid of the stigma that was associated with mental disorders.

The Modern Concept of Diabetes Mellitus by Charles Fredrick Menninger

Charles Menninger travelled to Rochester, Minnesota and Boston, Massachusetts in the first few decades of the nineteenth century. At Rochester, he studied under the Mayo family and was impressed with their familial connection and practices. In Boston, Charles met leading diabetologist Elliot P. Joslin. Joslin was widely known throughout the medical community as a diabetes mellitus expert, next to Fredrick Allen. Allen was the author of *Glycosuria and Diabetes*, which was one of the first written histories chronicling the discovery of a cure for the disease. Commonly known by his peers as “Dr. Diabetes,” he worked at both Harvard Medical School and the Rockefeller Institute. Allen was the first medical doctor to come up with an updated cure through proper dieting for diabetes mellitus known as the Allen Treatment or Allen Diet. The diabetic patient would only be allowed to eat roughly 800 calories a day (dependent on sugar present in the urine) and one fast day where the calories had to be cut in half.²¹

Oddly enough, Charles was interested in dietary control of diabetes and Joslin would help him with the best practices regarding diabetes mellitus. Charles let Joslin take one of his college students as a protégé so he could become an expert on diabetes mellitus treatment under the Allen Diet. When insulin was discovered in 1921, and widely distributed in 1923, Charles made another trip to go see Elliot Joslin at Joslin’s diabetic center in Boston to see how Charles could use this new miracle drug that would help people with diabetes mellitus. In his memoirs, Charles wrote “I went back to Josselyn

²¹ Thea Cooper and Arthur Ainsberg, *Breakthrough: Elizabeth Hughes, the Discovery of Insulin, and the Making of a Medical Miracle* (New York, NY: St. Martins Griffin, 2010), 7.

[sic] and studied again with him for several weeks to learn how to use it.”²² Talking to Joslin about the proper usages of insulin, and the Allen treatment, would ultimately lead Charles to publish an article titled “The Modern Concept of Diabetes Mellitus.”

At the Kansas Medical Society Meeting in Wichita on April 26-28, 1921, Charles Fredrick Menninger presented a paper about the modern view of the disease known as diabetes mellitus. Pointing to Charles’ own experiences with Elliot Joslin in Boston, and his desire to recreate a similar clinic to Joslin’s (specializing in mental disorders), it should come as no surprise why Menninger would write about the stunning advancements regarding diabetes mellitus. The paper was reprinted in the Kansas Medical Society Magazine in August 1921.

The article highlighted important advancements in medical science regarding diabetes mellitus. Menninger argued, “We should be hopeful in the fight of this dreaded disease.”²³ One of the most important treatments, according to Menninger, was the Allen Treatment. In his view this treatment restricted food intake and prolonged the lives of diabetic patients. He pointed out that medical science had pioneered more accurate medical tests to keep track of the patient’s disease. The most important advancement, according to Menninger, was the abandonment of alkaline solutions which were harmful to the patient’s well-being despite being the best cure at the time.²⁴ An interesting note in the article is the fact that diabetic deaths had decreased by 200 percent from the period of 1898 to 1914, the same period which saw the development of the Allen Treatment

²² Friedman, *Menninger: The Family and the Clinic*, 26.

²³ “Reprint: The Modern Concept of Diabetes Mellitus,” Box Number 107-09-05-04, C.F. Menninger Manuscripts, Kansas State Historical Society, Topeka, KS.

²⁴ “Reprint: Modern Concept of Diabetes Mellitus,” C.F. Manuscripts.

pioneered by Joslin.²⁵ This article by Charles Fredrick Menninger showcases why Charles became obsessed with diabetes mellitus. First, he worked with Joslin at his Diabetic Center in Boston, which inspired Charles to create his own team of doctors that would specialize in mental disorders. Furthermore, it proves that Charles Fredrick Menninger had a special interest in the disease and would try to work on the disease and its relationship to mental disorders of the brain whenever possible.

A Brief History of the Menninger Clinic's Major Developments in the Mid-Twentieth Century

Karl and Charles Menninger's clinical operations started out in the local Christ's Hospital in Topeka, Kansas, where they had a small office to see patients during the early 1920s. Karl was not pleased with how little room he had to work in and with the inner-hospital bureaucracy. Karl met Tim Neese, Neese was an attendant at Topeka State Hospital, who would help create a facility for Karl and his family for the sum of 5,000 dollars – as long as Neese had a share of the profit of the facility.²⁶ This was the beginning of the development of the Menninger Clinic Sanitarium. Investors began to increase as a local Kansas Treasury Department leader, Sam E. Cobb, joined to invest money into the Menninger's potential project as well. The original Menninger Sanitarium was located on the outskirts of Topeka, in 1925. It was situated on a twenty-acre farm, which was sold for \$40,000 to the Menninger Sanitarium Corporation. The local farmhouse was converted into a twelve-bedroom sanitarium, while the downstairs housed an office, reception room, library, kitchen, and a bedroom for Tim Neese and his wife.²⁷

²⁵ "Reprint: Modern Concept of Diabetes Mellitus," C.F. Manuscripts.

²⁶ Friedman, *Menninger: The Family and the Clinic*, 49.

²⁷ Friedman, *Menninger: The Family and the Clinic*, 50.

Thus the Menninger Clinic Sanitarium was born with a small group of investors and a small farm house on the outskirts of town. The garage to the farmhouse was converted into a six-bedroom house for patients who needed extreme care, with bars put over the windows so that the patients could not escape.²⁸ Little information is provided about how often this facility was used, but it is easy to assume it was used sparingly and for the most violent patients the clinic treated. In January 1928, the East Lodge, which was a 28-bedroom style home that would become the main housing for patients in the years to come, was completed. By the middle of 1928, the Menninger Clinic had become one unified campus for all those who needed to visit.²⁹

The clientele that visited the Menninger Clinic was very diverse. Historian Lawrence Friedman states that, “Anywhere from 95 to 158 patients were admitted in a given year. Most were about thirty-five or forty years of age and very bright. Their intelligence test scores ranged from high average to brilliant, and they had strong verbal abilities.”³⁰ People suffering from mental disorders were not the stereotypical clueless savages that society believed them to be. Menninger’s male patients tended to be wealthy businessmen or professionals who felt like they were not living up to their fathers’ high standards.³¹ Common issues found among the patients at the Menninger Clinic included relational problems (particularly marital discord), arrested sexual development, inappropriate emotional outbursts, and alcoholism.³² Some of this diverse population also had some form of diabetes. Sadly only 5 to 10 percent of the patients

²⁸ Friedman, *Menninger: The Family and the Clinic*, 50.

²⁹ Friedman, *Menninger: The Family and the Clinic*, 50.

³⁰ Friedman, *Menninger: The Family and the Clinic*, 77.

³¹ Friedman, *Menninger: The Family and the Clinic*, 77.

³² Friedman, *Menninger: The Family and the Clinic*, 78.

“fully” recovered from their mental disorders, while 55 to 75 percent improved somewhat from their mental issues, according to the early records of the Menninger Clinic.³³ This suggests that the Menninger Clinic in its early years had moderate success.

The beginning of 1926 saw the rise of another major institution on the Menninger Clinic’s grounds, the Southard School for Mentally Retarded and Emotionally Disturbed Youngsters. The school was named after Karl Menninger’s mentor in college, E.E. Southard from Harvard. Charles Menninger would be the main leader at this site. Charles expressed special interest in taking care of disadvantaged children and children who suffered from diabetes in particular.³⁴ This further proves Charles’ interest in diabetes and its treatment. The Southard School was in constant disarray from its inception, according to Karl’s second wife, Jenneta.³⁵ The cost of service in the 1930s was roughly \$112 a month for a patient to stay, which was well beyond what most people could afford during the Great Depression. Only five mentally disabled children were enrolled in the school when its doors first opened.³⁶ Fiscally, the Southard School was too costly to operate and had too few patients, forcing the Menningers to decide whether they should even keep it running from the 1940s onward. The Menningers would keep the program, since they firmly believed children needed, support just as did mentally disturbed adults.

The Menninger Clinic’s Boom to Bust in Kansas

During World War II, Karl Menninger worked with Surgeon General James Magee to help train medical officers in the realm of psychiatry. Karl’s work with Magee would lead to the development of the Winter General Army Hospital, which the

³³ Friedman, *Menninger: The Family and the Clinic*, 78.

³⁴ Friedman, *Menninger: The Family and the Clinic*, 91.

³⁵ Friedman, *Menninger: The Family and the Clinic*, 91.

³⁶ Friedman, *Menninger: The Family and the Clinic*, 95.

Menningers would run during the entirety of the war. It was here that medical officers would be trained by the Menninger staff to handle mental issues resulting from the war.³⁷ The Menninger Clinic, soon to be renamed the Menninger Foundation because of its rapid expansion from the 1930s onward, became a national institute when America entered World War II. Records show that 15 percent of all psychiatrists being trained in the United States were enrolled in the Menninger School of Psychiatry.³⁸ Walter Cronkite did a documentary in 1962 reporting how the Foundation had become a success.³⁹ The Cronkite documentary showcases that the Foundation was one of the strongest psychiatric institutes in America, and it was an interesting success story for all to see.

The Menninger Foundation was rapidly expanding, but the brothers who ran the clinic were getting on in years and had to adjust their roles respectively. From the 1970s onward, Karl Menninger was beginning to let the organization run its course with his son, Roy Menninger, stepping in to his father's shoes as a role model for the organization. Karl Menninger passed away on July 18, 1990. This was a major blow for the institution, since Karl was the main driving force behind the Foundation. The Menninger Foundation was beginning to lose a lot of in-house patients by the mid-1990's, which ultimately caused a major fiscal deficit for the Foundation because most mental illness was treated by outpatient care and the Foundation did not adjust with the times. With insufficient funding from the state of Kansas, it was in the best interests of the Foundation to look to moving elsewhere. In 2003, the Menninger Foundation would close its doors in Kansas and move to Houston, Texas where it is still in operation today.

³⁷ Friedman, *Menninger: The Family and the Clinic*, 171.

³⁸ Friedman, *Menninger: The Family and the Clinic*, 198.

³⁹ Friedman, *Menninger: The Family and the Clinic*, xi.

Charles Fredrick Menninger's interest in diabetes was not necessarily shared by his son Karl, who was the prominent partner in running the Menninger Clinic's business during the early years. Charles would maintain a keen interest in the disease though despite his son's reluctance to study about the disease. Many patients came to the Menninger Clinic during its earliest days. One of these patients suffered from a different form of diabetes. That form of diabetes was known as diabetes insipidus, which was an anomaly to Charles Fredrick Menninger and piqued his interest in the disease even more.

Chapter 2: The Menninger Clinic and Diabetes Insipidus

The history of diabetes insipidus spans back to the early eighteenth century. It is, therefore, a newer disease than diabetes mellitus, of which there is evidence in Ancient Egypt. Unfamiliar medical terms are present throughout the entirety of the thesis with proper definitions located in the appendix. The following section defines Menninger's thoughts on the disease and what caused it. Menninger's cure and treatment of the disease provide interesting information for anyone studying diabetes. A patient file known as "Diabetes Insipidus Case 4511" presents actual tests used by the Menninger Clinic in treating diabetes insipidus. Menninger's findings are compared to today's causes and treatment of the disease. The final section of the chapter focuses on the differences between diabetes insipidus and diabetes mellitus and how Menninger thought they were connected. Menninger's treatment of diabetes insipidus is important because it offers new insight on how difficult it was to treat a disease that had no easy cure and how he was ahead of his time. He also discovered that cranial damage could be a potential cause of the disease which few scientists were aware of at the time.

