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A Dogma Upended From Down Under
Sister Elizabeth Kenny's Polio Treatment

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Wonderful little, when all is said,
Wonderful little our fathers knew,
Half their remedies cured you dead--
Most of their teaching was quite untrue...
--Rudyard Kipling

In 1993, poliomyelitis broke out in Sudan; containment has been hampered by civil war. As with the polio epidemics that terrified Americans throughout the 1940s, 85% of those afflicted in the Sudan were less than 5 years old. These events seem distant to us; the threat of polio was eradicated from North America as of 1991. Today, the names Salk and Sabin are associated with polio because their vaccines eliminated it from the developed world. But a generation ago, the name for polio was Kenny.

On April 14, 1940, Elizabeth Kenny, a broad-shouldered Australian Army nurse in a wide-brimmed hat, disembarked from an ocean liner, and stepped onto a pier in Los Angeles. [1 p203] Portmanteau in hand, she was alone in every sense. She was 59 years old, bitter and battle-fatigued, though not from combat. No cameras recorded her arrival, though within two years news photographers' flashbulbs would punctuate her every public move. She was adamant that the universal standard of care for polio-afflicted patients rigid casting of diseased limbs was wrong.

As a lieutenant, she had earned the deference given to a head nurse, and the marquee moniker that would soon stir up professional and populist circles: Sister Kenny. In British tradition, a head nurse is called by the honorific "Sister," but how Elizabeth Kenny came by this title is speculative. She lacked formal education, was not above obfuscation about her qualifications (in later years she lied about her background for Who's Who in America), and possibly opportunized wartime circumstances, so "Sister" may have been self-bestowed. Because of her authoritarian manner, colleagues would have been unlikely to question the designation, whether earned, conferred, or assumed.

She kept asking, plaintively, "Why condemn patients to life with splinted arms and hobbled legs when they can be rehabilitated by my method"?

Two years earlier, in 1938, a ballyhooed position paper in the *Medical Journal of Australia* [2p187] had ridiculed Sister Kenny for asking that question.

The paper was produced by a special Australian Royal Commission, appointed in 1935 at her demand, to study her controversial method. Limb splinting for polio was an article of faith among English-speaking medical communities, and Kenny's insistence that it be abandoned infuriated Australian physicians. [3] She was a provincial woman, a homemade nurse without solid professional credentials, practicing what doctors (nearly all men) saw as insubordination.

Though she relished her role as David to their Goliath, Kenny was sure that a balanced examination would reveal the superiority of her approach. She cooperated with the Commission's doctors in their appraisal of how polio victims fared when treated by her regimen of massage and "muscle reeducation." The Commission included Kenny's longtime friend, advocate and mentor, Dr. Aeneas McDonnell. She was confident that its findings would vindicate her.

Her hopes were dashed. The Commission's findings, kept secret until the report's release, condemned her:

> "We are now in a position to sum up this discussion of the Kenny method of treatment of poliomyelitis_. The abandonment of immobilization is a grievous error and fraught with great danger, especially in very young children, who cannot cooperate in reeducation_. It would be particularly damaging to adopt the Kenny non-splinting method of treating early cases_." [2p203-4]

A critical reading of the report betrays serious flaws rife preconceptions, and dismissal of her ideas because they flew in the face of conventional wisdom. Kenny was devastated even though the report contained a small-print appendix acknowledging a recent British study that described marked improvement in 370 patients treated with the Kenny method, and concluding, "No published results we know of can compare with those achieved in Australia [by the Kenny method]." [4] The Commission chafed in rebuttal:

> "To the anatomist and orthopedist, this statement is so ridiculous as to need no further comment." [2 p222]

Sister Kenny knew that the medical establishment, at least in Australia, would not tolerate her. Her clinical allies rethought their allegiance to her. She would be unable to practice nursing effectively in Australia. She packed.

A Dreaded, Crippling Scourge

How did Sister Kenny care for patients with acute poliomyelitis? And why did the Kenny method, different from standard approaches, provoke the wrath of medical authorities?

In June 1911, Elizabeth Kenny was called to see a child, Amy McNeil, with acute infantile paralysis (poliomyelitis). Kenny, working alone in the desolate outback near Queensland, Australia, was an untrained, self-appointed nurse who roved on horseback among desert homesteaders. She was 31, and had never encountered polio before that summer outbreak.

