NEW YORK TIMES BESTSELLING AUTHOR OF
THE CHECKLIST MANIFESTO

Atul Gawande

Being Mortal

Medicine and What Matters in the End

Complications: A Surgeon's Notes on an Imperfect Science

Better: A Surgeon's Notes on Performance

The Checklist Manifesto: How to Get Things Right

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I see it now—this world is swiftly passing.
—the warrior Karna, in the *Mahabharata*

They come to rest at any kerb:
All streets in time are visited.
—Philip Larkin, “Ambulances”

I learned about a lot of things in medical school, but mortality wasn't one of them. Althoug I was given a dry, leathery corpse to dissect in my first term, that was solely a way to lea about human anatomy. Our textbooks had almost nothing on aging or frailty or dying. Ho the process unfolds, how people experience the end of their lives, and how it affects thos around them seemed beside the point. The way we saw it, and the way our professors saw i the purpose of medical schooling was to teach how to save lives, not how to tend to the demise.

The one time I remember discussing mortality was during an hour we spent on *The Death Ivan Ilyich*, Tolstoy's classic novella. It was in a weekly seminar called Patient-Doctor—part the school's effort to make us more rounded and humane physicians. Some weeks we wou practice our physical examination etiquette; other weeks we'd learn about the effects socioeconomics and race on health. And one afternoon we contemplated the suffering of Iva Ilyich as he lay ill and worsening from some unnamed, untreatable disease.

In the story, Ivan Ilyich is forty-five years old, a midlevel Saint Petersburg magistra whose life revolves mostly around petty concerns of social status. One day, he falls off stepladder and develops a pain in his side. Instead of abating, the pain gets worse, and h becomes unable to work. Formerly an "intelligent, polished, lively and agreeable man," h grows depressed and enfeebled. Friends and colleagues avoid him. His wife calls in a series ever more expensive doctors. None of them can agree on a diagnosis, and the remedies the give him accomplish nothing. For Ilyich, it is all torture, and he simmers and rages at h situation.

"What tormented Ivan Ilyich most," Tolstoy writes, "was the deception, the lie, which fo some reason they all accepted, that he was not dying but was simply ill, and he only nee keep quiet and undergo a treatment and then something very good would result." Ivan Ilyic has flashes of hope that maybe things will turn around, but as he grows weaker and mor emaciated he knows what is happening. He lives in mounting anguish and fear of death. Bu death is not a subject that his doctors, friends, or family can countenance. That is what caus him his most profound pain.

"No one pitied him as he wished to be pitied," writes Tolstoy. "At certain moments aft prolonged suffering he wished most of all (though he would have been ashamed to confess i for someone to pity him as a sick child is pitied. He longed to be petted and comforted. H knew he was an important functionary, that he had a beard turning grey, and that therefo what he longed for was impossible, but still he longed for it."

As we medical students saw it, the failure of those around Ivan Ilyich to offer comfort or t acknowledge what is happening to him was a failure of character and culture. The lat nineteenth-century Russia of Tolstoy's story seemed harsh and almost primitive to us. Just

we believed that modern medicine could probably have cured Ivan Ilyich of whatever disea he had, so too we took for granted that honesty and kindness were basic responsibilities of modern doctor. We were confident that in such a situation we would act compassionately.

What worried us was knowledge. While we knew how to sympathize, we weren't at a certain we would know how to properly diagnose and treat. We paid our medical tuition learn about the inner process of the body, the intricate mechanisms of its pathologies, and th vast trove of discoveries and technologies that have accumulated to stop them. We didn imagine we needed to think about much else. So we put Ivan Ilyich out of our heads.

Yet within a few years, when I came to experience surgical training and practice, encountered patients forced to confront the realities of decline and mortality, and it did n take long to realize how unready I was to help them.

I BEGAN WRITING when I was a junior surgical resident, and in one of my very first essays, I to the story of a man whom I called Joseph Lazaroff. He was a city administrator who'd lost h wife to lung cancer a few years earlier. Now, he was in his sixties and suffering from a incurable cancer himself—a widely metastatic prostate cancer. He had lost more than fif pounds. His abdomen, scrotum, and legs had filled with fluid. One day, he woke up unable t move his right leg or control his bowels. He was admitted to the hospital, where I met him a an intern on the neurosurgical team. We found that the cancer had spread to his thorac spine, where it was compressing his spinal cord. The cancer couldn't be cured, but we hope it could be treated. Emergency radiation, however, failed to shrink the cancer, and so th neurosurgeon offered him two options: comfort care or surgery to remove the growing tumo mass from his spine. Lazaroff chose surgery. My job, as the intern on the neurosurge service, was to get his written confirmation that he understood the risks of the operation an wished to proceed.

I'd stood outside his room, his chart in my damp hand, trying to figure out how to eve broach the subject with him. The hope was that the operation would halt the progression his spinal cord damage. It wouldn't cure him, or reverse his paralysis, or get him back to th life he had led. No matter what we did he had at most a few months to live, and th procedure was inherently dangerous. It required opening his chest, removing a rib, an collapsing a lung to get at his spine. Blood loss would be high. Recovery would be difficult. I his weakened state, he faced considerable risks of debilitating complications afterward. Th operation posed a threat of both worsening and shortening his life. But the neurosurgeon ha gone over these dangers, and Lazaroff had been clear that he wanted the operation. All I ha to do was go in and take care of the paperwork.

Lying in his bed, Lazaroff looked gray and emaciated. I said that I was an intern and tha I'd come to get his consent for surgery, which required confirming that he was aware of th risks. I said that the operation could remove the tumor but leave him with seriou complications, such as paralysis or a stroke, and that it could even prove fatal. I tried sound clear without being harsh, but my discussion put his back up. Likewise when his so who was in the room, questioned whether heroic measures were a good idea. Lazaroff didn like that at all.

"Don't you give up on me," he said. "You give me every chance I've got." Outside th

room, after he signed the form, the son took me aside. His mother had died on a ventilator intensive care, and at the time his father had said he did not want anything like that happen to him. But now he was adamant about doing "everything."