A History of Diabetes Insipidus

The term 'diabetes' was introduced by Demetrius of Apameia (first or second century B.C.E.). Diabetes is "derived from the Ionic, meaning 'to pass or run through,' as in a siphon."¹ This was the beginning of the term "diabetes," as many scientists and historians know of it today. Arateus of Cappadocia (second century C.E.) described the first clinical diagnosis of diabetes mellitus. Dr. Garabed Eknoyan attributes Arateus as being responsible for discovering diabetes insipidus as well. Eknoyan states:

¹ Garabed Eknoyan, "A History of Diabetes Insipidus: Paving the Road to Internal Water Balance," *American Journal of Kidney Diseases* 56, no 6 (December 2010): 1175.

With a license to interpret, diabetes insipidus may be traced to Aretaeus, who in his comments mentions another rarer cause of diabetes due to the bite of a venomous snake, *dipsas*, which “kindles up an unquenchable thirst.” The fabled serpent is told by several early Greek authors and in subsequent literature, came to be used as the name of enchanters, sibyls, and witches who inflicted various cravings in their victims. For our purposes, **dipsas** is the origin of the medical term “polydipsia,” for excessive thirst?² Aretaeus does not get credit for coining the term “diabetes insipidus.” He did make headway in defining medical terms that would become associated with diabetes insipidus, such as polydipsia, but diabetes insipidus wouldn’t be “discovered” by doctors until the late seventeenth century C.E.

Thomas Willis (1621-1675) was a professor of natural philosophy at Oxford, and he observed, “that the residue of evaporated diabetic (polyuric) urine was wonderfully sweet and tasted like honey (*quasi melle*).”³ This discovery was new to the realm of medical history. Willis’s research is important because it no longer defined diabetes as a kidney disease, but as a disease of the blood. If a diabetic patient’s urine was sweet, then the disease must occur in the patient’s blood as well. Urine analysis was also commonly used in the medieval and Renaissance eras. Without it, Willis would have never had the necessary research to distinguish between diabetes insipidus and mellitus. Willis used the term “diabetes” very casually in his research, but his studies help identify sugary polyuria from regular non-sugary polyuria.⁴ Urine that was sweet could be defined as being connected to diabetes mellitus, while non-sugary urine can be associated with the disease

² Eknayan, “A History of Diabetes Insipidus: Paving the Road to Internal Water Balance,” 1176.

³ Eknayan, “A History of Diabetes Insipidus: Paving the Road to Internal Water Balance,” 1176.

⁴ Eknayan, “A History of Diabetes Insipidus: Paving the Road to Internal Water Balance,” 1177.

known as diabetes insipidus. Scientists read Willis's work and agreed that sugary urine was the main side effect of diabetes mellitus. Diabetes insipidus wouldn't be identified by its name until Scottish physician and famed chemist William Cullen (1710-1790), of Glasgow and Edinburgh, made new findings in regards to diabetes.

In 1769, Cullen was the first modern scientist to describe polyuric urine that was "insipid" to taste and added "mellitus" to the disorders that Willis found in the seventeenth century.⁵ Cullen discussed his findings with Matthew Dobson (1732-1784) of Liverpool. Dobson was working on diabetes mellitus and found out that saccharine (sugar) was found both in the blood and urine.⁶ Cullen desired for Dobson to "examine both by taste and evaporation what might be called the *Urina Potus* or that copious limpid urine which runs in some people after drinking largely of water or watery liquors."⁷ This was the beginning of defining diabetes insipidus as a separate disorder from diabetes mellitus.

Johann Peter Frank (1745–1821) was one of the first medical scientists who gave a proper explanation for diabetes insipidus in 1794. At the University of Pavia, Frank defined diabetes insipidus as "a long continued abnormally increased secretion of non-saccharine urine which is not caused by the disease of the kidneys." The latter part of the statement was to differentiate diabetes insipidus from diabetes mellitus, which then was considered a disease of the kidneys.⁸ Frank didn't know what caused the disease or its treatment. It went by many names after Frank 'discovered' the disease. These included, "hydruria, hydruresis, paruria, incontinenens aquosa, hyperuresis aquosa, hydrops ad

⁵ Eknoyan, "A History of Diabetes Insipidus: Paving the Road to Internal Water Balance," 1177.

⁶ Eknoyan, "A History of Diabetes Insipidus: Paving the Road to Internal Water Balance," 1177.

⁷ Eknoyan, "A History of Diabetes Insipidus: Paving the Road to Internal Water Balance," 1177.

⁸ Eknoyan, "A History of Diabetes Insipidus: Paving the Road to Internal Water Balance," 1177.

matulam, uorrhoea, polyuresis and diarrhoea urinosa.”⁹ It was not until the turn of the twentieth century that medical science figured out what caused diabetes insipidus.

William Osler (1869-1939), in his medical text, defined the disease this way, “The nature of the disease is unknown. It is doubtless of nervous origin. The most reasonable view is that it results from a vasomotor disturbance of the renal vessels . . . giving rise to continuous renal congestion.”¹⁰ Osler’s definition is important because it links diabetes insipidus to its potential effects on the brain. A person’s brain was not functioning properly if diabetes insipidus occurred. Charles Fredrick Menninger began research on the issue of diabetes insipidus around the early twentieth century. Menningers’ findings advanced scientific thought regarding the disease known as diabetes insipidus.

Thoughts and Causes of Diabetes Insipidus

Charles Fredrick Menninger thought that there were three classes of diabetes insipidus. The first form was “direct” or haerostogus diabetes insipidus.¹¹ Menninger thought that there must be a direct cause or response from the body to secrete so much urine with very little glucose in the body. Menninger speculated that perhaps the brain or spinal cord is sending messages to the kidneys to secrete large amounts of urine. A second form was described as “indirect” or neuroconsequences diabetes insipidus.¹² This meant that the kidneys were triggered to secrete large amounts of urine indirectly. The brain was not sending proper signals to the kidneys, which caused issues with urine outflow. The last cause for the body to secrete excessive amounts of urine with stable glucose levels was diabetes insipidus itself. Charles Menninger wrote in his notebook,

⁹ Eknayan, “A History of Diabetes Insipidus: Paving the Road to Internal Water Balance,” 1177.

¹⁰ Eknayan, “A History of Diabetes Insipidus: Paving the Road to Internal Water Balance,” 1178.

¹¹ “Notebooks: Diabetes Insipidus,” C.F. Manuscripts.

¹² “Notebooks: Diabetes Insipidus,” C.F. Manuscripts.

“Diabetes Insipidus – unclassified by lack of knowledge.”¹³ The notebook where Charles F. Menninger listed his thoughts on the disorder was never dated. Therefore, it is likely that Menninger wrote this pamphlet in the early 1900s due to his lack of knowledge regarding the disease. Diabetes insipidus was not widely studied until the mid-1900s, when the disease received an adequate definition by medical scientists. The main cause for diabetes insipidus, according to Menninger, was the drinking of copious amounts of water.¹⁴ A normal human being should produce 800 to 2,000 milliliters of urine a day.¹⁵ A person with diabetes insipidus can urinate from 3,000 milliliters to 15,000 milliliters a day.¹⁶ Thus, the patient requires constant hydration because of the constant urine output.

Menninger relied on other medical documents to determine the exact cause of diabetes insipidus. He cites Dietrich Gerhardt’s classification of 1903. For example, Gerhardt argues that diabetes insipidus can be caused by functional neuroses. Another classification that Menninger came across regarding the disease was that it could occur without any apparent relation to the disease or nervous system (idiopathic).¹⁷ With this information in hand, Menninger speculated on what could possibly be other reasons for the disease to occur.

Menninger thought that diabetes insipidus could be linked to organic neuroses such as those that Gerhardt had suggested. He thought that if the central nervous system experienced a lesion from syphilis, a basal fracture of the skull, and/or tumors on the medulla, pons, hypothalamus, or cerebellum could all potentially lead to diabetes

¹³ “Notebooks: Diabetes Insipidus,” C.F. Manuscripts.

¹⁴ “Notebooks: Diabetes Insipidus,” C.F. Manuscripts.

¹⁵ Laura J. Martin, “Urine 24 Hour Volume,” *Medline Plus* 29, (August 2015): accessed May 13, 2016, <https://medlineplus.gov/ency/article/003425.htm>.

¹⁶ Martin, “Urine 24 Hour Volume,” accessed May 13, 2016, <https://medlineplus.gov/ency/article/003425.htm>.

¹⁷ “Notebooks: Diabetes Insipidus,” C.F. Manuscripts.

insipidus.¹⁸ All these issues have some kind of effect on the brain. Syphilis attacks the nervous system, perhaps causing diabetes insipidus, according to Menninger. He also believed a basal fracture would cause damage to the brain, thus making it possible for diabetes insipidus to occur. The medulla oblongata controls the urinary system, and tumors in that part of the brain could easily be connected with diabetes insipidus. Studies during Menninger's time connected diabetes insipidus in animals with the following parts of the brain: the medulla oblongata, cerebellum, and hypothalamus.¹⁹ This information documented by Menninger proves that he was on the right track in regard to identifying what caused the disease during his lifetime. At one point in this research, Menninger thought that diabetes insipidus could be caused or connected to diabetes mellitus.²⁰ The issue with this argument is that diabetes mellitus is an issue of the pancreas and Islets of Langerhans, but so little was known about either form of diabetes it was a worthy hypothesis. The biggest cause was head trauma, according to Menninger. If a patient hit his or her head, this could lead to diabetes insipidus immediately or in a few days. These were the main causes of diabetes insipidus in Menninger's opinion. The information represents how Menninger was one of the first scientists who attempted to identify the cause of the disease. Everything linked back to the brain. The brain was either not functioning right or experienced some kind of damage from the physical world or medical world, e.g., tumors. Treating diabetes insipidus was very difficult during Charles Menninger's life time.

Menninger's Treatment of the Disease

¹⁸ "Notebooks: Diabetes Insipidus," C.F. Manuscripts.

¹⁹ "Notebooks: Diabetes Insipidus," C.F. Manuscripts.

²⁰ "Notebooks: Diabetes Insipidus," C.F. Manuscripts.

Menninger's treatment of the disease begins with the use of diuretics. A diuretic causes a patient to urinate more frequently than normal. This was often used to collect samples of urine and test them as needed. He frequently used Newhal salts, luera, sugar, and digitalis in certain conditions. In his findings, Menninger found out that the salt was not absorbed and turned into diarrhea. In some patients, Menninger used pure bodies' diuretics, such as caffeine, which proved weak, and agrarian diuretics which made the blood oxygen poor.²¹ With all these diuretics going into effect, Menninger was trying to identify a cause of the disease and what correlated with it. A patient with diabetes insipidus tends to not absorb salt into the body like a normal patient should. Menninger injected a patient with a NaCl (salt) shot and noticed that the polyuria output was the same as that of a normal kidney. Salt was not the issue then, according to Menninger's research.

Menninger found out that polyuria ceased when there was no cerebral concussion and cerebral compression.²² Treatment thus needed to include relieving pressure of the brain. One of the other cures for the disease was the NaCl & Protein diet. This diet was heavy on sodium and any form of meat. The data showed that the urine output by the patient was not elevated in its nitrogen output and chlorine output. These levels should have been increased due the amount of salt in their diets. The amount of urine output was overall elevated above normal levels.²³ This was an oddity in Menninger's research, since it did not prove the hypothesis that a diet high in salt should have elevated nitrogen and chloride levels.

²¹ "Notebooks: Diabetes Insipidus," C.F. Manuscripts.

²² "Notebooks: Diabetes Insipidus," C.F. Manuscripts.

²³ "Notebooks: Diabetes Insipidus," C.F. Manuscripts.

