ISSN 2581 – 3781

AJCSE
ASIAN JOURNAL OF COMPUTER SCIENCE ENGINEERING

Available Online at www.ajcse.info
Asian Journal of Computer Science Engineering 2018;3(4):1-16

REVIEW ARTICLE

A Review of the Issues by Which a Blockchain Solution Could Improve the Prevailing Healthcare Paradigm

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Received on: 29-07-2018, Revised on: 30-08-2018, Accepted on: 01-10-2018

ABSTRACT

Blockchain, as applied to the health-care domain, is currently a dream or vision of what people want to happen. There are few technologies which offer the potential to disrupt the prevailing biomedical paradigm. The author discusses the existence of the first technology to be based on a precise and sophisticated simulation of how the brain regulates the autonomic nervous system and associated structures which has the potential to significantly disrupt the prevailing biomedical paradigm through the emergent neurological paradigm, i.e., understanding how the brain works and how this can be applied with diagnostic and/or therapeutic effect. Known commonly by the trade name "Strannik" the associated package of Strannik software programs have been shown in initial research, in 15–20 clinical studies conducted over the period 1997–2017, that Strannik Virtual Scanning is able to determine the onset and progression of pathologies 2–23% more accurately than the current plethora of medical tests; screen pathological onset from the presymptomatic level; define each pathology in terms of its genotype and phenotype; determine ca. 5–15 pathologies are determined in each of 30+ organs, provide results in ca. 10–15 min; more safely/non-invasively than contemporary methods of diagnosing and treating disease; achieve therapeutic outcomes with the neuromodulation technique strannik light therapy which initial studies indicate is 75–96% therapeutic effectiveness i.e., which appear to exceed that which is possible using biomedicine; and to do as at considerably lower cost by comparison with biomedical tests and treatments. The author discusses the limitations of biomedicine and how such a neurological approach, in the form of the Strannik technology, could be applied to address such limitations and provide an alternative and cost-effective approach to the provision of health care, in particular (but not exclusively), regarding the management of lifestyle-related medical conditions.

Key words: Autonomic nervous system, digital, blockchain, genotype, phenotype, physiological systems, Strannik Light Therapy, Strannik Virtual Scanning, Strannik Virtual Scanner

INTRODUCTION

In recent years, the health-care market has witnessed the emergence of a plethora of medical technologies which have the capacity to alter health care. There is often a great deal of hype surrounding the scope of such new medical technologies. This article reviews many of the issues which could prevent and/or lead to the adoption of possible blockchain solutions which could influence the future provision of healthcare. Many consider that digital, software, artificial intelligence, cognitive, and information-based technologies have immense potential to disrupt the provision of healthcare[1,2] however much of the research in the health-care market is devoted to improving the efficiency of existing technologies – effectively offering "more of the same" but at lower cost – rather than making significant improvements which advance the biomedical paradigm.

The technologies which claim to be "digital" are more precisely "digitally-enhanced," i.e., the only aspect of these many technologies which is digital is the transmission of data by digital means, e.g., by smartphone. The technologies which use "artificial intelligence" are not based on a fundamentally more advanced understanding of how the body functions

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but instead how algorithms could be used to improve and/or simplify the interpretation of scans generated by X-rays, magnetic resonance imaging (MRI), ultrasound scans, etc. This is commonly known as "line extension." The development of miniaturized scanning technologies[3] will reduce their cost and aid more flexible working in the secondary care environment.

The various Chatbot APPs which mimic the GP's consultation are unable to diagnose the health of patients with complex multisystemic and multipathological indications – the ca 20–25% of patients who take up ca 70% of health-care resources. Indeed if biomedicine is unable to do so, so why does the APP developer, developing technologies which mimic the GP's consultation, think that their APP can do so?

"Looking after the 15.4 million people in England with at least one long-term condition already takes up 70% of the National Health Services (NHS's) £110bn budget – £77bn – as well as £10.9bn of the £15.5bn spent on social care in England."

Comments attributed to Dr. Martin McShane, National Clinical Director, Long-term Conditions, NHS England.[4]

We are led to believe that the latest generation of wearable technologies add to our ability to monitor our health yet they are often purchased by "the worried well" who have little or no need for such technologies.[5] Moreover, the accuracy of such techniques is often relatively poor[6] and limited in its scope. It comforts the patient to have a monitor which tracks their health throughout the day. While there are undoubtedly case studies which are used to justify their more wide-spread application their main value for most people appears to be as a placebo or distraction from the more onerous task of managing their stress, diet, and lifestyle. The benefits and/or value of such technologies is often minimal. They merely add an additional layer of complexity and cost to the healthcare process.

Health care evolved from experiential origins. It is only by the knowledge gained from experimentation that medical research recognized the need to adopt an evidence-based approach and hence eliminate the various techniques which were ineffective or in some cases made the patient less well.

"Beware of trying to understand the whole by the arbitrary isolation of the separate components or by hazy or forced abstractions."

Albert Einstein

The organization of medical research around specific areas – commonly known as reductionism, e.g., nephrology, mental health, neurology; or syndromes, e.g., sleep, depression, mental health, diabetes, migraine; fails to take into account the whole and/or complete nature of the body's function[7] in which pathological onset in the visceral organs influences brain function and how changes of brain function influence the stable and coherent function of the autonomic nervous system and physiological systems, resulting in pathological onset in the visceral organs in the most destabilized and dysfunctional of these systems. For example: (i) If we eat and drink to excess and develop diabetes the problem of diabetes cannot be resolved by medication, only be reducing excessive consumption and/or hyperindulgent behaviors and (ii) if we experience stress, perhaps a bereavement, which creates pathological onset in the heart, digestive tract, and causes aches and pains the symptoms will continue until the person is able to deal with their stress. *Giving medication may enable the person to reduce the severity of the symptoms but does little to deal with the fundamental cause.*

Moreover, as there is not a recognized or accepted the understanding of how the body functions and/or is regulated, then we must consider the distinct possibility that further revelations are possible.

Despite the use of vaccines, the various medical tests and drugs the need for health care, and the associated costs continue to increase yet most we remain relatively healthy, in particular, those who live to maintain their weight at relatively normal BMI and who exercise regularly.

