

## Necessity of an Exclusive Health Care Model for Individuals with Quintessential Epigenetic Efficiency

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### ABSTRACT

Definition of health cannot be oversimplified. Understanding about health status of individuals should not be solely based on physiologic parameters examined in the resting state and comparing individual-specific health data with any established/obsolete statistical average because this approach could mislead people to anticipate better health without essential lifestyle interventions and modifications. Are we health-educating unhealthy people to curb their disease by adapting the lifestyle of healthy people? A healthy person could be abstaining from toxic substances, exercising regularly, consuming nutritious foods, sleeping adequately, reproducing naturally, excelling in sports, practicing spirituality, resisting disease developments/progressions, falling sick rarely every year, recuperating much faster even falls sick, ageing at slower pace and living longer. There is no miraculous medicine or therapy that could afford complete cure from the diseases unless unhealthy individuals incline to learn and adapt a healthy lifestyle. Unhealthy individuals, in this context, are those who have knowingly sabotaged their health despite being aware of the hazards of sedentariness, unstructured lifestyle, malnourishment, stress and ingesting toxic substances. Unhealthy people should not assume that they would return to health and sustain better health without comparing themselves with the qualities of healthy individuals. For instance, low back aches of people who cannot even activate their Erector Spinae to bend forward correctly are not the same as people who can bend forward correctly activating strong Erector Spinae while exercising with barbell or dumbbell. Of course, it may not be entirely possible to revitalize the chronically-diseased individuals but at least some of the health guidelines formulated on the basis of lifestyle of healthy individuals should be incorporated in the treatments and rehabilitations. The difference between healthy and unhealthy people is extremely vast which we have not yet acknowledged scientifically. Superior health-fitness excellence of healthy individuals is an expression of high epigenetic efficiency to favor Morbidity-Attenuated Life Years (MALYs). In contrast, Disability-Adjusted Life Years (DALYs) could be associated with different degrees of epigenetic inefficiency or epigenetic dysfunctions. MALYs belong to healthy persons and DALYs belong to unhealthy persons. DALYs are characterized by almost predictable disease/disability events but MALYs have been mysterious. The mysteries of MALYs can be solved by developing an exclusive health care model for healthy individuals and it would remain unsolved without the inclusion of Physiotherapists, Exercise Professionals and Dieticians.

**KEY WORDS:** Epigenetics, Exercise Tolerance, Health, DALYs, Spiritual intelligence, Fitness, Functional status, Aging, Physical Activity, Lifestyle, Sedentary, Co-morbidities, Kinanthropometry, Salutogenesis.

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## INTRODUCTION

Healthy lifespan needs tremendous commitment at personal level. An indomitable dedication to be healthy should be appreciated. In this rapid-paced era, humans might not be able to spend sufficient time to explore their personal health. By the time people start recognizing their unfit body and wish to improve their health, many of them would have only irreparable Disability-Adjusted Life Years (DALYs) left as remaining lifespan. Altered Body Composition with Disability (ABCD) is the fundamental consequence of Gravitational Torque Deficiency Syndrome (GTDS) caused by lack of complete exposure of neuro-musculo-skeletal system to the essential gravitational torques [1]. 'Metabolic Operations Vitalize Existence (MOVE)' is controlled by firm inter-dependency of metabolism and movement [1]. ABCD and impairment of metabolisms are always inseparable which can be easily understood if we interpret the data of health and fitness evaluations together. Not only for individuals in diseased states, the traits of individuals in best health should also be studied by amalgamating and interpreting the data pertinent to health and fitness. Fitness describes the ability to perform a given exercise task, and health explains a person's state of well-being, where physiological systems work in harmony [2]. Practical applications and quest for effectively treating the patients clearly reveal the lacunae about the Benchmark Physiologic State (BPS) of HEALTHY or NORMAL individuals. Even if such BPS are known, should not the patients be advised to adapt the lifestyle of healthy people? Or is it possible to attain the BPS through quick fixes or irrational treatments?

