

Chapter 1

Understanding Frailty: The Science and Beyond



I want to go to the park for a walk, but my leg muscles are not strong enough to take even a few steady steps. I am weak, shaky and slow. I am not depressed but I am not happy either. The doctor assures me that my heart, lungs, nerves and stomach are fine. I know I should eat a proper diet and do exercise, but I do not feel motivated to do anything except to just escape this life. The only thing that is remaining in me is my beautiful mind that urges me each day to love all and pray for all. I often wonder whether these are the features of a fast decaying mind and body? Or are these the perceptions and emotions of a frail person surrounded by decay and death.

Mr. M Kuppuswamy, an 87-year-old retired banker, wrote to me in his letter about his failing body and mind from Chennai. These thoughts resonate in the minds of several octogenarians (80–89 years) suffering from frailty. In his late 20s, Gautama Buddha, before leaving behind his materialistic royal life, had understood that old age was all about frailty [1]. Shakespeare in his masterpiece *Hamlet* talked about frailty; he considered it to be breakable, weak and delicate [2].

Several centuries after Shakespeare, in 2001, Dr. Linda Fried from the John Hopkins Institute tried to enlist “frailty” in the medical literature to explain the sudden decline in physical fitness of the elderly. This was an era when the word “frailty” did not even have a place in medical dictionaries. Although clinicians gave a subjective definition of frailty, Dr. Fried tried to explain the concept scientifically by introducing a phenotype, which included weakness, slowing, decreased energy, lower activity and unintended weight loss [3].

The frailty phenotype gained popularity among specialists in clinical practice as a method to identify vulnerable individuals undergoing medical or surgical interventions. Rockwood et al. from Dalhousie University, Canada, viewed frailty in terms of health deficits that are observed in an individual, leading to the continuous measure of frailty [4].

With increase in ageing population, frailty has become the foremost cause of disability and death among the elderly (Lang et al.) [5]. Prevalence of frailty exponentially increases with ageing in the 80+ American population (30%–45%), as per numerous studies. However, in India, the prevalence for hospital-seeking older adults is between 15% and 40% as per various studies [6, 7]. Starting from older adults, elderly care physician to policy planners has accepted frailty as an epidemic and probably a source of unavoidable agony for older adults [6, 8].

When I ask any octogenarian (80–89 years) or nonagenarian (90–99 years) about their biggest apprehension, if any at all, their concern is whether they will leave this planet with autonomy and independence. To alleviate these problems, they are ready to try every possible thing at hand, i.e. allopathic medication, homeopathy, ayurveda and/or spiritual healing. They want to bypass the problematic expression of ageing, i.e. frailty.

The natural path of extreme ageing and the last phase of life may not be similar. For some people, it may be from robust late adulthood, i.e. when the individual is at their peak, to subclinical frailty, i.e. they become lower in functional and physical domains. This is followed by early to late stages and then severe frailty, which results in a rapid downhill course that makes an individual completely dependent on others to perform their daily activities (Fig. 1.1).

At a subclinical stage, the person is clinically resilient but takes longer time to recover from any external or internal insult (e.g. after a fracture or any infection in vital organs). This stage is still reversible if noticed by an individual or the caregiver and intervened by medical team in the form of lifestyle modification, exercise and nutritional support. But, medical team should put maximum efforts to provide appropriate solutions instead of ignoring it as age-related phenomenon. If not intervened, the course could progress from early to late frailty, indicated by a steady decline in functional reserves and development of acute reversible disability and chronic irreversible disability.

However, a more desirable course could be from a robust and active life till their late 80s or 90s to sudden demise because of vital organ failure. The great Indian scientist and ex-president, Dr. A.P.J. Abdul Kalam, set a beautiful example of this. He led an active life all throughout and died a sudden, painless death, a course of life that many would desire.

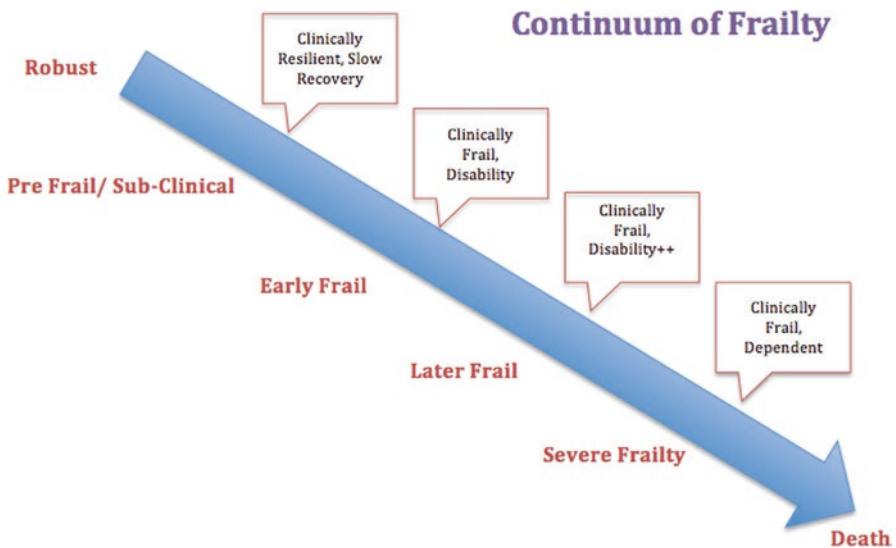


Fig. 1.1 A schematic demonstrating the continuum of frailty

1.1 Active Ageing and Life Course

Ageing is probably an individualistic and unique experience, a demonstration of multiple biological events that occur throughout life. How and why do we age? What is the secret of active ageing? Both these questions cannot be answered easily. My conversations with Mr. A. B. Tripathy, an 85-year-old retired engineer from Uttar Pradesh, would probably help improve our understanding of ageing and frailty.