- Drugs – which depend on the autonomic nervous system for their effect, i.e., on the phenotype – are foreign substances. If used at too low a level they are ineffective, if used at too high a level they are toxic, and if used at an appropriate level – they interfere with pathological processes and hence reduce or eliminate the symptoms which are commonly associated with the particular condition being treated; however, drugs depend on the autonomic nervous system for their effect – which is regulated by the brain – which conceivably explains why the effectiveness of many drugs declines over a period.
- Vaccines – which influence genotype – may prevent a future viral infection but increase

susceptibility to other infections and/or medical conditions. Indeed it is on such an observation that Jenner recognized how to vaccinate against smallpox.[8]

- Considered by many to be "a social lubricant" ethyl alcohol, the active constituent in alcoholic beverages, is a Grade 1 poison and carcinogen.[9,10]

Every way which we alter the body's biochemistry through the senses (stress) or through the viscera (by the food which we consume, water and/or what we drink, the quality of air which we breathe, viruses, drugs, and vaccines) influences the body's function and overall stability.

If such medications effected a cure the burden of healthcare would be in decline; however, this is clearly not the case. Every year the demand for health care and the associated cost of providing health care (n.b. the term "health care" is a misnomer – it is more precisely "illnesscare") continues to increase. The patient consults their GP and is often prescribed medication which requires that they adhere to the drug schedule, perhaps taking a pill or combination of pills, several times each day; however, in many cases, the drug becomes increasingly ineffective (because the brain compensates for the effect of this foreign substance and/or its metabolites) and thereafter an alternative drug is sought; until the patient presents with symptoms of ever greater complexity and severity which require ever greater levels of medication, testing, surgical intervention, and cost. It is a system-centric business model which requires patients to justify its immense cost yet it is increasingly evident that the biomedical paradigm has significant shortcomings and/or limitations, for example, it is the third-leading cause of death[11] and is failing to live up to expectations.[12,13] The total cost of outstanding legal claims for compensation in the UK is £65BN, i.e., 50%, of the UK's NHS budget, which is sufficient to bankrupt the organization. In the US >17.9% of GDP is spent on health care. The provision of health care by governments is at a level which is increasingly unsustainable.

In general, biomedicine treats the symptoms or consequences of autonomic dysfunction. A preventative approach based on an understanding of the causal mechanism(s) is required. It is only by understands the psychosomatic/somatic mechanisms which regulate the body's function that the complexity and cost of health care can be reduced. Accordingly there is a need for a better understanding of the mechanism by which the brain is organized and how it regulates the body's function, for example, how it maintains and/or optimizes the body's key functional parameters, for example, blood pressure, blood glucose, temperature, the supply of oxygen to the brain, and pH. Indeed, if such a mechanism could be understood this could be applied with therapeutic effect. To this end the European Commission initiated an immensely well-funded research project (the Human Brain Project)[14] to enable leading neurologists to develop an understanding of (i) what the brain does and how it does it; (ii) how this could be applied, for example, to develop a new generation of cognition-based diagnostic technology which could determine the pathological correlates of complex medical conditions such as Alzheimer's disease; and (iii) how a unified, multi-level understanding of how the human brain integrates the flow of pathological data from the viscera could be applied with therapeutic effect.

The EC's Human Brain Project has been followed by the US government's Brain Initiative which is largely intended to achieve the same objective. This has been augmented by the Cluster Exploratory, a National Science Foundation initiative, a program that funds research designed to run on a large-scale distributed computing platform developed by Google and IBM in conjunction with six pilot universities. Early CluE projects will include *simulations of how the brain regulates the nervous system* and other biological research that "lies somewhere between wetware and software," i.e., the development of a mathematical model. In Russia, despite the development of Grakov's Strannik technology,[15-17] the Russian government has established a similar project known as CoBrain; and in Switzerland, the BlueBrain project is a spin-off of the Human Brain Project. Such research seeks to integrate OMICS data (genomics, transcriptomics, metabolomics, etc.) with brain function, for example, the work of respected geneticists Michael Snyder,[18] J. Craig Venter, etc.

THE MARKET NEED FOR BLOCKCHAIN-TYPE SOLUTIONS

The health-care market has evolved from its humble ethical origins into a chain of profit

centers from the point when the patient requires health care and enters the health-care system until the point when the patient expires and ultimately leaves the health-care system.

It is a business sector which makes enormous profits for the many, many companies which supply products and services to the health-care sector. Indeed the regulated nature of this business makes it difficult to enter but, when approved, offers the prospect of making significant profits in a market with relatively few, if any, direct competitors.

In addition, the cost of health care has an adverse effect on the ability of a government to manage its priorities. Every £/$ which is spent on health care – ca.17.9% of GDP in the US and ca 9% in the major EC markets – detracts from the monies which can be spent by the government, companies, or the public on their many other priorities, i.e., profit and disposable income. Consequently, major industrialists are now examining ways of improving and/or reducing the cost of health care for their employees and/or reducing the amounts spent by their companies on health care. Every £/$/Euro saved has the potential to reduce the amounts required to fund health care, reduce the amounts spent by companies on health care and thereby improve company profitability, and reduce the taxes which are levied on the public. This is recognized as governments throughout the world redouble their efforts to improve the efficiency and effectiveness of health care, for example, by payments on results, stimulating innovation, and ensuring that the medications and therapies provide a cost-benefit, etc.

Originally, the role of the GP was designed to diagnose and treat disease; however, the requirement for more comprehensive and detailed diagnoses has evolved into the current paradigm in which there is a multi-tiered approach involving primary care, secondary care, histopathological testing, and tertiary care. It is largely for this reason that there are many histopathology laboratories yet most medical tests have an accuracy which ranges between 50% and 99%, many tests (estimated ca. 80%) yield a negative test result, and with the exception of antibiotics most drugs are on average abt. 50% effective,[19] i.e., ca. 50% of the disease process is not being considered in the prevailing medical paradigm re the management of lifestyle-related medical conditions, and the effectiveness of drugs declines over a period.

The solutions which are offered, of yet more tests and yet more drugs, deal only with the consequences of dysfunction and not the fundamental cause. *They fail to resolve the problem and lead to yet more side-effects of ever greater complexity and cost.*

The influence of nutrition and drugs on the body's function is considered – genomics dominates everything – but the dominant influence of "stress" on our physiology is largely ignored, perhaps because it is considered to be too complex to be addressed by the contemporary biomedical paradigm, i.e., it does not conform to the prevailing biomedical paradigm which involves the supply of drugs – to treat the consequences of stress – yet, almost paradoxically, most drugs act on the phenotype.

The patient's health details are held by their doctor and/or health-care provider(s) unless the patient specifically requests access to their health details.