The differences in disease conditions and treatment requirements among healthy and unhealthy individuals are not just minimal or negligible because differences in physiologic and pathologic factors contributing to constitution of these individuals are extremely vast. For instance, back ache or jaundice or respiratory infection or dehydration of a sprinter, computer professional, police man, fisherman, housemaid, bus driver, farmer, etc., cannot be viewed and treated as a similar clinical problem because their adaptations to their respective occupation could be varying tremendously. Thus, every

occupation blending with individual-specific lifestyle has its own disease-causing factors if appropriate preventive care is not sustained. Health care cannot be simplistic. People who have been healthy for several years and those who have been unhealthy for several years cannot be weighed as identical when they develop a health disturbance that only looks apparently alike or when the globe faces a common problem like COVID-19 pandemic. At any given point in time, a large number of individuals in every age group may be going through several diseases or DALY associated with polypharmacy whilst various other individuals of the same age group may be going through MALY associated with strong resistance to infectious and non-infectious diseases. Healthy people may not be easily allowing or developing 'sufficient cause' to acquire a disease. A 'sufficient cause' is defined as a set of minimal conditions that inevitably produce disease [3].

The medical profession should also put equivalent focus on learning about healthy individuals and all the factors contributing to their health-fitness excellence. 'Increased physical activity, proper nutrition, weight management, avoidance of tobacco, and stress reduction are all key modalities that can lower the risk of chronic disease and improve quality of life. Despite the overwhelming evidence that these practices have a profound impact on health, the medical community has been slow to respond in addressing these modalities and in encouraging patients to make positive lifestyle changes. The time has come to employ the vast body of evidence in lifestyle medicine and encourage positive lifestyle medicine not only for our patients but also in our own lives' [4]. Interdisciplinary medical researches or approaches are pivotal to excavate the multifactorial background of both physiologic and pathologic states of humans. Currently, such interdisciplinary efforts in the medical profession are almost non-existent. It may be possible to categorize the people based on their lifestyle and measurable functional status. The multifactorial background contributing to health can also be elaborately investigated by adapting a model similar to Rothman's pie. For now, it is becoming clearer after examining the individuals who are participating in person-

-alized fitness training that humans can be categorized based on their functional status strongly influenced by their lifestyle. Based on such categorization, the health care system can be (i) made specific for illnesses of healthy and unhealthy individuals so that they can get their health care justice (ii) revisited to set guidelines for unhealthy people to anticipate MALY-related health outcomes only if they would aim to change their lifestyle and acquire all or at least few of the BPS of healthy individuals.

**Categorization of people based on their lifestyle and corresponding functional status:**

Functional status at both rest and active state determines the health and healthy lifespan of the individuals. Evaluation of Functional Status at Rest (FSR) alone will not suffice to understand the outcomes of individual-specific lifestyles. Functional Status at Active state (FSA) will accurately unveil the metabolic and biomechanical efficiency of humans. FSA is not widely applied in the clinical settings, so there is no surprise we are still unable to objectively define 'Health'. Though FSR (vital signs, Master Health Check-up) could be assessed using similar testing methods for both healthy and unhealthy people, FSA may need personalized approach because people differ a lot in their ageing trajectories and functional capacities (muscular strength, flexibility,  $VO_2$  max, power, exercise tolerance) depending on their exercise habits, somatotype, body composition, occupation, etc., 'There is no longer any serious doubt that daily habits and actions profoundly affect both short-term and long-term health and quality of life. This concept is supported by literally thousands of research articles and incorporated in multiple evidence-based guidelines for the prevention and/or treatment of chronic metabolic diseases. The study of how habits and actions affect both prevention and treatment of diseases has coalesced around the concept of lifestyle medicine' [4].

'The primary interest of research studies has been centered on the positive health benefits of exercise as a gold standard medicine. Better understanding of the detrimental effects of both physical inactivity and sedentary behaviors can also assist in promoting positive health outcomes' [5]. 'General recommendations for