Another form of treatment by Menninger was the therapeutic measure. In this treatment, Menninger withdrew all forms of water from the patient, thus ruling out the idea that the more water a diabetic person drinks the more frequently they will urinate. Diabetic mellitus patients urinate more depending on the amount of sugar present in the blood. Menninger provided a medication that was designed specifically for hysterical polyuria. Hysterical polyuria is defined as copious amounts of urine that are beyond normal means. The follow up to this treatment was a remedy for a causative disorder, which Menninger does not describe in the pamphlet. The most important step, though, according to Menninger, was the regulation of diet. Food regulation was a common treatment for diabetics, so it doesn't come across as a shocking treatment for the disease.²⁴

In an October 1915 notebook entry, Menninger wrote that prolonged fasting in diabetes, as suggested by Fredrick M. Allen, was perhaps a better way to treat diabetes. Under this program the patient is supposed to have a minimal sugar-free diet and exercise as much as possible. Menninger states that the restriction of sugar, or brief fasting, must occur for best results. Allen's research proves that a proper diet must be maintained for the best results in diabetic patients.²⁵

According to Menninger, the most severe forms of diabetes require ritual fasting, which would last for weeks, rather than a couple of days as normally prescribed. The riding of animals, like horses, was prescribed by Menninger to keep patients at a low weight level and increase metabolism via exercise. If weight or metabolism were increased, it would bring back glycosuria in human patients. Symptoms of increased

²⁴ "Notebooks: Diabetes Insipidus," C.F. Manuscripts.

²⁵ "Notebooks: Diabetes Insipidus," C.F. Manuscripts.

glycosuria include lower tolerance for foods, emaciation, weakness, and death if not checked. The best treatment for diabetes was located at Rockefeller Hospital in New York. They prescribed two methods of treating any form of diabetes, fasting and the Oatmeal Cure.²⁶ The Oatmeal Cure was developed by Dr. Carl Von Noorden in 1903. Von Noorden specialized in metabolic disorders in Germany during the period of the late nineteenth century into the early twentieth century. Von Noorden's cure was met with both praise and skepticism because it was supposed to rid the body of ketonuria.²⁷ This was a major issue that led to diabetic ketoacidosis, which would cause death.

The Oatmeal Cure was described by Menninger as, "Dr. Von Noorden's latest modification of Oatmeal Cure which consists of a rotation of two to three days of the strictly sugar free diet, two to three days of the Green Diet, and two to three days of the Oatmeal Diet."²⁸ The Green Diet consists almost exclusively of vegetables. It is sugar-free. The diet was meant to reduce caloric intake. If the patient desired they could add two to eight eggs, oil, bacon, lard, butter, and sweet cream to increase daily caloric needs, if the Green Diet didn't supply enough. The oatmeal recipe consists of two cups of oatmeal, four cups of water and salt sufficient to taste. The oatmeal would be boiled for up to four hours. The doctor would then divide the oatmeal into five parts adding to each 1/10 to 1/8 pound of butter and serve with hot cream, not milk. The following feeding schedule was supposed to be followed in regards to diabetic patients, 7:30 AM, 10:30 AM, 1:30 PM, 4:30 PM, and 7:30 PM. The oatmeal diet had to be served alone, with no

²⁶ "Notebooks: Diabetes Insipidus," C.F. Manuscripts.

²⁷ James Herrick, "The Oatmeal Diet in The Treatment of Diabetes Mellitus," *JAMA 100 Years Ago* 17, (2008): accessed May 8, 2016, <http://jamanetwork.com/journals/jama/article-abstract/181594>.

²⁸ "Oatmeal Cure," Box Number 107-09-05-04, C.F. Manuscripts, Kansas State Historical Society, Topeka, KS.

other foods being provided in the diet.²⁹ This was one treatment prescribed to many diabetic patients throughout America at the time. The diet was very strict and caused many diabetics to perish due to the fact they had so little food intake that they became skin and bones. Menninger noted that patients who suffered from diabetes insipidus did not show increased sugars while being treated with the Oatmeal Cure, which was an irregularity with diabetic patients.

Menninger stated that glycosuria cleared up in eight to ten days of fasting. He finds that using alcohol is valuable during fasting since it does not produce glycosuria in patients. Freedom of glycosuria is attainable in most cases of uncomplicated diabetes before there is any danger of death or severe infection. Fasting had no harmful side effects according to Menninger. Menninger argues that fasting is required since it erases glycosuria and other diabetic symptoms. Although he admitted that it was hard for his patients to maintain the Oatmeal Cure, the worst side effect to the diet and fasting was the weakness.³⁰ The Menninger Clinic actually had a patient who suffered from diabetes insipidus. This patient file shows real evidence of how the Menninger Clinic tested for diabetes insipidus.

Diabetes Insipidus Case of 4511

In 1924, the Menninger Clinic received its first patient who suffered from diabetes insipidus. The patient will be referred to as *Patient X* for privacy purposes. In 1914 Patient X began drinking a copious amount of water and urinated quite frequently. He often complained of being tired from this point onward. Arriving at the Menninger Clinic on March 17, 1924 the records stated that he drank too much water, he gained 25

²⁹ "Oatmeal Cure," C.F. Manuscripts.

³⁰ "Notebooks: Diabetes Insipidus," C.F. Manuscripts.

pounds in two years, had no chest or spinal abnormalities, and had a small prostate. Patient X's family history was clear, and they had no history of diabetes mellitus or insipidus. His appetite was good, but he was drowsy often. Upon arrival Patient X was given the Wasserman Test, which tests for syphilis. It came back negative, thus ruling out sexual disease as a cause of Patient X's diabetes insipidus.³¹ The Clinic decided to run a glucose test on March 19, 1924. The results are displayed on the graph below.³²

Glucose Tolerance Test for Patient X Table

Time	Blood Sugar or BS	Urine Output	Glucose & Water Intake
8:45 AM	102.8 Milligrams	325 Cubic Centimeters (No Sugar in Urine).	130 Grams of Glucose 50 Cubic Centimeters of Lemon Juice 200 Cubic Centimeters of Water
9:15 AM	135.8 Milligrams	None	None
9:45 AM	165.4 Milligrams	385 Cubic Centimeters (No Sugar in Urine)	200 Cubic Centimeters of Water.

³¹ "Diabetes Insipidus, Case of 4511," Box Number 118-02-04-05, Karl Menninger Manuscripts, Kansas State Historical Society, Topeka, KS.

³² "Diabetes Insipidus, Case of 4511," Karl Menninger Manuscripts.

10:45 AM	142.8 Milligrams	215 Cubic Centimeters (2 Plus Sugar in Urine)	200 Cubic Centimeters of Water
12:45 PM	76.9 Milligrams	440 Cubic Centimeters	200 Cubic Centimeters of Water

The Menninger Clinic used the above information to test whether or not a patient suffered from diabetes. Normally this tested for diabetes mellitus, since a patient with mellitus has sugary urine. Patient X's blood sugar did rise, which is normal for someone who has eaten at least 130 milligrams of sugar food and lemon juice. It rose over the course of an hour, then dropped. The most important information on this chart, according to Menninger, was the fact that, four hours into the test, Patient X's urine output doubled from the amount of water he consumed. Patient X had little to no sugar in his urine, making it hard to determine if the patient had diabetes mellitus – since sugar should be more present in the urine. This led to the Clinic speculating that the patient could have diabetes insipidus instead.

Patient X was taken in for further tests in regards to his sugar intake. The Foundation tested his hemoglobin count, which was at 92 percent. This was normal for the most part. His red blood count was normal, which was a good sign. The following day Menninger asked for an x-ray of the patient to be taken of his brain and body. The x-rays showed that there were no brain abnormalities, no intra-cranial pressure, but there was an abscess in the jaw region. This ruled out that the insipidus could be caused by

cranial pressure or some other kind of brain damage. The abscess in the jaw was of little importance to Menninger's research. The notebook entry for March 22, 1924 stated that Patient X suffered from hypo-pituitary troubles. The patient needed two hypoderuric injections a day. Two days later the patient complained of feeling pressure in his head. More injections were scheduled. By the first of April 1924, Patient X no longer felt any pressure in his head and was less drowsy. The patient's file ends with this last record.³³

The information provided by Patient X's file proves two points in regards to the treatment of diabetes insipidus. First, Menninger still had no way of proving what caused the disease. Second, Menninger was on the right track in regards to tracing that the disease was caused by some sort of brain damage. Even though he labeled the disease of Patient X as a pituitary gland problem, he was on the right road in identifying that the disease was linked to the brain. Menninger clearly identified that the patient did not have diabetes mellitus through his glucose test. Patient X should have had more sugar in his urine if he had diabetes mellitus. This made Menninger speculate that the patient had diabetes insipidus, due to his chronic urine output. The fate of Patient X is never stated by the record, but it is likely that the patient did have diabetes insipidus and that Menninger was well aware of that fact. Menninger's treatment of the disease may be considered brash by today's standards, but he was on the right track none-the-less in studying the development of the disease.

Diabetes Insipidus Causes and Treatment in the Late Twentieth and Twenty-First
Centuries Medical World

³³ "Diabetes Insipidus, Case of 4511," Karl Menninger Manuscripts.

The National Institute of Diabetes and Digestive and Kidney Diseases offers numerous insights into the different forms of diabetes insipidus and how to treat the disease. Diabetes insipidus occurs when the hypothalamus and pituitary gland are not working properly; therefore, the kidneys do not function properly.³⁴ A key chemical component is required when the body produces the correct amount of urine, which is the antidiuretic hormone or ADH. A patient with diabetes insipidus is producing either very little of this hormone or none at all. This causes the patient to urinate frequently. There are four common types of diabetes insipidus in the world today that doctors have identified.

The first form is Central Diabetes Insipidus. This is the most serious form of diabetes insipidus. It results from damage to the pituitary gland, which controls the ADH hormone that regulates the correct amount of urine output. This can occur from head injuries, neurosurgery, and/or genetic disorders. To treat this form of diabetes insipidus, a patient is given a synthetic hormone called desmopressin, either in the form of an injection, nasal spray, or pill. The hormone regulates water excretion in the kidneys and allows for the kidneys to function properly.³⁵

Nephrogenic Diabetes Insipidus occurs when the kidneys are not able to respond to the ADH hormone properly. This can be caused due to drugs, like lithium, chronic disorders, including polycystic kidney disease, sickle cell disease, kidney failure, partial blockage of the ureters, and inherited genetic disorders. This form of diabetes insipidus

³⁴ Joseph Verballis and Gary Robertson, "Diabetes Insipidus," *National institute of Diabetes and Digestive and Kidney Diseases*, (March 2012): 1, accessed May 14, 2016, <https://www.niddk.nih.gov/health-information/kidney-disease/diabetes-insipidus>.

³⁵ Verballis and Robertson, "Diabetes Insipidus," 2, accessed May 14, 2016, <https://www.niddk.nih.gov/health-information/kidney-disease/diabetes-insipidus>.

sometimes has no direct cause and is baffling to modern day doctors. To treat this form of diabetes insipidus the patient is given hydrochlorothiazide (HCTZ) with amiloride, which regulates water excretion in the kidneys and allows them to function properly once again.³⁶

Dipsogenic Diabetes Insipidus is caused by a defect or damage in the thirst mechanism of the brain, which is located in the hypothalamus. The defect causes the patient to have an abnormal increase in thirst and fluid intake, which suppresses ADH secretion and increases urine output. Current drugs on the market for diabetes insipidus should not be used to treat this form of the disease. The drugs may decrease urine output but not decrease thirst and fluid intake. If the patient keeps drinking water while on these drugs, the patient will suffer water intoxication, which lowers the concentration of sodium in the blood and seriously damages the brain. No cure or treatment has been found to treat this form of diabetes insipidus.³⁷

The last form of diabetes insipidus is Gestational Diabetes Insipidus. Gestational DI occurs only during pregnancy. It results from an enzyme made by the placenta that destroys ADH in the mother. The placenta is the system of blood and other tissues that develop with the fetus. The placenta exchanges nutrients and waste products between mother and fetus, which makes it possible for the placenta to destroy ADH. Often, Gestational DI can be treated with desmopressin. Unless there is damage to the thirst

³⁶ Verballis and Robertson, "Diabetes Insipidus," 2, accessed May 14, 2016, <https://www.niddk.nih.gov/health-information/kidney-disease/diabetes-insipidus>.