I initiated the discussion with Mr. Tripathy, “Sir, what is your notion of old age?” He promptly replied, “Nothing specific, doc! To me, it is just a phase of life where I cannot concentrate for long. I cannot join various clubs and associates. And I am bound to keep away from the conflict of two or more generations, which is something most senior citizens are suffering from”.

After a pause, he added, “Anyway, I have accepted it on a positive note and in good spirits. At the age of 88, I am happy with my family”. I was really surprised by his positivity and understanding of his health and wellbeing. He continued, “I am still alive and in good spirits. I have conquered many morbidities and thankfully, God has not cursed me with cancer, major stroke, forgetfulness, or any other disabling/painful disease”. Probably, he was unaware of the fact that frailty is an equally or even more disabling truth of life.

Mr. Tripathy rightly said that an individual who had survived till the age of 80 (or above) had already escaped non-communicable diseases like diabetes, hypertension and coronary artery disease. Because of his lifestyle, optimism and adoption of active ageing, he had compressed the morbidity till his present age. “Compression of morbidity” is a concept encouraged by James Fries whose hypothesis was confirmed in 1998. He explained that if a person can postpone the development of chronic disease and simultaneously expand life expectancy, then they would enjoy more fruitful years without any morbidity. So, lifestyle with a healthy diet and regular exercise is probably the best way to compress the morbidity [9]. To better understand the concept of “compression of morbidity”, let us consider that a person develops diseases like hypertension, diabetes and arthritis at the age of 60 and his life expectancy is 80 years. For such a case, his living will be compromised in the last 20 years. But, with the help of a healthy lifestyle, another person can lead a healthy life and delay the onset of morbidity till 80 years and dies at the age of 90; thus, his compromised life is only 10 years (Fig. 1.2).

Mr. Tripathy never indulged in unhealthy practices like consumption of tobacco, alcohol or rich diets or so-called fast food. Instead, he was passionate about physical activities since childhood and continued to pursue them throughout his life. This helped him in compressing his morbidity till the age of 80, which was also very much in tune with the World Health Organization’s (WHO) concept of active ageing as an outcome of a lifelong process. Thus, at the population level, the WHO posited six primary determinants of active ageing: behavioural styles; personal, biological and psychological conditions; health and social services; physical environment; and social and economic factors [10]. In addition to having lifelong healthy practices,

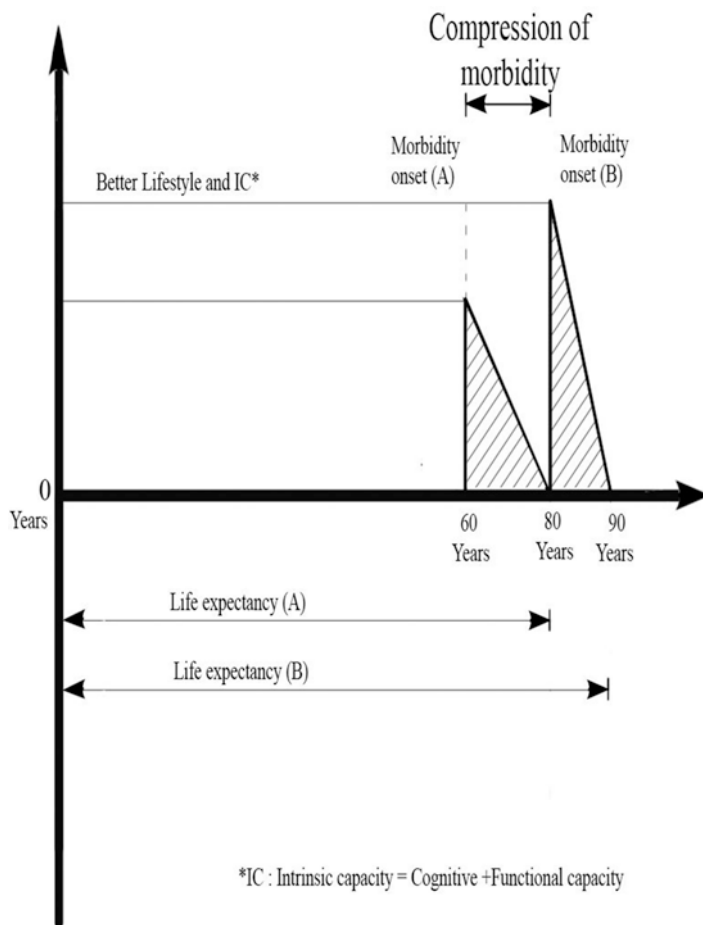


Fig. 1.2 Schematic explaining the concept of compression of morbidity

Mr. Tripathy was lucky to have been born to a mother whose nutrition was taken care of before and during her pregnancy to give birth to a healthy baby. There is a partially proven theory of anti-natal influences on the emergence of risk factors for chronic diseases during adulthood [11]. To me Mr. Tripathy was the epitome of active ageing. He had the fantastic ability to adapt to any situation. He told me:

I feel that I have the 'let-go attitude' that keeps me going. I try to learn new things from the next generation. My granddaughter is in Canada and my daughter has taught me to talk over Skype, which I use regularly. I enjoy the wonders of science and I take full advantage of digital ageing. I give regular updates to my family doctor through my smart phone. I am financially secure and happy as we (me and my daughter) are in the elite club of the elderly and enjoy each other's company.

Studies have suggested that a sexagenarian (60–69 years) can be the best caregiver for an octo- or nonagenarian. This was the case with Mr. Tripathy and his daughter; they were able to positively engage with each other and understand each other's psycho-familial-societal problems more empathetically. The National Center on Caregiving has confirmed this in the results of their report: *Selected Long-Term Care Statistics* [12]. Digitization has opened various possibilities to positively engaging the elderly with enhanced access to up-to-date information and widening of social connections. It has often become the best vehicle to connect different generations together. Moreover, studies have suggested that learning new skills, like working with computers, keeps an elderly person cognitively healthy and reduces the risk of developing dementia and frailty [13].

