

The Health System Quartet: Four basic systems—cure, care, heal and deal—to foster the co-production of sustained health

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1 Introduction

The development of life on Earth was an emergent process, which is called evolution. If evolution is the natural process of development, we ought to ask the question how we can harness emergent properties for health care policy and practice. The theory of Complex Adaptive Systems (CAS) provides tools to understand the features of this question.

Millions of years ago life began, developed and sustained itself without human interventions. It is only for the past 200 years, with Semmelweis seen as a founding father, that medical sciences were developed, mainly focusing on pathology and cure. It is curious that almost at the same time Darwin launched the theory of evolution, however, medicine hardly learned anything from it for use in the health sciences, while evolution resulted in the features of growth, maintenance and recovery.

Our observations demand us to think about how to harness the intrinsic features of health, in particular our self-healing capacities, back into the health care system. Positive support of biological, mental and behavioural characteristics is rapidly gaining in importance to restore health and to make health systems sustainable.

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A better insight in the possible use of the self-healing potential of human beings can facilitate the emergence of a more ecological approach to health and healthcare. Like the wind and the sun can help us with energy transition, the energy of life and wellbeing are important sources to sustain health. Utilizing resources without using them up—the principle approach to ecological management—is the basis for an ecological approach to health, and as a consequence, the sustainability of healthcare systems. This idea resonates with the call for the adaptation of systems thinking in public health [1], in medical sciences (e.g. [2, 3]), and in policy making more general [4].

Life, health, evolution, biology, neurology, behaviour, social systems, culture, economy, management, organization, communication, amongst others, are normally studied trying to isolate cause response relations.

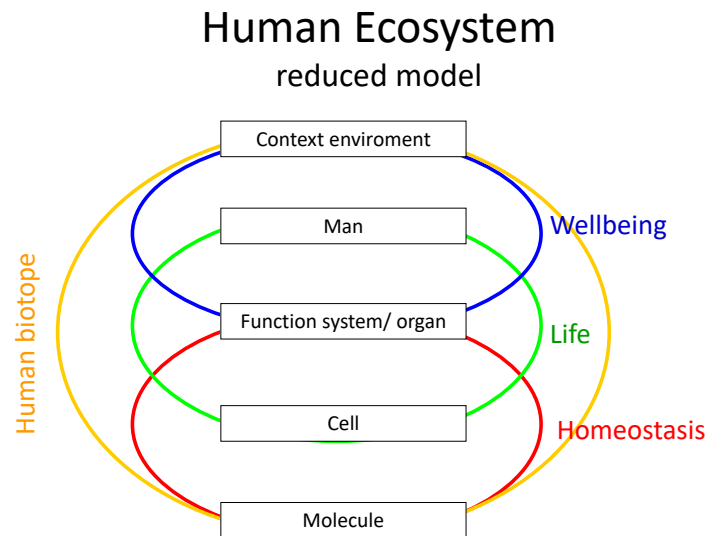
When agents in an open system are sensitive to external influences and interact with each other over time, relationships become complex and this is typically the case in matters of health and disease. For instance, Friel *et. al.* showed that the dietary behaviour of neighbourhood residents might depend on local availability of healthy food choices, while the choice of available foods in shops depends on the buying behaviour of the same people. In a complex adaptive system (CAS) the aforementioned interaction (or feedback loop) between agents over time results in agents adopting new properties, i.e. systems become emergent. This way of thinking helps to distinguish between the multidimensional aspects of health, and their single dimensional representations in disease, which is crucial to advance our understanding of health and disease.

Thereby, the term "complex adaptive system" refers to a system that emerges over time into a coherent form, and adapts and organizes itself without any singular entity deliberately managing or controlling it [6]. These complex relationships can be seen at all possible levels and scales: global, national and local policy, the health care system, two or more people dealing with each other, a person dealing with his health (problem/s), the immune system, homeostasis, the functioning of a cell and more. Systems and scaling in CAS are bottom up self-organizing and self-balancing dynamic processes, adaptive at all scale levels. The adaptivity makes a positive development manageable by conditions like nourish, challenge and support.