The primary care practice, practices which offer non-mainstream health-care services, manufacturers, and suppliers of medical devices manufacturers and suppliers of drugs (as raw materials and/or drug formulations), major health-care providers which have primary care and secondary care units, tertiary care providers/ care homes, providers of electronic health record software, and an enormous range of suppliers of the materials are required to sustain the operation of these enormously complex organizations, structures, and systems.

A blockchain solution would conceivably "put the patient at the center of the health-care ecosystem" and reduce the need for such organizations. In the UK, it was the conclusion of Sir Robert Francis QC in the NHS Mid Staffordshire Healthcare Trust[20] inquiry conducted in the period 2010–2015 that such a solution was necessary – *placing the patient's health at the primary end-point* – and should be a legal requirement for all providing health care. A blockchain solution could reasonably be expected to increase the privacy and security of patient health reports; improve the effectiveness, accuracy, and security of electronic health records; reduce fraudulent claims based on misdiagnosis; significantly reduce costs; hold doctors accountable for their actions, etc.

In addition, the health-care market is haunted by future forecasts which have enormous implications for the future provision of health

care, i.e., the steadily increasing cost of managing the health of patients with (i) diabetes and diabetic comorbidities which now consumes more and more of health-care budgets as patients require ever more complex and expensive interventions; (ii) cardiac testing to support patients with diabetic comorbidities and smoking-related cardiac issues; (iii) regressive autism which is now influencing the health of 1 in 59 children[21] and which will steadily require increasing levels of medical support throughout their lives; (iv) antibiotic-resistant bacterial infections; and (v) claims for misdiagnosis, misprescribing of drugs, adverse drug events, etc.

THE BENEFITS AND OBSTACLES TO NEWER AND BETTER HEALTH-CARE TECHNOLOGIES

The introduction of a cost-effective screening technology could be expected to meet many of the key aims and objectives for cost-savings which have been identified by the NHS (including those outlined above), for example,

- Reduce the flow of patients into the healthcare system, i.e., a preventative care system.[22]

"I think it's unarguable that prevention is better than cure, and if you wait until the patient presents with signs or symptoms of kidney disease, liver disease, heart disease, very often most of the damage is done and can't actually be recovered. So if it were possible to take steps while still in health to prevent or delay the onset of disease that seems to make very good sense."

Sir Robert Lechler[22]

- Reduce or eliminate the need for repeat medical consultations.
- Reduce the immense cost and complexity of training the GP.
- Reduce and/or eliminate GP errors.
- Avoid erroneous drug prescribing; or for drugs to treat the side effects of other drugs.
- Reduce the flow of patients from primary care to secondary care and hence the high level of expenditure in secondary care.

"The NHS in its current form is not well set up to look after patients who are medically complicated, especially if they have several long-term conditions, such as arthritis, heart failure, and the early signs of dementia while the total number of people with long-term conditions is expected to stay at around 15 million, the number with three or more conditions is expected to rise from 1.9 million to 2.9 million by 2018." Comments attributed to Dr. Martin McShane, National Clinical Director, Long-term Conditions, NHS England.[4]

- Reduce the vast numbers of medical tests which yield a negative test result
- Reduce the need for highly expensive scans and tests. An inexpensive screening modality would reduce the number of tests which yield a negative.
- Reduce expenditure on equipment and increase the cash which is available to support biomedical treatments and recovery.
- Enable everyone to have a clear understanding of their health and to assume control and responsibility for their health and how this is likely to be manifest in the future.
- Change the focus of medicine re lifestyle issues; from treating the symptoms of disease and morbidity to that of treating the fundamental cause of disease and morbidity.
- Provide the patient with a written report of their health which they could use to seek out alternative therapeutic options which are not available in their local health services.
- Reduce the overall cost of health-care, especially so in the financially challenged markets.
- For example., which are affected by financial constraints or where the per capita income is low.

Research by health economists[23] has found that the average cost of a healthy patient costs the UK's NHS ca £290 pa, those with one long-term condition an estimated £783 pa, those with two long-term conditions £1,521, those with three long-term £2,559 pa, those who need frequent treatment and monitoring with five such conditions £5,512 pa, and those with six £8,083 pa. Note 1: Clearly the costs vary according to the nature of the comorbidities.

- Reduce the 3–5% of road journeys (fuel costs and pollution) which are involved in attending medical consultations, transporting samples, etc.
- Improve the accuracy and sophistication of electronic health records.
- Reducing the amounts of clinical waste (rubber gloves, syringes, fluid and tissue samples, and face masks).

The introduction of a cost-effective therapeutic modality could be expected to meet many of the key aims and objectives for cost-savings which have been identified by the NHS (including those outlined above), for example, improving therapeutic outcomes – conceivably up to a theoretical ceiling of 90–95%; reduce the need for drugs; enable the patient to be screened and treated in their homes or offices and reduce the need for treatment in primary and secondary care; slow the progression of patients into tertiary care, i.e., enabling them to live for longer in their home.
The health-care system is staffed by those who are trained in clinical medicine. Accordingly, their ability to rationalize such an alternative or modified paradigm is based on, for example, their ability to understand such a concept, their willingness to embrace such technologies, the fear of stepping out of line and associated repercussions, political considerations, how such technologies would interfere with other research priorities and initiatives, for example, genetic research and electronic health records, and influence from established suppliers. There is an innate bias against change and especially so against radical and disruptive health-care solutions.
Perhaps, the dilemma was ably summarized by Carl Lindegren when he commented:
"One links to think of science as divorced from personality because one seeks the guidance of a principle rather than a person. Thus the individual scientist experiences a feeling of freedom since he has the impression he lives in a community in which the law and not the man is the ultimate arbiter. This truly democratic process has led to the fallaciously democratic process of determining the validity of a scientific view by determining how many other scientists agree with it. Voting in this context is so much influenced by past training and indoctrination that it tends to reject the new and reaffirm the old."
Nevertheless, such a technology presents an opportunity to improve the management of current health data/management, for example,

- Reduce or eliminate claims, for example, for misdiagnosis and/or misprescribing of drugs – est. >£3BN pa in the UK;[24]
- Reduce or eliminate fraudulent claims, for example, for whiplash injuries sustained in road accidents;[25]
- In the US fraudulent claims from the Medicaid program[26] are >USD14BN pa (4% of Medicaid spend) while Medicaid fraud[27,28] is estimated at 15–22% of total spend;
- Reduce claims arising from adverse outcomes as a result of drugs;[11]
- Diagnose the many medical conditions which are poorly diagnosed or where there is an unmet clinical need.
- Modern medicine is the 3rd largest cause of death.[11]