I met Mr. Tripathy in November 2013 when he visited me at my OPD with a complaint that he has become relatively slower in the past 2 or 3 months.

This is a common issue in the day-to-day practice of an elderly care physician. The usual approach would be to counsel the patients and convince them that these are just age-related changes and nothing much is required.

During our discussion, I came to know that he had a decreased appetite but no apparent weight loss. I asked him a few more questions related to cancer of the gastrointestinal tract and tuberculosis (TB). He mentioned that his previous doctor had performed all the relevant tests and examinations like endoscopy and CT scan of the chest and stomach. Reports revealed that he had no major disease like TB or cancer; however, he was worried about losing weight.

Among the elderly in India, acute weight loss with loss of appetite should be investigated thoroughly for TB and cancer. Cancer of the lungs, oral cavity and stomach are the most prevalent forms, often underdiagnosed and undertreated.

Among Indian elderly women, breast cancer and lung cancer are very common [14], similar to the prevalence of cancer in developed nations. However, cervical cancer is largely prevalent but underdiagnosed in developing nations like India. Developed nations are not that concerned about diseases like TB compared to developing nations like India, which bears the major brunt of this disease and accounts for nearly two-thirds of the world's tuberculosis prevalence [15].

In subsequent conversations with Mr. Tripathy, I realized that he was an 85-year-old retired engineer from the Uttar Pradesh government in north India. After his retirement in 1988, he kept himself busy by providing consultancy services to various private firms. On his health front, he regularly went for morning walks, prayers and laughter clubs and to the bank. In fact, he had been doing most of his tasks by himself. He said, "I know that the secret of successful ageing is to be physically and cognitively active [16]. So, I have a plan for every decade unlike most elderly patients in India".

He stopped bothering with cooking after the death of his spouse over a decade ago. He instead opted for home delivery services from a food agency in East Delhi. As he was an active man, he preferred climbing stairs to reach his apartment on the fourth floor of the building.

He was focused on his work and accepted the randomness of life's events, which one cannot control and can only embrace.

With confidence and some nostalgia, he disclosed that even his wife's demise did not let him down. "I understand that death is natural and inevitable process of life. It was her turn then and will now be mine. We enjoyed each other's company". He also commented that one should enjoy the togetherness. He mentioned that his passion till recently was running marathons, in which he took part until the age of 88. He felt that recently he had become weaker and no longer possessed the calibre to be part of long-distance runs. There was a significant decline in physical fitness, followed by a bout of influenza 2 months before our first meeting. He took medicines as prescribed by his doctor and recovered from the symptoms, but his weakness persisted. He tried various vitamins, minerals and antioxidants, but they did not help. When he came to me speaking general frailty and weakness, I examined his lungs, heart, vision, hearing, cognition and mood and conducted a few other investigations that could account for weakness (such as for blood testosterone levels, IL6, etc.). Studies have suggested that low testosterone in elderly after andropause can be the cause of shrinking of muscle and generalized fatigability [17]. However, in his case, all the results were normal.

This is probably a common scenario in the clinical practice of an elderly care physician, particularly while catering to patients in their late 80s or 90s, or even a family member who looks after them. The physician must not ignore symptoms of generalized weakness; however, they should also not overprescribe medicines just to give solace to the patient. Rather, a physician should start looking beyond organ-specific issues and look for generalized functional decline and frailty.

1.2 Managing Frailty: A Holistic Approach

After receiving a comprehensive geriatric assessment, which involved a thorough organ-specific and system-specific assessment, the provisional diagnosis was that Mr. Tripathy was suffering from pre-frailty, as per Fried's criteria [3].

Mr. Tripathy had a comfortable walking speed of 0.5 m/s in the 4 metre walking test, and the maximum grip strength in his right hand came out to be 11 kg. He had lost >6 kg in the last 3 months and had a significant level of subjective exhaustion. Subjective exhaustion is of immense value in assessing frailty as the subject is comparing his present "capacity to do work" with his past. Mr. Tripathy's geriatric depression score, which helps assess the mood of an elderly by asking 15 different questions, was 4/15, which means he was not depressed. Similarly, his Mini-Mental Status Examination (MMSE), which assesses the cognitive status by 30 questions, was 28/30; therefore, he probably did not have any major cognitive impairment. As per a study published by All India Institute of Medical Sciences (AIIMS), India, a comfortable walking speed in a 4 metre walk for both males and females from all age group should be >0.6 m/s, and grip strength in 60–65 years, 66–70 years and > 70 years should be >20 kg, >15 kg and > 15 kg for males and 8 kg, 6 kg and 6 kg

for females, respectively [18]. Fortunately, Mr. Tripathy was neither depressed nor suffering from any major cognitive impairment; however, he informed me that his power to register new things had become slower and he was unable to focus on certain important things. The medical term for this is “decreased attention span”. He felt tired both physically and mentally even after 10 h of sleep a day; it had been a month since he had stopped going to the club, and he could no longer keep up with his consultancy work. All of this led him to quit his job on moral grounds.

A study conducted by Woods (2013) titled *Cognitive Frailty: Frontiers and Challenges* confirmed that cognitive frailty is common among physically frail individuals. Kelaiditi et al. mentioned that cognitive frailty is characterized by reduced cognitive reserves, i.e. the capacity of an individual to resist cognitive decline, which is dependent on education and prior cognitive abilities [19]. Regardless of the definition, there seems to be considerable value in recognizing the vulnerability towards cognitive functional decline among people who are already physically frail. There is evidence that shows cognitive and physical frailty to be a common patho-physiologic mechanism with risk factors such as low walking speed, alleviated inflammatory cytokines (IL 6, IL 8, CRP) and low brain-derived natriuretic factor (BDNF). After conducting a randomized controlled trial (RCT) and with additional efforts from a nutritionist, occupational therapist and physiotherapist, we began interventions on Mr. Tripathy.