future sedentary physiology research efforts indicate that studies of sedentary behavior, including that of sitting time only, should focus on the physiological effect of a "lack of human movement" in contradistinction to the effects of physical movement and that new models or strategies for studying sedentary behavior-induced adaptations and links to disease development are needed to elucidate underlying mechanisms' [6]. 'Human aging is accompanied by a decline in muscle mass and muscle function commonly referred to as sarcopenia. Sarcopenia is associated with detrimental clinical outcomes, such as reduced quality of life, frailty, increased risk of falls, fractures, hospitalization and mortality' [7]. Aging is a complex multifactorial biological process shared by all living organisms and the end result of epigenetic changes during aging is associated with aberrant gene expression, reactivation of transposable elements, and genomic instability [8]. 'Specifically, aging is associated with profound epigenetic changes, resulting in alterations of gene expression and disturbances in broad genome architecture and the epigenomic landscape. The potential reversibility of these epigenetic changes that occur as a hallmark of aging offers exciting opportunities to alter the trajectory of age-related diseases. Long thought to be an inexorable road toward decline and diseases, aging is in fact remarkably plastic. Such plasticity could be harnessed to approach age-related diseases from a novel perspective' [9]. Individuals who engage in healthy lifestyle must ideally display objective improvements in functions (functional efficiency) associated with modifications in body composition (loss of excess fat mass, increase in lean mass). Table-1 shows three categories of people based on the outcomes of their healthy lifestyle. 'Category A' is always superior though they might also go through at least slightly fluctuating functional status due to overtraining or loss of fitness excellence due to vicissitudes in personal life. 'Category B' does not try to become 'Category A' and even if they would try, they get hindered by inability to abstain from few or many unhealthy habits (smoking, alcoholism, sleep deprivation, malnutrition, medications, incorrect or inadequate exercises), so able to obtain only some

degree of improvements in functional status or at least retention of the functional status without significant changes in body composition and body mass. 'Category C' experiences only Altered Body Composition with Disability due to severe GTDS as a result of unhealthy lifestyle. Eventually, they would become patients with multiple morbidities and may not be able modify their lifestyle and respond to medical interventions, hence show gradual or rapid decline in functional status associated with unfavorable changes in body composition (especially loss of musculoskeletal mass and weight loss). Table-2 shows elaboration of table-1 to know about the possible diversity of functional status of humans.

**Table 1:** Three major Lifestyle versus Functional status categories.

A	Gains in functional efficiency associated with favorable changes in body composition.
B	Gains in functional efficiency but very little or no favorable changes in body composition.
C	No gains in functional efficiency but unfavorable changes in body composition.

**Table 2:** Hypothetical Human Diversity based on Lifestyle versus Functional Status. Category A = Alpha to Epsilon Category B = Zeta to Nu. Category C = Xi to Omega. Unhealthy habit = UH.

VARIANT	STATUS OF HEALTH
Alpha	Exemplary Fitness Excellence for age, Possesses BPS.
Beta	Possesses 75% of BPS traits of Alpha.
Gamma	Possesses 50% of BPS traits of Alpha.
Delta	Possesses 25% of BPS traits of Alpha.
Epsilon	Nascent stage of BPS traits of Alpha.
Zeta	Tries to be healthy but not interested to acquire any BPS traits of Alpha.
Eta	Tries to be healthy, has few reversible health issues inadvertently acquired.
Theta	Tries to be healthy, has many reversible health issues inadvertently acquired.
Iota	Tries to be healthy, decides to quit all UH.
Kappa	Tries to be healthy, can quit only few UH.
Lambda	Tries to be healthy, not interested in quitting UH.
Mu	Tries to be healthy, has few irreversible health issues caused by UH
Nu	Tries to be healthy, has many irreversible health issues caused by UH.
Xi	Reluctant to be healthy, has many irreversible health issues caused by UH
Omicron	Co-morbidities, Polypharmacy, Unable to adapt healthy habits.
Pi	Dependency begins due to rapid functional decline
Rho	25% Dependency
Sigma	50% Dependency
Tau	75 % Dependency
Upsilon	100% Dependency yet alive
Phi	100% Dependency, occasional emergencies arise
Chi	100% Dependency, frequent emergencies arise
Psi	100% Dependency, under lifesaving support
Omega	100% Dependency, Terminal stage of life.

