The Ageing Pilot: A New Paradigm

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Introduction

- **Emergency medicine > 15 years**
  - Consequential medicine
- **Aerospace Medicine > 15 years**
  - 85% lost medicals – preventable disease
  - Lifestyle risk factors present > 20 years before grounding
- **Preventive medicine > 10 years**
  - Behavioural approach, coaching, gradual
  - Cognitive Simulator Training
  - Partnering with professional coach Eric MacIntosh
Some beginning thoughts...

- I’m slowing down
- I keep gaining weight as I get older
- I’m not as strong as I used to be
- My memory isn’t good anymore
- My body is aching
- I’m getting too old for this…
- I don’t buy green banana’s anymore
- I’m getting older (I am helpless)
A Paradigm of Ageing

• The human lifespan is increasing
• The burden of absolute morbidity increasing
• Ageing is irreversible and genetic
• There is nothing the individual can do
• We need more cures for disease and ageing
• Drug/therapy/genetic manipulation will be discovered for each and every condition of disease and ageing eventually
• These will ultimately be cost-effective and available to everyone
Are we really living longer?

Human Survival 1900-1975: Accurate Median Survival Data
In search of Shangri-La!

- Vilacamba, Ecuador 1979
- Actual vs. Stated Age
- As stated age increases…
- Actual age increased slower!
- Social, political power, influence
- Abkhazians (Ural), Hunza (Pakistan)
- Low daily calorie intake, vigorous activity @ altitude, no retirement!

Rectangularization of survival

- Rats live 300-600 days
- Survival changes as infection, predation and trauma decreased
- Free access to food... rats die @ 800 days
- How can you make rats live until 1200?
**TABLE 4-3.**
Maximum Doubling Numbers and Maximum Species Life Span

<table>
<thead>
<tr>
<th>Species</th>
<th>Maximum life span (years)</th>
<th>Maximum doubling number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Galapagos tortoise</td>
<td>175</td>
<td>125</td>
</tr>
<tr>
<td>Man</td>
<td>110</td>
<td>60</td>
</tr>
<tr>
<td>Horse</td>
<td>46</td>
<td>82</td>
</tr>
<tr>
<td>Chicken</td>
<td>30</td>
<td>35</td>
</tr>
<tr>
<td>Cat</td>
<td>28</td>
<td>92</td>
</tr>
<tr>
<td>Kangaroo</td>
<td>16</td>
<td>46</td>
</tr>
<tr>
<td>Mink</td>
<td>10</td>
<td>34</td>
</tr>
<tr>
<td>Mouse</td>
<td>4</td>
<td>28</td>
</tr>
</tbody>
</table>

Decline in Function

- Genetically determined vitality until age 40
- Age @ progeny reproducible age
- No selective pressure to preserve
- Gradual decline in organ reserve
- When demand exceeds supply, infirmity (relative) or death (absolute) ensues
- NB The slope of the curve is modifiable through lifestyle change
Homeostasis = Inherent Stability

- As individual organ reserve declines…
- Overall organism survivability declines
- When organism homeostasis is compromised, death ensues
- Expand capacity of all organ systems = longevity
- Turn on your latent genes!
Frailty & Natural Death
Reducing Premature Disease?

- 19th Century witnessed dramatic decline in TB death rate/100,000
- When was Streptomycin first made available?
- Why the decline?
- Nutrition, hygiene, infection control, sanatoriums
- Prevention, public health and host factors
The New Epidemic: Chronic Disease

- During the 19th century, death was due to infection, the first epidemic
- Life expectancy @ birth went from 49 years to 76 years
- Chronic disease replaced infectious disease
- 1977 Gruenberg published “The Failures of Success”
- Infections killed, chronic diseases lingered $$$
Vitality or Infirmity?