Mr. Tripathy was found to have a high protein deficiency, along with a deficiency in essential amino acids like lysine and leucine [20]. Thus, as per medical terminologies, he was malnourished; therefore, Mr. Tripathy had to be made aware about frailty and its management. I talked to him about his global functional decline, which is beyond any organ-specific disease. This was a state of increased risk compared to others of the same age. I explained how an otherwise healthy-looking elderly person like him might benefit from interventions to address significant latent health risk. Moreover, interventions would be important to avoid further rapid decline and a cascade of reactions at the cellular, subcellular and organ level from common diseases like flu.

He was very attentive and asked me why he was suffering from frailty, although he had led a healthy life without any addictions and with plenty of exercise. I tried to explain to him that we are still trying to identify a definite cause; however, ageing is multifactorial in nature; it includes a human’s genetic makeup, lifestyle, food habits, resilience power, homeostatic system, immune system, inflammatory system and many other factors unknown to us.

“Is this the penultimate phase of life?” he asked.

I could only quietly tell him that medical science has proven that this functional decline can be slowed down or prevented by simple interventions like proper diet and physiotherapy of various forms. The Indian vegetarian diet, as compared to the Caucasian diet, contains less protein and amino acids. Studies have suggested that protein intake slightly above 1.0 g/kg may be beneficial to enhance muscle protein anabolism and reduce progressive loss of muscle mass with age [22]. Older muscle is still able to respond to amino acids, primarily the essential group of amino acids, which have been shown to stimulate muscle protein synthesis. It is possible that this

stimulatory effect of essential amino acids is caused by the direct effect of leucine on the initiation of mRNA translation, which is still prevalent in old age. Recent data had suggested that long-term essential amino acid supplementation, particularly excess leucine, might be a useful tool for preventing and treating sarcopenia or loss of skeletal muscle mass because of ageing [20]. I suggested a high protein diet and advised more frequent meals. However, according to Mr. Tripathy, his sense of smell and taste had drastically decreased; he could not differentiate between different foods and eating the same home-delivered food that he had been having for the past few years. Therefore, to be able to change his diet, his appetite had to be improved first.

Ageing is specifically associated with changes in the muscle protein metabolism response to a meal, possibly because of alterations in response to endogenous hormones. For elderly people like Mr. Tripathy, anorexia of ageing is not a new phenomenon; however, it is ignored by doctors, individuals and family members. Food intake is centrally controlled and peripherally by satiation signals. As Mr. Tripathy mentioned, smell and taste sensations decrease with decline in salivary secretion. The hunger hormones, ghrelin (released from mucosa of stomach) and neuropeptide Y, reduce with ageing, whereas there is a high circulating level of cholecystokinin (CCK), leptin and insulin, all of which play a key role in decreasing the desire for food many hours after a meal (postprandial anorexia) [21].

CCK is a prototype of satiety hormones, released by the proximal small intestine (food pipe after stomach) in response to delivering nutrients, primarily proteins and lipids, thereby decreasing desire. Consequently, the combined actions of CCK, leptins and peptide YY convey anorexigenic signals (signal for decrease food intake) to the hypothalamus (Fig. 1.3) [21].

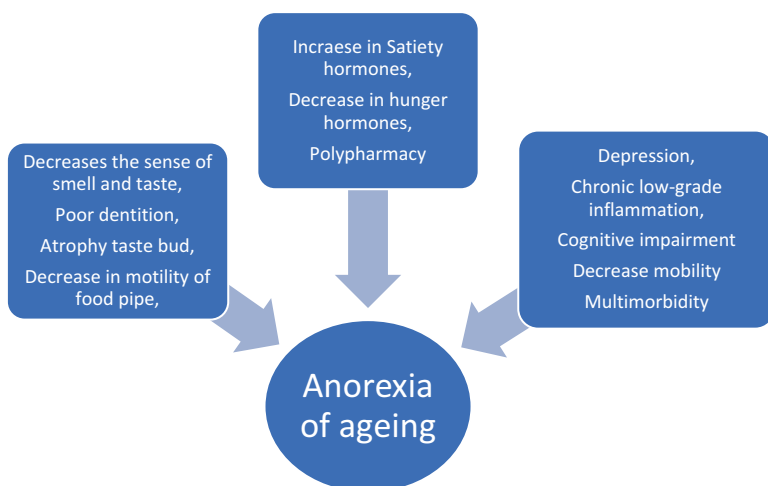


Fig. 1.3 Age-related factors precipitating anorexia of ageing

There are other crucial factors like improper dentures, medical morbidity like depression, financial problems, social inhibitions, drugs and, commonly decrease in gastrointestinal motility.

Furthermore, in frail elderly patients who have chronic low-grade inflammation, circulating IL1, IL 6 and TNF alpha directly stimulates leptin mRNA expression and enhances circulation of leptin levels. It stimulates the hypothalamic corticotropin-releasing factor, a mediator of the anorexigenic effect of leptin [22]. The physiotherapist assessed his balance problems by taking the Berg Balance Scale as reference. After thorough discussions, an individualized nutritional supplementation along with balance exercise and Nordic walking (NW) were advised to him as interventions. NW is a type of resistance training activity comprising energetic walking that helps in improving the quality of shoulder, arm and trunk muscles. It helps in walking for elderly people who do not place much load on their knees. It is also very safe to practice and required minimum supervision compared to other types of physiotherapy (Fig. 1.4). Furthermore, it is a good alternative to running because injury-relevant variables and loading rates are much lower as compared to running at the same speed; it is suitable for all ages too. This is a simple training for walking, which can be practiced by elderly people who have weak lower limb muscle strength.