³⁷ Verballis and Robertson, "Diabetes Insipidus," 2, accessed May 14, 2016, <https://www.niddk.nih.gov/health-information/kidney-disease/diabetes-insipidus>.

mechanism, similar to Dipsogenic DI, desmopressin should not be used under any circumstance.³⁸

Figuring out the cause and form of diabetes insipidus requires a few medical tests. These tests include urine analysis along with a water deprivation test. The urine analysis examines the physical and chemical characteristics of the urine. A person who suffers from diabetes insipidus will have less-concentrated urine. Less concentrated urine can be determined by the salt and waste concentrations being low and the amount of water present in the urine as being high. A physician will evaluate the urine by measuring how many particles of water are in a kilogram or by comparing the weight of the urine with an equal volume of distilled water.³⁹

The water deprivation test helps physicians determine if diabetes insipidus is caused by any of the following: excessive intake of fluids, a defect in ADH production, and/or a defect in the kidney's response to ADH. The test measures changes in the body's urine output and urine composition when fluids are withheld from the body. If this proves inconclusive, then measuring blood levels may be required to assess ADH output. In some patients, a magnetic resonance imaging (MRI) of the brain may be necessary as well to determine if there is any cranial pressure on the brain.⁴⁰

Menninger's Findings Compared to Today's Information and Importance

Diabetes Insipidus Case 4511 by the Menninger Clinic offers insight into how accurate or inaccurate the Clinic was in diagnosing diabetes insipidus compared to

³⁸ Verballis and Robertson, "Diabetes Insipidus," 2, accessed May 14, 2016, <https://www.niddk.nih.gov/health-information/kidney-disease/diabetes-insipidus>.

³⁹ Verballis and Robertson, "Diabetes Insipidus," 2-3, accessed May 14, 2016, <https://www.niddk.nih.gov/health-information/kidney-disease/diabetes-insipidus>.

⁴⁰ Verballis and Robertson, "Diabetes Insipidus," 3, accessed May 14, 2016, <https://www.niddk.nih.gov/health-information/kidney-disease/diabetes-insipidus>.

today's medical information. The first sign that Menninger was on the right track was the amount of water that Patient X drank. That is the first sign that a person potentially could have diabetes of some sort, either mellitus or insipidus. Doctors now know that patients with diabetes insipidus drink a lot of water, due to the fact that they can't regulate their water intake. The Clinic also tested Patient X's urine for sugar molecules. This is the same practice that doctors use today to see if a patient has diabetes mellitus or insipidus. The x-ray taken on Patient X represents how Menninger was ahead of his time.

Menninger knew diabetes insipidus had to be connected with the brain. As a necessity, he requested that scans be taken of the patient's brain – ruling out that there was some kind of brain damage present. Doctors today scan the brain via MRI to rule out the possibility of damage to the brain.

The most important finding of Patient X's diagnosis was his hypo-pituitary issues. Menninger was not quite sure if the patient suffered from diabetes insipidus, even though it was easy to speculate that he did. The fact that Menninger knew the pituitary gland was not producing enough ADH showcases how Menninger and his colleagues were medical geniuses in a way. During Patient X's lifetime, little was known of the cause and treatment of diabetes insipidus. A report was created in 1926 stating that the cause of the disease was an issue with pituitary glands.⁴¹ This study came out two years after Patient X's studies. In many ways, Menninger and his colleagues advanced medical science regarding diabetes insipidus by linking the disease to the pituitary gland. Today's doctors know this form of diabetes insipidus as Central DI.

⁴¹ "Diabetes Insipidus Cause Believed Found," *The Science News Letter* 8, no. 253 (February 1926): 10.

In many ways, Karl Menninger, and the Menninger Clinic as a whole, is an important medical institution especially in regards to diabetes. Menninger stated in his medical notebook that there was very little information on diabetes insipidus at the time.⁴² The main focus of the institution was mental health. Yet diabetes insipidus intrigued Menninger so much that he devoted an entire notebook to studying the disease. Patient X in Case 4511 was, in many ways, Menninger's first encounter with the disease. Menninger thought it could be a case of normal diabetes mellitus but was intrigued that Patient X had so little sugar in his urine. The absence of sugar in the urine made it a completely different disorder than expected. He took x-rays of the brain to make sure there was no cranial pressure. The Clinic then figured it must be due to low ADH secretion by the pituitary gland, which is directly connected to diabetes insipidus. Menninger did not know what caused the disease, but he did know that it must be related to the pituitary gland. His findings correlate well with the current understanding of the disease. The biggest discrepancies are the Oatmeal Cure and mandatory fasting for a week, since that ultimately hurts the patients' health by not getting proper nutrients. Without the Menninger Clinic's treatment of diabetes insipidus, modern medicine would probably not be the same.

Diabetes Insipidus versus Diabetes Mellitus

Diabetes insipidus and diabetes mellitus share the same initial name. The two disorders should not be confused with one another, though. The term 'diabetes' came from Demetrius of Apameia which means "to pass through or siphon."⁴³ Diabetes mellitus results from an insulin deficiency or resistance, which can lead to high blood

⁴² "Notebooks: Diabetes Insipidus," C.F. Manuscripts.

⁴³ Eknayan, "A History of Diabetes Insipidus: Paving the Road to Internal Water Balance," 1175.

glucose or blood sugar.⁴⁴ Diabetes mellitus requires patients to take insulin, as injections or as pills, to maintain blood glucose levels. The issue with the two disorders is the symptoms both of them portray. In his notebook, Menninger speculated that the two disorders could be connected somehow.⁴⁵ This research proved irrelevant though, thanks to modern medicine. Diabetes insipidus and diabetes mellitus cause excessive thirst and excessive urination, making the two disorders very similar; however, diabetes mellitus is more common than diabetes insipidus.⁴⁶ The two conditions, are unrelated because insipidus is about internal water balance, while diabetes mellitus is about blood glucose control. Needless to say, both diseases are potentially devastating and must be properly maintained in the individuals afflicted by them.

Diabetes insipidus was a disease Menninger admitted he knew very little about in his notebook regarding the disease, but he did wonder if it could be connected to diabetes mellitus. Charles's interest in the disease, and the increase of diabetes mellitus in human history by the 1900s, allowed for diabetes to be studied in the realm of psychiatry. Psychiatrists knew very little about the relationship that proper diet and insulin intake had on a diabetic's mental wellbeing, and the Menninger Clinic would be the first to conduct studies on the relationship between mental health and diabetes mellitus.

⁴⁴ Verballis and Robertson, "Diabetes Insipidus,"², accessed May 14, 2016, <https://www.niddk.nih.gov/health-information/kidney-disease/diabetes-insipidus>.

⁴⁵ "Notebooks: Diabetes Insipidus," C.F. Manuscripts.

⁴⁶ Verballis and Robertson, "Diabetes Insipidus," 1, accessed May 14, 2016, <https://www.niddk.nih.gov/health-information/kidney-disease/diabetes-insipidus>.

Chapter 3: The Menninger Clinic and Diabetes Mellitus

The history of mental illness, or the study of mental wellbeing, is as old as diabetes mellitus. Hippocrates of Cos normally receives credit as being the first amateur doctor to document mental illness in Ancient Greece in 400 B.C.E. He argued that mental health issues were caused by disturbed physiology rather than by demonic possession and the Greek gods' wrath. Greek physicians would often prescribe silence and a drug known as hellebore.¹ The plant has medicinal qualities when properly used, such as being a purgative to clear the body of any unwanted toxins.² The family of the mentally unstable was the main caretaker of those who suffered from mental disorder for centuries.

During the period known as the Middle Ages (476-1400s), the mentally ill were not treated as outcasts by society, but they were not truly integrated into it either. Mentally unstable women could be accused of witchcraft and be burned at the stake for heresy against the Catholic Church. Arabs built makeshift asylums for the mentally unstable and continued the Greek traditions of treating mental disorders during the eighth century. The first mental institute was established in Baghdad in 792, with Damascus and Aleppo creating more institutions in the following years.³ Valencia, Spain was the first European city to house the mentally unstable in an asylum in 1407. France's first major asylum was the La Maison de Chareton, established in 1641. In Vienna, Austria the Lunatics Tower was created in 1784, which allowed for the public to view what madness

¹ Allison Foerschner, "The History of Mental Illness from Skull Drills to Happy Pills," *Inquiries Journal: Social Sciences, Arts, and Humanities* 09, (2010): 1, accessed: September 20, 2016, <http://www.inquiriesjournal.com/articles/283/the-history-of-mental-illness-from-skull-drills-to-happy-pills>.

² "Health Benefits of Hellebore," last modified 2016, <https://www.organicfacts.net/health-benefits/herbs-and-spices/hellebore.html>.

³ Foerschner, "The History of Mental Illness from Skull Drills to Happy Pills," 1-2, accessed: September 20, 2016, <http://www.inquiriesjournal.com/articles/283/the-history-of-mental-illness-from-skull-drills-to-happy-pills>.

truly was.⁴ Throughout the sixteenth to the eighteenth centuries, mentally unstable Europeans were often thrown in prison with vagrants and thieves. These individuals could often be seen chained up and treated poorly by their caretakers during this period. The late eighteenth century brought hope for the mentally ill. French physician Phillippe Pinel (1745-1826) took over the Bicetre insane asylum and forbade the use of shackles and chains on any of his patients. His patients were also no longer confined to dungeons. They were moved to rooms that brought in sunlight, and they were allowed to exercise on the grounds under appropriate supervision. American Dorothea Dix, in 1848, began a nationwide campaign to reform the penal system in the United States. Dix noted how the mentally ill in Massachusetts were left unclothed and without proper heat or bathroom facilities. Dix helped create 32 state mental health hospitals throughout the nation. Pope Pius IX began to reconsider how the Catholic Church should handle the mentally ill after speaking with Dix.⁵

In 1883, German psychiatrist Emil Krapelin began to document mental disorders in a more scientific manner. Krapelin is credited with discovering the differences between schizophrenia and manic depressive behavior.⁶ Around the late nineteenth century in America, a *New York World* reporter, Nellie Bly, posed as a mentally unstable American; she was taken to a mental asylum and she later gave the public a detailed report that American asylums were overcrowded and in poor condition. Bly's report lead

⁴ Foerschner, "The History of Mental Illness from Skull Drills to Happy Pills," 2, accessed: September 20, 2016, <http://www.inquiriesjournal.com/articles/283/the-history-of-mental-illness-from-skull-drills-to-happy-pills>.

⁵ Foerschner, "The History of Mental Illness from Skull Drills to Happy Pills," 2-3, accessed: September 20, 2016, <http://www.inquiriesjournal.com/articles/283/the-history-of-mental-illness-from-skull-drills-to-happy-pills>.

⁶ Foerschner, "The History of Mental Illness from Skull Drills to Happy Pills," 3, accessed: September 20, 2016, <http://www.inquiriesjournal.com/articles/283/the-history-of-mental-illness-from-skull-drills-to-happy-pills>.

to more funding for mental health institutions across America. The early twentieth century then saw the rise of Sigmund Freud and Carl Jung and the development of psychoanalytical theory or conversation therapy.⁷

Clifford Beers published his autobiography, *A Mind that Found Itself*, in 1909. The book details his inhumane treatment in a Connecticut mental hospital. *A Mind that Found Itself* demanded that America improve the mental health system or there would be no cured minds in America. One year later Beers was the leader of the Mental Hygiene Group, which advocated for better treatment of the mentally ill throughout America. This would go on to become the Mental Health Institute of America.⁸ Karl Menninger began operating the Menninger Diagnostic Clinic in Topeka in 1919, which would become a leading institute in mental health across the world. Unfamiliar psychological terms are present throughout the chapter with proper definitions in the appendix.