I believed then that Mr. Lazaroff had chosen badly, and I still believe this. He chose bad not because of all the dangers but because the operation didn't stand a chance of giving hi what he really wanted: his continence, his strength, the life he had previously known. He w pursuing little more than a fantasy at the risk of a prolonged and terrible death—which w precisely what he got.

The operation was a technical success. Over eight and a half hours, the surgical tea removed the mass invading his spine and rebuilt the vertebral body with acrylic cement. Th pressure on his spinal cord was gone. But he never recovered from the procedure. intensive care, he developed respiratory failure, a systemic infection, blood clots from h immobility, then bleeding from the blood thinners to treat them. Each day we fell furth behind. We finally had to admit he was dying. On the fourteenth day, his son told the tea that we should stop.

It fell to me to take Lazaroff off the artificial ventilator that was keeping him alive. checked to make sure that his morphine drip was turned up high, so he wouldn't suffer fro air hunger. I leaned close and, in case he could hear me, said I was going to take th breathing tube out of his mouth. He coughed a couple of times when I pulled it out, opene his eyes briefly, and closed them. His breathing grew labored, then stopped. I put m stethoscope on his chest and heard his heart fade away.

Now, more than a decade after I first told Mr. Lazaroff's story, what strikes me most is n how bad his decision was but how much we all avoided talking honestly about the choi before him. We had no difficulty explaining the specific dangers of various treatment option but we never really touched on the reality of his disease. His oncologists, radiation therapist surgeons, and other doctors had all seen him through months of treatments for a problem th they knew could not be cured. We could never bring ourselves to discuss the larger tru about his condition or the ultimate limits of our capabilities, let alone what might matt most to him as he neared the end of his life. If he was pursuing a delusion, so were we. He he was in the hospital, partially paralyzed from a cancer that had spread throughout his bod The chances that he could return to anything like the life he had even a few weeks earli were zero. But admitting this and helping him cope with it seemed beyond us. We offered n acknowledgment or comfort or guidance. We just had another treatment he could underg Maybe something very good would result.

We did little better than Ivan Ilyich's primitive nineteenth-century doctors—wors actually, given the new forms of physical torture we'd inflicted on our patient. It is enough t make you wonder, who are the primitive ones.

MODERN SCIENTIFIC CAPABILITY has profoundly altered the course of human life. People live longer a better than at any other time in history. But scientific advances have turned the processes aging and dying into medical experiences, matters to be managed by health ca professionals. And we in the medical world have proved alarmingly unprepared for it.

This reality has been largely hidden, as the final phases of life become less familiar

people. As recently as 1945, most deaths occurred in the home. By the 1980s, just 17 perce did. Those who somehow did die at home likely died too suddenly to make it to the hospit —say, from a massive heart attack, stroke, or violent injury—or were too isolated to g somewhere that could provide help. Across not just the United States but also the enti industrialized world, the experience of advanced aging and death has shifted to hospitals an nursing homes.

When I became a doctor, I crossed over to the other side of the hospital doors an although I had grown up with two doctors for parents, everything I saw was new to me. I ha certainly never seen anyone die before and when I did it came as a shock. That wasn because it made me think of my own mortality. Somehow the concept didn't occur to m even when I saw people my own age die. I had a white coat on; they had a hospital gown. couldn't quite picture it the other way round. I could, however, picture my family in the places. I'd seen multiple family members—my wife, my parents, and my children—g through serious, life-threatening illnesses. Even under dire circumstances, medicine ha always pulled them through. The shock to me therefore was seeing medicine *not* pull peop through. I knew theoretically that my patients could die, of course, but every actual instanc seemed like a violation, as if the rules I thought we were playing by were broken. I don know what game I thought this was, but in it we always won.

Dying and death confront every new doctor and nurse. The first times, some cry. Some sh down. Some hardly notice. When I saw my first deaths, I was too guarded to cry. But dreamt about them. I had recurring nightmares in which I'd find my patients' corpses in m house—in my own bed.

"How did he get here?" I'd wonder in panic.

I knew I would be in huge trouble, maybe criminal trouble, if I didn't get the body back t the hospital without getting caught. I'd try to lift it into the back of my car, but it would b too heavy. Or I'd get it in, only to find blood seeping out like black oil until it overflowed th trunk. Or I'd actually get the corpse to the hospital and onto a gurney, and I'd push it dow hall after hall, trying and failing to find the room where the person used to be. "Hey someone would shout and start chasing me. I'd wake up next to my wife in the dark, clamm and tachycardic. I felt that I'd killed these people. I'd failed.

Death, of course, is not a failure. Death is normal. Death may be the enemy, but it is als the natural order of things. I knew these truths abstractly, but I didn't know them concretel —that they could be truths not just for everyone but also for this person right in front of m for this person I was responsible for.

The late surgeon Sherwin Nuland, in his classic book *How We Die*, lamented, "The necessit of nature's final victory was expected and accepted in generations before our own. Docto were far more willing to recognize the signs of defeat and far less arrogant about denyin them." But as I ride down the runway of the twenty-first century, trained in the deployme of our awesome arsenal of technology, I wonder exactly what being less arrogant reall means.

You become a doctor for what you imagine to be the satisfaction of the work, and th turns out to be the satisfaction of competence. It is a deep satisfaction very much like the on that a carpenter experiences in restoring a fragile antique chest or that a science teache experiences in bringing a fifth grader to that sudden, mind-shifting recognition of what aton

are. It comes partly from being helpful to others. But it also comes from being technicall skilled and able to solve difficult, intricate problems. Your competence gives you a secu sense of identity. For a clinician, therefore, nothing is more threatening to who you think yo are than a patient with a problem you cannot solve.

There's no escaping the tragedy of life, which is that we are all aging from the day we a born. One may even come to understand and accept this fact. My dead and dying patien don't haunt my dreams anymore. But that's not the same as saying one knows how to cop with what cannot be mended. I am in a profession that has succeeded because of its ability fix. If your problem is fixable, we know just what to do. But if it's not? The fact that we hav had no adequate answers to this question is troubling and has caused callousness, inhumanit and extraordinary suffering.