On Mr. Tripathy's question about how diet and physiotherapy would help him, I explained that diet and physiotherapy improve muscle mass and strength, i.e. prevent sarcopenia, which is a prototype of frailty [23]. It improves the inflammatory state, mood and cognition. Studies had suggested that NW helps in improving mood and cognition in the long run [24]. From our study at AIIMS, we concluded that NW with individualized nutritional supplementation could revert the steadily decaying physical body and mind of a frail elderly person. Mr. Tripathy was called in to learn his exercise and nutritional module after 6 weeks and was examined after 3 months.

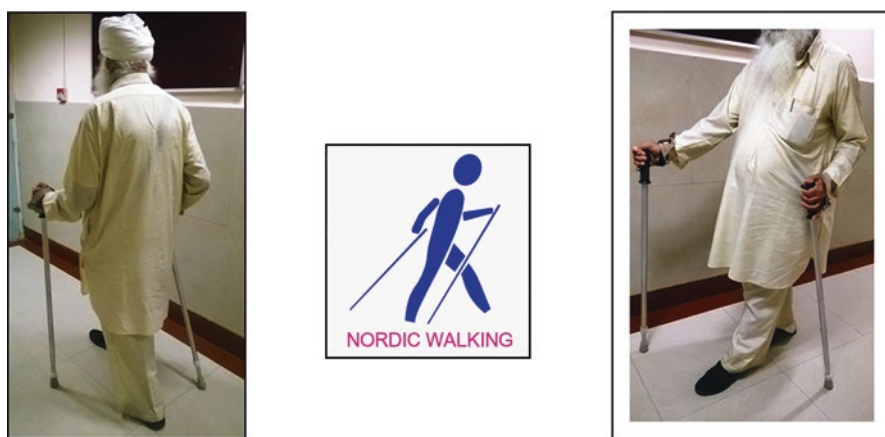


Fig. 1.4 Nordic walking. An elderly patient walking with Nordic sticks at the Department of Geriatric Medicine, AIIMS, New Delhi (under supervision of the physiotherapist)

Although there is no universal model to treat or reverse frailty, I presumed that he had been doing well in his consultancy services as I did not hear from him for over 2 years.

Then, towards the end of 2015, he visited me again with similar complaints of tiredness, but this time he shows an advanced stage of functional decline, or severe frailty, and he was suffering from recurrent falls. Any geriatric syndrome paves the way for others, and studies have suggested that a frail elderly patient is prone to falls, disability, cognitive impairment and depression [25, 26]. Mr. Tripathy informed me that he was facing balance problems and had become very slow in his activities.

It turned out that it was actually his meaningful engagements with his company that kept him going and not just our 3 months of aggressive management itself, because frail muscles require continuous mentoring, strengthening and nutritional support to remain healthy [27]. When frail patients like Mr. Tripathy have significantly weak, thin muscles, classified as sarcopenia muscles, they are prone to have balance and gait problems. They are also at a significant risk for recurrent falls. Fortunately, he did not have any fractures despite two/three falls in the recent past.

While observing Mr. Tripathy, I noticed how an active, healthy individual was steadily declining towards dependency despite maintaining a healthy lifestyle throughout his life. I was keen to know, as a researcher and as an enthusiastic clinician, if he had been following the diet regime and exercises prescribed by us. He explained that not only did he respond very well to the treatment but, most importantly, the detailed explanation about this condition helped him understand his decaying body better. In fact, he had followed the regime for 6 months to 1 year, and he was busy helping a consultancy company too.

He, of course, had accepted his ageing and was taking it seriously. But, simultaneously, he believed that ageing is more of an imbalance between negative and positive determinants of the subconscious and unconscious mind, as well as the internal conflicts of the two states of mind. Mr. Tripathy mentioned:

... I read a chapter of Sigmund Freud that stated that the unconscious plays a key role in causing certain disease that makes a person emotionally vulnerable. So, I thought my unconscious mind should be strong enough to conquer my decline, which you termed as frailty. He also pointed out that disease like frailty can also be cured or the course can be modified by a mere understanding of the disease and by active participation in the recovery process, which I am doing. [28]

Mr. Tripathy's perceived control, i.e. the extent to which an individual believes that they can control the events they experience, had not reduced compared to other elderly people of his age [29]. But, his agreeableness (a personality trait of kind, sympathetic and considerate individual), conscientiousness (desire to do a task well) and openness were praiseworthy. His aspiration index was very high, which made him stronger with each passing day.

The aspiration index has seven categories with five items in each category. Intrinsic aspirations focus on meaningful relationships, personal growth and community contributions, which Mr. Tripathy had. However, extrinsic aspirations

include wealth, fame and image, which were not relevant for him. Mr. Tripathy had meaningful relations with his daughters: the elder one who was a teacher by profession in Uttar Pradesh who had shifted to her father's residence to take care of him. She was separated from her husband. Her son and daughter are settled in Canada and southern India, respectively. She understood her father's requirements quite well as she too was growing old. She realized that her presence and assistance were required by her father. She said:

I feel this is the best thing I can do in this situation. I still remember the days when my father used to take us to the government school that was around 30 miles away from our residence, on a motorbike. One day, I fell from the bike and fractured my left knee. He rushed me to the nearest super specialty hospital that was approximately 50 miles away, where he spent 2 weeks of sleepless nights in order to help me recover from a complicated surgery. It is a situation that decides our course of action. Individually, we were lonely but together we are at ease. It is now my turn to be present next to him and assist him.