![Diagram showing the relationship between age and various health conditions leading to death. The diagram illustrates the progression of subclinical disease to severe symptoms and eventually to death. Conditions such as transient ischemic attacks, angina pectoris, intermittent claudication, abnormal arteriogram, high blood pressure, and elevated cholesterol are shown on the y-axis, with age (years) on the x-axis. The lines indicate two courses: insidious incremental and catastrophic (probabilistic).]
Changing the slope of the curve

Premature death

Natural Death

Diagram showing stages of disease progression:
- **Threshold**
- **Subclinical Disease**
- **Symptoms**
- **Severe Symptoms**
- **Prevented**
- **Original**
- **Death**

X-axis: 20, 40, 60, 80
Y-axis: Threshold, Subclinical Disease, Symptoms, Severe Symptoms, Prevented, Original, Death
The Cure for the Second Epidemic?

Compress morbidity against the 85 year life span!

Fries & Crapo, Compression of Morbidity, Vitality & Ageing, 1981
Where is the Evidence?

- The Pennsylvania Study, NEJM 1998
  - 1741 university alumni
  - High, mod and low risk based on smoking, BMI and exercise patterns
  - Disability measured by Health Assessment Questionnaire (HAQ)
  - Midlife and late adulthood lifestyle predicts subsequent disability
Evidence of Delayed Disability

Progression of Disability By Age

Fries JF et. al. NEJM 338:1035-1041 (April 9), 1998
Changing Life-Expectancy

Infectious diseases eradicated

Chronic diseases
Natural Aging
The Perfect Life: Vitality & Brief Infirmity
The Problem

- 19th Century infectious diseases largely controlled by vaccination and public health.
- 20th Century diseases increasingly manageable by medical/surgical/genetic Rx.
- 21st Century will see chronic universal diseases of the old and the very old.

WHAT CAN WE OFFER THE PATIENT?
FIGURE 9-3.
Improvement of fluid intelligence in two groups (average age, 70 years). (Redrawn with permission from J. K. Plemons, S. L. Willis, and P. B. Baltes, *Journal of Gerontology* 1978, 33:224–231.)
The Plasticity of Ageing!

- Passive ageing results in linear senescence.
- Stimulating a constellation of latent genes through nutrition, fitness, stress and health management = SHALLOW GLIDE SLOPE = ENDURANCE.
- We need to challenge all assumptions and talk of ageing as non-modifiable.
- Evidence-based, behavioural approaches.
Old Paradigm of Ageing

- The human lifespan is increasing
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- There is a drug/therapy/genetic manipulation that will be discovered for each and every condition of disease and age
A New Paradigm of Ageing

- The Human Life Span is Fixed (85 years)
- Vitality is genetically assured until 40 years
- After 40, sloth, gluttony and excess \( \uparrow \) slope
- Optimizing lifestyle \( \downarrow \) slope
- Lifestyle determines vitality & infirmity = ACTIVE PATIENT PARTICIPATION
- Lifestyle depends upon personal efficacy
- You can toggle the switch of your latent genes!
- This will require behavioural methods (psycho-social re-engineering)
Observations of Longevity

- **Nutrition**
  - Composition (colourful, natural, complex)
  - Behaviour (satisfied not full, IFR not VFR)
  - Longevity (Calorie reduction, adaptation)

- **Fitness**
  - 3-legged stool: Endurance; Flexibility; Strength
  - Daily activity; enjoyable; social; immediate Vitality

- **Stress**
  - Rest; relax; contemplate/meditate/pray
  - Reduce frenzy; play; retain purpose & meaning

- **Health & Environment**
  - Smoking, obesity, BP, lipids, diabetes, cancer, heart, stroke, arthritis, dementia, helplessness
Some closing thoughts...

- I was slowing down but now I exercise and feel #1
- I stopped gaining weight by eating consciously
- I’m getting stronger since I started weight lifting
- My memory is improving ever since I started running and practicing concentration
- My joints stopped aching when I started training
- I’m 70 years old but my body and mind feels 40!
- I only buy organic green banana’s!