A Brief History of Diabetes Mellitus

Diabetes is one of the oldest known chronic debilitating diseases in world history. The earliest record of diabetes dates back to a 1500 B.C.E. Egyptian papyrus which stated, ‘a medicine to drive away the passing of too much urine.’ The papyrus also mentioned frequency and retention of urine making it unclear whether it was truly diabetes or some other bladder disorder such as a kidney stone.⁹ Roughly around the sixth century B.C.E. in India, the Hindu physician Sushruta described urine that tasted sweet like honey. He also noted that ants tended to gather around these patients’ urine and was

⁷ Foerschner, “The History of Mental Illness from Skull Drills to Happy Pills,” 3-4, accessed: September 20, 2016, <http://www.inquiriesjournal.com/articles/283/the-history-of-mental-illness-from-skull-drills-to-happy-pills>.

⁸ Foerschner, “The History of Mental Illness from Skull Drills to Happy Pills,” 3-4, accessed: September 20, 2016, <http://www.inquiriesjournal.com/articles/283/the-history-of-mental-illness-from-skull-drills-to-happy-pills>.

⁹ Robert Tattersall, *Diabetes: The Biography* (New York, NY: Oxford, 2009), 10.

not sure of why this occurred. However, he did note that these symptoms were most common in overweight individuals or individuals who tended to overeat. His cure was to have overweight patients eat more vegetables and exercise on a regular basis, while thinner patients were given a more nourishing diet.¹⁰ These symptoms all point out diabetes in today's medical world. Therefore, the ancient Egyptians and Indians were truly ahead of their time.

Hippocrates of Cos (460-370 BCE) is considered the father of medicine by many. Hippocrates did not recognize diabetes like the Egyptians and Indians. In his work *The Epidemics*, Hippocrates' patients urinated excessively compared to the amount of water consumed, which is a common symptom of diabetes. The urine, according to Hippocrates, was watery or diluted – another sign of diabetes.¹¹ Medical historian Robert Tattersall and other medical historians are not sure why Hippocrates never connected these symptoms with diabetes, but the most common assumption is lack of knowledge of past works on the disease, such as that of the Egyptians and Indians. Arateus gives the first description of diabetes mellitus:

“Diabetes is a wonderful affection, not very frequent among men. Being a melting down of the flesh and limbs into urine. Its cause is of a cold and humid nature as in dropsy. The course is a common one, namely the kidneys and the bladder; for the patients never stop making water, but the flow is incessant, as if from the opening of aqueducts. The nature of the disease, then, is chronic, and it takes a long period to form; but the patient is short lived, if the constitution of the disease be completely established; for the melting is rapid, the death speedy. Moreover, life is disgusting and painful; thirst unquenchable; excessive drinking, which, however, is disproportionate to the large quantity of urine, for more urine is passed; and one cannot stop them either from drinking or making water; Or if for a time they abstain from drinking their mouth becomes parched and their body dry; the viscera seem as if scorched up; they are affected with nausea, restlessness and a burning thirst . . . they stand out for a certain time, though not very long, for they pass urine with pain and the emaciation is dreadful; nor odes any great

¹⁰ Tattersall, *Diabetes: The Biography*, 10.

¹¹ Tattersall, *Diabetes: The Biography*, 11.

portion of the drink get into the system, and many parts of the flesh pass out along with the urine.”

Arateus described diabetes from factors such as polydipsia and polyuria; the only issue with his assessment is that it was not discovered by Europeans until the 1550’s, leaving his assessment widely unknown for many years.¹²

The physician Galen (129-210 A.D.E.) suggested that diabetes could be an issue of kidneys. Galen’s viewpoint that diabetes was a kidney disorder remained the accepted explanation until the nineteenth century when it was debunked.¹³ The Islamic Persian philosopher and physician, Avicenna (980-1037), was the first to note secondary health-related issues caused by diabetes such as gangrene, carbuncles, and phthisis (tuberculosis). He also noted that when the patient’s urine evaporated it left a honey-like residue.¹⁴ Thomas Willis (1621-1675) was the first physician to declare that diabetic urine tasted sweet by drinking diabetic urine and noting how it tasted. This idea was furthered by Matthew Dobson (1735-1784), who tested a 33-year-old male known as Peter Dickonson who was passing 28 pints, or 15 liters, of urine a day. Dobson evaporated Dickonson’s urine and found out that it left a substance that tasted, oddly enough, like sugar. He also noted how Dickonson’s blood was sweet as well.¹⁵

During the same time period, William Cullen (1710-1790) of Edinburgh distinguished two different forms of polyuria. Cullen discovered urine that was sweet should be called diabetes mellitus and urine that tastes insipid or tasteless should be called diabetes insipidus.¹⁶ In 1815, the French chemist Eugene Chevreul (1786-1889)

¹² Tattersall, *Diabetes: The Biography*, 11.

¹³ Tattersall, *Diabetes: The Biography*, 12.

¹⁴ Tattersall, *Diabetes: The Biography*, 12.

¹⁵ Tattersall, *Diabetes: The Biography*, 14.

¹⁶ Tattersall, *Diabetes: The Biography*, 15.

discovered that diabetic urine contained glucose or sugar. The 1830s brought forth scientific proof that diabetic blood contains abnormal amounts of sugar in it. The discovery of elevated sugars in the blood led to the first glucose test in 1841 by Karl August Tommer (1806-1879), which required patients to pour their urine in with blue cupric (copper) sulphate; the solution would turn into red cuprous oxide when sugar was present. German doctors in 1857 began to notice that when diabetic patients were entering critical stages of diabetes their urine and breath smelled like acetone (nail varnish remover), and the ferric chloride and nitroprusside tests proved that acetone was present in the urine.¹⁷ In 1877, these symptoms received a proper name known as ketoacidosis, or diabetic coma, by German physician Bernard Nyuan (1839-1925). Diabetes was still considered a kidney disease in the mid-1880s, until Oskar Minkowski studied the pancreases in dogs, which helped lead to the discovery of insulin.

Treatments before the Discovery of Insulin and the Discovery of Insulin

Life for the diabetic before the discovery of insulin was a miserable one. Diabetes before the nineteenth century was treated by bleeding, blistering, and doping. Meanwhile in the mid-nineteenth century, the French physician Piorry suggested that diabetics eat large amounts of sugar to replace the sugar lost in the urine. Patients died in a mere matter of days from these archaic medical practices.¹⁸ The most common remedy for diabetics up to the early twentieth century was to smoke opium. Many doctors argued that it dulled the pain that the diabetic was suffering from, while others, like Fredrick Allen, thought its addictive properties outweighed any medical benefit to diabetic patients. German physician Von Noorden announced his 'Oat-Cure' for diabetes in 1902.

¹⁷ Tattersall, *Diabetes: The Biography*, 24.

¹⁸ Michael Bliss, *The Discovery of Insulin* (Chicago, IL: University of Chicago, 2007), 23.

This began a long line of diabetic cures including, but not limited to, ‘the milk diet,’ ‘the rice cure,’ and ‘potato therapy’ to name a few. These ‘cures’ were made possible due to the fact that fad diets were beginning to spawn throughout the world in a variety of pamphlets and magazines.¹⁹ Diabetes would not have a real treatment until Fredrick Allen began working with diabetic patients in 1914.

Allen began his experiments with dogs. He removed most of the pancreas, leaving a small section intact. The dogs would eat and would develop diabetes after the course of a few days. Allen noticed that dogs whom ate less tended to have less glycosuria compared to dogs that ate more. Once Allen was allowed to experiment with human diabetic patients he began to notice that meals low in carbohydrates caused less glycosuria.²⁰ This realization led to Allen discovering that undernourishment was the key to fighting diabetes. Allen’s *Total Dietary Regulation in the Treatment of Diabetes* appeared in 1919, documenting his success with cutting calories until glycosuria disappeared. Treatment was attempted on diabetics, from the newly-diagnosed to almost-comatose diabetics in hospitals. Medical historian Michael Bliss describes the treatment as the following,

“When a diabetic was admitted to hospital, he or she was put on a fast (liquids only) until the glycosuria and in the severe cases acidosis disappeared. Then there would be a gradual buildup of diet, measuring by carbohydrate tolerance, but with strict weighing of all foods to see how much a patient could take before becoming glycosuric. When sugar was present in the urine then the limit had been reached. A fast day would clear the urine again and the diet would be fixed at a total caloric intake just under the tested tolerance.”²¹

¹⁹ Bliss, *The Discovery of Insulin*, 24.

²⁰ Bliss, *The Discovery of Insulin*, 34.

²¹ Bliss, *The Discovery of Insulin*, 35.

One of Allen's most famous patients was Elizabeth Hughes, the daughter of important Republican and Supreme Court Justice Leader Charles Evan Hughes. Elizabeth's diet consisted of 800 calories each day for a six-day period, and one day with only 400 calories known as a fast day. During the time period of the discovery of insulin, Elizabeth weighed only 45 pounds by the age of eleven.²² A normal girl at Elizabeth's age should weigh about 80 pounds thus making her no more than skin and bones. Allen's practice was used by hospitals throughout the world. The treatment was considered harsh by many, but it was the only successful treatment of the disease before insulin was discovered in 1921-1922 by a group of Canadian scientists.

Fredrick Banting, was an aspiring physician who studied at the University of Toronto, who had to give a lecture about carbohydrate metabolism on October 31, 1920. Banting had no interest in studying diabetes or carbohydrate metabolism. One night he was reading an article titled, "The Relation of the Islets of Langerhans to Diabetes with Special Reference to Cases of Pancreatic Lithiasis," by Moses Baron. Later that night he wrote in his notebook, "Diabetes. Litigate pancreatic ducts of dogs. Wait six to eight weeks for degenerate leave islets. Try to isolate the internal secretion of these to relieve glycosuria."²³ Banting discussed his idea with some close colleagues, and they suggested he talk to James R. Macleod of the University of Toronto, who specialized in carbohydrate metabolism. Macleod was skeptical at first and suggested that it had been tried before with little success. Macleod was willing to loan Banting one of his graduate

²² Caroline Cox, *The Fight to Survive: A Young Girl, Diabetes, and the Discovery of Insulin*, (New York, NY: Kaplan, 2009), ix-xiii.

²³ Michael Bliss, *The Discovery of Insulin* (Chicago, IL: University of Chicago, 2007), 50.

students, Charles Best, to conduct experiments. The research began in the summer of 1921.

The two men experimented with dogs. The dogs would undergo surgery led by Banting, who took out the pancreas and studied the urine and blood of the dogs. The first few months led to no discoveries and many deceased dogs. Banting and Best would ground up frozen dog pancreases in an alcohol solution using a mortar and pestle where it then would be filtered through cheesecloth and warmed to body temperature. The extract was a pinkish color. On July 30, 1921, Best injected four ccs of the extract into a white terrier, number 410. Its blood sugar before the injection was .20. Within an hour, the dog's blood sugar dropped forty percent to .12, suggesting that they were on the right track.²⁴ The results that summer were as follows, "42 favorable results, 22 unfavorable ones, and 11 inconclusive ones", showing that the extract was not completely refined. By the end of 1921, Banting demanded that Macleod ask J.B. Collip, a brilliant chemist who specialized in internal secretions, to join the team to help refine the extract. Collip agreed to help and asked his lab assistant to go to the local butcher and collect "sweetbreads," or the pancreases of cattle, to begin research.²⁵

Banting and Best's extract was tested orally on a local diabetic friend, Joe Gilchrist, on December 20th with negative results. Banting and Best discovered from this test that the extract must be given subcutaneously because the stomach acids would destroy the active compounds.²⁶ Meanwhile, Collip was working on his own extract and discovered a more potent version that caused hypoglycemia or insulin shock. The first

²⁴ Bliss, *The Discovery of Insulin*, 68.