Mr. Tripathy had lived an ideal life and had been enjoying it in an excellent and satisfied manner [30]. This is true for his daughter too. He understood that even for a severely frail patient, to prevent further decay in the physical, mental and cellular functioning of the body, a holistic approach should be followed, which should be over and above the medical support. He requested me to not put him through the same aggressive regime of exercise and nutritional module, stating that he would try to exercise on his own.

Mr. Tripathy left my clinic and taught many others and me that apart from nutrition, exercise and healthy lifestyle, agony of frailty can be conquered by a mature mind that knows how to comprehend the natural course of human life.

1.3 Preparation for the Penultimate Phase of Life

I did not believe that the 70-year-old Mrs. Bajaj would survive when I saw her lying on a stretcher in front of the Geriatric Medicine Department OPD. I looked at the referral details from the Neurology Department of AIIMS. I studied her case summary and inferred that she was suffering from tubercular meningitis (TB infection and inflammation of cerebrospinal fluid that covers the brain and spinal cord). She was on treatment but had developed a urinary tract infection and an acute confusional state. Any infection in vulnerable older adults can present with an acute state of confusion, medically termed as delirium. It is acute and mostly reversible, but caregivers and treating doctors must focus on managing the cause rather than symptoms. In most cases, an infection increases the release of special chemicals called cytokines, interleukin-1 and interleukin-6, which are responsible for the acute state of confusion [31].

Recently, the Geriatric Medicine Department of AIIMS has been getting references from various other specialties because of the difficulty in managing multimorbidity aspects of older adults. Whenever they understand a patient has global functional decline along with generalized vulnerability, the risk of iatrogenesis (complication

due to medical intervention) or overburdening with polypharmacy, they refer them to the Department of Geriatric Medicine.

Mrs. Bajaj, a widow since the age of 40, had been taking care of her family single-handedly after her daughter-in-law passed away 8 years ago. She left behind two children aged 4 and 7 years. Her son, Anuj, was a small-scale businessman. Despite his hectic schedule, he was completely devoted towards his mother's care. However, Mrs. Bajaj's elder son lived a life of luxury and bothered little about his mother.

According to Anuj, "After losing my wife, my mom took back the charge of the whole family despite being retired for fourteen years. She is the only one who can take care of my children. Doctor, please save her".

One fine morning, when Mrs. Bajaj developed a high-grade fever and back pain, her situation started rapidly deteriorating. She was in a confused state and Anuj took her to AIIMS emergency medical department. From emergency department she was shifted to the Neurology Department. By tapping the cerebrospinal fluid from her spine and chest X-ray, she was diagnosed with tuberculosis of the lungs, which had spread to her spine and brain [32].

While she was in the neurology ward for a week, she was in a constant state of confusion, although she was treated with both oral and injectable medicines for TB. However, her orientation improved by the time she was discharged. She was advised to take a protein and calorie-rich diet along with the prescribed medicines for the next 18 months and to come for follow-ups after 2 months. Tuberculosis is a disease that affects the immune system (T-cells); therefore, a person, especially a child whose immune system is yet to evolve or a frail elderly person whose immune system has weakened (immunosenescence), is more prone to tuberculosis [33].

With the intake of TB medicines, she was doing well and had even gained some weight. But, one afternoon, while preparing lunch for her family, she suddenly felt giddy and extremely exhausted. She would have had a bad fall had Anuj not been around to catch her. Anuj was surprised when he noticed that his mother's body temperature was very high. When asked, Mrs. Bajaj replied with a smile, "It is nothing, *beta*. I had mild fever for the past few days. But today I am feeling extremely weak and I have a burning sensation when I pass urine". As per his assessment, Anuj gave her paracetamol 650 mg and decided to take her to the neurology OPD the next morning. But, her condition rapidly deteriorate with that night perhaps being the worst.

Anuj brought his mother to the Emergency Department at AIIMS early next morning and stood in a queue for an hour to consult a doctor. He was fortunate enough to meet Dr. Vipul from the neurology department who agreed to his request of immediately examining his mother. He told Dr. Vipul that Mrs. Bajaj was uttering meaningless things about her past life the whole night, mostly about her husband. She said, "Mujhe akela chhodke kahan chale gaye? Mujhe lagta hai ki mere jaane ka time bhi aagaya hai. (Where have you gone, leaving me alone? I feel it's time for me to go too.). 'I spent the entire night, sitting near my mother's bed and crying. Her temperature was continuously fluctuating between 102 and 105 degrees. I continu-

ously kept on putting cold-water cloth straps on her forehead to bring the temperature down”.

Anuj even ended up giving two more paracetamols to her that night to relieve her temperature and in the fear that his mother might not survive the night. After a thorough examination, Dr. Vipul informed Anuj about the need for geriatric care for his mother's conditions.

As mentioned in the OPD, we provisionally diagnosed her for urinary tract infection, which had accelerated her current problem. She was admitted to the geriatric ward of AIIMS and treated with appropriate antibiotics. Her recovery, however, took a long time. She was in the hospital for over a month because of the waxing and waning course of the disease. There was a significant decline in her physical activity and functional status, and her overall muscles reduced because of protein loss as was expected. Multiple studies have shown that deconditioning and functional decline commence on the second day of hospitalization and increase with every passing day [34].

However, most importantly, Mrs. Bajaj lost her confidence to take care of her family and her aspiration to live healthy. This is a common scenario for the frail elderly and elderly persons with multimorbidity when they have acute deconditioning; they take longer time to recover. Public hospitals in India do not have many dedicated beds for older adults. Furthermore, keeping an elderly person hospitalized for a long time (more than 2 weeks on an average) reduces the turnover of any hospital. This is one of the major reasons why private hospitals are not keen on starting dedicated geriatric centres, which has created the need for a long-term care facility for older individuals [35].