This experiment of making mortality a medical experience is just decades old. It is youn And the evidence is it is failing.

THIS IS A book about the modern experience of mortality—about what it's like to be creatur who age and die, how medicine has changed the experience and how it hasn't, where ou ideas about how to deal with our finitude have got the reality wrong. As I pass a decade surgical practice and become middle-aged myself, I find that neither I nor my patients fin our current state tolerable. But I have also found it unclear what the answers should be, even whether any adequate ones are possible. I have the writer's and scientist's faith however, that by pulling back the veil and peering in close, a person can make sense of wh is most confusing or strange or disturbing.

You don't have to spend much time with the elderly or those with terminal illness to se how often medicine fails the people it is supposed to help. The waning days of our lives a given over to treatments that addle our brains and sap our bodies for a sliver's chance benefit. They are spent in institutions—nursing homes and intensive care units—whe regimented, anonymous routines cut us off from all the things that matter to us in life. Ou reluctance to honestly examine the experience of aging and dying has increased the harm w inflict on people and denied them the basic comforts they most need. Lacking a coheren view of how people might live successfully all the way to their very end, we have allowe our fates to be controlled by the imperatives of medicine, technology, and strangers.

I wrote this book in the hope of understanding what has happened. Mortality can be treacherous subject. Some will be alarmed by the prospect of a doctor's writing about th inevitability of decline and death. For many, such talk, however carefully framed, raises th specter of a society readying itself to sacrifice its sick and aged. But what if the sick and age are *already* being sacrificed—victims of our refusal to accept the inexorability of our li cycle? And what if there are better approaches, right in front of our eyes, waiting to b recognized?

Growing up, I never witnessed serious illness or the difficulties of old age. My parents, bot doctors, were fit and healthy. They were immigrants from India, raising me and my sister the small college town of Athens, Ohio, so my grandparents were far away. The one elder person I regularly encountered was a woman down the street who gave me piano lesson when I was in middle school. Later she got sick and had to move away, but it didn't occur me to wonder where she went and what happened to her. The experience of a modern o age was entirely outside my perception.

In college, however, I began dating a girl in my dorm named Kathleen, and in 1985, on Christmas visit to her home in Alexandria, Virginia, I met her grandmother Alice Hobso who was seventy-seven at the time. She struck me as spirited and independent minded. Sh never tried to disguise her age. Her undyed white hair was brushed straight and parted o one side, Bette Davis–style. Her hands were speckled with age spots, and her skin wa crinkled. She wore simple, neatly pressed blouses and dresses, a bit of lipstick, and heels lon past when others would have considered it advisable.

As I came to learn over the years—for I would eventually marry Kathleen—Alice grew u in a rural Pennsylvania town known for its flower and mushroom farms. Her father was flower farmer, growing carnations, marigolds, and dahlias, in acres of greenhouses. Alice an her siblings were the first members of their family to attend college. At the University Delaware, Alice met Richmond Hobson, a civil engineering student. Thanks to the Gre Depression, it wasn't until six years after their graduation that they could afford to ge married. In the early years, Alice and Rich moved often for his work. They had two childre Jim, my future father-in-law, and then Chuck. Rich was hired by the Army Corps of Enginee and became an expert in large dam and bridge construction. A decade later, he was promote to a job working with the corps's chief engineer at headquarters outside Washington, DC where he remained for the rest of his career. He and Alice settled in Arlington. They bought car, took road trips far and wide, and put away some money, too. They were able to upgrad to a bigger house and send their brainy kids off to college without need of loans.

Then, on a business trip to Seattle, Rich had a sudden heart attack. He'd had a history angina and took nitroglycerin tablets to relieve the occasional bouts of chest pain, but th was 1965, and back then doctors didn't have much they could do about heart disease. He die in the hospital before Alice could get there. He was just sixty years old. Alice was fifty-six.

With her pension from the Army Corps of Engineers, she was able to keep her Arlingto home. When I met her, she'd been living on her own in that house on Greencastle Street fo twenty years. My in-laws, Jim and Nan, were nearby, but Alice lived completel independently. She mowed her own lawn and knew how to fix the plumbing. She went to th gym with her friend Polly. She liked to sew and knit and made clothes, scarves, and elabora

red-and-green Christmas stockings for everyone in the family, complete with a button-nose Santa and their names across the top. She organized a group that took an annual subscriptio to attend performances at the Kennedy Center for the Performing Arts. She drove a big V Chevrolet Impala, sitting on a cushion to see over the dashboard. She ran errands, visite family, gave friends rides, and delivered meals-on-wheels for those with more frailties tha herself.

As time went on, it became hard not to wonder how much longer she'd be able to manag She was a petite woman, five feet tall at most, and although she bristled when anyon suggested it, she lost some height and strength with each passing year. When I married h granddaughter, Alice beamed and held me close and told me how happy the wedding mad her, but she'd become too arthritic to share a dance with me. And still she remained in h home, managing on her own.

When my father met her, he was surprised to learn she lived by herself. He was a urologis which meant he saw many elderly patients, and it always bothered him to find them livin alone. The way he saw it, if they didn't already have serious needs, they were bound develop them, and coming from India he felt it was the family's responsibility to take th aged in, give them company, and look after them. Since arriving in New York City in 196 for his residency training, my father had embraced virtually every aspect of America culture. He gave up vegetarianism and discovered dating. He got a girlfriend, a pediatri resident from a part of India where they didn't speak his language. When he married he instead of letting my grandfather arrange his marriage, the family was scandalized. H became a tennis enthusiast, president of the local Rotary Club, and teller of bawdy jokes. On of his proudest days was July 4, 1976, the country's bicentennial, when he was made a American citizen in front of hundreds of cheering people in the grandstand at the Athen County Fair between the hog auction and the demolition derby. But one thing he could neve get used to was how we treat our old and frail—leaving them to a life alone or isolating the in a series of anonymous facilities, their last conscious moments spent with nurses an doctors who barely knew their names. Nothing could have been more different from th world he had grown up in.