²⁵ Bliss, *The Discovery of Insulin*, 90.

²⁶ Bliss, *The Discovery of Insulin*, 120.

patient to ever receive Banting's insulin was a 14-year-old boy by the name of Leonard Thompson. Thompson was only 65 pounds and very fragile according to Best, Banting, and Collip. "The result of the injection, as reported in a publication signed by Banting, Best, Collip, and Campbell, was as follows: Leonard Thompson's blood sugar dropped from .440 to .320. The twenty-four excretion of glucose fell from 91.5 grams in 3,625 cc of urine to 84 grams in 4,060 cc of urine. The Rothera test for ketones continued to be strongly positive. 'No clinical benefit was evidenced.' A sterile abscess, caused by the impurities of the extract developed at the site of one of the injections."²⁷ This report showcases that Banting's insulin was not very effective, but Collip would continue working on his extract which Thompson received beginning in January 1922. Thompson's glycosuria disappeared, as well as his ketonuria, under Collip's extract.²⁸ The success of Collip's extract was further proven when Joe Gilchrist received the extract in February 1922, where with one injection of Collip's extracts erased all traces of glycosuria.²⁹ This showed that Collip had developed a more refined version of the extract and it was safe for clinical trials.

The name 'insulin' came about in April of 1922. There is no record of why the name was chosen over any other name. Macleod suggested the name since it was based on the Latin root for 'island,' but one will never know.³⁰ The middle of May 1922 saw the development of limited quantities of insulin in Canada. Demand was high and many were turned away due to the limited production of insulin. This led to issues with the potency of insulin. Elizabeth Hughes received insulin in the middle of 1922 and often

²⁷ Bliss, *The Discovery of Insulin*, 113.

²⁸ Bliss, *The Discovery of Insulin*, 120.

²⁹ Bliss, *The Discovery of Insulin*, 122.

³⁰ Bliss, *The Discovery of Insulin*, 126.

experienced hypoglycemic reactions requiring that she be careful.³¹ Insulin was refined throughout the 1920s and became a medical miracle for many throughout the entire world.

The Physician's Instructions to Diabetic Patients

Karl Menninger was no stranger to diabetes in his psychiatric clinic. Diabetes was on the rise through the 1920s and 1930s, thus making it a relevant topic for Menninger and his colleagues to study. Menninger gave a pamphlet to every diabetic patient that walked through his clinic. This pamphlet was titled, "The Physician's Instructions to Diabetic Patients."³² The first page allowed for a patient to write their name down with a statement in bold declaring they were a diabetic. This page goes on to state "If I am taken sick, or am found unconscious please summon a physician, or take me to the hospital."³³ The last statement conveys the importance the Menninger Clinic put upon taking care of diabetic patients, such as getting them the help they needed even if they were out of the Clinic. Patients at the Menninger Clinic were required to document how many calories they were allowed for breakfast, lunch, and dinner. This section also contained appropriate insulin doses for all three meals.³⁴ These details most likely were kept in the patients' files, and among the nurses, so they could check and administer proper insulin dosages to their diabetic patients.

This pamphlet gives a brief description of diabetes. It documents the most basic symptoms of diabetes, such as sugar being present in the urine and excessive flow of

³¹ Bliss, *The Discovery of Insulin*, 155.

³² "The Physician's Instructions to Diabetic Patients," Box Number 107-09-05-04, C.F. Menninger Manuscripts, Kansas State Historical Society, Topeka, KS.

³³ "The Physician's Instructions to Diabetic Patients," C.F. Menninger Manuscripts.

³⁴ "The Physician's Instructions to Diabetic Patients," C.F. Menninger Manuscripts.

urine. The causes of diabetes are listed as being unknown, but they are attributed to overeating, obesity, and disease of the pancreas.³⁵ This description shows that Menninger was aware of two types of diabetes. One type was an issue with the pancreas (Type 1 or Juvenile Diabetes) while the other type was due to obesity and overeating (Type 2 or Adult-Onset Diabetes) It goes on to describe what insulin does in the body and how it was discovered by physicians in Toronto. Patients are then instructed to give injections subcutaneously (under the skin) using a hypodermic needle and syringe. The best syringe, according to the pamphlet, to use was the Wilder syringe by Becton/Dickinson Companies. The needle needed to be made of rust-less steel and needed to be $\frac{3}{4}$ inches in length minimum. It would be boiled for three minutes before each usage.³⁶ The amount of detail that the Menninger Clinic put in the pamphlet showcases how important diabetic patients were to the clinic. They knew that if anything were to happen to a diabetic patient under their care, it would be held against them. This pamphlet allowed diabetics to take care of themselves, and it would properly train the medical staff at the Clinic.

Insulin Squibb

The Menninger Clinic received a letter from the Drisko-Hale Drug Company on November 5, 1925. The company promised C.F. Menninger a fresh supply of insulin squibb whenever he demanded it. The insulin was produced by E.R. Squibb and Sons. An official license was granted by the University of Toronto.³⁷ This is an important development for the Menninger Clinic because by the mid-1920s insulin was being

³⁵ "The Physician's Instructions to Diabetic Patients," C.F. Menninger Manuscripts.

³⁶ "The Physician's Instructions to Diabetic Patients," C.F. Menninger Manuscripts.

³⁷ "Diabetic Neuritis," Box Number 107-09-05-04, C.F. Menninger Manuscripts, Kansas State Historical Society, Topeka, KS.

produced through major corporations such as Eli Lilly. The insulin from Eli Lilly would be costly due to shipping of the product from Indianapolis, Indiana to Kansas in the mid-1920s. The patents that were developed for Lilly insulin would also make it costly for the Menninger Clinic to receive a large batch of insulin for its diabetic patients. The Drisko-Hale Company was located right in Topeka, Kansas, which made it easily accessible for the Clinic.

The letter goes on to document the major details of insulin squibb. It had a low nitrogen count, high stability, extreme accuracy and potency, low substances to cause dropouts, and was free from pigment impurities.³⁸ This description made the insulin very promising for potential buyers. Insulin during the mid-1920s tended to be unstable, causing considerable challenges for the diabetic who used it. These challenges included hypoglycemia symptoms, which occur when the blood sugar is too low and lead to potential comas and even death. The lack of pigment impurities was another important factor that insulin squibb had over other insulins at the time, since if the pigment was impure it could cause issues such as infections at the injection site. The insulin could be bought in a variety of sizes and the sizes were indicated by label color. These colors ranged from a blue bottle which was 50 units of insulin up to a green label which was 800 units of insulin.³⁹ This color scheme allowed for the Menninger clinic to get a variety of sizes depending on the needs of their diabetic patients. As far as the records show there was no listed number of diabetics in the Clinic, but it seems likely there were quite a few if the company was willing to send Menninger a detailed list of the insulins they provided. Drisko-Hale Drugs promised that the Menninger Clinic would receive prompt

³⁸ "Diabetic Neuritis," C.F. Menninger Manuscripts.

³⁹ "Diabetic Neuritis," C.F. Menninger Manuscripts.

attention whenever the Clinic needed insulin.⁴⁰ Therefore, the Menninger Clinic would have never been short on insulin, which was a major issue for most hospitals at that time.

Diabetes and Mental Disorders 4519-A

Karl Menninger conducted his studies of diabetic patients during the 1920s and 1930s. There is no exact date on the patient files that he studied other than that the research was conducted during this time frame. Menninger developed a practice among his associates to focus on each individual's issue with the utmost care. This mentality required each of the doctors and nurses at the Clinic to be on the same page in regards to their patients.⁴¹ The Clinic was a research-based clinic, which required Menninger to conduct a variety of psychiatric tests in regard to their patient's mental wellbeing. The discovery of insulin in the 1920's allowed diabetics to live longer, which allowed Menninger to study his diabetic patients' mental health in depth.

The case file, *Diabetes and Mental Health Disorders 4519 A*, was one of these experiments. The file contains both men and women. Children are not present in the file at all. This absence is very interesting because juvenile diabetes held so much potential of study for the Clinic. No reason is given as to why the Clinic strayed away from studying children, even though they developed the Southard School for children with mental disabilities in the 1920s. Patient names are not present on the file, which eliminates the need for patient privacy. Menninger kept track of the patients he studied in a graph labeled by age, sex, mental issue, correlation, treatment for diabetes, and final diagnosis.

⁴⁰ "Diabetic Neuritis," C.F. Menninger Manuscripts.

⁴¹ Kansas State Historical Society, "The Menninger Clinic," Kansapedia, June 2013, accessed October 7, 2016, <https://www.kshs.org/kansapedia/menninger-clinic/12147>.

The first patient studied was a fifty-year-old woman. She suffered from ‘Toxic Psychosis,’ according to Menninger. There was no apparent factor as to why she suffered from mental psychosis according to Menninger’s notes. She had had mild diabetes, or Type 2 diabetes, for seven years. There was no change in mental status with the disease. She controlled her diabetes with diet. She was transferred to a state hospital shortly after research began with no reason given for why the transfer occurred.⁴² The next patient was a fifty-seven-year-old male who also suffers from ‘Toxic Psychosis.’ Menninger noted that the patient always dealt with ‘queer’ periodic short depressions. He goes on to state that when the patient’s sugar was high, his mental health was always worse. This patient died while at the clinic. The notes indicate that he controlled his sugar with diet and insulin, but it was not regularly controlled.⁴³ A fifty-eight-year-old male who experienced ‘Toxic Psychosis’ had a vague onset of the disease, which means that Menninger did not know when the patient developed diabetes. He noticed that once the patient’s sugars were controlled, his mental health improved vastly. These findings made it a ‘parallel improvement’ scenario in which the two issues were correlated. The patient made a full recovery, but no date is given for when he left the Clinic. His diabetes was controlled by diet and insulin.⁴⁴ The last patient studied was a fifty-seven-year-old female who was bipolar. She lost her leg at fifty-six due to gangrene. The record does not state if the gangrene was caused by complications due to diabetes, but it is highly likely. Menninger

⁴² “Diabetes & Mental Disorders 4519-A,” Box Number 118-02-04-05, Karl Menninger Manuscripts, Kansas State Historical Society, Topeka, KS.

⁴³ “Diabetes & Mental Disorders 4519-A,” Karl Menninger Manuscripts.

⁴⁴ “Diabetes & Mental Disorders 4519-A,” Karl Menninger Manuscripts.

noted that her mental health improved, but it did not improve when her diabetes was out of control. She controlled it through a combination of insulin and diet.⁴⁵

The information by Menninger offers some interesting insights. The fifty-seven-year-old female who controlled her diabetes through diet alone had no success in controlling her mental health. From the present information, Menninger was able to deduce that diet alone was not the best way to control diabetes and could possibly be the reason she was sent away to a state hospital where they could put her on insulin. The fifty-seven-year-old male who suffered from psychosis and bouts of depression had issues with his mental wellbeing when his sugars were out of order. When his sugars were in proper balance through the introduction of insulin and proper dieting, his mental health seemed to become better – even though this happened irregularly. The fifty-eight-year-old male who suffered from psychosis recovered considerably when his sugars were under control. The last patient experienced the same conditions as the aforementioned patient. Once her sugars were under control, her mental wellbeing improved. This study allowed for Menninger to prove that diabetics who maintain proper sugars tend to have a better mental state. Furthermore, it proves that a diabetic patient must use insulin and diet to improve his or her mental health, and that using diet alone would not help the patient's diabetes or mental health.

