Chapter 7
Stroke, Premorbid Status and Resilience

I was unable to prognosticate Ms. Reena Zaveri, an 82-year-old lady, who got admitted in our department in a delirious state with a probable brain stroke.

Ms. Reena hailed from a rich business family of Surat, Gujarat, but she had suffered a lot during her childhood. Her father, Mr. Nagin Das Zaveri, was a diamond merchant. Being the first girl child, she was an apple of his eye. But her happiness didn't persist as Mr. Zaveri died in a car accident along with his wife. Reena's uncle took over all their property. She couldn't complete her primary education, as she had to take care of her younger brothers.

I got a phone call on Friday, December 2015, from Ms. Poonam Zaveri, working in one of the embassies in Delhi. She sounded worried, "Mother is in a confused state. Should we bring her to AIIMS?"

7.1 Delirium: Family Support, Love and Care

I was looking after Ms. Reena for some time. In December of 2013, she got admitted in a private hospital for urinary tract infection followed by hyponatraemia, that is, low sodium level. The hospital treated her for 5 days with intravenous antibiotics for infection and with 3% sodium chloride to raise her low sodium levels. But she was still delirious and a little aggressive. She had been treated with antipsychotics (risperidone) with partial response.

Ms. Poonam brought her mother to AIIMS after a week of previous discharge.

"The hospital authority insisted on discharging her after 6 days", she was discussing.

"Elderly take more time to recover".

"The authority just instructed me to manage her at home & continue her medication".

The situation was worse with the high dose of antipsychotics. She had developed rigidity, tremor and slowness of gait other than her agitated behaviour. We had to

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admit her again in private ward with a diagnosis of drug-induced Parkinsonism and delirium for evaluation. We stopped the offending antipsychotics (risperidone) gradually and ruled out other cause of delirium and multicomponent multidisciplinary non-pharmacological therapy instituted by targeting risk factors, like cognitive impairment, immobility, sensory impairment, sleep deprivation and dehydration [1].

Discharge plan in elderly is a complex procedure. Incompletely treated infection, cognitive impairment, COPD, frailty, other complex geriatric syndromes and lower triage category are few risk factors for early revisit to hospital after discharge. Early emergency return is inevitable and even encouraged in some frail older patients. Most common cause for early revisit to the hospital as per evidence to be more likely for the index diagnosis of last visit. In the case of Ms. Reena also, the cause of her hospital visit in both the cases was delirium. Discharge planning from private hospital many a times has financial implication than evidence based guideline.

Ms. Reena had a clock in the room that oriented her about time. Her daughter, Ms. Poonam, brought her spectacles so that she could read the *Gita* in Gujarati, which she had been chanting for the last 30 years. *Gita* is not only a sacred book in Hindu religion but also has universal relevance as a philosophical text as it conveys the message of life—peace, harmony and *karmayog* to the mankind. Reciting Gita had imparted spiritual healing for Ms. Reena and brought harmony in the family. Her family was encouraged to rearrange the hospital room as far as possible like her own bedroom at their house in Vasant Kunj in Delhi and also place things familiar around her. We advised Ms. Poonam to spend maximum time sitting near her mother and avoid any form of argument. She was in AIIMS for 2 weeks to rule out all the reversible causes. There were no features of Parkinsonism, but her delirium persisted, and the lucid interval increased.

Delirium duration is variable, and evidence from meta-analysis has revealed that 44.7% of patients had evidence of delirium at the time of hospital discharge, and about half of these recovered within or by 3 months post discharge [2].

Ms. Reena had good cognitive reserve, and she recovered after mere 3 weeks of discharge. Non-pharmacological intervention (mentioned early) at home, along with love, care and patience of the family members, helped her to recover.

Sometimes, masterly inactivity is the treatment of choice of team managing older adults, but the treating team must be aware of the cause of delirium and treat accordingly.

Ms. Reena was on a regular follow-up on 3-month basis at AIIMS and on physiotherapy at home. She recovered around 60%, but it was never like her premorbid state with complete independence. Ms. Poonam wanted to know why despite best possible care and evidence-based management, her mother was not regaining her strength.

I tried to explain to her that, “It’s all about the discord between your resilience power composed of functional reserve, cognitive reserve, life-course management, genetic makeup, epigenetic mechanisms and aspiration, versus life-long cumulative deficit telomere shortening, immune-senescence and frailty status. Only a handful of them were modifiable at this age”.

But I feel Ms. Reena is understanding her ageing better than us like other octogenarian. In her last OPD visit, we had a long chat.

Table 7.1 Cause of Delirium or Acute Confusional State

- **Medications:** Caregiver/family members must be careful about recently started drugs, such as:
  (a) Cough and cold syrup containing anticholinergics (e.g., Benadryl)—Indian elderly are very happy to take cough syrup.
  (b) Medicine for depression (such as tricyclic antidepressants).
  (c) Pain relievers containing morphine like drugs.
  (d) Drugs against Parkinson's diseases.
  (e) Digestive medicines including H_2 receptor blocking agents, antispasmodic drugs and antinausea pills.
  (f) Antibiotics like levofloxacin—commonly prescribed antibiotics.
- **Infections:** Infection of any organ, especially the chest, kidney, skin or brain.
- **Pain:** As pain threshold is different for different individuals, sometimes moderate pain can cause delirium, so it must be evaluated.
- **Hearing and vision deficits:** Not being able to communicate or understand verbal interactions either due to hearing or vision problems during any internal or external stress increases the chances of delirium.
- **Dehydration (lack of fluids in your body):** Often goes unrecognized in older people, even though they are prone to develop dehydration. They tend not to feel thirsty due to age-related changes; excessive usage of tea, coffee and diuretics; and less physical activity.
- **Low or high body minerals:** Such as low or high sodium, potassium, calcium, magnesium, etc. by dysregulation of various organ functions.
- **Alcohol withdrawal:** This is when people suddenly stop drinking after they have been drinking a lot of alcohol every day.
- **A problem in the brain:** Such as infection, seizure or strokes.
- **Hormonal imbalance**: Like too high or low sugar, thyroid, steroid hormone, etc.
- **Falls and fractures**: Fractures of hip or any other joints present with delirium.