THE LIMITATIONS OF BIOMEDICINE

The quality of the data

All aspects of the body's function are, without exception, biological – however, biology does not, and cannot, explain how the body maintains the complex executive and/or intensely regulated functions of blood pressure, blood glucose, sleep, pH, body temperature, the supply of oxygen to the brain, etc. There is an issue of "regulation" – the distinction between biological hardware and software – which researchers have yet to explain or to accept.
Medical research is faced with the apparently paradoxical situation that there are physiological systems – which it does not understand and, as a result, chooses to disregard (despite it forming the basis of the medical examination conducted by the GP) – and that there are genes which it considers to be the panacea for all ills yet we know that our exposure to environmental factors and lifestyle, our phenotype, is far more significant than our genotype – and drugs act on the phenotype. A recent study, published in PLoS Genetics, indicated that only a small minority (est. 5–10%) of diabetes has genetic origins.[29]
What does genotype mean? It means that the complex chemical and structural arrangement of the genes act together to express a protein or complex spectrum of proteins.[30] It is not actually the genes which are important, although they are not unimportant; it is the rate of expression of proteins which is most significant. Consider that over 20 genes[31] are implicated in the expression of preproinsulin! *It is what the genes do that is significant, how they function in a collaborative manner to express a particular protein, not what they are!* By the time, we are 75 years we express the only about 10% of the insulin which we expressed when we were in our prime, but

we do not drop dead. *It is only when our demand for insulin exceeds the supply and/or reactivity of insulin that there is a problem.* What this illustrates are that there is a mechanism which continuously regulates and adjusts how the body functions – but this is not new to doctors, sports physiologists, neurologists, psychologists, etc.

Second, are the proteins coiled and reactive or uncoiled and unreactive? What are the factors which influence protein coiling?

Third, how well does the expressed protein react with its substrate? Problems of protein reactivity are often denoted by the term "protein resistance," for example, as "insulin resistance." This is more commonly known as the "phenotype."[32]

These three fundamental processes are chemical processes – proteins are characterized by a COOH group and an NH2 group – therefore, they are influenced by acidity and hence by the prevailing levels of minerals which perform an essential function, catalyzing biochemical processes. They are also characterized by the rate of emission, energetics, and intensity of biophotons which influence color perception – because proteins absorb and emit biophotons[33] during the course of their reaction with enzymes and/or other substrates. The organic and inorganic chemistries coexist with mutual effect; however, in general, biologists tend to ignore the immense significance of other inconvenient, and complicating parameters, for example, acidity and light.

If there are (i) changes of molecular biology, there must be (ii) changes of cell biology, (iii) changes of organ function, and (iv) changes of system function and/or dysfunction.

Accordingly, a precise mathematical model of the autonomic nervous system must diagnose at these different levels of physiological significance – at the level of the physiological system, the organs in each system, the cells in each organ, and at the molecular level (as genotype and phenotype). Moreover, if there is such a precise, structural relationship, this can be mathematically modeled: See Strannik operating manual, case studies, and test reports.[34]

Biomedicine seeks to define the nature and levels of metabolites which can be used to characterize a particular medical condition yet, as outlined, the health of a patient is far more complex than can be characterized by a single pathological process or metabolite. The body's biomedical indices vary throughout the day. Moreover, most medical conditions are multi-systemic, multipathological, polygenomic,[35] and each pathology comprises its genotype and its phenotype (see below example reports).

It is for this reason that most medical tests are rarely precisely accurate, for example, the HbA1c test used to diagnose diabetes is 40% irreproducible after 1 month;[36] MRI scans used to screen patients with cardiac problems are considered to be 72–90% accurate (10–28% inaccurate);[37] Mammography is considered to be only 50% accurate,[38] etc. The failings of medicine are widely recognized; however, the lack of a viable option which is able to significantly improve how the patient is screened and treated has not hitherto been available – so the system grinds on – without proof points or killer applications which can compete with the biomedical status-quo on which health care is based.

"It takes 50 years to get a wrong idea out of Medicine, and 100 years a right one into Medicine."

John Hughlings Jackson, FRS1878

What is the mechanism which regulates the stable and coherent function of the autonomic nervous system – the balance between the sympathetic and parasympathetic – and the organ networks? This has been referred to by various researchers as brainwave coherence or brainwave entrainment, bioresonance, biofeedback, neuromodulation, neurofeedback, neurostimulation, etc. Many such techniques have been developed in this USD10-20BN market.

Biofeedback techniques have been around for almost 100 years. It is the level of understanding of such phenomena which remains beyond such researchers.

Brain function, EEGs, neural networks, autonomic nervous system, and physiological systems

The EEG states are significant because we require typically 8 h of sleep each day and we sleep for the majority of this period in the delta state; without sleep, the quality of our lives declines significantly; the EEG states reflect different levels of neurological function.

Different stimuli act by stimulating the function of the different EEG states, for example, emotional

freedom technique, cognitive behavioral therapy, reiki, hypnosis, meditation, music, biofeedback techniques, sleep, and neuromodulation techniques (Strannik Light Therapy [SLT]).

The body is a biological entity, but its biology is not "regulating" the body's function. It is this dysregulation or imbalance which is responsible for what we experience as pathologies and morbidities. The brain uses EEG frequencies to regulate the body's function. It functions as a neuromodulator yet biological changes are responsible for the autonomic dysfunction which influences systemic stability and which alters the perceived stability of the EEG frequencies, Figure 1. This is apparent if we consider the EEG-based mechanisms which sustain the body's function and existence. *The body is a biological entity which fuels a biophysical entity – the brain.*

An understanding of this mechanism would enable the provision of healthcare to treat the fundamental causal mechanisms as well as the symptomatic presentation of the person's unique medical conditions.

Some companies now seem to have grasped the idea that such understanding could be applied by virtual reality and some are working on "digital pathology," however at this time it is uncertain whether such research is based on a fundamental scientific observation or, like so many before are just based on an experiential understanding of the phenomena and/or principles.

The brain uses frequency to regulate the coherent function of the autonomic nervous system and physiological systems.[39] It explains why the wrong frequencies can cause photosensitive events, for example, by stimulating reductions in blood flow and/or the flow of oxygen to the brain, for example, in migraine or epilepsy. Molecular and cellular pathologies are the consequence of this process; however, biological input (nutrition, air, water, and drugs) influences brain function, i.e., the neural and visceral data matrices operate dynamically. Stress (the stress response or phenotype) influences this dynamic and is manifest as a spectrum of pathologies, for example, influencing heart function, breathing, kidney function, pancreatic function, and sleep.