MY FATHER'S FATHER had the kind of traditional old age that, from a Western perspective, seem idyllic. Sitaram Gawande was a farmer in a village called Uti, some three hundred mile inland from Mumbai, where our ancestors had cultivated land for centuries. I remembe visiting him with my parents and sister around the same time I met Alice, when he was mo than a hundred years old. He was, by far, the oldest person I'd ever known. He walked with cane, stooped like a bent stalk of wheat. He was so hard of hearing that people had to sho in his ear through a rubber tube. He was weak and sometimes needed help getting up fro sitting. But he was a dignified man, with a tightly wrapped white turban, a pressed, brow argyle cardigan, and a pair of old-fashioned, thick-lensed, Malcolm X–style spectacles. He wa surrounded and supported by family at all times, and he was revered—not in spite of his ag but because of it. He was consulted on all important matters—marriages, land dispute business decisions—and occupied a place of high honor in the family. When we ate, w served him first. When young people came into his home, they bowed and touched his feet

supplication.

In America, he would almost certainly have been placed in a nursing home. Healt professionals have a formal classification system for the level of function a person has. If yo cannot, without assistance, use the toilet, eat, dress, bathe, groom, get out of bed, get out a chair, and walk—the eight "Activities of Daily Living"—then you lack the capacity for bas physical independence. If you cannot shop for yourself, prepare your own food, maintai your housekeeping, do your laundry, manage your medications, make phone calls, travel o your own, and handle your finances—the eight "Independent Activities of Daily Living"- then you lack the capacity to live safely on your own.

My grandfather could perform only some of the basic measures of independence, and fe of the more complex ones. But in India, this was not of any dire consequence. His situatio prompted no family crisis meeting, no anguished debates over what to do with him. It wa clear that the family would ensure my grandfather could continue to live as he desired. On of my uncles and his family lived with him, and with a small herd of children, grandchildre nieces, and nephews nearby, he never lacked for help.

The arrangement allowed him to maintain a way of life that few elderly people in moder societies can count on. The family made it possible, for instance, for him to continue to ow and manage his farm, which he had built up from nothing—indeed, from worse than nothin His father had lost all but two mortgaged acres and two emaciated bulls to a moneylende when the harvest failed one year. He then died, leaving Sitaram, his eldest son, with th debts. Just eighteen years old and newly married, Sitaram was forced to enter int indentured labor on the family's two remaining acres. At one point, the only food he and h bride could afford was bread and salt. They were starving to death. But he prayed and staye at the plow, and his prayers were answered. The harvest was spectacular. He was able to no only put food on the table but also pay off his debts. In subsequent years, he expanded h two acres to more than two hundred. He became one of the richest landowners in the villag and a moneylender himself. He had three wives, all of whom he outlived, and thirtee children. He emphasized education, hard work, frugality, earning your own way, staying tru to your word, and holding others strictly accountable for doing the same. Throughout his lif he awoke before sunrise and did not go to bed until he'd done a nighttime inspection of ever acre of his fields by horse. Even when he was a hundred he would insist on doing this. M uncles were worried he'd fall—he was weak and unsteady—but they knew it was importa to him. So they got him a smaller horse and made sure that someone always accompanie him. He made the rounds of his fields right up to the year he died.

Had he lived in the West, this would have seemed absurd. It isn't safe, his doctor woul say. If he persisted, then fell, and went to an emergency room with a broken hip, the hospit would not let him return home. They'd insist that he go to a nursing home. But in m grandfather's premodern world, how he wanted to live was his choice, and the family's ro was to make it possible.

My grandfather finally died at the age of almost a hundred and ten. It happened after he h his head falling off a bus. He was going to the courthouse in a nearby town on busines which itself seems crazy, but it was a priority to him. The bus began to move while he wa getting off and, although he was accompanied by family, he fell. Most probably, h developed a subdural hematoma—bleeding inside his skull. My uncle got him home, and ov

the next couple of days he faded away. He got to live the way he wished and with his fami around him right to the end.

FOR MOST OF human history, for those few people who actually survived to old age, Sitara Gawande's experience was the norm. Elders were cared for in multigenerational system often with three generations living under one roof. Even when the nuclear family replace the extended family (as it did in northern Europe several centuries ago), the elderly were n left to cope with the infirmities of age on their own. Children typically left home as soon they were old enough to start families of their own. But one child usually remained, often th youngest daughter, if the parents survived into senescence. This was the lot of the poet Emi Dickinson, in Amherst, Massachusetts, in the mid-nineteenth century. Her elder brother le home, married, and started a family, but she and her younger sister stayed with their paren until they died. As it happened, Emily's father lived to the age of seventy-one, by which tim she was in her forties, and her mother lived even longer. She and her sister ended u spending their entire lives in the parental home.

As different as Emily Dickinson's parents' life in America seems from that of Sitara Gawande's in India, both relied on systems that shared the advantage of easily resolving th question of care for the elderly. There was no need to save up for a spot in a nursing home arrange for meals-on-wheels. It was understood that parents would just keep living in the home, assisted by one or more of the children they'd raised. In contemporary societies, b contrast, old age and infirmity have gone from being a shared, multigeneration responsibility to a more or less private state—something experienced largely alone or wi the aid of doctors and institutions. How did this happen? How did we go from Sitara Gawande's life to Alice Hobson's?

One answer is that old age itself has changed. In the past, surviving into old age wa uncommon, and those who did survive served a special purpose as guardians of traditio knowledge, and history. They tended to maintain their status and authority as heads of th household until death. In many societies, elders not only commanded respect and obedienc but also led sacred rites and wielded political power. So much respect accrued to the elder that people used to pretend to be older than they were, not younger, when giving their ag People have always lied about how old they are. Demographers call the phenomenon "ag heaping" and have devised complex quantitative contortions to correct for all the lying censuses. They have also noticed that, during the eighteenth century, in the United States an Europe, the direction of our lies changed. Whereas today people often understate their age census takers, studies of past censuses have revealed that they used to overstate it. Th dignity of old age was something to which everyone aspired.