"Dr Chatterjee, I don't know why you are insisting on me becoming active. I have struggled throughout my life. I must know how long to stretch. I was fortunate enough to have a wonderful life partner. We did our best for our three daughters. They are all well settled. I lost my husband when I was 62. Thereafter I have been staying with my elder daughter Poonam and her husband Tushar. They are excellent people and have been caring to me as if I were their child", Ms. Reena told me.

I reciprocated, "Oh! then you are really lucky".

"Yes! God had tested my patience in my initial years. But in my later years, I received my quota of mother's love from my daughter", said Ms. Reena with an

enigmatic smile. “But you know, the machine (body) is getting older. How long will it stretch?” she ended wistfully.

I was shocked when I saw her in our ward in bed number 7, during my Sunday morning round in 2015, with tube through nose to feed her and a catheter to empty her bladder. Two days earlier Ms. Poonam had called me to inform about her mother’s bladder problems. I thought it was urinary tract infection which she had suffered twice previously and suggested oral antibiotics (nitrofurantoin). When I got the call on Sunday morning, I thought she was not responding to oral antibiotics. She arrived in AIIMS in a police ambulance. They had tried to call many ambulance agencies in the morning but without any success. Private ambulance agencies give priority to younger patients, as shifting an elderly is more cumbersome since they require one or two extra persons, especially when they are staying in second or third floor. Public ambulances are not in adequate number considering the population density in a metropolitan city like Delhi [3].

When I examined her, she had right-sided complete weakness of both legs and was only responding to painful stimulus but was restless within. By the evening, her consciousness level had improved, but she was unable to speak.

Mr. Tushar, her son-in-law and a medical scriptwriter, also a good friend of mine, called me in the evening, “Hey Prasun, *ma* is opening her eyes, but she is unable to speak”. I came to know from my junior resident that emergency CT of brain had been organized which showed massive infarction of brain (left sided). There was occlusion of blood vessels, which supply blood to most important part of the brain—Broca’s aphasia, a part of the brain which controls speech.

Signs and symptoms variegate depending on the severity and location of the occlusion in middle cerebral artery (MCA) syndrome. Prominent symptoms include hemiparesis, which means weakness of one entire side of the body, or hemiplegia, meaning complete paralysis of half of the body, of the lower contralateral face or contralateral extremities; sensory deficits of the contralateral face, arm and leg; ataxia of contralateral extremities; and visual impairment [4].

I immediately informed Ms. Poonam.

Ageing is the most common and an irreversible risk factor for brain stroke. When I informed Ms. Poonam about her mother’s prognosis, her first question was, “Why she?”

“She had no major comorbidity. Her blood pressure was under control. She never had an addiction, she was not under stress in her late life”. Ms. Poonam tried her best to understand how a brain stroke could debilitate her mother.

Ms. Reena improved a lot after the last episode, and we were thinking that she would come back to normalcy in due course. I tried to explain her that ageing and physical inactivity along with vascular disease like hypertension are definitely major risks of developing stroke. In fact, stroke would unavoidably be a major problem of this octogenarian population as one-third of incidence is in this group. But more worrisome fact is that stroke is the most common cause of disability among this group of population, something that I didn’t mention to her immediately.

I tried to explain to her about the theory of life-course approach; vascular phenomenon like cardiovascular diseases and stroke may have long natural history with accumulation of risk beginning in early life and continuing through childhood into

adolescence and adulthood. The life-course overview considers physical as well as social perils and the ensuing behavioural, biological and psychosocial systems, which act across all levels of the lifespan to affect disease risk in the later years of life. The stages of lifespan include gestation, infancy, childhood, adolescence, young adulthood and midlife [5].

In Ms. Reena's case, her childhood, adolescence and young adulthood had been under severe stress. She used to work in a cotton mill factory for her survival and to take care of her two younger brothers. Ms. Poonam even revealed a shocking fact that there had been a history of regular physical and mental abuse of her mother by her uncle. Despite suffering such trauma, she had an excellent quality of forgiveness, patience and ambition.

Her next question was more interesting and complex: whether there had been any diagnostic delay? I didn't think there were any delays and went on to explain why. Stroke in the very elderly may present atypically, especially when there is synergism of multimorbidity, geriatric syndrome and age-related delayed response of the body. In this case, her premorbid status was not optimal, with minimal mobility, and the motivation to walk was almost none. She was managing her activities of daily living (ADL) with support from Balma. However, I agreed that the flipside to managing or assessing the medical condition of older adults over phone was that so often stroke symptoms are not identified.

According to Balma "There was no feature like weakness of leg, clouding of consciousness, slurring of speech, numbness of leg or hand before the day of admission". But strokes in the very old may have a different clinical picture upon presentation to the hospital such as falls, reduced mobility and delirium.