The outcome of this process is changes of how we behave – of memory(s), speed of movement, smoothness of movement; how we organize our lives and our priorities throughout the day, weeks, and months ahead; and our effectiveness, i.e., our ability to start and complete the many tasks which we require to complete each day.

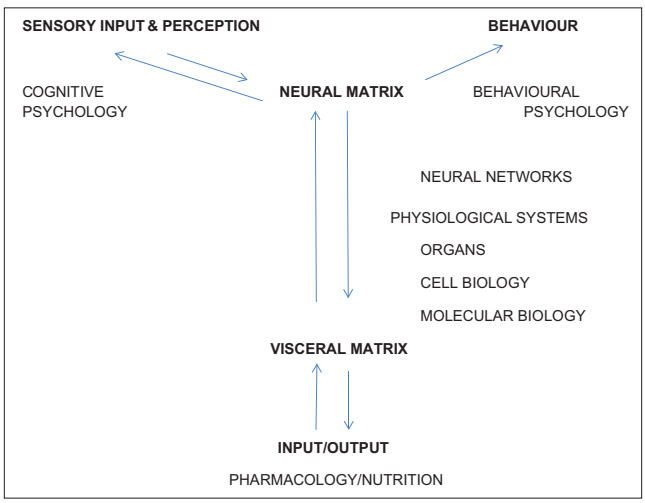

Figure 1: The structural nature of the autonomic nervous system

WHAT STRANNIK OFFERS

The Strannik technology[15] *is based upon the principle of "personal biomathematical modeling" i.e., a mathematical model of the autonomic nervous system. It is a simulation technique, typical of virtual reality, first developed in the late 1990's. It uses a more advanced methodology and level of understanding than is currently used by any current medical technology including genetic screening.*

In principle "it is an open and generally permission less system which can be accessed remotely by the patient or doctor –a form of peer-to-peer system – that no government can shut down," i.e., it exhibits the hallmarks of a blockchain technology which can disrupt the prevailing health-care paradigm. In practice, it can be offered through a PC or an online system but is nevertheless required to comply with the prevailing regulatory regulations in most markets.

Strannik comprises a suite of software programs including (but not limited to) the Strannik test, the screening modality Strannik Virtual Scanning (SVS) and the neuromodulation modality SLT.

Strannik technology offers a number of significant benefits by comparison with contemporary methods of diagnosing and treating disease, for example,

- SVS is able to determine the onset and progression of pathologies earlier (from the

presymptomatic level), better (both genotype and phenotype are defined for each pathology), more comprehensively (circa 5–15 pathologies are determined in each of 30+ organs), faster (results in circa 10–15 min), and more safely (non-invasive technique) than contemporary methods of testing and diagnosing disease.

As outlined SVS screens the health of the patient at the level of the physiological system, i.e., identifying the degree of stability of the various physiological systems [Figures 2 and 3] and in particular the most destabilized physiological systems on which the course of SLT is based; the most dysfunctional organs; and at the cellular and molecular level(s) [Figure 4].

- SVS is offered at a price which is an order of magnitude lower than that of current diagnostic techniques – because it is a software-based technique which does not, therefore, involve the design, assembly, and testing of a "device." It would, for example, be able to screen the health of ca 75–90% of the entire UK population (est. 50M patients) at an estimated cost of £3BN.
- SLT is offered at a similar price to the SVS test which is considered to be an order of magnitude lower than that of current therapeutic options (digital therapeutics) – because it too is software which is designed to deliver data – and does not involve the design, assembly, and testing of a "device."

It meets the requirements stated by Sir Robert Lechler[22] for a technology which can be used predictively to establish and treat the range of pathologies which will emerge in future if the patient continues with their current lifestyle, i.e., does not alter their unhealthy lifestyle. It will reduce the need for repeat consultations in primary care, for medical tests, for expensive screening technologies, for surgical procedures in secondary care, and conceivably reduce demand for organ transplants. It will improve the accuracy of drug prescribing, reduce waiting lists for medical treatment, etc. Case studies and peer-reviewed medical papers illustrate that it has the potential to contribute to a better understanding of many morbidities, improve therapeutic outcomes, improve Quality of Life indices, and significantly reduce the cost of healthcare.

EVIDENCE

Initial indications are that SVS is able to determine the onset of pathologies in a level of detail which is unprecedented in modern medicine. The technology has been evaluated by 15–20 groups of medical researchers (reports available on request). The test results in these various studies[40] indicated