Modelling is a powerful tool to understand the agents and their possible interactions within a CAS. Understanding the current behaviour of a CAS allows one to develop different scenarios of changed agent configuration or interactions and evaluate these changes on the system as a whole. Comparing different scenarios allows one to find patterns of successful system change. It is the means of understanding "emergent practice" [1].

The central thrust of this chapter is that applying CAS understandings to human health, medicine, public health and healthcare systems is needed to better understand the processes of health and disease, and it ultimately will help to improve the functioning of our healthcare systems. Notwithstanding leading health scientists have made the case for CAS in health research (e.g. [2, 3, 7]), however, the consequences of CAS based health knowledge for the functioning of medicine and healthcare more generally remains poorly understood. Thinking in terms of CAS

Fig. 1: The human ecosystem is horizontally and vertically integrated



will require the rethinking of the cure and care dominated healthcare systems. We will argue that it will be the driver for a so called heal and deal support system that complements the existing cure and care ones: *the health systems quartet*.

2 Human Health as a CAS

Let us look after a human being in another way than usual. One is familiar with the different levels of the human body's structure, such as the molecule level, the cell level, the organ system level, the human as a whole level, and the context in which the person resides, and which influences his health. Normally we are looking after horizontal relationships within these levels, like cells in a tissue (e.g. cells of the immune system). Only recently did we start to look after the processes between the different levels—how they are interrelated. Figure 1 provides a simplified schematic overview how human health functions as a whole across different levels. In this model five horizontal levels are used—molecule, cell, functional system/organ, man, context/environment. These levels are functionally integrated vertically.

The core of the system consists of molecular agents that create the functional systems around the cell and ensure *homeostasis*. Around the functional system of cells and the man as a whole arises the living system or *life*. The man living in his context and interrelated systems results in *wellbeing*. Homeostasis, life and wellbeing, together forming the human biotope, are dynamic systems. Whereas the component

levels behave as adaptive agents, working together they entail the complex adaptive system of health.

Can it be helpful to see a human's health as a CAS to be able to improve his/her health? Recently a published obesity study showed a relationship between cellular fat content (cell level), exercise, food intake and individual rates of metabolism (function system level), and the microbiome and gene expression (molecule level) on wellbeing [8, 9]. This study demonstrated that metabolic change occurred within physically active children resulting in the formation of easily burnable brown fat instead of structural, metabolically inactive white fat. Changes solely focused on one factor without taking account of others, this factor had little impact on overall weight control. The authors concluded that insight from self-organizing systems theory can be helpful to solve the obesity problem.

Within this theory, all the different factors and their interrelationships behave like agents and are adaptive. As such, the problem of obesity could be approached as a CAS problem—including all identifiable factors into a system model could identify which ones are dominant, and which ones are easiest to influence to reduce being overweight and to help maintaining a steady normal weight. Then, the objective is no longer the fight against obesity as a risk factor, but to create a system that maintains optimal body weight. It could be that improving self-respect and wellbeing are the key for the majority of people, whereas the few with a "lazy metabolism" or an "unfavourable gene expression" require more specific treatments. Behavior in the system "wellbeing" will play an important role as a conductor of the underlying systems [10]. Let us next have a look at the role of acting and adapting human behaviour and wellbeing in CAS.

2.1 The Evolving Human Role

During the WHO Alma Ata conference (1978) one of the turning points in health policy was the acknowledgement of the role of human beings in the health care system. No longer only an object requiring good practice approaches, attention shifted to their participation in the health care system. In the Alma Ata Declaration this participation mainly concerned the emancipatory role arising from the democratisation of the system—active participation in health care, recognising that health is a human right, and the importance of lay care for health, well-being and system sustainability.

Ten years later during the WHO Adelaide Conference on Healthy Public Policy (Adelaide Recommendations [11]) the Director General Mahler underlined the importance of participation, by mentioning the parable of the chicken and the pig discussing a joint venture to start a ham and egg restaurant. The pig suddenly became alert and said to the chicken: "for you it is only participation, but for me it will be total involvement". Humans are constantly involved in their health responding to their biological, emotional, cognitive and behavioural experiences [12, 13].