Mrs. Bajaj stayed with us for almost 3 weeks and was eventually in a wheelchair. It was becoming only harder for her son to take care of her. After a minimal improvement in her functional status, Mrs. Bajaj went home and promised to come to our daycare centre every alternate day. During her discharge, we prescribed multimodal therapy: a dietician's advice, physical therapy by a physiotherapist and mental exercises in the form of calculation, vision-special orientation and augmenting of attention span taught by our psychologist.

While formulating the discharge plan and further management needs, it is important to prime the patient and the care provider in advance to understand their psychosocial orientation. Since Anuj ran a small business and there was no other family member to take care of his mother. So, advising him to bring Mrs. Bajaj to the hospital every alternate day was not a pragmatic advice. Bringing a patient with partial dependency to the hospital is not only difficult; it is time-consuming and a costly affair. Clinicians catering to the elderly and frail population ought to be considerate about their patient's compliance, feasibility, financial status and social support and overall situation of the family.

Although there are no set guidelines for the best exercise regime for the frail elderly, resistive training exercise, such as upper limb and lower limb strengthening exercises, balance exercises and aerobic exercises are good options. These are a simple set of repetitive body movements that once explained to patients can be easily performed at home by the patient with or without the help of caregiver [36].

These include exercises like toe-heel pointing, marching, leg kicks, armchair rise, calf raises and so on. The level of exercises can be stepped up once the patient had adhered to the prescribed set or regimen. These small-scale movements of the muscles, in the form of flexion extension of the elbow, knee and ankle joint, can have great effects for improving mobilization as well as balance. As explained aptly by Norman Doidge in *The Brain That Changes Itself*, even merely imagining that one is flexing their biceps can make one's biceps stronger because of cortical simulation [35]. This could be of great help in an Indian set up where patients are unable to visit for follow-ups because of their physical constraints or caregiver issues as seen in the case of Mrs. Bajaj [37].

For the follow-up and adherence of the regimen, usage of technology would be of immense help, e.g. providing necklace-worn sensors or getting remote feedback using a tablet PC is an innovative method for physical activity stimulation in frail older adults [38]. However, this might be an overambitious approach considering the economic status of the average older Indians.

Frailty among the elderly is probably the most difficult expression of ageing with significant compromise in autonomy and independence. Moreover, it takes a toll on the family's budget because of its chronic progressive disability and recurrent hospitalization [3].

1.4 Primary/Secondary Frailty and Family Distress

Frail individuals are physically weak, mentally slow and functionally dependent on family members, as has been seen in the case of Mrs. Bajaj who was suffering from TBM, malnutrition and probably secondary frailty. Although age is the strongest determinant of frailty, it is worth noting that Mrs. Bajaj was only 70 years of age. But, she could biologically be considered as old as Mr. A. B. Tripathy or even older than him. She was immunologically weak because of TB and malnutrition. Although she had an active lifestyle, her mobility was restricted only to her small home. She was from an underprivileged socio-economic background with minimal educational level. Cases like hers and many other studies show that people from economically weaker section with less education are more prone to frailty and other geriatric syndromes [39].

Although the phenotype of frailty will be similar, it may be an amalgamated effect of undiagnosed multimorbidity like chronic heart lung disease, kidney disease, depression, etc. There may not be an evident medical morbidity, but it may be because of extreme biological ageing with generalized immunosenescence. Accordingly, there are two entities to refer to frailty in the absence or presence of chronic disease, which are described as primary and secondary frailty, respectively. The presence of acute or chronic diseases makes a person more prone to frailty as it results in mobilization of resources of various organ systems to overcome the disease. This is catastrophic as it exhausts the reserve functions of organ systems.

There is a statistically significant trend of increasing prevalence of frailty among the patients with chronic diseases [40]. For patients with chronic diseases and/or conditions like depression and obesity, it is difficult to sort out frailty as a disease if it is not suspected at an early stage because of shared characteristics [41].

For Mrs. Bajaj, ever since her diagnosis of TBM by neurologists at AIIMS, Anuj had incurred an expense of approximately 5,00,000 INR within 2 years, although all of her treatment at the Department of Geriatrics, AIIMS, had been almost free. Anuj was compelled to use all the money that he had saved up for his children's education. Instances like this should encourage readers to prepare for late life. To save up for one's last phase of life will not only help in physical independence but will help to maintain financial autonomy. It is a significant relief for the next generation too. In fact, it is unfortunate when frailty makes the economically challenged more vulnerable to disability and death, which gradually creates a life expectancy gap among various sections of the same society.

Mrs. Bajaj resided with her son and grandchildren at a Delhi Development Authority Low Income Group flat. The family had accommodated themselves within two small rooms. Anuj's children were of school-going age and required just the essential space to study and complete their daily tasks. The other room was meant for Mrs. Bajaj and her needs. So, Anuj would sleep in the corridor next to his mother's room. He was running a stationery shop close to the flat, which often had to be managed by his younger daughter who was in Class VII (secondary school). Due to lack of space, it was difficult to move Mrs. Bajaj on the wheelchair. Thus, Anuj resorted to carrying her in his arms for cleaning and bathing purposes. Also, she would be on the bed using the bedpan. Despite these difficulties, Anuj would bring his mother for physiotherapy once every week.

She showed marginal improvement with physiotherapy and a diet regime. She started taking a few steps in her small room. Mobility and space are important prerequisites for treating a deconditioned (chronically disabled) patient. Space-time restriction is itself a liable factor for disability and mortality [42]. Before falling severely ill, Mrs. Bajaj used to sit in their stationery shop, which is just 100 m from their home, and she used to walk in the nearby park for 30 min every evening. The concept of space-time restriction has a lot of relevance for older Indians. It is a subjective assessment of somebody's morbidity, which is one of the most important parameters for long-term and short-term health and wellbeing in the later age.