Menninger's Findings Compared to Other Doctor's Findings

One of the earliest publications about diabetes and mental health came from Daniel Noble, a medical doctor from Manchester England. Noble described how one of his patients tended to suffer from massive anxiety and insomnia due to his diabetes. He

⁴⁵ "Diabetes & Mental Disorders 4519-A," Karl Menninger Manuscripts.

described how he tried to rid his patient's mind of the fear that death was certain in a matter of a year.⁴⁶ Noble's case study proves that diabetics, before the discovery of insulin, would certainly have had mental health issues such as anxiety because of the complications the disease had. These complications included premature death, losing a limb, or even heart issues.

George Davenport Brown conducted studies in 1938 regarding the mental personalities of diabetic children from a Minnesota hospital for non-diabetic children. Brown concluded that diabetic children tended to be more irritable and excitable when compared to regular children. The intelligence of diabetic children, compared to non-diabetic children, was roughly the same.⁴⁷ Brown's results provide interesting insight into the lives of diabetic children, since the results note that they were not that different from their classmates. The reason that diabetic children become excited or irritable easily could very well stem from hypoglycemia or low sugars. It is not an uncommon side effect of hypoglycemia to be irritable. Menninger's findings tended to be completely new during the time period in which he studied. As presented, there are very few articles on the subject of diabetes and mental health before the 1980s, making Menninger one of the first major psychiatrists to study the relationships between diabetes and mental disorders.

Menninger's Findings Compared to the Findings of Today's Doctors

The New England Journal of Medicine published an article describing a group of patients who suffered from chronic illnesses, such as cancer, arthritis, and diabetes, and the relationship of diabetes with mental health issues. The study found that diabetes was

⁴⁶ Daniel Noble, "A Question as to Pathological Distinctions in Cases of Diabetes," *The British Medical Journal* 1, no. 107 (1863): 58.

⁴⁷ George Davenport Brown, "The Development of Diabetic Children, with Special Reference to Mental and Personality Comparisons," *Child Development* 9, no. 2 (Jun 1938): 183.

correlated closely with patients who suffered from mental depression.⁴⁸ In an article published by the American Diabetes Association, it was asserted that diabetic patients were two times as likely to be diagnosed with depression compared to the regular American populace.⁴⁹ A recent study from 2012 observes that Type 1 diabetics who suffered from mental disorders such as anorexia, depression, and bipolar disorder tended to have worse glucose control when the patient's mental health issue was not being treated.⁵⁰ These findings by modern doctors prove that mental health and glucose control are related. Diabetics who have better control of their sugars tend to do better with their mental wellbeing. Menninger's findings are verified by the recent studies on mental health and diabetes. Doctors today are finding out that diabetics tend to have some kind of mental disorder, ranging from simple depression to more serious issues such as anorexia.

The Menninger Clinic had conducted studies on diabetes mellitus and its effects on the mental wellbeing of their patients. What the studies found was that patients who had better control of their mental health tended to have better control of their sugars. Elliot Joslin believed and admired the diabetic because of the toll the disease had on both the body and the mind. Charles Menninger would pass away in 1952, but his works on diabetes mellitus would inspire the Menninger Foundation to partner with the American Diabetes Association. Together they would conduct lectures on how diabetes affected the mental wellbeing of not only the diabetic but also of the family that cared for the diabetic.

⁴⁸ Barrie Casselith, "Psychosocial Status in Chronic Illness — A Comparative Analysis of Six Diagnostic Groups," *The New England Journal for Medicine*, (1984): 1.

⁴⁹ Leonard Edged, "Comorbid Depression is Associated with Increased Health Care Use and Expenditures in Individuals with Diabetes," *American Diabetic Association*, 2002.

⁵⁰ Carrie Bernstein, "Mental Health Issues in Adolescents and Young Adults with Type 1 Diabetes Prevalence and Impact on Glycemic Control," *Sage Journals*, 2012.

Chapter 4: The Menninger Clinic and Public Health Initiatives Regarding Diabetes

The Progressive Era (1890-1920) in American history was marked by a variety of changes in American society. Benjamin Dewitt defined the progressive movement as ‘the exclusion of privileged interest from political and economic control, the expansion of democracy and the use of government to benefit the weak and oppressed members of American society.’¹ The progressives helped Congress enact the Pure Food and Drug Act in 1906, which sparked the progressives’ interest in public health. One of the most important tools used by the progressives to support the Pure Food and Drug Acts was Upton Sinclair’s book, *The Jungle*. The book details the horrors of the meat packing industry and how unclean it was. People read *The Jungle*, including President Theodore Roosevelt, who was so astonished by the story that he helped push the Meat Inspection Act through Congress – proving the major push the progressive movement had in the realm of public health. Public health historian David Rosner argues that the progressive movement led to “the use of sanitarian techniques of cleaning and altering the physical environment through street cleaning, removal of refuse, provision of clean water, removal of waste through public sewer systems, removal of night soil and regulation of privies, and inspection of milk and other products had been established as legitimate activities of the state through local health departments.”²

The Spanish Influenza Pandemic of 1918 was a different beast that the progressives had to tackle. The initial response to the rise of influenza was “calming rather than altering the public about the dangers relating to the epidemic.”³ Similar to

¹ Peter Feiline, "An Obituary for "The Progressive Movement,"" *American Quarterly* 22, no. 1 (1970): 21.

² David Rosner, “” Spanish Flu, or Whatever it Is. . . . “: The Paradox of Public Health in a Time of Crisis,” *Public Health Reports* 125, (2010): 38.

³ Rosner, “” Spanish Flu, or Whatever it Is. . . . “: The Paradox of Public Health in a Time of Crisis,” 44.

other epidemics in human history, the initial response to the flu pandemic was very meager, since no one could tell how deadly the disease could or would be. Local doctor Charles Chapin of Rhode Island Public Health believed that progressive thought demanded an efficient public health establishment that focused on finding the germ, not reforming the environment in which the individual lived.⁴ The Progressive Era and the Spanish Influenza Pandemic showcases the importance of public health in American society, which can be defined as “What we, as a society, do collectively to assure conditions in which people can be healthy.”⁵ These public health initiatives by the progressives and the various health regulations that the Spanish Influenza Pandemic of 1918 spawned were role models for how organizations like the American Diabetes Association and the Menninger Clinic should address diabetes in the public health sector.

A History of the American Diabetes Association (ADA)

The American Diabetes Association has its roots during the public health concerns of the Great Depression Era. At a meeting of the American College of Physicians located in New Orleans in 1937, a small group of doctors interested in the topic of diabetes gathered for a lunch meeting to discuss the subject. The men noticed that despite the discovery of insulin in 1921, the issue of diabetes still presented significant treatment problems in many hospitals and medical societies. Some of the questions raised at the meeting were: “What constituted good control of the disease? How and when insulin should be given? Which diet was appropriate and if exercise was really a factor in control?”⁶ These men knew that insulin was just the beginning of the study of

⁴ Rosner, “” Spanish Flu, or Whatever it Is. . . . “: The Paradox of Public Health in a Time of Crisis,” 45.

⁵ Rosner, “” Spanish Flu, or Whatever it Is. . . . “: The Paradox of Public Health in a Time of Crisis,” 46.

⁶ American Diabetes Association, “The Journey & the Dream: A History of the American Diabetes Association,” The American Diabetes Association Inc. (1990), 3.

diabetes, but no one had considered researching the issue further, since insulin was a miracle drug that seemed to control diabetes.

Two of the leading men from this meeting were Dr. Cecil Striker of Cincinnati and Dr. Herman O. Monsthal of New York who corresponded with each other about how to develop an organization that would monitor diabetes and produce information for the public regarding the disease. Monsthal believed, “For a national diabetes association I believe there are three requirements: . . . leadership, a definite program, and monetary funds.”⁷ These requirements were well-grounded and necessary for any society to flourish. Leadership was easy to obtain since numerous local organizations from New York, Detroit, Cincinnati, Philadelphia, and Rochester, New York had diabetic interest groups who would answer employer questions on how to handle the diabetic worker and handle questions from any diabetic in the local area to gain new information regarding the disease. These local groups sent representatives to the Committee for Establishment of a National Diabetes Association at the Hotel Statler in Cleveland, Ohio, on April 2, 1940.⁸ Dr. Striker was to lead the Committee, and he noted that the Tuberculosis Association was willing to join forces with the Diabetic Association, since the mortality rates of diabetics and tuberculosis patients in 1940 were about the same. Striker and the Committee decided not to join the organization as it would pull focus away from diabetes and drain the funds of the Tuberculosis Association.⁹

⁷ American Diabetes Association, “The Journey & the Dream: A History of the American Diabetes Association,” 3.

⁸ American Diabetes Association, “The Journey & the Dream: A History of the American Diabetes Association,” 3.

⁹ American Diabetes Association, “The Journey & the Dream: A History of the American Diabetes Association,” 4.

The name for the organization was brought up by Monsethal who stated that the name ‘National Diabetic Association’ would alienate the Canadians. Canada was the founding country of insulin, thus Monsethal felt that it should be called ‘The American Diabetes Association’ to encompass all parts of North America.¹⁰ The organization was funded by a \$500 contribution by the Union Life Insurance Company of Cincinnati and a \$1,000 gift from Eli Lilly and Company for the first three years of its development.¹¹ The organization had its funding, but it needed a purpose and a constitution. The American Diabetes Association Constitution was officially adopted and went through legal scrutiny to be adopted as a non-profit organization on August 28, 1940.¹² The first members during the beginning years of the organization were limited to medical professionals who paid \$2 annual dues to be an active member of the Association in 1940.¹³ The organization would not accept non-medical personnel until the 1970s.

The American Diabetes Association and the Menninger Clinic Partnership

The Kansas Diabetes Association was founded in 1972. The Association applied to be incorporated into the American Diabetes Association by the end of that year, and the request was granted. By the end of 1974, the Kansas Diabetes Association would be officially named the ADA Kansas Affiliate. This organization created a successful diabetic camp known as Camp Discovery. The camp was supposed to help educate children about diabetes and how to manage it properly. The camp got a permanent home

¹⁰ American Diabetes Association, “The Journey & the Dream: A History of the American Diabetes Association,” 5.

¹¹ American Diabetes Association, “The Journey & the Dream: A History of the American Diabetes Association,” 7.

¹² American Diabetes Association, “The Journey & the Dream: A History of the American Diabetes Association,” 7.

¹³ American Diabetes Association, “The Journey & the Dream: A History of the American Diabetes Association,” 8.

in 1979 at the WaShunGa Area of Rock Springs Ranch.¹⁴ One of the most important aspects of the ADA Kansas Affiliate was its emphasis on education programs in which the Menninger Clinic participated.

Jan Larson was the Director of the Family and Education and Support Program at the Menninger Clinic. Larson gave a variety of presentations throughout the Midwest regarding diabetes and the mental wellbeing of those who suffered from it. On October 8, 1987 in Paola, Kansas, Larson gave a speech called, “Coping with Long Term Chronic Disease” at the Paola Cultural Center.¹⁵ No exact details or written copy of the speech remains, but the American Diabetes Association of Kansas paid Larson \$240 for the presentation proving that the speech was a success.

Larson had also given other presentations regarding the issue of diabetes and mental wellbeing in Tulsa, Oklahoma earlier that same year. Larson presented a lecture called, “All in the Family: Family Interactions and Dynamics,” which was met with much acclaim. Larson followed this lecture up with “Family Ties – Strengthening the Bond.” Larson’s speeches highlight the importance of the family in working with diabetes. The disease would pose a different dynamic for the family, such as a new stressor fiscally and mentally. Questions that the family might ask included, “How do I handle diabetes? Will my child live a normal life?” Larson’s speeches addressed these issues because diabetes was on the rise throughout America during this time-period. Doctors were becoming better at diagnosing the disease, allowing for the Menninger Clinic to discuss how one handles chronic disorders like diabetes.

¹⁴ American Diabetes Association, “The Journey & the Dream: A History of the American Diabetes Association,” 296.