status and health standards with Alpha. Alpha individuals may or may not be aware of their benchmark health traits. For example, athletes know their training intensities and performance standards but various labourers (farmer, load man, mason, shepherd, fisherman, road worker, washer man, house keeper, street sweepers, manual scavenger) may not know that they possess excellent health status, almost equivalent or even better than the successful athletes, despite their exposures to highly challenging climatic conditions, environmental hazards and socioeconomic pressures. A lot of Dancers, Fitness Instructors, Sports coaches and Defence personnel also might belong to Alpha category. These individuals can be expected to have far superior survival adaptations, acclimatization potential and epigenetic efficiency to live longer without painful morbidities and pharmacological interventions. However, if they voluntarily opt an unhealthy lifestyle or involuntarily lose their health standards due to uncontrollable circumstances (loss of job, loss of family members, iatrogenic damage, stress overload, repetitive strain injuries, occupation-induced illness, road traffic accidents, natural calamities,

malnutrition, exploitation), their Alpha health status could deteriorate temporarily or permanently depending on the scopes, scientific guidance and voluntary efforts to return to normal. It is widely known that a lot of sports men, athletes and defence personnel who were outstanding in their physique and fitness standards in the beginning of their career or during their peak performance stages, gradually lost their overall fitness competence associated with ruination of their attractive physique. For now, only a little knowledge about BPS traits of Alpha is known because Scientists could have rarely specifically focused on learning about them in detail through appropriate research methodologies, instruments and interdisciplinary approaches. Quite naturally, attaining and retaining traits of Alpha are based on probability, opportunity, affordability and determination (Table - 3).

It may be possible, regardless of the ‘probability’, to enable humans to not only become a successful Alpha human being during their early life but also to become an exemplary septuagenarian, octogenarian, nonagenarian and centenarian. The FSA of all the categories can be objectively assessed (Table - 4).

**Table 3:** Facilitators & Regulators of Alpha.

Probability	Meiotically inherited epigenetic system from parents, Motherland
Opportunity	Sources for subsistence, education and recognition
Affordability	Time and money to focus on cutting-edge learning about health and fitness
Determination	Persevering to attain/retain/improve the health excellence

**Table 4:** FSA Assessments (Non-invasive).

<b>Category A (Alpha to Epsilon)</b>	Aerobic Endurance (VO <sub>2</sub> max), Sprinting, Walking, Stair climbing, Jumping, Throwing, Weight lifting, Pull up, Parallel bar dips, Push up, Rowing, Swimming, Grip strength, Single Leg Balance, Spirometry, Blood pressure during exercise, Heart rate during exercise, Respiratory rate during exercise, Kinanthropometry, Flexibility, etc.,
<b>Category B (Zeta to Nu)</b>	Aerobic Endurance (VO <sub>2</sub> max), Sprinting, Walking, Stair climbing, Jumping, Weight lifting, Pull up, Parallel bar dips, Push up, Rowing, Swimming, Grip strength, Single Leg Balance, Spirometry, Blood pressure during exercise, Heart rate during exercise, Respiratory rate during exercise, Kinanthropometry, Flexibility, etc., More expertise is needed to customize the assessment model to suit to their lifestyle characteristics, exercise exposure, health issues and biomechanical dysfunctions of these individuals.
<b>Category C (Xi to Omega)</b>	Customizing the assessment model for these individuals with irreversible diseases and dependency needs interdisciplinary approach. Scales for Activities of Daily Living (Barthel’s index) and Cognition can be used. For extremely deteriorated bedridden individuals, the only option would be Glasgow Coma Scale.

**Epigenetic Efficiency:** ‘Heritable changes in gene expression that do not involve coding sequence modifications are referred to as “epigenetic”. DNA hypermethylation and histone hypoacetylation are hallmarks of gene silencing, while DNA hypomethylation and acetylated histones promote active transcription. Aberrant DNA methylation and histone acetylation have been linked to a number of age-related disorders including cancer, autoimmune disorders and others. Since epigenetic alterations are reversible, modifying epigenetic marks contributing to disease development may provide an approach to designing new therapies’ [10]. Epigenetics is the study of heritable changes in gene expression that occur without changes in DNA sequence that has a role in determining when and where a gene is expressed during development [11]. Epigenetic mechanisms

are flexible genomic parameters that can change genome function under exogenous influence but also provide a mechanism that allows for the stable propagation of gene activity states from one generation of cells to the next [12]. 'Chronic diseases arise as a consequence of an unhealthy lifestyle primarily characterized by physical inactivity and unbalanced diets. Regular physical activity can improve health, and there is consistent evidence that these improvements may be the result of epigenetic modifications. Given the heterogeneity and complexity of the existing literature, it is currently not possible to propose a specific recommendation about the type, intensity, or duration of exercise that could be beneficial for different subsets of the population (healthy, diseased, and/or trained) and there is a need to perform more research in this emerging area to identify epigenetic biomarkers that could serve as indicators of exercise adaptations' [13]. Non-invasively quantifiable adaptations to lifestyle (FSR, FSA) could be indirect epigenetic efficiency biomarkers. 'Category A' individuals could be considered as 'Epigenetically Efficient' because they display high FSA attributable to healthy lifestyle and they should remain cautious as well as determined not to disrupt health-related gene expressions under any toxic exogenous influence.