What she saw, first in this farm family's daughter, appalled her:

> "_It was the little girl [Amy], my special pet, who was ill. She lay upon a cot in the most alarming attitude. One knee was drawn up toward the face, and the foot was pointed downward. The little heel was twisted and turned outward, or abducted, as we say. One arm lay with a flexed elbow across the chest. Any attempt to straighten a member caused the child extreme pain. The little golden-haired girl_was indeed very sick, and with an ailment that was unknown to me_.
>
> [Her] obvious agony called for immediate action_. The cruel shortening of the muscles affected, the wild fear expressed in the once laughing blue eyes, the tenseness and terror of contact even with the loving arms of the almost distracted mother, were sufficient to wring the heart of anyone who witnessed them." [1 p22-3]

Even allowing for some license in this description (written with a biographer's help), the clinical acumen is apparent. She recognized muscles in tetanic spasm, not merely contracting unopposed by disease-stunned muscles opposite them.

She was baffled, scared, and miles from help. A scrappy bush nurse desperate for advice, she telegraphed Aeneas J. McDonnell, MB, BCh, a clinical mentor and family friend. McDonnell was a highly-regarded physician in nearby Toowoomba. His Morse-code reply came by wire hours later. It gave her little hope but, unwittingly, sage advice: "Infantile paralysis. No known treatment. Do the best you can with the symptoms presenting themselves." [1 p22-3]

Virtuoso Ignorance

She did precisely as he suggested. Her crisis, as Confucius says in his Analects, was opportunity. "Fortunately," she writes, "I was completely ignorant of the orthodox theory of the disease." [1 p22-23]

She poured steaming-hot water over strips of wool. Assisted by the child's parents, she applied these hot, wet compresses hour after hour to affected limbs. By her reckoning, the tense muscles needed relaxation, and moist heat seemed a good strategy. Gradually, the hot packs eased the agonizing, palpable muscle spasms of the acute myelitis. At the time, neither the term "spasm" nor the occurrence of tetanic contractions in affected muscles was accepted by clinicians treating polio. Sister Kenny would be told that the muscles she had seen only seemed to have increased tone. Things looked that way, standard teaching argued, because muscles on the limb's opposing side had been rendered flaccid by poliovirus.

Paracelsus said that patients should be the clinician's textbook, for "they will never mislead." As Kenny saw for herself at the bedside, muscles that were, at first, animated by spasticity soon became flaccid, leaving arms and legs useless. Depending on the spinal levels of anterior horn cells affected, various extensor and flexor muscles were left with more or less severe impairment of function. The distribution was commonly asymmetric.

To Sister Kenny, it seemed as though these slackened muscles had "forgotten" how to work, or the brain had forgotten how to control them. She reckoned that nerve damage had "alienated" them from the brain. The muscles, denervated by poliovirus-induced damage in the spinal cord, needed "reeducation," she said. But how could one work a muscle that was

not downloading commands from the brain? She knew that striking muscle tendons provokes a reflex muscle contraction. This was a way to make muscles work without the brain's intervention. Methodically, diligently, shaman-like, she spent long sessions at patients' bedsides, striking the patellar, biceps, and other tendons. She guessed that this would maintain muscle strength until brain and muscle could become reacquainted. [5]

Meanwhile, worried that unused joints would stiffen, she began flexing them passively through their ranges of motion. Diseased limbs needed increased blood flow, she decided, so she massaged them. She flexed and extended muscle groups, stimulating proprioceptive sensations. Throughout, she helped the afflicted children devise mental images of how their brains could command their "alienated" muscles to work again.

Kenny was too unsophisticated clinically for a pattern-recognition approach to polio. She had neither seen, studied, nor been taught about the disease. In blunter terms, she was too unschooled to begin automatically the standard treatment of polio fixed immobilization of affected limbs. If her formulation of the problem was homespun, it was leavened by hope and enthusiasm. A redeeming positivism ran through out the Kenny method. She energetically set upon the affected arms and legs of her patients. Her task was to enliven the children, encourage them, and reanimate their limbs to recovery by hands-on persistence. She cheered when they showed improvement.