7.2 Stroke and Risk Factors

"What are the risk factors of her stroke?"

'My maternal uncle died last year due to brain stroke at the age of 70. Is it a risk factor for her?"

"Of course".

I continued, "Family history of stroke amongst parents, grandparents, sisters or brothers are definitely a risk factor".

In addition, female gender, prior stroke, transient ischemic attacks or heart attack is also a matter of concern [6]. A person who has experienced stroke previously has a much higher risk of having another stroke in the future than a person who has never had one. Socio-economic conditions may also play an essential role in determining risk of stroke. Evidence indicates that strokes occur more likely among persons who have lower income, smoking history and obesity. The other factor that comes into play is poor accessibility of healthcare services in individuals belonging to underprivileged socio-economic backgrounds [7]. Additionally, alcohol abuse can also increase the overall risk multiple times [8].

"She will be fine *na*?" asked Ms. Poonam.

A tricky question with no answer.

Table 7.2 Modified Rankin Scale for Neurologic Disability

No symptoms	0
No significant disability despite having symptoms; able to perform all usual duties and activities	+1
Slight disability; unable to perform all previous activities but able to look after self- affairs without assistance	+2
Moderate disability; require some help but able to walk without assistance	+3
Moderately severe disability; not able to walk and attend to bodily needs without help or assistance	+4
Severe disability; bedridden, incontinent and requires nursing care and attention	+5

I tried to prognosticate Ms. Reena as per the admission status. Stroke is more common among the females who have had a poor premorbid status as per the Modified Rankin Scale (mRS) for Neurologic Disability, was hypertensive, with a positive family history (Table 7.2).

In view of routine protocol for treatment of strokes, we started managing her with a blood thinner (aspirin and clopidogrel), aggressive physiotherapy and monitoring her blood pressure and sugar. Primary goal of management was to prevent another stroke or any further damage in the form of a blood clot in the leg (DVT) and look after the electrolyte imbalance and prevent advent of any infection.

She was suffering from UTI which was sensitive only to IV antibiotics (meropenam). There was a probability that she had either an infection or a stroke, or it could be that both were precipitants of delirium.

Due to infection or stroke, she developed hyponatraemia (low sodium) which we were correcting slowly with 3% saline (NaCl). Clinically or radiographically, there was no lower respiratory tract infection (LRTI), at that point of time.

7.3 Importance of Family Support

On the third day of admission, I saw a slight improvement in her conscious level. She was looking at me with teary eyes and tried to speak but was unable to do so. Advance care planning has to be started early. I was discussing this with Dr. Sunita Paul from New Zealand that advance care planning should be documented even when you are not too old. In fact, we who are adults now should write for advance care planning (ACP). “But even in our centre in NZ where we are working on sensitizing older adults for the past 10 years, less than 10% of older adults had ACP when they had to visit the emergency ward of any hospital.”–Dr. Sunita

Ms. Reena was looking at Mr. Tushar and expressing her helplessness and unwillingness to live a dependent life without dignity. I was glad to see the love, care and affection of a son-in-law for his mother-in-law. Over a cup of coffee, Mr. Tushar recollected, “She has been there with us for the last 18 years after the demise of my father-in-law. I don’t consider her as my mother-in-law but as my mother. I had lost my mother in early childhood”. He was upset. After a pause, he said, “You know,

she has an excellent quality to love and stay dormant in any situation and she had really helped us to settle our misunderstandings between me and Poonam but subtly".

Unfortunately, on the fourth day of my visit, I observed that there were some haemorrhagic spots on her leg, and the duty doctor mentioned about one episode of haematuria, which is blood in the urine. She was on low molecular heparin (LMWH) to prevent deep vein thrombosis (DVT) along with clopidogrel to prevent further instance of stroke.

We had to stop the LMWH, but haematuria persisted so we had to stop clopidogrel too. It was a catch-22 situation when somebody needed a blood thinning agent to improve blood circulation to the brain or heart, but they developed some haemorrhagic manifestation externally and internally. So, I had to prognosticate about Ms. Reena to her family. It was really a critical situation when a very elderly lady like Ms. Reena was presented with a major stroke with an unfavourable premorbid status. We had to stop the blood thinner which was an essential drug to prevent further stroke as a major stroke begets another stroke.

As per literature review, all persons with stroke have 9.5% recurrence risk at the end of first year and 25% recurrence risk at the end of 5 years [9].

A young lady was staying with Ms. Reena as her constant associate. On the fifth day of admission, she asked me if I could spare some time to discuss about her *Baa* (mother in Gujarati). But I had more to listen than to explain.

"Dr. Uncle please save my Baa". She surprised me with her plead.

"I am Saloni, her granddaughter, but she is more than my mother to me as she took care of me when I needed my mother the most. Probably I was one year old or so when *baa* began looking after me".

"I stayed more with her than my mother because my mother was working".

"I know she is one of the most wonderful persons of this universe. I don't want to lose her". She was sobbing.

I allowed the reality to sink in.

She wanted to know more about stroke.

"What is happening with *Baa*?"

"Why is it not curable?"

I explained to her, with a pictorial, how blood supply happens in the brain and how it has been occluded, pointing out subtly how the situation was not favourable for her grandmother. Female sex, aged more than 80, premorbid disability, and lack of motivation—all of these factors were poor prognostic signs after stroke in her case.