**Multifactorial background of Functional Efficiency and Functional Decline:** 'The concept of "lifestyle" includes different factors such as nutrition, behavior, stress, physical activity, working habits, smoking and alcohol consumption. Increasing evidence shows that environmental and lifestyle factors may influence epigenetic mechanisms, such as DNA methylation, histone acetylation and microRNA expression. Several lifestyle factors have been identified that might modify epigenetic patterns, such as diet, obesity, physical activity, tobacco smoking, alcohol consumption, environmental pollutants, psychological stress, and working on night shifts' [14]. 'During the course of human life, we are exposed to an environment that abounds with a potent and dynamic milieu capable of triggering chemical changes that activate or silence genes. There is constant interaction between the external and internal environments that is required for normal development and health

maintenance as well as for influencing disease load and resistance. For example, exposure to pharmaceutical and toxic chemicals, diet, stress, exercise, and other environmental factors are capable of eliciting positive or negative epigenetic modifications with lasting effects on development, metabolism and health. These can impact the body so profoundly as to permanently alter the epigenetic profile of an individual' [15]. Research has shown that epigenetic mechanisms provide an "extra" layer of transcriptional control that regulates how genes are expressed [16]. Alterations in epigenetic marks have also been associated with a variety of human diseases, including cancer, cardiovascular, respiratory and neurodegenerative diseases [17]. Functional ability considered a proxy for healthy aging, not only related to mental and physical health but it also determines social well-being [18]. 'Activities of daily living (ADLs), often termed physical ADLs or basic ADLs, include the fundamental skills typically needed to manage basic physical needs, comprised the following areas: grooming/personal hygiene, dressing, toileting/continence, transferring/ambulating, and eating. These functional skills are mastered early in life and are relatively more preserved in light of declined cognitive functioning when compared to higher level tasks. Basic ADLs are generally categorized separately from Instrumental Activities of Daily Living (IADLs), which include more complex activities related to independent living in the community (e.g., managing finances and medications). The ability to perform ADLs and IADLs is dependent upon cognitive (e.g., reasoning, planning), motor (e.g., balance, dexterity), and perceptual (including sensory) abilities. There is also the important distinction of the individual's ability to complete the task (physical and/or cognitive ability) versus the ability to recognize that the task needs to be done without prompting (cognitive ability)' [19]. Spiritual Intelligence helps to fulfill the potentialities of the individuals' abilities through the non-cognitive virtues to prepare them to solve the everyday problems for life creatively and constructively in the new situation of the socio-psycho-physical environment for attaining the highest knowledge and wisdom [20]. Dementia is a term for a clinical syndrome character-

-ized by progressive acquired global impairments of cognitive skills and ability to function independently [21]. Unconsciousness is generally caused by a temporary or permanent impairment of either the reticular activating system in the brainstem, both cerebral hemispheres, or bilateral thalami. The causes for an unconscious patient can be differentiated into structural pathology local to the brain, or systemic pathology [22]. Alcohol use disorders cause oxidative stress in the lower airways and increase susceptibility to pneumonia and lung injury and currently there is no therapeutic options exist to mitigate the pulmonary consequences of alcoholism [23]. Smoking impacts both innate and adaptive immunity and plays dual roles in regulating immunity by either exacerbation of pathogenic immune responses or attenuation of defensive immunity [24]. In contrast to such toxic substances leading to major health risks at personal level and the surroundings, nutritious Foods Obstruct and Overcome Diseases (FOOD) and DIET must be aimed at improving the functional capacity, thus can be regarded as Diet Improves Exercise Tolerance [25]. An equitable public health model encompassing Spiritual Intelligence, Holistic health, Agriculture, Research and Eldercare (SHARE) should be aimed at resisting morbidities and mortalities [26]. Spiritual intelligence is the nucleus of BPS and MALYs. Breathing rate/rhythm reveals overall health of an individual and numerous health benefits of impeccable breathing/breathing exercises are 'Pulmonary panacea' [27]. Somatotype diversity study on non-athlete population shows high prevalence on endomorphy dominance and mesomorphic endomorphs [28]. Many erroneous body movements organize themselves as the earliest asymptomatic biomechanical dysfunctions of unhealthy ageing [29]. There is a compelling need to construct novel functional efficiency scales like Single Leg Balance assessment tool from the perspectives of healthy ageing and fall prevention strategies [30]. If government dexterously gathers fundamental health-related data of every citizen once in a year (Height, Weight, Somatotype, Blood pressure, Heart rate, Respiratory rate, Blood glucose, Blood cholesterol, Existing morbidities, Medicines being consumed) to understand the