At that time there was a strong belief that achieving best possible health would be achieved by identifying disease conditions and for the health system to provide necessary services to control or cure them. In that view people with health problems were mainly seen as victims of their biological systems that had failed them. Health policy makers were left behind—the emancipation movement had caught on and people were willing and able to manage their own lives. Nothing much has changed; in 2018 we still have ethical problems dealing with the tension of policy being responsible to protect human health as much as possible whilst at the same time recognising the importance of individuals having a right to make—albeit at times poor—decisions for themselves. Respecting the human right for health includes both people having the right to be protected as well as being respected in their autonomy. Recognising this duality can help to bridge the gap between both sides with an open mind.

Thirty years ago human behaviour was mainly seen through medical eyes—one mainly saw what was going wrong. The relationship between behaviour and conditions/diseases became an area of do's and don'ts. This is an impediment to recognising "the human spirit" as a positive resource for health. The change in appreciation can be exemplified in relation to sport—initially sport was highly suspected to be a potential cause of injuries, today we recognise the importance of sport as a resource for health even in those with severe and disabling conditions and the frail.

The positive appreciation of human behaviour deserves more attention. Basically, humans are competent to manage their own lives, including their health. Through their essential involvement they are natural partners; people are no longer only "consumers of health care services" but should be regarded more and more as the co-producers of their own health. Self-determined people develop their commitment and skills to become as independent as possible. Not at least this is facilitated by the digitalisation of society as manifested in web-based information, e-health applications and social media. Thereby, empowering people's competence is a major goal.

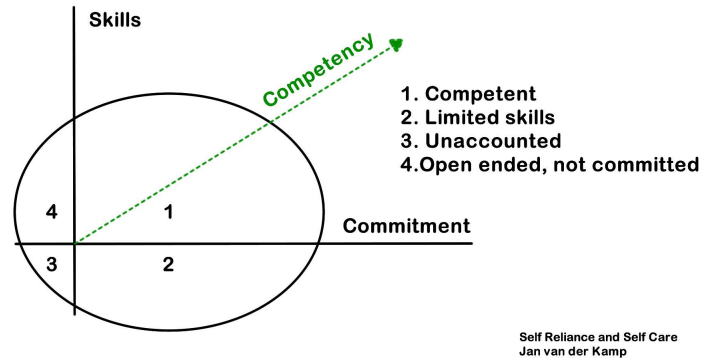
2.2 Competence

It is clear that not everybody is equally competent at managing their own health [14]. And even when they are, it is far from self-evident that people will manage their own health in a societal context that incites them to behave unhealthily. Starting from their existing competence, most people can improve their skills, self-reliance and commitment to look after themselves. However, there are also groups that will need more specific approaches to engage them in their own healthcare.

Figure 2 depicts the possible combinations of levels/lack of commitment and available skills, the intersection between the two indicating the level of competence for self-care [14]. Strengthening self-care competence will vary for each of the four segments:

Fig. 2: Enhancing people's health competence

Empowering Competency



1. People, with an ordinary level of skills and commitment (segment 1), can maintain/enhance their competence by both maintaining/increasing their commitment and available skills for self-care.
2. People, committed but with a lack of skills and an inability to develop them will need a additional (individual) service (segment 2). Many adolescents belong to this group.
3. People with neither the skills nor the commitment to look after their own health (segment 3) will require special individualised help to increase their skills and commitment for self-care. This group often has "multiple—congenital and/or acquired—problems".
4. People who have the skills but no commitment to look after their own health (segment 4), will require professional help to change their attitudes towards a more appropriate balance between personal and professional health care expectations. They exhibit the typical behaviour of "free riding", i.e. they demand that health professionals and society will come to their help and fix their illnesses when they occur

3 A New Era in Health Care?

If people are considered competent to manage their own health, healthcare needs to adapt accordingly opening up a whole array of innovative health interventions. The traditional way of healthcare professionals providing cure and care services

and patients consuming those services does not fit any more. People and/or patients co-produce their own health, being actively involved in their own treatment, which would require the transformation of professionals' expertise, and ultimately the nature of employed interventions [15].

This latter point can be illustrated by the management of intermittent claudication. Traditionally, this was a choice between surgery and angioplasty. Nowadays walking exercises are the preferred approach, stimulating the production of collaterals resulting in symptom reversal [16]. Both, surgical interventions and simple walking exercises have one aspect in common—both achieve recovery. Whereas the former is "high-tech" and requires a highly trained surgeons, the latter is "low-tech" and merely requires commitment, as well as social network pressures, either positive or negative, to "co-produced one's own recovery".