¹⁵ “American Diabetic Association – Paola KS October 8th 1987,” Box Number 118-K9-05-03, Menninger Foundation Archives, Kansas State Historical Society, Topeka, KS.

ADA Forecast: A Leading Public Health Information Tool Regarding Diabetes

One of the earliest forms of public health awareness articles regarding diabetes was the *ADA Forecast (Diabetic Forecast Today)*, which was published in 1948. The *ADA Forecast* was the first quarterly magazine to really bring about new insight for people already acquainted with the disease and those who were just diagnosed with the disease. The *ADA Forecast* published about 53,000 copies, which were sent to physicians, pharmacists, and clinics throughout the nation.¹⁶ The magazine described new findings about the disease and was published by the American Diabetes Association. A major event occurred in 1964 with Olympian Billy Mills winning a gold medal for the men's 10,000-meter race.¹⁷ This event was published in the magazine because it brought awareness about diabetes to the public; it also gave diabetics a sense of hope that the disease was not a limit on one's capabilities in society. Diabetes for many years was viewed as a debilitating disease that limited what one could do in society.

In 1974, The National Diabetes Mellitus and Education Act was passed by Congress. This act allocated funds for diabetes research, training centers, and a long-range plan on how to combat the disease.¹⁸ This congressional act was an important milestone for diabetics everywhere, since it helped bring about public awareness regarding a disease that was becoming a major issue in American society. A few years later, the Centers for Disease Control and Prevention opened a division devoted solely to diabetes. In 1989, the name would change to Division of Diabetes Translation, which remains in operation today in hopes that a cure will be found.¹⁹ In 1986, the American

¹⁶ Regan Minners, "Living History," *Diabetes Forecast*, (November/December 2015): 54.

¹⁷ Regan Minners, "Living History," 55.

¹⁸ Regan Minners, "Living History," 56.

¹⁹ Regan Minners, "Living History," 56.

Diabetes Association published the first National Standards for Diabetes Education. Around the same time the National Certification Board for Diabetes Educators was born, creating a system for accredited diabetes educators in American society. These educators specialized in diabetes and taught their patients how to maintain proper control of sugar, eating, exercise, and coping with diabetes.²⁰ An important milestone for the ADA was publishing the “Standards of Care for Patients with Diabetes Mellitus” in 1989. This set of standards made guidelines for all health providers to follow when treating diabetic patients, and it is updated every year by the American Diabetes Association, so health providers stay current on the best diabetic practices.²¹ All these resources that the *ADA Forecast* published highlight just how important diabetes awareness had become in American society. Beginning with a simple magazine, public health awareness regarding diabetes has morphed into congressional acts and a new form of healthcare professional known as a Diabetic Educator. A Diabetic Educator is a licensed medical professional who teaches patients about diabetes and how to properly maintain glucose levels.

Diabetic Summer Camps: An Age-Old Public Health Tool

1925 saw the birth of the first summer camp for children with diabetes when the discovery of insulin being only three years old. Diabetes camps were the first illness specific camps created in American history. The camps have blossomed; while only 1,300 children attended 19 North American camps in 1952, more than 20,000 children went to camps worldwide in 2005.²² Children with juvenile diabetes, or Type 1 diabetes, needed to be educated on proper management of the disease. That was what the camps

²⁰ Regan Minners, “Living History,” 56.

²¹ Regan Minners, “Living History,” 57.

²² Gary Maslow, “Diabetes Summer Camps: History, Safety, and Outcomes,” *Pediatric Diabetes* (2009): 278.

were all about. Dr. Henry John's camp in Cleveland is the oldest run diabetes camp, while Elliot P. Joslin created the first diabetic camp exclusively for boys and girls in 1940. Charles Best, the co-founder of insulin, helped start a camp in Toronto in 1946.²³ A year later the American Diabetes Association opened up its first diabetic camp for children in Montgomery, Alabama in 1947.²⁴ The ADA officially stated in 2006, "The mission of specialized camps for children and youth with diabetes is to allow for a camping experience in a safe environment. An equally important goal is to enable children with diabetes to meet and share their experiences with one another while they learn to be more personally responsible for their disease."²⁵ This, to its core, is a public health initiative by the American Diabetes Association. The camps are meant to be a way to enhance the health of diabetic youth in American society. A study was conducted by Dr. Gary Maslow, who paid special attention to the psychological outcomes of children who visited diabetic camps and those who did not.

Self-concept and self-esteem increased considerably for children who attended diabetic camps over those who did not. Girls had lower self-esteem when it came to suffering from diabetes upon entering the camps.²⁶ This assessment by Maslow is an important figure in the history of diabetic camps, since it shows the success the camps had in the realm of mental wellbeing. These camps were meant to improve how children felt about themselves ultimately. Children who attended diabetes summer camps tended to think that they had more control of their sugars and their lives in general than those

²³ Maslow, "Diabetes Summer Camps: History, Safety, and Outcomes," 278.

²⁴ Regan Minners, "Living History," 54.

²⁵ Maslow, "Diabetes Summer Camps: History, Safety, and Outcomes," 279.

²⁶ Maslow, "Diabetes Summer Camps: History, Safety, and Outcomes," 285.

who did not.²⁷ Finally, the issue of anxiety for children with diabetes diminished significantly compared with those who did not attend a diabetic camp at all.²⁸ These studies show how, historically and statistically speaking, diabetic camps have improved the overall mental wellbeing of diabetic children. These studies also show that it was an important public health tool for children and their families living with diabetes.

²⁷ Maslow, "Diabetes Summer Camps: History, Safety, and Outcomes," 285.

²⁸ Maslow, "Diabetes Summer Camps: History, Safety, and Outcomes," 285.

Conclusion

As of 2012, the American Diabetes Association estimates that 29.1 million Americans have pre-diabetes or Type 2 Diabetes, while 1.25 million Americans have juvenile or Type 1 Diabetes. Diabetes is not a new disease to human medical history. It has been around since the Egyptians, but the rise of cases regarding diabetes began with the age of rapid industrialization in human history during the nineteenth century. Many medical historians such as Robert Tattersall argue that the ease of accessing food and the minimal labor required in the workplace from the twentieth century onwards could have helped cause this epidemic to grow to where it is today.

Charles Fredrick Menninger's keen interest in diabetes led to the Menninger Clinic becoming deeply involved in the issue of the spread of diabetes across America. Charles had worked with Elliot Joslin in Boston before and after the discovery of insulin, demonstrating how important the issue of diabetes was to him. He knew that many people who studied diabetes didn't focus on the mental health of their diabetic patients. They were interested in the new discovery of insulin during the early twentieth century. They forgot that suffering from diabetes caused a lot of mental stress, emotional stress, and physical stress.

The Menninger Clinic knew how important the issue of diabetes was in America. Each year it seemed to be increasing faster than any other chronic disease in America. Besides Charles Menninger's interest in diabetes, the Clinic knew that many of their patients may have suffered from diabetes. Their awareness of what patients were diabetic allowed them to conduct research never done before in diabetes regarding the mental wellbeing of a diabetic. The results of the Menninger Clinic's research proved that

diabetics who tended to have better control of their sugar through proper diet and/or insulin injections would suffer from fewer mental disorders and issues. Medical doctors would emulate the research of the Menninger Clinic in the late twentieth century and into the twenty-first century, leading to discoveries that diabetic patients tend to suffer from a wide range of mental disorders, including depression and anorexia.

The Menninger Clinic of Topeka knew that diabetes was an issue that needed to be addressed beyond simply measuring sugars and testing for ketoacidosis. The Clinic's research into diabetes insipidus and mellitus needs a place in medical history. Without the research conducted by the Clinic, and later on the lectures that the Menninger Foundation gave regarding the disease, the public would not be aware of how diabetes is more than testing blood sugars and taking insulin shots. It is a way of life that contains mental struggles to which people are oblivious. The Menninger Clinic and Foundation wanted to highlight this point and bring it to the public's attention as the disease began its rapid expansion.

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Appendix of Medical Terms¹

Anorexia - the lack or loss of appetite accompanied by an aversion to food and the inability to eat. It is the defining characteristic of the disorder Anorexia Nervosa.

Bipolar Disorder - a major affective disorder marked by severe mood swings (manic or major depressive episodes) and a tendency to remission and recurrence.

Diabetes Insipidus - a disease that is characterized by frequent urination, excretion of large amounts of dilute urine, and excessive thirst. Etiologies of diabetes insipidus include deficiency of antidiuretic hormone (also known as ADH or Vasopressin) secreted by the Neurohypophysis, impaired kidney response to ADH, and impaired hypothalamic regulation of thirst.

Diabetic Ketoacidosis - a condition characterized by an abnormally elevated concentration of Ketone Bodies in the blood (acetonemia) or urine (acetonuria). It is a sign of diabetes complication, starvation, alcoholism or a mitochondrial metabolic disturbance (e.g., Maple Syrup Urine Disease).

Depression - depressive states usually of moderate intensity in contrast with major depression present in neurotic and psychotic disorders.

Glycosuria - the appearance of an abnormally large amount of glucose in the urine, such as more than 500 mg/day in Adults. It can be due to hyperglycemia or genetic defects in renal reabsorption (Renal Glycosuria).

Hyperglycemia - abnormally high blood glucose level.

¹ Medical Dictionary Online, <http://www.online-medical-dictionary.org/>.

Hypoglycemia - a syndrome of abnormally low blood glucose level. Clinical hypoglycemia has diverse etiologies. Severe hypoglycemia eventually leads to glucose deprivation of the Central Nervous System resulting in hunger, sweating, paresthesia, impaired mental function, seizures, coma, and even death.

Insulin - a 51-amino acid pancreatic hormone that plays a major role in the regulation of glucose metabolism, directly by suppressing endogenous glucose production (glycogenolysis; gluconeogenesis) and indirectly by suppressing glucagon secretion and lipolysis. Native insulin is a globular protein comprised of a zinc-coordinated hexamer. Each insulin monomer containing two chains, A (21 residues) and B (30 residues), linked by two disulfide bonds. Insulin is used as a drug to control Insulin-Dependent Diabetes Mellitus (Diabetes Mellitus, Type 1).

Ketones - the metabolic substances acetone, 3-Hydroxybutyric acid, and acetoacetic acid (acetoacetates). They are produced in the liver and kidney during fatty acids oxidation and used as a source of energy by the heart, muscle and brain.

Oedeula - the buildup of urine in the kidneys.

Polydipsia - excessive thirst manifested by excessive fluid intake. It is characteristic of many diseases such as diabetes mellitus, diabetes insipidus, and nephrogenic diabetes insipidus. The condition may be psychogenic in origin.

Polyphagia - medical term for constant hunger without any physical reason.

Polyuria - urination of a large volume of urine with an increase in urinary frequency, commonly seen in diabetes (diabetes mellitus; diabetes insipidus).

Psychosis - disorders in which there is a loss of ego boundaries or a gross impairment in reality testing with delusions or prominent hallucinations.

Schizophrenia - a severe emotional disorder of psychotic depth characteristically marked by a retreat from reality with delusion formation, hallucinations, emotional disharmony, and regressive behavior.

Type 1 Diabetes Mellitus - a subtype of diabetes mellitus that is characterized by Insulin deficiency. It is manifested by the sudden onset of severe hyperglycemia, rapid progression to diabetic ketoacidosis, and death unless treated with insulin. The disease may occur at any age, but is most common in childhood or adolescence.

Type 2 Diabetes Mellitus - A subclass of diabetes mellitus that is not insulin-responsive or dependent (NIDDM). It is characterized initially by insulin resistance and hyperinsulinemia, and eventually by glucose intolerance, hyperglycemia, and overt diabetes. Type II Diabetes Mellitus is no longer considered a disease exclusively found in adults. Patients seldom develop ketosis but often exhibit obesity.

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