disease trends in the country, the health departments will be in competent state to manage any health crises like 'Epidemiological Intersection' [31]. Without taking these multifactorial backgrounds and interdisciplinary approach into account, the health care system will remain chaotic and continue to render injustice to both healthy and unhealthy individuals. Salutogenesis is not limited by the disciplinary borders of one profession but rather an interdisciplinary approach and a question of bringing coherence between disciplines and realise what connects them through the people's ability to comprehend the whole situation and the capacity to use the resources available (called as sense of coherence - SOC) to move in a health promoting direction [32].

## CONCLUSION

Lifestyle is the major yet habitually neglected determinant of health and disease. Assessment of functional status (kinanthropometry) is the only option available to understand the efficacy of lifestyle and lifestyle modifications. Without structured exercises as an integral part of lifestyle, it is quite impossible to overcome DALYs or achieve MALYs. DALYs could be highly crippling and it cannot be effortlessly combated without laying down a health-fitness foundation during early adulthood or even earlier. Metabolic efficiency, Movement efficiency and Epigenetic efficiency are the interdependent cornerstones of health and healthy lifespan. During routine activities of life, it may not be always feasible to control the postures consciously, hence erroneous postures and movements are frequently possible and repetitive. Structured exercises without counter-productive postures and dosages, obviously strengthen the musculoskeletal system and help withstand the injurious stresses caused by such inevitable erroneous postures and movements. Sufficient evidences exist to support the plethora of health benefits of exercises (prophylactic and therapeutic) and the devastating effects of sedentary life.

Quite a lot of humans in the globe have been highly active either through structured (athletes) or unstructured (manual labourers) in association with healthy lifestyle, hence 'epigenetically efficient' to resist communicable and non-com

municable diseases. From the immediate future, the medical profession should try to advance itself and develop a specialized interdisciplinary domain to study about the adaptations of survival and healthy lifespan of such 'epigenetically efficient' individuals. The same domain should study the epidemiology of healthy individuals (because healthy individuals also could develop illnesses occasionally) and develop an exclusive health care model for them that puts emphasis mainly on rest, sleep, meditation, structured exercise and nourishment as health restoration strategies. Unhealthy individuals, in this context, are those who have knowingly sabotaged their health despite being aware of the hazards of sedentariness, unstructured lifestyle, malnourishment, stress and ingesting toxic substances. Departments for unhealthy individuals should guide them to attain better health by developing cognizance about the BPS (FSR, FSA) and lifestyle of healthy individuals. People who have been steadfast and outstanding despite their major functional and survival limitations caused by congenital disorders, inborn errors, acquired disabilities (neurological disorders, amputation, burns, multiple fractures, etc.,) should also be regarded as role models of health. If the BPS of individuals with high epigenetic efficiency is clearly understood with more generalizable data, we would be able to confirm their ability to survive without crippling morbidities (DALYs), extended pharmacological interventions, vaccinations and the strategies applicable for unhealthy individuals, at any stage in their life. DALYs are characterized by almost predictable disease/disability events but MALYs have been mysterious. The mysteries of MALYs can be solved by developing an exclusive health care model for healthy individuals and it would remain unsolved without the inclusion of Physiotherapists, Exercise Professionals and Dieticians. MALYs should be made feasible to all the families, and long-living population should be channelized to become compassionate and beneficial citizens.

**Conflicts of interest: None**

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