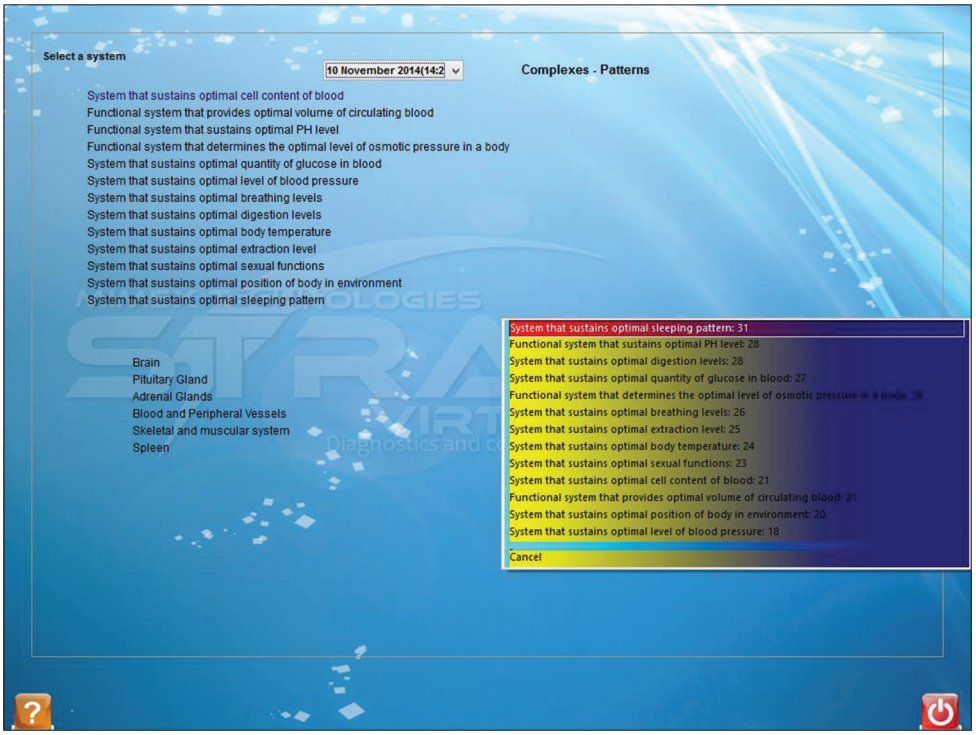

Figure 2: Example report/most destabilized physiological systems

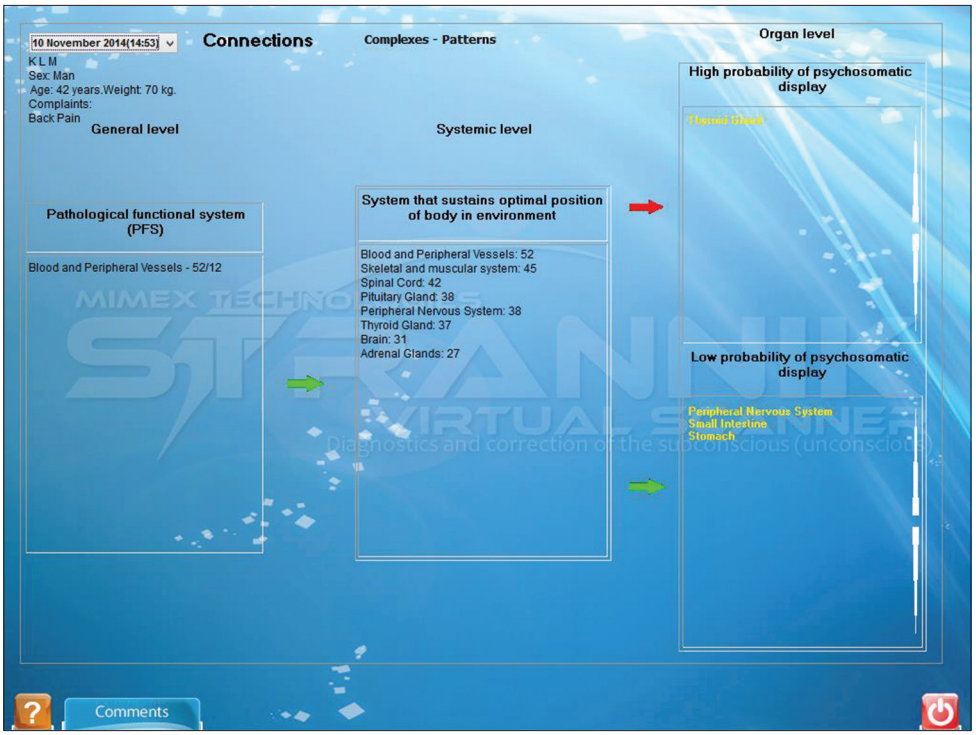

Figure 3: Example report/most destabilized physiological system and organs

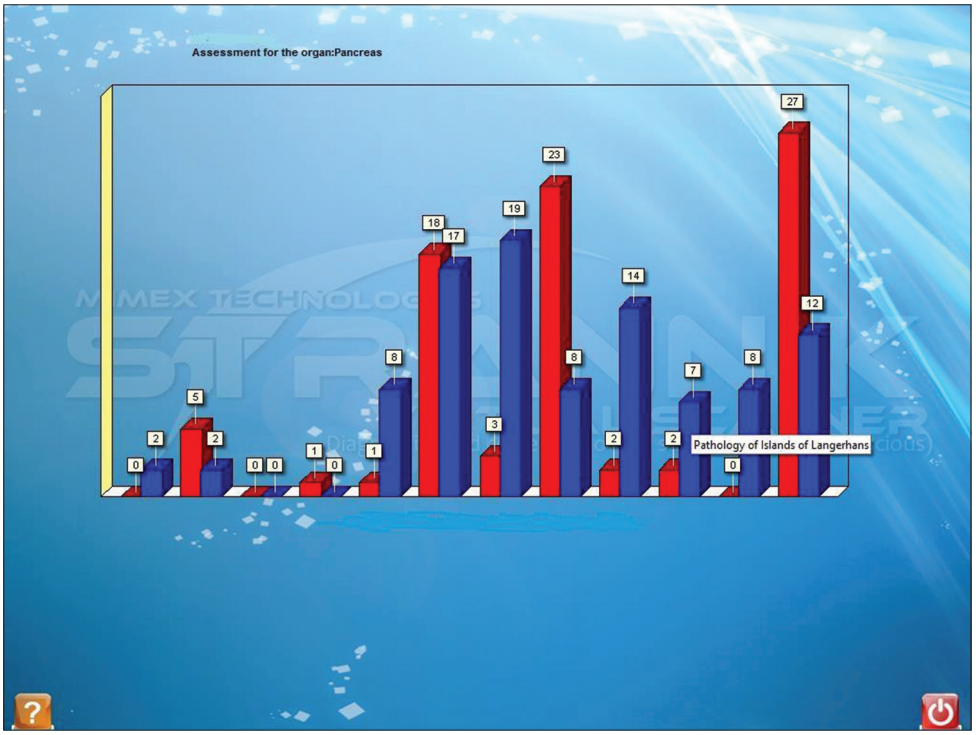

Figure 4: Example organ report/pancreas

that SVS is 2–23% more accurate than the range of diagnostic technologies against which it was compared and which were in use in the various clinical units. A report compiled at the behest of the Russian parliament THE DUMA by Vysochin *et al*. at the University of St Petersburg indicated that SVS was circa 21.4% more accurate, across a range of ca 30 pathologies, than the current range of medical techniques[41-48] which were available in medical clinics, thereby justifying the claim that it could determine the onset of pathologies from the presymptomatic level and that as a therapy it was 93.2% effective.[15,41]

Two recent studies, like all before, equivalent to how the technology would be used in a GP's consultation, reported how SVS was able to identify all known medical conditions in the patient cohort,[43,44] i.e., 100+% accuracy in 85%

of the patients (study groups: 20 and 58 patients). Of the remaining patients (15% of the study group) the patients did not disclose their health profile OR were unable to complete the test to MMHL's satisfaction, i.e., the results were effectively 100+% accurate in the 100% who complied with the study protocol. This data have now been incorporated into a meta-analysis of published and hitherto unpublished data.[40]

An extensive range of case studies documents how this technology has been used to diagnose[15,41-50] and treat[15,39,51-53] a wide range of medical conditions. Testimonials support claims that the technology has performed at a level which is more advanced than that of contemporary biomedicine and at a level which clearly illustrates patient satisfaction with the test results and therapeutic outcomes. An extensive range of articles which have been published in peer-reviewed medical journals (ca 75), conference presentations, book chapters, and books illustrates the scientific rationale for the technology.

