

A mainstay of preventive medicine innovators and medical futurists has been the concept of Longevity Escape Velocity (LEV). LEV represents the time at which someone is gaining greater than 1 year of predicted healthy life expectancy per year; essentially making their healthy life expectancy unlimited. Whilst futuristic, over the past decade, leading innovators in the field have predicted persons reaching LEV soon. Human Longevity Inc., headed by Craig Venter, Peter Diamandis and Robert Hariri frequently claim their goal is to make “100 the new 60” by 2025; the Methuselah Foundation “want to create a world where 90 year olds can be as healthy as 50 year olds by 2030”; whilst Ray Kurzweil predicts that one LEV “will be reached” by 2029, two, baby boomers will still be alive and healthy in 2100 and three, that in 2017 he personally has already reached LEV.

But practically, what are the likely requirements to reach such a “Longevity Escape Velocity”? Around 95% of medical service budgets today are spent on acute medicine, with only around 5% on preventive care. How can today’s medicine adapt to bring around a care system that provides LEV on a population scale? Here I outline 5 core strategies for “LEV Medicine”, a new paradigm of medical care.

*LEV Medicine: The medical specialty focused on measuring, achieving and maintaining a persons’ longevity escape velocity (LEV) through using diverse measurements and therapies to maximally reduce all-cause-mortality and aging pathology and processes.*

#### 1) Creation of an LEV Medical Specialty & training of healthcare professionals

To help patients achieve and maintain LEV, medical knowledge is required from diverse medical specialties and from outside specialties typically practised by doctors. General Practice (also known as primary care or family medicine) is the current specialty with the most similarity to LEV medicine, however it lacks in knowledge in many key areas, as well as in availability of time.

An LEV medical specialty could be a subspecialty training of General Practice, Internal Medicine, Geriatrics or Clinical Research.

Core elements of an LEV medical speciality training would include education in: prioritisation of clinical problems according to magnitude and probability of clinical

outcome or surrogate marker impact to a specific person's budget; understanding clinical biogerontology frameworks including pathology (SENS) and processes (Lopez-Otin Hallmarks of Aging) and the associated markers and current state of therapies and clinical or research access to these; nutriogerontology, in particularly managing and monitoring safety and efficacy of calorie restriction optimal nutrition diets as well as optimising micro and macronutrient intakes to reduce all cause mortality; concordance, motivational interviewing and behaviour change; experimental medicine methodologies including accessing clinical trials and off-label prescribing of pharmaceuticals with potential promise for impact on aging such as metformin, acarbose, rapamycin; as well as ensuring an optimal response to any emergency situation – including training in best practices and the science of whole body or neuro-only cryopreservation; to name but a few.

## 2) Better calculations of a person's LEV

How can LEV be measured accurately? Initial models are needed that take into account a minimum number of quality measurements across broad clinical outcomes and frameworks of aging (such as SENS and Lopez-Otin Hallmarks of Aging). Optimal ranges for clinical outcomes can be established for diverse markers and used to create an effective “biological age” for individual organs or systemic aging pathologies. Combined with current best risk prediction calculators for broad sets of diseases as well as a current annual “coefficient of baseline gain in life expectancy” due to current innovation rates (of which Ray Kurzweil believes was 0.25 in 2016), and taking into account a qualitative measure of a person's financial budget, motivation and “LEV related education”, a client's LEV can be determined to fall within a certain range.

## 3) New guidelines for LEV medicine

Whilst gold standard medical guidelines such as the UK's NICE Guidelines are very high quality and should be used in LEV Medicine, such guidelines are not designed for systematically assessing and maximally reducing all-cause mortality risk, do not have a current broad coverage of preventive medicine topics, are designed around a budget of around £400 per QALY (median) and £10,000 - £10,000 per QALY (maximum) expenditure –

not taking into account private services that can spend beyond this, and have high cut off requirements for efficacy evidence – which may not be beneficial in LEV Medicine.

#### 4) Appreciation of Emergency Medicine for achieving LEV

A patient's ability to respond optimally to all emergency situations is an under-looked component of preventive medicine (i.e. preventing an unoptimal response and care pathway in emergency medical situations through planning, training, appropriate equipment purchase or healthcare system service availability). A patient's emergency medical risk should be systematically assessed as part of LEV medicine, including personal emergency medical knowledge, geographic emergency medical service availability and performance metrics, medical emergency equipment owned or accessible, and whole body or neuro cryopreservation services.

#### 5) A culture of 100% effective capture and open-sourcing of all data from all patients

Research is paramount to accelerate the generation of evidence of efficacy and safety of new measurements, therapies and clinical pathways that are relevant to LEV. A core element of LEV medicine should be that any novel practice across any aspect of LEV medicine, be it a new annual screening panel, an off label pharmaceutical, an experimental stem cell or gene therapy, or new diet or nutraceutical combination, should be part of a formal registry, with all data captured and published open-access, and ideally collated to a central LEV society or organisation for analysis, methodological and ethical critique and distribution to parties that may benefit. For example, what proportion of potentially useful surrogate marker or clinical outcomes data is captured, collated and distributed from the proportion of people globally experimenting with novel therapies nutritional supplements (such as nicotinamide riboside or complex personalised stacks of nutraceuticals), pharmaceuticals (such as low dose rapamycin, metformin or acarbose), advanced therapies (such as placental tissue mesenchymal stem cells or AAV myostatin gene therapy) etc? It is likely under 0.01%; global standards to capture such data usefully – such as via guidelines for basic experimental protocol for each novel intervention and patient-opt in registries – could have ensured perhaps 1,000 or 10,000 times more data on all novel practices to date, providing benefits for everyone. People should have the right to

experiment, but it is much, much better if they experiment according to a minimum scientific protocol and have the opportunity to measure for efficacy and safety before and after with high-quality markers or be followed up on a registry for clinical outcomes. LEV medicine, or even all healthcare professionals should be trained with appropriate guidelines to ensure this and incentives for experimenters aligned such as through rewarding with results, resources or fiat or cryptocurrency.

In conclusion, the current medical specialty framework does not accommodate well for medical care that would provide persons with maximum LEV outcomes. How does society transition to an LEV focused one? (and this becomes increasingly important as new aging therapies become available and economically lucrative.) Might a new medical specialty and paradigm of medicine founded on the tenets above achieve this?

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#### **Disclosure of interests**

Oliver Zolman is a medical student at King's College London Medical School, England, and CEO & Founder of 20one Clinic Limited, a medical organisation focused on transitioning society to an LEV focused one through providing clinical services to achieve LEV and through open-sourcing its results, methods, knowledge, services and guidelines.