But age no longer has the value of rarity. In America, in 1790, people aged sixty-five older constituted less than 2 percent of the population; today, they are 14 percent. Germany, Italy, and Japan, they exceed 20 percent. China is now the first country on ear with more than 100 million elderly people.

As for the exclusive hold that elders once had on knowledge and wisdom, that, too, ha eroded, thanks to technologies of communication—starting with writing itself and extendin to the Internet and beyond. New technology also creates new occupations and requires ne

expertise, which further undermines the value of long experience and seasoned judgment. A one time, we might have turned to an old-timer to explain the world. Now we consu Google, and if we have any trouble with the computer we ask a teenager.

Perhaps most important of all, increased longevity has brought about a shift in th relationship between the young and the old. Traditionally, surviving parents provided source of much-needed stability, advice, and economic protection for young families seekin pathways to security. And because landowners also tended to hold on to their property unt death, the child who sacrificed everything to care for the parents could expect to inherit th whole homestead, or at least a larger portion than a child who moved away. But once paren were living markedly longer lives, tension emerged. For young people, the traditional famil system became less a source of security than a struggle for control—over property, finance and even the most basic decisions about how they could live.

And indeed, in my grandfather Sitaram's traditional household, generational tension wa never far away. You can imagine how my uncles felt as their father turned a hundred an they entered old age themselves, still waiting to inherit land and gain econom independence. I learned of bitter battles in village families between elders and adult childre over land and money. In the final year of my grandfather's life, an angry dispute erupte between him and my uncle with whom he lived. The original cause was unclear: perhaps m uncle had made a business decision without my grandfather; maybe my grandfather wante to go out and no one in the family would go with him; maybe he liked to sleep with th window open and they liked to sleep with the window closed. Whatever the reason, th argument culminated (depending on who told the story) in Sitaram's either storming out o the house in the dead of night or being locked out. He somehow made it miles away t another relative's house and refused to return for two months.

Global economic development has changed opportunities for the young dramatically. Th prosperity of whole countries depends on their willingness to escape the shackles of famil expectation and follow their own path—to seek out jobs wherever they might be, d whatever work they want, marry whom they desire. So it was with my father's path from U to Athens, Ohio. He left the village first for university in Nagpur and then for profession opportunity in the States. As he became successful, he sent ever larger amounts of mone home, helping to build new houses for his father and siblings, bring clean water an telephones to the village, and install irrigation systems that ensured harvests when the rain seasons were bad. He even built a rural college nearby that he named for his mother. Bu there was no denying that he had left, and he wasn't going back.

Disturbed though my father was by the way America treated its elderly, the mor traditional old age that my grandfather was able to maintain was possible only because m father's siblings had not left home as he had. We think, nostalgically, that we want the kin of old age my grandfather had. But the reason we do not have it is that, in the end, we do no actually want it. The historical pattern is clear: as soon as people got the resources an opportunity to abandon that way of life, they were gone.

THE FASCINATING THING is that, over time, it doesn't seem that the elderly have been especially sorr to see the children go. Historians find that the elderly of the industrial era did not suffe

economically and were not unhappy to be left on their own. Instead, with growi economies, a shift in the pattern of property ownership occurred. As children departed hom for opportunities elsewhere, parents who lived long lives found they could rent or even se their land instead of handing it down. Rising incomes, and then pension systems, enable more and more people to accumulate savings and property, allowing them to mainta economic control of their lives in old age and freeing them from the need to work until dea or total disability. The radical concept of "retirement" started to take shape.

Life expectancy, which was under fifty in 1900, climbed to more than sixty by the 1930 as improvements in nutrition, sanitation, and medical care took hold. Family sizes fell fro an average of seven children in the mid-1800s to just over three after 1900. The average ag at which a mother had her last child fell too—from menopause to thirty or younger. As result, vastly more people lived to see their children reach adulthood. In the early twentie century, a woman would have been fifty when her last child turned twenty-one, instead of her sixties a century before. Parents had many years, easily a decade or more, before they their children had to worry about old age.

So what they did was move on, just like their children. Given the opportunity, both paren and children saw separation as a form of freedom. Whenever the elderly have had th financial means, they have chosen what social scientists have called "intimacy at a distance Whereas in early-twentieth-century America 60 percent of those over age sixty-five reside with a child, by the 1960s the proportion had dropped to 25 percent. By 1975 it was belo 15 percent. The pattern is a worldwide one. Just 10 percent of Europeans over age eighty liv with their children, and almost half live completely alone, without a spouse. In Asia, whe the idea of an elderly parent being left to live alone has traditionally been regarded shameful—the way my father saw it—the same radical shift is taking place. In China, Japa and Korea, national statistics show the percentage of elderly living alone rising rapidly.

This is actually a sign of enormous progress. Choices for the elderly have proliferated. D Webb, an Arizona real estate developer, popularized the term "retirement community" 1960 when he launched Sun City, a community in Phoenix that was among the first to lim its residents to retirees. It was a controversial idea at the time. Most developers believed th elderly wanted more contact with other generations. Webb disagreed. He believed people the last phase of their lives didn't want to live the way my grandfather did, with the fami underfoot. He built Sun City as a place with an alternate vision of how people would spen what he called "their leisure years." It had a golf course, a shopping arcade, and a recreatio center, and it offered the prospect of an active retirement of recreation and dining out wit others like them to share it with. Webb's vision proved massively popular, and in Europe, th Americas, and even Asia, retirement communities have become a normal presence.