She had a genuine concern, "Why is she not speaking?"

Will she never be able to speak (Fig. 7.1)?

I tried to explain to her, "Brain consists of two hemispheres. Language and analysis tasks are controlled by the left hemisphere in around 97% of people and the right hemisphere is referred to as the 'creative brain', which is engaged mostly in daydreaming and imagination. Henceforth, insults or injury in language generation area (Broca's area) primarily from blockage of middle cerebral artery would result in loss of speech and language abilities, but she would able to comprehend" [10].

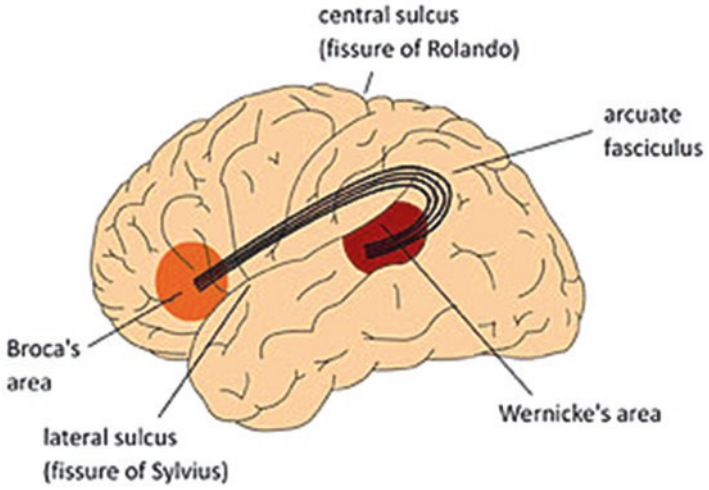

Fig. 7.1 Language area and its connection. (*Source:* https://digest.bps.org.uk/2016/11/01/broca-and-wernicke-are-dead-its-time-to-rewrite-the-neurobiology-of-language/)

"You mean she is able to understand whatever I tell her?" was her immediate question.

"The brain areas for understanding and speech output are different, so it is good that the sensory speech area which is also on the left side has been spared in her case. Sometimes in some patients, we notice that they don't even understand the commands [11] as the same artery which is supplying the speech output area is also supplying the area responsible for comprehension".

She was silent for a minute.

"Is there any sign of improvement that is positive in my Baa?"

I muttered a hesitant "No".

"Why is the best institute in this country unable to manage a stroke?" was Saloni's lamentation as she burst out sobbing.

7.4 The Virtue of Joint Family

This is a classic example of the strength of a joint family and intergenerational solidarity, where grandmother takes care of granddaughter in the absence of the parents. This bonding helps in childhood development, which is sometimes more than the

bonding between parents and their child and is a win-win situation for the grandparents too.

The best part of Indian culture is adherence to age-old prevailing traditions of the joint family system that keeps all family members united. This characteristic uniqueness that involves caring and respecting elders by touching feet, speaking in a polite manner, taking elders' wisdom and advice before decision-making, etc. is the defining feature of societies that have survived across the ages. Working together to solve problems faced by one or more members of the joint family is the core of this system which permits family members to be satisfied despite difference of opinions. Gradually, the protocol of the joint family system is transforming from value-based system to a visible productivity-based one. But Ms. Reena was fortunate to have such a caring son-in-law and a granddaughter who came to take care of her from London where she was pursuing her graduation in Economics. It was obvious that Ms. Reena had prepared for her late life. With changing social structures, she had also changed her attitude to adjust with the next generation.

Saloni was inconsolable and desolate the day I advised them to spend as much time as possible with her *Baa* and try to communicate with her. Ms. Reena's health condition was deteriorating with every passing day despite evidence-based multidisciplinary care, which included caring by a dietician, physiotherapist, occupational therapist, geriatrician and neurologist. Her soul wanted to be liberated whereas her family members were unwilling to accept that.

Ms. Reena's right leg and right hand were totally flaccid and shrunken due to loss of muscle mass and atrophy. Her gaze was towards right with a whitish-grey mark in the corner of her eyes due to continuous flow of tears. Saloni was carefully and softly cleaning it with a wet cotton swab. The flow of tears was relentless. It was an amazing bond between a modern educated girl and her frail grandmother who were attached to form a celestial relation. There was no verbal communication, but both were sobbing relentlessly.

The situation was worsening day by day. On day 12 of admission, she lost her communication with Saloni. She became delirious again with low sodium. Dr. Raj mentioned high-grade fever (>100°F), productive cough with sputum, abnormal respiratory rate, (tachypnoea >22 breaths/min), tachycardia (heart rate > 100/min) and inspiratory crackles. X-ray was abnormal, suggesting pneumonia, a complex but sometime inevitable complication of a major stroke. We were not sure how she developed chest infection. It could be due to hospital-acquired infection or aspiration of stomach fluid in lungs through the windpipe. Although she was on Ryles tube for feeding, studies have suggested that frail bedridden patients were always prone to develop aspiration pneumonia, when there is enteral feeding, either orally or by Ryles tube [12]. I explained this to the family that anybody who is in hospital for more than 48 h is at risk of developing hospital-acquired pneumonia. But Mr. Tushar was a little upset as he felt that hand hygiene of our departmental doctors and nurses were not adequate, which could be one of the causes of infection.