A week after her discharge, when Anuj went to the nearest temple in the morning, Mrs. Bajaj tried to go to the restroom. Once she got down from her bed, she felt giddy and lost control and fell. Fortunately, she suffered no injuries to her head or any fractured bones. The incident left her shaken and more vulnerable. She stopped all movement including visiting AIIMS for physiotherapy. Factors like gender, malnutrition and financial instability and, most importantly, mobility restriction further worsened frailty in her case.

All she wanted now was to pass away in peace “*Mujhe ab jaane do. Mujhe nahi lagta main ab ka bhi apne pairon par khadi ho sakti hoon* (Let me make my exit

from this life now. I don't think I will be able to stand on my feet ever again) I do not want to be a burden on my son anymore after this fall and its related miseries. Please let me die peacefully. This 10' × 8' room is my world now".

Although Anuj tried his best to convince her to go with him to the hospital for physiotherapy, she would refuse. He could not afford a physiotherapist at home either. It had been over 6 months since I had heard from them. Suddenly, one of the days when I was doing my rounds at the High Definition Unit of our department, I saw Mrs. Bajaj admitted with aspiration pneumonia, a very common complication for the frail elderly. Aspiration of small amounts of material from the buccal cavity, particularly during sleep, is not an uncommon event. Usually, aspirated material is cleared by mucociliary action and alveolar macrophages. But, once there is defect in the mucociliary mechanism because of a weak immune system or impaired functional capacity, the organism or food particle may reach the lung parenchyma during food intake particularly while lying down.

There is a chance of lung infection or chemical injury to lungs during aspiration. So, feeding should never be encouraged in the lying posture, which obviously makes the respiratory path straighten and food particles to reach the lungs.

Mrs. Bajaj's oxygen saturation (which decides oxygen supply to the vital organs) was falling and she was unconscious. Under our care for the next 3 days, she was in septicemia, i.e. infection, which had spread to her entire body through blood. Because of the strict instructions she had given to Anuj 'not to resuscitate' her if the situation arises, we did not put her on ventilator.

Despite being uneducated, Mrs. Bajaj knew that a time would come when we would need to resuscitate her, so she had informed the doctor and her son not to do so. It is a rare practice in this country, irrespective of the education, knowledge and economic status.

Most of the elderly inevitably suffer from frailty, which leads to progressive deterioration of the overall functionality. Unfortunately, 65% of India's elderly population are financially dependent on others [43]. Moreover, rarely do Indians prepare themselves for last-minute expenses of their deteriorating health incurred because of complications related to frailty. Thus, India faces a substantial challenge of financial and health security for older adults. The formal workforce has a pension system, but a majority (90%) of our elderly belongs to the informal sector and has no structured pension security [44]. The concept of health insurance has not trickled down to the lower-middle classes. They fail to save adequately for their health expenditure and become dependent on their progeny. Therefore, placing elderly health in a broader framework of universal access and affordability of Universal Health Coverage (UHC) has the potential to transform structural conditions that hinder the wellbeing of the aged.

In October 2010, a high-level expert group recommended an essential package of care (comprising primary-, secondary- and tertiary-level services) be cashless at point of service using a national health entitlement card (which would also serve as

an identifier for electronic medical records, thus carrying patient histories and care-seeking profiles) [45]. This provision will be particularly useful for the elderly poor patients.

1.5 A Wake-Up Call for Older Adults and the Society

After analysing these two stories, it is obvious that managing frailty is not restricted to just medical science. A strong socio-familial and economic support, meaningful engagement with a high aspiration index and life satisfaction are crucial factors. Moreover, one's perception about old age and preparation for it is crucial. It is important to consider the fact that 66% of the country's elderly reside in rural India and frailty increases exponentially with ageing [44].

It should serve as a wake-up call for our politicians and policy planners to equip our health system to be more receptive to this vulnerable community. This would require establishing a multidisciplinary and skilled manpower base for old age healthcare at the primary care establishments.

The large gap between the availability of trained geriatricians and the population's requirement has to be bridged in a fast and efficient manner. Moreover, the need for setting up of dedicated geriatric units to manage complex cases is escalating. A critical mass of specialist geriatric expertise is required to adequately train other professionals in gerontology and geriatrics. Policy-makers should plan to build the capacity within educational institutions to meet these established standards in this field.

Healthy lifestyle, especially nutrition and physical exercise of any form, will prevent age-related accelerated decay. But, there is no universal rule to prevent frailty. In fact, your life course management matters most as we start ageing from the day we were born. There is a requirement to identify scientific basis and genetic models to help diagnose and characterize frailty, as well as to promote an inter-specialty cooperative approach among specialists of all fields—geriatricians, researchers and clinicians—all over the world. This will help to identify solutions that cater to the requirements of the frail elderly in their penultimate period in a holistic way.

It is evident from these two stories that inculcating strength of mind, will power and preparation for ageing is important to help us to navigate through frailty. A condition like frailty is one that opens the floodgates for various morbidities that culminate in a tragic loss of both body and mind. Such an inevitable phase of decay and agony of losing one's beauty and brilliance and becoming dependent on others is undoubtedly painful and seems undignified. It is at such a juncture that we need to look for beauty in decay—to conjure one's mental strength and maintain an optimistic attitude to deal with this phase of inevitable decay and not with fatalism and misery, but with dignity and hope:

Thy large smooth forehead wrinkled shall appear;
 Vermilion hue to pale and wan shall turn;
 Time shall deface what youth hath held most dear;
 Yea, those clear eyes, which once my heart did burn,
 Shall in their hollow circles lodge the night,
 And yield more cause of terror than delight.

Anonymous



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