For those who had no interest in moving into such places—Alice Hobson, for instance— became acceptable and feasible to remain in their own homes, living as they wanted to liv autonomously. That fact remains something to celebrate. There is arguably no better time history to be old. The lines of power between the generations have been renegotiated, an not in the way it is sometimes believed. The aged did not lose status and control so much share it. Modernization did not demote the elderly. It demoted the family. It gave people- the young and the old—a way of life with more liberty and control, including the liberty be less beholden to other generations. The veneration of elders may be gone, but not becau

it has been replaced by veneration of youth. It's been replaced by veneration of th independent self.

THERE REMAINS ONE problem with this way of living. Our reverence for independence takes n account of the reality of what happens in life: sooner or later, independence will becom impossible. Serious illness or infirmity will strike. It is as inevitable as sunset. And then new question arises: If independence is what we live for, what do we do when it can n longer be sustained?

In 1992, Alice turned eighty-four. She was in striking health. She'd had to make a transitio to false teeth and undergo removal of cataracts in both eyes. That was all. She'd had no majo illnesses or hospitalizations. She still went to the gym with her friend Polly and did her ow shopping and took care of her house. Jim and Nan offered her the option of turning the basement into an apartment for her. She might find it easier to be there, they said. Sh wouldn't hear of it. She had no intention of not living on her own.

But things began to change. On a mountain vacation with the family, Alice didn't turn u for lunch. She was found sitting in the wrong cabin, wondering where everyone was. We never seen her confused like that before. The family kept a close eye on her for the next fe days, but nothing else untoward happened. We all let the matter drop.

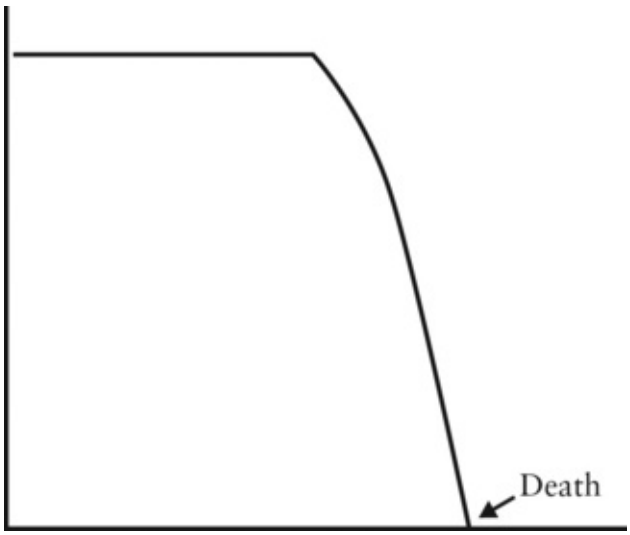
Then Nan, visiting Alice at home one afternoon, noticed black-and-blue bruises up an down her leg. Had she fallen?

No, Alice said at first. But later she admitted that she'd taken a spill going down th wooden basement stairs. It was just a slip, she insisted. It could have happened to anyon She'd be more careful next time.

Soon, however, she had more falls, several of them. No broken bones, but the family wa getting worried. So Jim did what all families naturally do nowadays. He had her see a docto

The doctor did some tests. He found that she had thinning bones and recommende calcium. He fiddled with her medications and gave her some new prescriptions. But the tru was he didn't know what to do. We were not bringing him a fixable problem. Alice wa unsteady. Her memory was slipping. The problems were only going to increase. He independence would not be sustainable for long now. But he had no answers or direction o guidance. He could not even describe what to expect would happen.

Medicine and public health have transformed the trajectory of our lives. For all but our mo recent history, death was a common, ever-present possibility. It didn't matter whether yo were five or fifty. Every day was a roll of the dice. If you plotted the typical course of person's health, it would look like this:

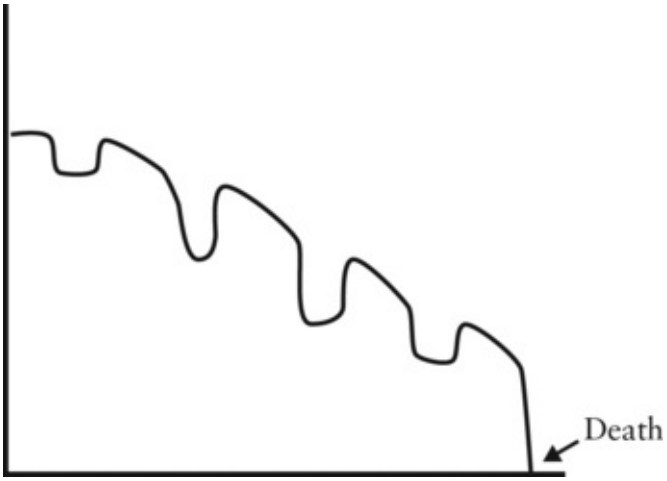


Life and health would putter along nicely, not a problem in the world. Then illness wou hit and the bottom would drop out like a trap door—the way it did for my grandmoth Gopikabai Gawande, who'd been perfectly well until the day she was struck by a fatal case malaria, not even thirty years old, or for Rich Hobson, who had a heart attack on a busine trip and then was gone.

Over the years, with medical progress, the bottom has tended to drop out later and late The advent of sanitation and other public health measures sharply reduced the likelihood death from infectious disease, especially in early childhood, and clinical advanc dramatically reduced the mortality of childbirth and traumatic injuries. By the middle of th twentieth century, just four out of every hundred people in industrialized countries die before the age of thirty. And in the decades since, medicine found ways to cut the mortali of heart attacks, respiratory illnesses, stroke, and numerous other conditions that threaten adult life. Eventually, of course, we all die of something. But even then, medicine has pushe the fatal moment of many diseases further outward. People with incurable cancers, fo instance, can do remarkably well for a long time after diagnosis. They undergo treatmen Symptoms come under control. They resume regular life. They don't feel sick. But th disease, while slowed, continues progressing, like a night brigade taking out perimet defenses. Eventually, it makes itself known, turning up in the lungs, or in the brain, or in th spine, as it did with Joseph Lazaroff. From there, the decline is often relatively rapid, muc