Similarly, evidence is emerging that the treatment of non-insulin dependent (type 2) diabetes by lifestyle modification can achieve full recovery in most patients [17]. Lastly, physiotherapy achieves low back pain resolution in most patients, and physiotherapists teaching patient-specific exercise programmes can prevent most recurrences [18].

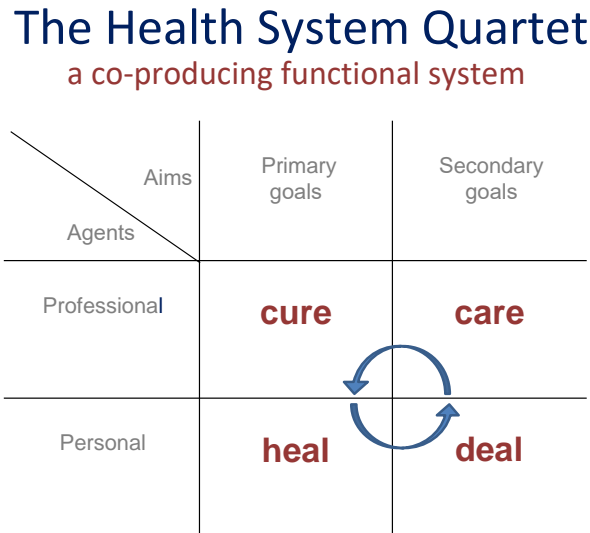
Facilitating the conditions to heal, with or without full recovery, requires a professional support system. In addition to professional care, people help themselves and each other by learning to cope (*deal*) and recover (*heal*) or to adapt to disability (*deal*). Finding a balance between relative dependence and independence is an ongoing process, however, the skills to expose patients to the possibilities of healing and dealing remain underdeveloped. The latter begs for attention—especially given the unsustainability of most healthcare systems worldwide. When people can better rely on themselves and keep themselves more fit, they will consume less cure and care services.

4 The Health System Quartet

Given the relevance and urgency of heal and deal, it is now timely to explore and operationalise the relationships and interactions with the professional-led cure and care systems. The latter are well described in the literature. In its simplest form we conceptualise cure as professional-led causal interventions aiming at the full recovery from a problem, e.g. reducing and fixating a broken leg. The care system entails professional-led services aiming at the care for people recovering from curative interventions or for whom cure is no longer possible to overcome a problem, e.g. home nursing, running therapy or activities-of-daily-living support. On the other hand, prevention can entail professional-led interventions to remove or ease risk factors that have the potential to ultimately result in disease requiring cure and care system interventions.

Professional-led cure and care are developed on the basis of scientific methodologies and are continuously under development. Interventions are discovered by causal relationships and statistical significance. The direction of the action is causal.

Fig. 3: The Health System Quartet



The person-led *heal* and *deal* systems are of a very different nature. In line with complexity science thinking both can be considered as self-organising. The co-evolving processes within these systems can result in growth, development, learning, resilience and recovery. Desired outcomes are more difficult to achieve than those within the cure and care systems. Based on the principles of complex adaptive systems, heal and deal are *autonomous*, *sensitive to initial conditions* and *attractors*. A better understanding of the "dynamic causes" of heal and deal conditions is crucial to enable health professionals to steer patients towards their desired outcomes.

The delivery of relational services incorporating positive feedback will benefit the majority of patients by enabling them to act as co-producers of health. Here health care providers and patients behave like adaptive agents, and the focus thus is on better understanding their interactions and their emergent potentials. Put differently, how can we—as health professionals—mobilize the huge potential of biological and mental properties inherent in every individual to enhance "their ability to adapt and to self-manage" [19]?

Both acute and time-limited conditions as well as chronic diseases can be studied within this model. More importantly, it provides the conceptual basis for shifting the focus to **health** rather than disease, as one key lever to more sustainable healthcare systems and healthier societies in general. Supportive professionals' coaching and enabling will help patients to better use their *heal* and *deal* abilities and to become healthier as well as easing current pressures on our healthcare systems.