In the beginning, the rudimentary Kenny method was extemporaneous: Kenny's wits collaborating with nature to help Amy McNeil, and other children stricken in the Australian outbreak of 1911, to walk again. Word spread in the outback. Her ignorant improvisation worked so well that when doctors saw the results ambulatory children, often none the worse for their brush with crippling illness they scoffed. [1 p29-32] A mistake had obviously been made. The unschooled Kenny must have misinterpreted what she had seen. If these children had truly come down with polio, she was told, they would be crippled.

Like her medical and orthopedic contemporaries, Kenny recognized that the polio symptom complex, untreated, left deformed, functionless limbs, twisted spines, and contracted muscles. Affected muscles might be overcome by stronger muscles on the opposite side. Dangerous torque and shear forces would be exerted on joints and on the vertebrae. The disease made limbs crooked, and the task of doctors was to force those limbs, and keep them, straight. Here Kenny broke rank with conventional wisdom.

Orthopedic Orthodoxy

The "orthodox theory" of polio, summarized in 1941 in the *Journal of the American Medical Association*, [6] was, ironically, published just five months before JAMA endorsed the Kenny method. Dr. C. E. Irwin, a noted clinician at the Warm Springs Foundation (Georgia) polio treatment center (famed for a presidential patient, see below) wrote:

> "The first and most important indication, is absolute and complete rest and no exercise. Exercise is contraindicated as much in these cases as in cases of acute myocarditis or overfeeding a patient with intestinal ulcerations following typhoid_. Complete rest is the basic principle of treatment which I wish to emphasize_. In addition to recumbence and non-weight bearing, adequate rest is best provided by plaster casts_. Casts are comparatively inexpensive and are more positive_. The patient is more comfortable_. My purpose is to emphasize the importance of complete rest_." [7]

Dr. Irwin's paper articulates flatly the pre-Kenny standard of polio care. Its innuendo, however, provokes hopelessness and stigmatization. To contract polio was to face life with crutches and garish orthopedic devices or, possibly, confined to bed. Irwin calls casts "more positive" than splints, but that he resorts to such a description underscores the dreadful negativity of the treatment advocated by experts. In 1962, this orthopedic approach was condemned as "the abuse of rest." [8]

When Sister Kenny came in 1940, America was the right place at the right time for someone offering hope to polio victims. After a serious polio epidemic in 1916, the United States had experienced relatively few cases, but polio outbreaks were on the rise again. In public view, future-President Franklin D. Roosevelt was stricken in 1921. Outbreaks, real, rumored, or feared, were the stuff of newspaper headlines. Families cancelled spring and summer vacations, as these seasons were riskiest for outbreaks. People avoided public places and shunned persons rumored to have polio. Polio, or the fear of it, was a scourge threatening the social fabric of this country. [9]

Kenny's first months in America were spent much as she had lately lived in Australia, roving in search of acceptance, touting her polio ideas. She arranged introductions to prominent surgeons at tertiary-care medical centers. Yet garnering attention for her concepts without calling attention to herself proved nearly impossible. She was a woman an uneducated spinster with quaint hats, a brusque manner and a peculiar accent asking powerful white-coated men in a male establishment to rethink their most entrenched assumptions about polio. Listening to Sister Kenny required a suspension of disbelief.

Two men who listened and got it right were Dr. Wallace Cole, chief of orthopedic surgery at the University of Minnesota Medical School (Minneapolis), and Dr. Miland Knapp, a young surgeon who chaired the school's department of physical therapy. Sister Kenny had come to Minneapolis after failing to win converts on either coast. [3]

Sister Kenny's claims, based on scattered newspaper reports of her visits, began to attract a populist following. To many, Kenny was a charismatic underdog whose rejection by doctors suggested that she had a disarmingly powerful message. She offered hope where doctors offered only crutches, braces, and guarded prognoses. Whether she was right or wrong, at least one well-placed person, Basil O'Connor, recognized that her popular admiration could be a motherlode of political equity.

O'Connor was the shrewd amanuensis and law partner of President Franklin D. Roosevelt. O'Connor was an astute businessman, his nose for trends and opportunities ever in the wind. He was the driving force behind the National Foundation for Infantile Paralysis (founded by FDR in 1938 and the White House's favorite charity, it was christened "March of Dimes" by entertainer Eddie Cantor). If the Foundation cautiously supported Kenny, donations and presidential approval might soar in tandem.