Note 2: The full list of systems, organs, and pathological indications which can be detected by an SVS scan is available in the operating manual.[34]

The above report [Figure 4] indicates the onset of type 1 diabetes (2 units/blue/genetic) and type 2 diabetes (7 units/red/phenotype) although both are below the presymptomatic/symptomatic interface of 10 units.

Various "Strannik" observations have subsequently been confirmed by medical researchers, for example,

i. That depression often accompanies the onset of cardiac pathologies and that epilepsy and migraine have common genetic origins.
ii. The diagnostic conclusions arising from SVS tests are consistent with the results of other researchers.
iii. SVS has determined the onset of various medical conditions before they could be confirmed by other diagnostic tests, i.e., before they were subsequently confirmed by conventional tests, for example, the early-onset of pancreatic cancer in a lady who subsequently died, 1–2 years later, of pancreatic cancer.
iv. Conclusions made by Russian medical researchers indicate that the SVS technology is 2–23% more sensitive than contemporary diagnostic techniques and that the SLT (light therapy) is typically 75–96% effective. This is at the level which we could reasonably expect if, indeed, the technique is able to determine the onset of conditions from their pre-symptomatic origins and that, as claimed, it is based on a precise understanding of the mathematical relationship between color perception and pathological onset.
v. The technique has routinely been demonstrated on various occasions since 2003 to doctors and clinicians and almost always provides the expected results, even when used in non-ideal circumstances, and out with the conditions specified in the operating manual, i.e., the known medical indications which were not disclosed to us before the challenge.
vi. On several occasions, the results of the technique were challenged by medical doctors and/or by medical testing. SVS was proven to be correct and the medical diagnosis by the GP to be incorrect. On one occasion the patient obtained a compensatory payment for the GP's misdiagnosis of an ulcerative condition.
vii. The spectrum of pathologies identified by SVS re complex conditions such as migraine and Raynaud's phenomenon is consistent with known etiology.
viii. The observations made by SVS are theoretically sound, i.e., that it fills the criteria for a "mathematical model of the autonomic nervous system and physiological systems" and explains "the hitherto unresolved relationship between cognition and cellular and molecular biology" in particular between genotype and phenotype.
ix. SVS has been able to track the onset and progression of a "migraine" signal from its presymptomatic origins until eventually, the patient suffered from a migrainous event.
x. Delineate between a benign and malignant tumor.
xi. Determine the onset of conditions where there is not yet a satisfactory medical test, for example, Alzheimer's disease, pancreatic cancer, liver cirrhosis, and whiplash injury.
xii. SVS successfully predicted the occurrence of stroke – the test patient experienced a transient ischemic attack several months after his SVS consultation.

LIMITATIONS

SVS is a screening modality. Its intended purpose is to assist the patient or GP to make a precise

assessment of the patient's health. To do so, the GP may wish to submit tissue or fluid samples to corroborate the SVS test results.

SVS indicates the extent of a medical condition, bacterial, or viral infection on the body. It does not, in general, make an indication of a viral or bacterial infection, for example, influenza. It does, however, identify hepatitis, pleurisy, pneumonia, and herpes. It is not suitable for use in A ad E and maternity, i.e., by those who are pregnant or who are cognitively unable to complete the test, in particular, those who are too young (typically <7 years) or too old. It is not yet determined whether the test performs satisfactorily in a patient who has had an organ removed.

SLT is a neuromodulation-type technique. Its intended purpose is to enable the patient to improve their health. It treats "autonomic dysfunction," i.e., it acts on the neural mechanism by which the brain regulates the autonomic nervous system and physiological system and does not act on a specific medical condition. While SLT has been used with some successes to treat severely epileptic patients (see Case Studies), it is also recognized that extreme care should be taken when using SLT to treat such patients.

CASE STUDIES

Strannik has been used to screen and treat the health of over 1M patients since it was first evaluated[41] and approved for use by the Russian Health Authorities in 1999.

It has been used to treat a broad spectrum of over 30 categories of medical conditions, often achieving results which exceed that which has been possible using drugs.

We list the following example case reports arising from the use of SLT (the full list of case reports is available at www.montaguehealthcare.co.uk):

- Female, ca 35 y.o., suffering facial neuralgia or Trigeminal Neuralgia. In the 1st week of a course of SLT, she has advised that she is delighted with the progress which drastically reduced her pain.
- Female, 56 y.o., after effects of head trauma. She suffered from migraines and of taking anti-epilepsy medications and was depressed by the effect that her condition was having on the quality of her life and on the lives of her immediate family. After two modules of SLT she was, once again fit and well, happy and healthy, and no longer required medications.
- Female, 82 y.o., with migraines for many year contacted us following discussions with her GP daughter. During the third module of therapy, her migraine attacks ceased. She reported a reduced rate of occurrence and severity of migraines, improved vitality, and mobility. Her weight reduced by 5 kg during the course of SLT. In addition, she was scheduled for a knee replacement operation; however, she no longer suffered from pains in her knee and postponed the operation.
- Male, 54 y.o., disseminated/multiple sclerosis, 1st group of disablement; general weakness, shaky walk, moved only with the help of others, irritable, disturbed sleep, poor appetite, weight deficit, and depression. After the first course of SLT, he began walking unassisted, gained weight (2 kg in 1 month), had a good appetite and normal sleep. After the second course of SLT, he began doing simple work at home.[41]
- Patient, 60 years old neuritis of the facial nerve and the second branch of trifacial nerve (trigeminal neuralgia): Skin desensitization of the right side of the face, speech infringement, and headaches. After the fourth session of SLT speech improved, and at the end of the treatment course it was fully restored, headaches disappeared.[41]
- Female, 28 y.o., endometriosis/bleeding in the womb continuously for 8 months; hospitalized several times in gynecology department for the scrape of uterus plus hormonal treatment without any positive results. Her husband posed the question about divorce. Intense anemia, erythrocytes 2.8M SLT module for ovaries plus womb and appendages, two sessions daily: After several sessions, blood discharges started to thicken and stopped after the fourth session. Finished complete treatment, 3 months later her menstrual cycle stabilized/normalized.[41]
- Male, 62 y.o., extreme hypertension due to work stress had immediately been declared unfit to continue and retired from work. After a course of SLT, his blood pressure declined to a more normal 130/90.[32]
- Female, 60 y.o., 2–3 year-old without sleep following removal of a brain tumor. Her condition was emotionally unstable/tearful outbursts. Within 2 weeks of receiving her

first course of SLT she settled into regular sleep (she enquired whether it was reasonable to sleep for 12–14 h), health, and demeanor were greatly improved and sleep patterns normalized.[39]

- Female, 50 y.o., myocardious cardiosclerosis with arrhythmia. The SVS diagnosis including a previously unidentified calcium deficit was confirmed by available diagnostic tests. After a course of SLT and the microelements supplement the patient's heart rhythm disorders fully disappeared.[41]
- Male, 14 y.o. had been epileptic since 8 y.o. Clinical investigations identified the part of the brain responsible for epilepsy. He was sedated using medication every morning and evening.