Hospital-acquired infection (HAI) is a largely preventable threat, and maintenance of adequate hand hygiene (HH) is regarded as the most beneficial preventive step to eliminate the harmful consequences of HAI. In a study conducted in the

labour room and neonatology ward of R G Kar Medical College and Hospital in Kolkata, among 90 doctors from teaching faculties, medical officers, senior residents and junior residents, it was found that only 67.8% doctors underwent formal training on HH. In addition, 77.8% doctors claimed that they were aware of six steps of proper handwashing. Nonetheless, 53.33% of all doctors did not engage in handwashing before approaching a patient. Therefore, knowledge of HH was not reflected in original practice [13].

Another study points toward the role played by continuous auditing in meaningful conversion of HH knowledge into practice [14].

I discussed this with our junior doctors and nurses in charge of the department. But there is no mechanism in place to scrutinize doctors and medical professional about this on a continuous basis. Hospital administration department occasionally conduct hand hygiene workshop, but not very successfully.

It could be due to aspiration pneumonia (AP) also. AP is a type of pneumonia in which oropharyngeal or gastric secretions are aspirated through windpipe and get associated with recognizable pulmonary sequelae. It occurs during the impairment of upper and lower airway protective reflexes in older adults with compromised level of consciousness or a central nervous system disorder. Nasogastric (NG) tube feeding may be partially but not fully protective of aspiration unlike common belief.

Study by R. Dziewas suggests that the incidence of AP was 44% in acute stroke patients needing tube feeding because of dysphagia [15]. Similarly, a study by Mamun and Lim Role observed that the patients with nasogastric tube feeding did not represent any significant outcome against aspiration pneumonia and mortality, when they were compared to patients who were undergoing oral feeding [16].

We started treating her aggressively with three antibiotics to cover all potential microbes, in consultation with a microbiologist. Ms. Reena had developed rattling while breathing. Saloni was sitting near head-end caressing her *Baa*'s forehead, the way her grandmother used to do in her childhood to lull her to her sleep, a classic example of role reversal.

She was on antibiotics for the next 7 days with minimal improvement in her chest symptoms and a waxing and waning course in her alertness. She developed swelling in her right leg, both due to immobility and probable DVT.

On day 20 of her admission, all of us realized that the situation was beyond repair. The list of problems was increasing day by day. Ms. Reena had multiple complications like chest infection, DVT, delirious state, immobility and stroke in the dominant (left) hemisphere with motor aphasia and complete weakness of right side of the body. Most importantly, the inherent peace which was always visible on her face was missing.

"You know Dr Prasun, *ma* responded to me today with a spontaneous tear and holding my hand with her left hand, but I understood she has liberated herself from all of us. She is in search of peace, comfort, and relief from all these external agony and restlessness".

Saloni was no more in the hospital. She understood what fate had in store for her *baa*. She was staying with her cousin and aunty at home.

"She wouldn't be able to take in …" Ms. Poonam said about Saloni. "But I am happy that her last meeting with Baa was very exciting".

"What happened?"

"We didn't know that Saloni had gotten a tattoo on her neck. It was her *baa*'s name 'Reena' in Gujarati. That day she was showing it to *Ma*. *Ma* was trying to read what is that. So Saloni went closer to her and made her wear the specs and told her that I have imprinted your name on my neck but you actually live in my heart, don't leave us".

"Ma understood, and she was so happy and excited despite her agony".

"How was it possible? She uttered Oh! Saras (very good in Gujarati) for a second. There were tears in her glittering eyes".

"We were all in tears, but Saloni decided that she would no longer be coming to the hospital".

"This was the only time *ma* responded since she had the stroke."

I tried to explain that the response was an emotional one and came out automatically. It was a simple but a learned 'word' like 'Oh!' or 'Saras' from early childhood.

Sometimes even patients with non-fluent aphasia, even when they are speechless, may sound once or twice in the name of God, often to the shock and surprise of friends and family [17].

Ms. Poonam asked me about the future course of management. I suggested supportive and comfort care and a PEG tube to feed her as she would aspirate with Ryles tube feeding again. There was a detailed discussion about dignity and autonomy within their family members. Ms. Poonam was not in the favour of life-prolonging therapy without dignity. She tried to explain that her mother had lived a meaningful life, with lots of challenges, successes, failures and aspirations, but she was always at peace within. But this event was probably a terminal event over her frailty status. She had lost probably for the first and the last time in her life.

"We shouldn't prolong her agony".

"She should have a dignified departure from this life". Ms. Reena took her last breath next morning in the presence of Tushar.

It is important to strengthen intrinsic capacity through life as much as possible. Older adults who are in their 60s rather who are in their 50s need to build physical and cognitive resilience, against overlapping challenges, including the effects of societal attitude, family issues, financial insecurity, multimorbidity, geriatric syndrome and mobility limitation.

7.5 The Gravity of Problems Alter with Changing Support System

Our junior resident Dr. Ashish Goel was a little jittery to admit Ms. Bhawani Devi, aged 89, who came to us with similar findings like Ms. Reena—right-sided hemiparesis with numbness of right leg and motor aphasia. My only question was, "How was she doing before this episode?"

In a resource-constrained country, a patient with apparently no hope is not considered worthy to be even admitted.

Ms. Bhawani Devi was living alone in the semiurban town of Hathras in the state of Uttar Pradesh, around 60 km from Delhi. She had suffered a stroke 3 days ago on Friday. Her son Mr. Amit came to see me in the OPD and asked, "What should we do?" as his mother was unable to move her right leg and couldn't speak. I asked them to bring her immediately; she needed admission.