Paying attention to the dynamics of healthcare delivery within the framework of the Health Quartet has society wide implications—it will achieve better health and

lower the burden of care on health professionals and it will make health systems more effective, more efficient and also more sustainable.

To illustrate this point consider a person who had a car accident. The surgeon can *cure* the fractures and allow the patient to let his wounds heal. Rehabilitation services provide *care* during the recovery phase, but the patient has to *deal* with the ongoing consequences like the need to adapt to a stiff leg. The patient becomes independent again after dealing with his physical and mental shock—only then has he managed to *heal* as a person.

Until now health professional intervention predominantly focuses on physical cure, care and recovery. Giving greater attention to the personal participation in care and developing greater coping capacities by dealing with the person's illness allows the emergence of true healing. Making this process explicit will allow the person to enhance his recovery.

5 Discussion

The ideas outlined in the Health Quartet will not be realized overnight. They will result from studying possibilities that appear achievable. This can be seen as "trend watching", i.e. placing a point at the horizon for orientation guiding the direction to search for solutions. The reality is that progress can only be made step by step. We regard as important those initiatives that focus on wellbeing, positive health and system approaches that promote personal health development. The focus on personal growth might show more success and sustainability for health than—still prevailing—approaches to behaviour change based on "do's and don'ts". Nevertheless, there always will be specific cases in which to demand a patient to change his/her attitudes and approach to his/her care.

The dynamic processes between behaviour, mind and biology are continually evolving, preferably in such a way that they are mutually reinforcing. Positive support by health professionals will enhance these dynamics in a positive way and reflects the human relational level for self-sustainability.

Adaptive and self-organizing learning makes growth possible. The relationships in the figure show the evolving processes which—hopefully—will be recognized by practitioners and policy makers in due course as they are requirements for keeping the health system affordable. Only awareness strives for a fit. Think of a string quartet—the beauty emerges from co-adaptive self-organization.

The output of professional interventions can lead to sustainable outcomes by positive co-operation amongst behaviour, biology and mind amongst co-productive people. This positive co-operation will become increasingly important to make health systems effective and sustainable. In the Netherlands we see positive developments exemplified by "Buurtzorg", "Institute for Positive Health", "Immunowell" and the dynamic description of "Health as the ability to adapt and to self-manage". The co-adaptive self-organizing synergy is promising better health and the sustainability of the health system.

In this paper wellbeing and behavior were the focus. As a next step we want to include mental health, biological health and the environment in this framework. We believe that this not only will sustain personal health but also has the potential to substitute professional level care with personal level self-care and personal growth. This outcome can be expected when health professionals not only provide best possible curative interventions but simultaneously act as change agents to facilitate their patients to *heal*. As part of a system where self-confidence and competence can grow substitution between professional and self-care may be expected.

6 Conclusions

The natural healing capacity and the ability of people to adapt and to self-manage should be given a much greater prominence in the healthcare system. The initiatives for this deserve systematic attention in research, policy and practice. Be it that the functions *cure*, *care*, *heal* and *deal*, being partly independent, when acting together can provide added value (emergence) to patient care and health system organization—the Health System Quartet offers a coherent framework for such an endeavour. In practice, a relative contribution of the four functions will always be weighed, which can be adjusted in the course of a treatment. The promise is that it will relieve the pressures on healthcare systems as people will better use their own abilities, arguably leading to less healthcare use, and thus contributing to the imperative of making our healthcare systems more person-centred, equitable and sustainable [20].

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The Transformative Aspects of this Study

The chapter proposes the juxtaposition of "heal and deal" next to the existing "cure and care" based focus of healthcare systems. In its simplicity, it unifies key dynamics within health policy for the future sustainability of healthcare: (1) the focus on prevention and health promotion, (2) more integrated and holistic approaches towards health and disease, and (3) the empowerment of people and patients.

TAKE HOME MESSAGE

- The health care system's *Cure* and *Care* focus can cooperate with people's agency to *Deal* with their biological and mental dynamics to *Heal*.

- The interactions of Cure, Care, Deal and Heal are at the heart of the **Health Systems Quartet**, a framework to form a simple basis for the complex transdisciplinary approaches to achieve "health".
- It opens a new perspective for sustainable health policy, health system organization and health praxis.
- The intrinsic emerging powers of life and wellbeing have a huge potential to guide health system redesign.

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