SVS identified epilepsy. The patient commenced a course of SLT for module "brain" however at the first session an intense seizure occurred, ambulance called to the patient's home. Treatment continued with no further seizures/fits next module "spinal cord." After 2 months, during investigations, the part of the brain responsible for the epilepsy was found to be functioning normally. After a year the antiseizure medication was terminated, no headaches and no further seizures, leading an active normal life.[41]

DISCUSSION

This paper reviews the immense scope of technologies, in particular, the Strannik technology, which has been developed and/or which is planned, with the express purpose of disrupting health care.

The author's extensive bibliography has illustrated how such a technology was developed, the scientific basis for the technology, the precedents for a technology of this type, case studies which illustrate the scope of the technology, and proof-of-concept clinical studies (perhaps more aptly "in-market surveillance studies"), which illustrate how well the technology performs in the clinical context; and the shortcomings of the current biomedical approach to medicine, for example, that biomedicine is considered by some to be as little as 8% scientifically proven[54] that it treats the symptoms of disease rather than the fundamental causal mechanisms, and hence that NHS could, in future, be "overwhelmed" by people with long-term medical conditions.[55]

Mohanlall when discussing the SVS test results described it as "a great screening tool." He particularly focused on the SVS technology, developed by Igor Gennadyevich Grakov in a program of research which commenced at the University of Novosibirsk in the early 1980's, the launch of the first version of virtual scanner (Strannik) in 1997, and which culminated in the launch of the current version in the period 2003–2006.

Such a technology, based on an understanding the significance of bioluminescence emitted in the blood (the company BioAstral[56,57] secured a grant [estimated £2M] from the UK's Technology Strategy Board [the precursor of Innovate UK] to develop a screening technology based upon this phenomena), exceeds by far what many have considered possible e.g., PwC issued a report which outlined six areas where blockchain technologies could have a profound impact: Supply chain and inventory management, enrolment and provider data management, back office functions and payments, data management, managing risk and regulatory issues, research and development i.e., the report did not consider how blockchain- type technologies could influence diagnosis and/or treatment.

Idealism has to give way to a pragmatic assessment of what is possible and indeed what is likely if the Strannik technology was more widely accepted as a diagnostic and/or therapeutic modality. The ideal application of Strannik is at the beginning of the health-care process, screening patients and being used to reduce the effect of stress on the patient's health. If used in this role, we could reasonably expect that the flow of patients into health care would stabilize and thereafter steadily decline. On the other hand many patients – the ca 20–25% of patients who use up ca 70% of health-care resources, are at the stage when the most pragmatic approach is by drugs and/or surgery, i.e., they require a combination of approaches to combat their steadily deteriorating quality of life. They have spent a lifetime devoted to their self-indulgent lifestyles and practices, for example, smoking, which have led to their current state. If, their health was to improve it would only allow them to go back to what they know. So given this knowledge, we recognize that it may take a lifetime

to convert health care from the current allostatic approach (treating the symptoms using drugs which is the 3rd largest cause of mortality)[58] to a homeostatic approach (i.e., treating the causes).[59] The initial assessment of what is possible is based on the existing evidence-base which indicates the possibility to dramatically reduce the complexity and associated cost of identifying the health of the patient with SVS and then treating them with SLT. As a screening modality, SVS has the potential to reduce the flow of patients into the healthcare system – the patient can do their test and identify what is the matter with their health. This puts them in the position to make further research through the internet and to recognize whether they need to have a consultation with their GP. If the patient attends their GP, it puts the GP in the position where he can reduce the number of tests required to assess the health of the patient and reduce the number of referrals to secondary care. It is estimated that SVS could, for example, screen the health of 50M of the UK's 65M+ population for ca £3BN pa and significantly reduce the cost of managing a wide range of medical conditions.

Initial research has illustrated that SVS performs at a level which is 2–23% more accurate than the entire range of diagnostic tests which are used to determine the patient's health. This illustrates how the amount of medical testing could be significantly reduced – >50% of medical tests yield a negative test result and are used by the GP as part of their forensic investigations to rule out specific indications – and improved; and because SVS is an inexpensive screening modality it would be used to determine whether other expensive screening techniques should be used (e.g., an estimated 20% of MRI cardiac tests yield a negative test result).

Initial research has illustrated that SLT performs at a level which is 75–96% effective. As most drugs (with the exception of antibiotics) are ca 50% effective, this presents the opportunity to improve therapeutic outcomes and reduce the costs from biomedicine in particular re the management of lifestyle-related pathologies, perhaps significantly so.

Strannik meets the aims and objectives of a blockchain-type technology although not in the envisaged manner. Nevertheless, it is an ideal blockchain application. It can be accessed by any patient by PC or through the internet. It works as a decentralized network of nodes – linked to the central Strannik software – which access the system enabling the patient to provide information to the test, to generate the test data which is processed into the patient's health report which is then available for the patient or doctor to use to assess what is the matter and/or to treat the patient; or in conjunction with current diagnostic and therapeutic approaches.

Such a technology can be used by the patient, anonymously if necessary and independent of corporate or government control if required. There is no need for the patient's test results to be held on a centralized database unless the patient agrees. The patient's health data can be encrypted to preserve the patient's request for privacy.

ACKNOWLEDGMENTS

The author recognizes the contribution of the many researchers who through their research have made this article possible, in particular, Dr. Igor Gennadyevich Grakov, developer of the Strannik technology; and encouragement by Dr. Syed Hasan Parvez, and others.

CONFLICTS OF INTEREST

The company Mimex Montague Healthcare, its CEO and author of this paper, is privately funded without the involvement of any outside parties. Mimex Montague Healthcare is a company which is devoted to the commercialization of Strannik technology.

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