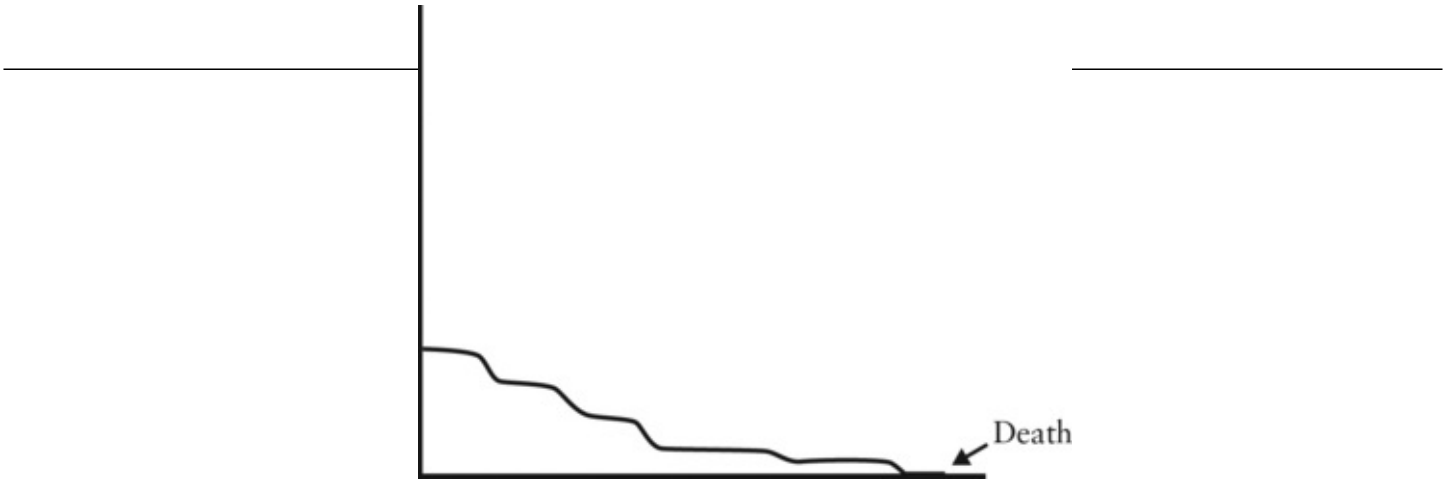
as in the past. Death occurs later, but the trajectory remains the same. In a matter of month or weeks, the body becomes overwhelmed. That is why, although the diagnosis may have been present for years, death can still come as a surprise. The road that seemed so straight and steady can still disappear, putting a person on a fast and steep slide down.

The pattern of decline has changed, however, for many chronic illnesses—emphysema, liver disease, and congestive heart failure, for example. Instead of just delaying the moment of the downward drop, our treatments can stretch the descent out until it ends up looking less like a cliff and more like a hilly road down the mountain:



The road can have vertiginous drops but also long patches of recovered ground: we may not be able to stave off the damage, but we can stave off the death. We have drugs, fluids, surgery, intensive care units to get people through. They enter the hospital looking terrible and some of what we do can make them look worse. But just when it looks like they've breathed their last, they rally. We make it possible for them to make it home—weaker and more impaired, though. They never return to their previous baseline. As illness progresses and organ damage worsens, a person becomes less able to withstand even minor problems. A simple cold can be fatal. The ultimate course is still downward until there finally comes a time when there is no recovery at all.

The trajectory that medical progress has made possible for many people, though, follows neither of these two patterns. Instead, increasingly large numbers of us get to live out a full life span and die of old age. Old age is not a diagnosis. There is always some final proximate cause that gets written down on the death certificate—respiratory failure, cardiac arrest. But in truth no single disease leads to the end; the culprit is just the accumulated crumbling of one's bodily systems while medicine carries out its maintenance measures and patch jobs. We reduce the blood pressure here, beat back the osteoporosis there, control this disease, treat that one, replace a failed joint, valve, piston, watch the central processing unit gradually give out. The curve of life becomes a long, slow fade:



The progress of medicine and public health has been an incredible boon—people get to liv longer, healthier, more productive lives than ever before. Yet traveling along these altere paths, we regard living in the downhill stretches with a kind of embarrassment. We nee help, often for long periods of time, and regard that as a weakness rather than as the ne normal and expected state of affairs. We're always trotting out some story of a ninety-seve year-old who runs marathons, as if such cases were not miracles of biological luck b reasonable expectations for all. Then, when our bodies fail to live up to this fantasy, we fe as if we somehow have something to apologize for. Those of us in medicine don't help, f we often regard the patient on the downhill as uninteresting unless he or she has a discre problem we can fix. In a sense, the advances of modern medicine have given us tw revolutions: we've undergone a biological transformation of the course of our lives and also cultural transformation of how we think about that course.

THE STORY OF aging is the story of our parts. Consider the teeth. The hardest substance in th human body is the white enamel of the teeth. With age, it nonetheless wears away, allowin the softer, darker layers underneath to show through. Meanwhile, the blood supply to th pulp and the roots of the teeth atrophies, and the flow of saliva diminishes; the gums tend t become inflamed and pull away from the teeth, exposing the base, making them unstable an elongating their appearance, especially the lower ones. Experts say they can gauge a person age to within five years from the examination of a single tooth—if the person has any teet left to examine.

Scrupulous dental care can help avert tooth loss, but growing old gets in the way. Arthriti tremors, and small strokes, for example, make it difficult to brush and floss, and becaus nerves become less sensitive with age, people may not realize that they have cavity and gu problems until it's too late. In the course of a normal lifetime, the muscles of the jaw los about 40 percent of their mass and the bones of the mandible lose about 20 percen becoming porous and weak. The ability to chew declines, and people shift to softer food which are generally higher in fermentable carbohydrates and more likely to cause cavities. B the age of sixty, people in an industrialized country like the United States have lost, o average, a third of their teeth. After eighty-five, almost 40 percent have no teeth at all.