With financial backing from the National Foundation for Infantile Paralysis, Drs. Cole and Knapp enrolled 50 patients with early poliomyelitis in a clinical trial in Minneapolis. Their study, begun in June 1941, would treat patients by the Kenny method, either with the supervision of Sister Kenny or with assistants trained by her. [3]

An unsigned editorial in *JAMA* on December 6, 1941, begins the concession to Sister Kenny:

> "At one time it was believed that in early cases of poliomyelitis, complete immobilization should be done as far as the affected muscles were concerned.

> Several years ago, Sister Kenny in Australia recommended that early movement should be allowed and that affected muscles should be accorded the benefit of massage and passive movement instead of immobilization_." [Motor units] become atrophic under conditions of immobilization, since muscle fibers are dependent on their local reflexes (e.g., stretch reflexes) and immobilization arrests the flow of these proprioceptive impulses as effectively as it abolishes the flow of lymph. Massage and freedom of movement, therefore, are clearly indicated_." [10]

On December 20, 1941, another *JAMA* editorial cited a meeting of the National Foundation for Infantile Paralysis:

> "It is the opinion of this Committee on Research for the Prevention and Treatment of After-Effects of the National Foundation for Infantile Paralysis, after a study of the report of the workers at the University of Minnesota, that during the early stages of infantile paralysis the length of time during which pain, tenderness, and spasm are present is greatly reduced and contractures caused by muscle shortening during this period are prevented by the Kenny method." [18]

The editorial applauds the "revolutionary_abandonment of early rigid splinting and the adoption of continuous and meticulous hydrotherapy and physical therapy to maintain the function of muscles which still have nerve supply at highest possible point, at the same time producing increased comfort for the patient." [11] Dr. Cole and Dr. Morris Fishbein, *JAMA* editor-in-chief, broadcast a national radio address endorsing the Kenny method as the new standard of care that should replace existing approaches polio. [2]

Sister Kenny became and remained a celebrity ever pressed for autographs, her face instantly recognized, her photograph displayed like an icon in many American homes. In 1943, and for nine years thereafter, she ranked behind only Eleanor Roosevelt as the most-admired woman in America. She received honorary doctorates from the University of Rochester, Rutgers, and New York University. She returned to her outback home a hero, and died near Queensland, Australia, in 1952.

Truth and Consequences

In *Aesopus Emendatus*, Ambrose Bierce writes of a woman named Truth: "I live in the desert in order to be near my worshippers when they are driven from among their fellows. They all come, sooner or later."

Kenny's victory was a Pyrrhic one: a revised treatment for a disease in its twilight, promulgated by a woman in her twilight. The cost to Kenny was high: professional ostracism from her homeland, three decades of rejection and, arguably, personal happiness. For us now, two aspects of her story are salient. To paraphrase Santayana, history repeats itself because no one is listening. These two aspects of the Kenny saga are likely to be experienced by others who challenge conventional wisdom.

First, Kenny's method emerged from an improbable source of discovery. Despite her lack of formal education (maybe even because of it) Sister Kenny perceived a deeper truth about the clinical manifestations of acute polio. For many, education is synonymous with training, prescribing what must be learned and should be believed. This can preempt open-mindedness. Barry Marshall, the Australian physician who found that Helicobacter

pylori causes most upper gastrointestinal ulcers, says he was able to do his work because he wasn't adequately schooled in the conventional belief that acid caused all ulcers. [12]

Kenny's story is emblematic of the process of seeing "see-ing," as Charcot said to the medical students 13 things afresh, being helped but not misled by learning. Sister Kenny wrote of a physician who said he wanted to learn about her method and professed an open mind: "I have encountered many 'open minds' in the medical profession in many parts of the world, and I have learned to proceed with caution when I come upon one now. Some minds remain open long enough for the truth not only to enter but to pass on through by way of a ready exit without pausing anywhere along the route." [1 p29-32]

In his Choruses from '*The Rock*,' T. S. Eliot asks, "Where is the wisdom we have lost in knowledge?" Sister Kenny showed that rehabilitation of the polio-afflicted was simple and reasonable. It makes one wonder whether decades of entrenched clinical dogma about polio was sensibly formulated. Carrying Eliot's sentiment further, is wisdom undermined by learning? Sister Kenny's work was predicated on a primal reverence for nature beheld firsthand and undiffracted by learning. Kenny's initial encounter with polio evokes the "understanding through empathy" memorably described by British education professor Peter Kelly as he watched 7-year-old children go about observing plants and animals. He contrasts their behavior with that of a group of 14-year-olds:

> "The seven-year-olds looked at, smelled, handled, listened to, and even tasted the elements of their environment. They immersed themselves in their individual tasks and came out of their endeavors only occasionally, to inform and sometimes to show off their discoveries to their fellows_.
>
> The older children approached their work differently. They used their eyes, but rarely their other senses. They were very concerned with social approval. Were they doing what their fellows were doing? Would they make fools of themselves? When asked questions about their work, they called on the authenticity of the books they had read, television programs they had seen, or what they had been told by their teachers. They remained at a distance from the reality they were studying. The 7-year-olds tended to work themselves right into the reality.
>
> This experience demonstrates what I believe to be a truth: that through the processes of formal education and social development, a young person is drawn away from the realities of his or her environment, away from other living things_." [14]

Second, Kenny's saga is a cautionary parable about how often fresh insights are laughed at, and how clinical breakthroughs gain acceptance only after first being called heretical. Prior to Kenny, doctors mistakenly equated one manifestation of polio muscle denervation and weakness with the totality of the illness. Kenny was told sternly that muscle spasms did not exist, and that what she had observed were diseased, weakened muscles simply overcome by opposing muscles. Kenny saw this as flawed reasoning and reckoned that the problem in polio was acute spasm, not flaccidity. This was an essence that doctors had missed.

Though the notions of muscle rehabilitation and passive joint motion were accepted tenets of polio care before Kenny, rehabilitation was rarely, if ever, attempted. Polio was a grim fate because it commonly meant life constrained by orthopedic braces. Limb rest often led to more limb rest because disuse atrophy and flexion contracture put the diseased limb at risk of injury by well-meaning attempts to work it. Bracing limbs prevented deformity, but

the limbs became useless for anything other than being braced. Sister Kenny was fond of pointing out how stiff the braced limbs of patients became: "The reply invariably was, 'That is of little consequence. See how straight [they are].'" [1 p29-32]

Much of medicine is comprised of efforts to oppose and neutralize symptoms as if they are disease itself. Thus crooked limbs in polio were forced straight, as though superficial aesthetic rectitude meant better health. Even in our time, doctors generally advise antipyretics for patients with fevers. Much evidence, however, suggests that the febrile response is strongly associated, at least when infection is present, with both shorter duration of illness and greater likelihood of survival. Prior to the recognition of Helicobacter pylori as a cause of peptic ulcer, ulcer therapy was aimed at decreasing acid production. Excessive acid generation, however, is a secondary manifestation of H. pylori infection, and inhibition of acid secretion may promote proliferation of an antibiotic-resistant form H. pylori.

Much of medicine's history, as with Sister Kenny, documents the tormenting of those who challenge orthodoxy. On March 20, 1849, Ignaz Philipp Semmelweis was fired from his job as assistant physician in the First Obstetric Clinic of the Allgemeines Krankenhaus in Vienna. [15] He had discovered a clear link between puerperal fever and failure of clinicians to wash their hands between examinations or after performing autopsies (deaths were frequent in the clinic). His insistence on hand washing earned him the scorn of Viennese physicians. He fled Vienna and a promising career in medicine there, and returned to Budapest, his home. Semmelweis died four years later, at age 47, in a mental institution because of psychotic depression. The efforts of peers to ruin him had been successful.

As Canadian physician Earle Scarlett notes, the "human tendency to follow tradition and to blindly refuse to correct error is neatly contained in an old word that we would do well to resurrect and use more commonly. The word is a curious one and bears a strange look to modern eyes mumpsimus. But it is a respectable word and has a most interesting history. It may be defined as 'a traditional custom obstinately adhered to however unreasonable it may be.'" [16]

A Cautionary Story

Nearly 60 years have passed since Elizabeth Kenny came to America. History has not been generous to her. What remains of her legacy is found in Bettmann Archive photographs of Kenny with the children she helped, in out-of-print books, rare newspaper clippings, and Movietone newsreels. Platitudes about her life's work are easily wrought, and her personality had a cantankerous, self-destructive, untrusting element that precluded long-term collegiality, but her story reminds us how breakthroughs come from unlikely sources, and how they are often recognized as breakthroughs only after first being called heresies. This, too, is the history of medicine.

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