Mr. Amit was working as a clerk in a public institute, and his wife wasn't keen to look after his mother. Sumit, the older brother of Amit, lived in the United States. He was a busy scientist in Miami. He tried to pursue his mother to shift to the States but she refused. He told Amit, "I will transfer the currency for her hospitalization and if possible please allow me to talk to the doctor and update me everyday. It would be difficult to visit India now as I am working on a big project".

Ms. Bhawani Devi was always independent in her life and did everything, starting from providing best care to her three sons and husband to caring for their three cows and their calves. Hailing from a middle class but educated family, she studied up to graduation in Hindi medium. She got selected as a Hindi teacher in a secondary school. After marrying Dr. Prakash from the same village, she quit her job to take care of their family.

7.6 Stroke in a Healthy Octogenarian, from Rural India

"Ms. Bhawani had no comorbidities like hypertension, diabetes, coronary artery disease, frailty, or dementia. She was independent in daily activity and instrumental activity". Dr. Ashish apprised me.

Amit, her younger son, was worried that if his mother was admitted, who would accompany her in the hospital.

Ms. Bhawani smiled with glittering eyes and tried to fold her hands in the greeting "namaste", which she couldn't due to motor aphasia. Then again, she become delirious. Her house servant Amina, a lady of around 35 years of age, was standing next to her, enthusiastically said, "I will be there with her in the hospital, doctor please admit her and save her life". I told Mr. Amit and our ward attendant to shift her to the geriatric high definition unit.

Ms. Bhawani came to the hospital on the third day of the stroke. She stayed alone in the village that was devoid of any specialist care facility. Although Hathras is not far from Delhi, health facility in places closer to the metropolitan city is not optimum; rather functionality of primary healthcare is questionable [18]. Octogenarians like Bhawani Devi and their associates still rely on health quacks, alternate medicine even for acute onset stroke, which they consider as age-related weakness that should subside automatically. Delayed hospital presentation was very common among rural elder people. A study conducted by Srivastava and Prasad from AIIMS, New Delhi, suggested that economic status, living alone, residing in a rural area, lack of awareness and many more factors lead to delay in hospital admission [19]. It was unfortunate that an educated lady like her with well-established next generation had to live at the mercy of some local village guys. But Amina was different; a

tribal Muslim from the same village was caring for Bhawani Devi for last 20 years when her near and dear ones had left her alone.

Ms. Bhawani got admitted on bed no. 10, incidentally on the same bed where Ms. Reena was admitted. A study conducted in AIIMS shows that almost 60% of the elderly visit hospital only after 72 h. But previous studies suggested that the earlier the patient reached the hospital, better the prognosis [20]. Factors such as being single and living in isolation, being retired, contact with local medical officers, nocturnal commencement of the condition and ischemic stroke were observed to procrastinate the onset of stroke, while daytime stroke, haemorrhagic stroke, severe stroke and previous stroke history result in an early arrival of patients to the hospital [21].

The socio-demographic patterns in India are different from that observed in several developed countries. In India, a majority of people live in villages and towns, preferring joint family residence. It has been reported that general education and awareness level is unsatisfactory and people preferentially opt for alternative treatment modalities for such illnesses [22].

There is a paucity of adequate transport facilities that worsen the scenario even further. Arrival of older patients before stipulated time would only be possible as per the availability of younger adults, capable of arranging transportation. Multivariate analysis revealed that contact with a local doctor after the occurrence of an episode of acute stroke had independent significant association with a delay in arrival. This is corroborated by a previous study as well, and the primary reason for it could be attributed to numerous unqualified practitioners and ignorance of available qualified practitioners concerning the need to transfer patients to a well-established stroke care facilities.

Managing a stroke patient, once the initial 24 h was over, is predominantly a multidisciplinary and holistic care by elderly care physician, physiotherapist, dietician, occupational therapist, social workers and nursing staff who are yet to be recognized as a major player.

We had anticipated that Bhawani Devi will have the same story as that of Ms. Reena. On taking a detailed history after admission, we came to know that Ms. Bhawani had suffered from TIA, 2 weeks prior to this episode.

“Mother felt dizzy and there was slurring of speech for few seconds. She was about to fall but I held her. Once she was fine with in an hour or so, she continued with her activities normally”.

“Why didn’t you take her to a doctor?”

“She never listen to anybody, I called the local pharmacist who checked blood pressure which was normal”.

Amma said “It’s nothing, you know. I am ageing” and continued feeding the calf. She was fond of the cow and her calf. She had cared for them life-long.

“You know, the last episode was an alarm sign for this major stroke”. I told her.

Transient ischaemic attack usually lasts for a few minutes to maximum for an hour. Presentation is similar like stroke as pathology, i.e., blockage of some artery supplying a portion of brain for a short period of time [23]. I was trying to find out

her vascular risk factors like HTN/DM/CAD. Sometimes it is more complex. Amina was more concerned about the mental stress that her adoptive mother *Amma* was going through.

"Doctor, you know, she was very positive previously and her contribution to the society was immense. She has adopted my family. My son is going to school and daughter completed her college. Not only my family, but she guided many underprivileged students to study".

"She never bothered about her ageing, but some recent episodes with her sons had changed her attitude. Her elder son told her a few days ago that he can't visit India in the next three years, Amit *ji* doesn't call her regularly, more importantly her favorite cow had an abortion a month back" shared Amina. Even if she didn't express much to them, Amina reminisced how often she would say, "Don't educate your child too much, they would also leave you forever".