Even as our bones and teeth soften, the rest of our body hardens. Blood vessels, joints, th muscle and valves of the heart, and even the lungs pick up substantial deposits of calcium an

turn stiff. Under a microscope, the vessels and soft tissues display the same form of calciu that you find in bone. When you reach inside an elderly patient during surgery, the aorta ar other major vessels can feel crunchy under your fingers. Research has found that loss of bon density may be an even better predictor of death from atherosclerotic disease tha cholesterol levels. As we age, it's as if the calcium seeps out of our skeletons and into ou tissues.

To maintain the same volume of blood flow through our narrowed and stiffened bloo vessels, the heart has to generate increased pressure. As a result, more than half of us develo hypertension by the age of sixty-five. The heart becomes thicker-walled from having to pum against the pressure, and less able to respond to the demands of exertion. The peak output the heart therefore decreases steadily from the age of thirty. People become gradually le able to run as far or as fast as they used to or to climb a flight of stairs without becomin short of breath.

As the heart muscle thickens, muscle elsewhere thins. Around age forty, one begins to los muscle mass and power. By age eighty, one has lost between a quarter and a half of one muscle weight.

You can see all these processes play out just in the hand: 40 percent of the muscle mass the hand is in the thenar muscles, the muscles of the thumb, and if you look carefully at th palm of an older person, at the base of the thumb, you will notice that the musculature is no bulging but flat. In a plain X-ray, you will see speckles of calcification in the arteries an translucency of the bones, which, from age fifty, lose their density at a rate of nearly percent per year. The hand has twenty-nine joints, each of which is prone to destruction fro osteoarthritis, and this will give the joint surfaces a ragged, worn appearance. The joint spac collapses. You can see bone touching bone. What the person feels is swelling around th joints, reduced range of motion of the wrist, diminished grip, and pain. The hand also ha forty-eight named nerve branches. Deterioration of the cutaneous mechanoreceptors in th pads of the fingers produces loss of sensitivity to touch. Loss of motor neurons produces lo of dexterity. Handwriting degrades. Hand speed and vibration sense decline. Using a standar mobile phone, with its tiny buttons and touch screen display, becomes increasingl unmanageable.

This is normal. Although the processes can be slowed—diet and physical activity can mak a difference—they cannot be stopped. Our functional lung capacity decreases. Our bowe slow down. Our glands stop functioning. Even our brains shrink: at the age of thirty, th brain is a three-pound organ that barely fits inside the skull; by our seventies, gray-matte loss leaves almost an inch of spare room. That's why elderly people like my grandfather ar so much more prone to cerebral bleeding after a blow to the head—the brain actually rattle around inside. The earliest portions to shrink are generally the frontal lobes, which gover judgment and planning, and the hippocampus, where memory is organized. As a consequenc memory and the ability to gather and weigh multiple ideas—to multitask—peaks in midli and then gradually declines. Processing speeds start decreasing well before age forty (whic may be why mathematicians and physicists commonly do their best work in their youth). B age eighty-five, working memory and judgment are sufficiently impaired that 40 percent o us have textbook dementia.

WHY WE AGE is the subject of vigorous debate. The classical view is that aging happens because
random wear and tear. The newest view holds that aging is more orderly and geneticall
programmed. Proponents of this view point out that animals of similar species and exposu
to wear and tear have markedly different life spans. The Canada goose has a longevity
23.5 years; the emperor goose only 6.3 years. Perhaps animals are like plants, with lives th
are, to a large extent, internally governed. Certain species of bamboo, for instance, form
dense stand that grows and flourishes for a hundred years, flowers all at once, and then dies

The idea that living things shut down instead of wearing down has received substanti
support in recent years. Researchers working with the now famous worm *C. elegans* (twice
one decade, Nobel Prizes went to scientists doing work on the little nematode) were able, b
altering a single gene, to produce worms that live more than twice as long and age mo
slowly. Scientists have since come up with single-gene alterations that increase the life spa
of fruit flies, mice, and yeast.

These findings notwithstanding, the preponderance of the evidence is against the idea th
our life spans are programmed into us. Remember that for most of our hundred-thousan
year existence—all but the past couple of hundred years—the average life span of huma
beings has been thirty years or less. (Research suggests that subjects of the Roman Empi
had an average life expectancy of twenty-eight years.) The natural course was to die befo
old age. Indeed, for most of history, death was a risk at every age of life and had no obviou
connection with aging, at all. As Montaigne wrote, observing late-sixteenth-century life, "T
die of age is a rare, singular, and extraordinary death, and so much less natural than others:
is the last and extremest kind of dying." So today, with our average life span in much of th
world climbing past eighty years, we are already oddities living well beyond our appointe
time. When we study aging what we are trying to understand is not so much a natural proce
as an unnatural one.

It turns out that inheritance has surprisingly little influence on longevity. James Vaupel,
the Max Planck Institute for Demographic Research, in Rostock, Germany, notes that only
percent of how long you'll live, compared with the average, is explained by your parent
longevity; by contrast, up to 90 percent of how tall you are is explained by your parent
height. Even genetically identical twins vary widely in life span: the typical gap is more tha
fifteen years.

If our genes explain less than we imagined, the classical wear-and-tear model may expla
more than we knew. Leonid Gavrilov, a researcher at the University of Chicago, argues th
human beings fail the way all complex systems fail: randomly and gradually. As enginee
have long recognized, simple devices typically do not age. They function reliably until
critical component fails, and the whole thing dies in an instant. A windup toy, for exampl
works smoothly until a gear rusts or a spring breaks, and then it doesn't work at all. B
complex systems—power plants, say—have to survive and function despite having thousan
of critical, potentially fragile components. Engineers therefore design these machines wi
multiple layers of redundancy: with backup systems, and backup systems for the backu
systems. The backups may not be as efficient as the first-line components, but they allow th
machine to keep going even as damage accumulates. Gavrilov argues that, within th
parameters established by our genes, that's exactly how human beings appear to work. W
have an extra kidney, an extra lung, an extra gonad, extra teeth. The DNA in our cells