"Amma was not communicating with neighbours, son, or granddaughter Tina, from Miami for last couple of months. She was not very expressive about her problems".

Her food intake was also reduced over couple of months.

Probably she was suffering from depression, resulting from loneliness, feeling neglected and hopelessness.

On reviewing the literature about relationship between stroke and psychological stress, it was interesting to review an article which mentioned that negative feelings of discontent, hopelessness and anger had been associated with atherosclerosis [24]. In fact, stress activates the hypothalamic pituitary axis, high cortisol, and high sympathetic nerve activity thereby endothelial dysfunction and atherosclerosis. Stress activates the hypothalamic pituitary axis and sympathetic nervous system, along with the renin-angiotensin system, thereby generating stress hormones including glucagon, catecholamines, growth hormone, renin and homocysteine. These hormones stimulate elevated cardiovascular activity, impaired endothelium and initiation of adhesion molecules on endothelial cells to which specific inflammatory cells adhere and translocate to the arterial wall. Stress also contributes towards an undesirable lipid profile with oxidation of lipids and, in chronic cases, a hypercoagulable state that may lead to arterial thromboses. It would probably have a synergic effect on the inflammatory system of the elderly. The heightened inflammatory cascade can also add on in the formation of atherosclerosis and related complication like stroke [25]. It has been demonstrated that the absence of positive attitude, a reduced sense of coherence [26] and low-grade depression increase the chances of occurrence of stroke.

Her state turned towards normalcy from delirium within a week, and she responded well to supportive treatment by management. The only complication she developed on seventh day was pressure sore, which is common complication in a bed-bound elderly. It is referred to as pressure ulcers and pressure sores. Bed sores occur mainly when there is unrelieved pressure on one part of the body. People who cannot indulge in minor movements are at a higher risk of developing pressure sores. Though these sores can affect any part of the body, specifically the bony areas around the elbows, knees, heels, coccyx and ankles are more likely to have pressure sores.

Bedsores are treatable, but, if treatment comes too late, they can lead to fatal complications.

Pressure sore prevalence in ICUs in the United States (US) is reported to range from 16.6% to 20.7% [27]. We managed that with repeated change of posture (reduction of pressure), using hydrocolloid dressings as an occlusive barrier over wounds while maintaining a moist environment and preventing bacterial infections.

In 2 weeks, she was shifted to private ward because of the insistence of attendants to reduce the chances of cross infection (infection that transfers from patient to others or health professionals to patient). On the 16th day of her admission, I was very happy to see her response. Amina was feeding her homemade liquid food as trained by our speech therapist. She was able to swallow but took a lot of effort and stepwise assessment of her swallowing mechanism.

Aspiration pneumonia is a frequent problem of elderly people who are in bed for a long time and have had stroke, frailty, dementia, delirium, etc. We always try to explain to the patient's caregiver that we should be slow in giving food to patients in such a state. Patient should be seated in at least 60° posture. Swallowing of food should be assessed by some trained personnel. Food should be given to the patient by mouth slowly and gradually according to the instructions of doctors and dieticians.

Next morning, physiotherapist Ms. Rima Chawdhury informed me that there was minimal improvement in muscle tone of right hand and right leg. I was keen and insisting that she must recover, as her premorbid status (her physical, mental and functional status) before this episode was extremely well. According to Rockwood deficit model, Ms. Bhawani Devi was functionally Nonfrail, but her mood was not okay as her acceptance towards the neglect of her progeny was poor.

7.7 The Pivotal Role of Rehabilitation

Physiotherapy was continued to strengthen her lower and upper limb muscles. Speech therapy was started, and she was enthusiastic to speak but not with much result. On day 21 of admission, she sat with a support, and tone of upper and lower limb had improved further. Amina was elated, "Doctor, her loose and flabby muscles of right hand has gained some tone. How long will it take for Amma to get back her own strength?"

It was a difficult question, "It may take 6 months or so. But it is good that she is improving".

On day 25, she expressed her desire to go home. It was convenient for Amina too.

Older adults always prefer to get discharged and return to their native place irrespective of their recovery status. They prefer to live or die at their birth place.

Home-based rehabilitation is the need for many older adults after discharge but mostly inadequate. The importance of rehabilitation is yet underestimated or stated

by even medical fraternity. From doctors to policy-makers and family members are still not agreeable to physiotherapy, occupational therapy and dietician's advice, as the notion is pharmacotherapy is superior and would provide relieve. One reason could be pharmacological therapy and its impact assessment are methodologically easy to study compared to the intervention like occupational therapy/health education [28].

Ms. Bhawani Devi went home on day 27. I had requested Mr. Amit to keep her at Delhi and have physiotherapy session with trained physical therapist. Our physiotherapist explained him and Amina the importance of "post stroke rehabilitation".

I had a long discussion with our physical therapist about the rehabilitation.

Ms. Rima, our therapist, explained me in detail about "good rehabilitation".

Its outcome is apparently highly linked with greater patient-family motivation and engagement. Even though the biological children were away, but Amina had lot of motivation to help Ms. Bhawani to recover.

Stroke rehabilitation is a continuous process involving the following steps:

1. Assessment: to determine the patient's needs.
2. Goal defining: define achievable goals.
3. Intervention: help in the achievement of goals.
4. Reassessment: assess progress against previously defined goals.

She also instructed to assist to break the synergy pattern. The stroke patient may have abnormal and involuntary position, the arms stiff and bent at elbow with clenched wrists and bent fingers pressed against the chest (decorticate posture) while the legs sticking out straight.

This abnormal posture is caused by damaged connections between the brain and the spinal cord.

To break the synergy, Amina was explained to keep Ms. Bhawani's elbow extension and lower limb flexed position. Motor weakness of lower limb was her predominant problem along with speech output difficulties.

Studies have suggested that training, which is primarily task-oriented, can facilitate the natural pattern of functional recovery, driven chiefly by adaptive strategies that compensate for affected body functions [29].

A pragmatic goal for Amina was "Doctor, I will do everything for her, but she will be happy only if she can use her right hand to feed herself and her dearest calf Radha".

As per the requirement and the functional status of Ms. Bhawani at the time of discharge, Amina was instructed to help her to perform various tasks such as (a) sit to stand, (b) bringing the right hand to mouth, (c) bringing hand to the ears, (d) lifting hand above the head to comb hair, (e) reaching out to an object and keeping it, (f) trying to hold a ball and keeping it, (g) trying to hold a glass and take it to the mouth, (h) trying to hold a spoon and take it to the mouth, (i) picking the glass from the table and keeping it on the bed side, (j) picking the glass from the bed side and keeping it on the table, (k) pulling the drawer and taking out something, within her supervision.

Our occupational and speech therapists spent 45 min each during her hospital stay trying to improve activities of daily living and speech. She started speaking monosyllable words such as maa, Baa, yes, no, etc. and communicating enough to Amina by gesture.

We discharged her with blood thinner, one antihypertensive pill, antidepressant and calcium, in addition to the prescription of the therapist and dietary advice.

Ms. Bhawani Devi never came back for reassessment. I met Mr. Amit in his office for my official work and came to know that his mother was not in Delhi. With hesitation he told me, "But she is following your advice", I understood the situation and it was disheartening.

Post-stroke rehabilitation is equally important like medical management. People who have undergone a stroke need timely rehabilitation to enable them resume their previous roles at their own pace and place.

Very few are fortunate like Ms. Reena, who had support from her family and managed to obtain inpatient and outpatient rehabilitation treatment.

Partial rehabilitation needs may eventually lead to a loss of functional independence, which elevates utilization of health services, hospitalizations, institutionalization and death. Surprisingly, in a developed country like Canada, approximately 10–15% of people with stroke receive inpatient rehabilitation services [30]. Rehabilitation should not only focus on management of daily chore, it should also focus on satisfaction with life and leisure activities.

After 3 months, I got a message on my mobile phone stating: "With profound grief we wish to inform you the sad demise of our beloved mother Smt. Bhawani Devi on 16-12-2016". It was an invitation for a prayer meeting in her honour in Delhi.

Amina came to see me after few months. It was shocking to know that Mr. Amit visited her mother only after her demise.

Amina did the last rites as per her Amma's wish.

"You have been serving me for the last 20 years, so you are my daughter. When I die, don't call my sons, you do the last rite".

Probably she died of sudden cardiac arrest as she had stopped taking medicine, including medicine for depression. Amina informed me, "She used to spit it out".

"Her family never came back to see her even after discharge from hospital".

"Her only wish was to see my daughter's marriage". Amina told me with teary eyes.

Ms. Reena and Ms. Bhawani Devi both were female aged more than 80 and from similar socio-demographic profile. Ms. Bhawani Devi had better functional and cognitive reserve, as she was active till the episode of major stroke, but she had minimal family support and was under psychological stress. Whereas Ms. Reena had a great family support system with a feeling of completeness of life, but her premorbid functional status was not favourable. Her mobility was restricted to her bedroom. Studies suggest that improving mobility [31] and preventing life space constrictions [32] keep an individual psychologically and functionally robust. Ms. Bhawani Devi had incomplete wish list, such as "attending marriage of her adopted

granddaughter." But both of them lost interest to live anymore. There was no "will to live".

When I met Mr. Tushar, he recalled the condition of his daughter, "Saloni did not sleep for couple of days after the demise of her grandmother. She was very close to her".

Ms. Reena had always been there by Saloni's side with her unconditional love and nonjudgemental and wise advices irrespective of her minimal education. Saloni would often say, "Now I would never be hugged by baa and would not be able to play with her heavenly warmth. I still wake up in the middle of the night, dreaming about her and then cry". What a bonding they had, a classic example of intergenerational solidarity, a tradition of Indian culture. But not everyone is fortunate enough have such a loving family; rather situation might not be favourable for people like Ms. Bhawani Devi.

Ms. Bhawani Devi, when she was active, almost 6 months before her hospitalization, would often say "I don't fear death but what bothers me is how I am going to die. I don't want to die in bedridden status, losing the movement of my body, leg or without any speech. I don't want to be burden on you". Amina told me while sobbing.

In spite of surprising advancement of medical science in the last three decades, we are still unable to assess low-grade chronic inflammation and related consequences in ageing vascular system. We are happy and proud in our effort to manage hypertension, diabetes, smoking, obesity and lipid disturbances in preventing stroke for limited health-seeking older adults with economic and educational understanding.

But how to manage stress, life course trajectory with fluctuating intrinsic capacity, behaviour of healthy eating, physical activity in a frail patient like Ms. Reena and lastly the ageing body, mind and artery.

Yet to accept and answer to our limitation.

After all…

"A man is as old as his arteries".—Thomas Sydenham

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