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COMMENTARY

Continuity of care: A systems-based approach

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Abstract: Continuity of care is still a poorly conceptualized construct – on the one hand it is understood as the process of ongoing care, on the other it has been seen in the broad context of an outcome of care. Both notions rightly coexist, and it is proposed that both views can be reconciled through a systems-based approach. This paper describes the development of a 'continuity of care system' and shows the potential of the model to better understanding the provision of medical care.

Key words: complexity, continuity of care, system approach.

Introduction

Despite more than 25 years of research, confusion remains about the definition and clinical importance of continuity of care.[1] The present paper traces the conceptual developments of continuity of care, before proposing a framework that unifies the various aspects emphasized through a systems approach.

Historical perspectives – a linear model of continuity of care

In 1975 Geyman,[2] Hansen,[3] Hennen,[4] and McWhinney[5] were the first to systematically explore the concept of continuity of care. Important aspects in their descriptions included:

- first contact care and care for any disease
- an ongoing or longitudinal relationship between patient and doctor, the resulting 'contractual' responsibilities, and the depth of knowledge gained by both parties from the relationship
- appropriateness and integration of care in the context of the patient, seen as a whole, being accurately recorded in the medical record, and;
- the family as the unit of care.

Theoretical frameworks of continuity of care

The first conceptual framework of continuity was built on a dimensional construct. Hennen described *'4 dimensions of the act of providing continuity'*: the chronological, geographic, interdisciplinary, and interpersonal.[4] Rogers and Curtis expanded it in 1980 by adding the informational, accessibility and stability dimensions (Table 1).[6]

In addition, emphasis was placed on the interrelationships of the components of continuity of care. Hansen observed that the interactions within the consultation, through 'continuity of the patient-professional relationship', affected the 'desired outcome' of patient care.[3] Wall reiterated the central role of the medical encounter, but stressed the importance of understanding the doctor and the patient as distinct factors influencing the consultation, noting that the encounter influences the doctor and the patient as individuals, and thereby impacting on their relationship in the next encounter.[7]

Hjortdahl formally introduced the concept of 'quality of care' as another element into the framework.[8] He hypothesized that provider continuity through a series of intermediary steps would determine the quality of care provided/received. The first intermediary step is a provider's knowledge and sense of responsibility for the patient, leading to appropriate resource use, improved compliance and satisfaction with the treatment. The influence of continuity of care can then be described by health economic, and patient morbidity and mortality data.

The value of continuity of care

An outcomes focus – rather than the more historical view of care by one provider from the cradle to the grave, that is, perfect chronological (provider) continuity[9] – was raised early. Initially Becker *et al*. considered 'continuity of care to be a basic public health and medical care tenet, . . . a sine qua-non-to "good"

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Table 1 Continuity of care: a comparison of the linear approach using *'dimensions'*, to the systems-based approach using *'patterns of organization'*

Dimensions	**Characteristics**	**Pattern of organization**	**Structural components**
Chronological	– the care of patients of all ages – the change of health over time change in the individual, or change in the natural history of the illness	Context of care including demographics	– health care policy – health care financing – doctor–patient ratio – accessibility of practice/doctor (rural/urban) – socioeconomics of local area – access to other health care providers – time of care, e.g. in-hour surgery versus emergency care
Geographical	– the place of care where the patient is seen: surgery, home, hospital, or nursing home – the physician being available at all of these	Patient	– attitudes and expectations – beliefs – prior experiences – morbidity – self perceived health – cost expectations
Interdisciplinary	– the caring for multiple diseases in the same patient – dealing with the illness experience of the patient and his family – coordinating the management to restore the function of the whole family	Doctor	– attitudes and expectations – beliefs – prior experiences – income expectations – knowing the patient
Interpersonal	– the doctor–patient relationship – interpersonal family relationships – the relationships with other health care professionals involved in the care of the patient	Doctor–patient interaction	– stability of practice – stability of relationship – consultation length – consultation difficulty – communication – reaching understanding – ordering investigations – prescribing – referring to other providers
Informational	– the keeping of adequate medical records – good communication between doctors other health care providers	Outcomes of care	– ability to cope with illness – coordination of care – appropriateness of care – functional health status, e.g., COOP or EQ-5D (functional health assessment charts) – concordance with treatment plans – resource use
Accessibility	– convenient offices – effective appointment systems – the provision of after-hours care – ease of access to medical advice		– satisfaction
Stability	– the community – the family and the individual – the provider himself		

medical care.'[10] More pragmatically Gonella and Herman[11] suggested that continuity of care is a means to an end – 'continuity is of value only to the extent that it has an impact on outcomes of care, the prevention or reduction of physical, mental, or social disabilities, the satisfaction of patients and the cost of care.' This outcome focus is a central concern in Hjortdahl's work.[8]

More recently Hjortdahl[12] suggested that continuity of care is a defining characteristic of the discipline of general practice – continuity of care is an orientation away from fragmentation of patient care towards integrated care.

These assertions support a broader notion of continuity of care as being both process and outcome orientated. Consequently, simple linear approaches do not adequately describe continuity of care, and a systems model may be a more appropriate framework for future continuity research.

The way forward – a systems-based model of continuity of care

A long-term doctor-patient relationship is a prerequisite for, but in itself, does not equate to continuity of care. This view has been clearly expressed by experienced general practitioners,[13] who described three essential aspects of continuity – a stable care environment, good communication that builds a responsible doctor–patient relationship and the goal of achieving improved patient health outcomes. Such a broader concept of continuity of care is best described by a complex adaptive system and its internal dynamics.

Defining systems

Capra synthesized the key characteristics of a system in terms of three conceptual dimensions – pattern, structure and process.[14] The pattern of organization describes the configuration of relationships that determine the system's essential characteristics, its structure represents the physical embodiment of the system's pattern of organization, and its processes describe the activities involved in the continual embodiment of the system's pattern of organization.

'Living systems' are described as complex adaptive systems. Such complex adaptive systems exist in a state far from equilibrium and have the ability to self organize. This means the processes occurring within the system are constantly changing its components, making the system unstable, but, despite this instability complex adaptive systems reproduce and maintain their overall structure and function.

The relationships of and the function within a complex adaptive system are non-linear, they cannot be condensed into a 'single formula'. They are described by the non-linear equations of complexity theory. The results of these equations are usually presented graphically depicting the dynamics of the system as trajectories in 'phase space'. The meaning of this should become apparent from the ensuing text and figures.

Applying a systems-approach to continuity of care

Continuity of care can be described in terms of a complex adaptive system – medical care occurs within a highly structured organizational network, delivered through well defined structures, and the processes of care influence the system in multidimensional ways. The system is clearly unstable, and constantly adapts to changes forced upon it.

Figure 1 describes in broad terms a 'continuity of care' system. This can be conceptualized consisting of five layers, each describing a discernable pattern of organization – in broad terms these are:

- the context in which care is provided/received
- the patient and
- the doctor, as individuals
- the consultation, and
- the outcomes of the care provided/received.

Each of these layers is a discernable pattern of organization (Table 1) and consists of additional networks of relationships.

The processes within the system are abundant, and the interactions between two related components – a linear relationship – affect all other components within the system – a non-linear or complex relationship (Fig. 2). For example, a reduction in revenue to a department will maintain the overall budget, however, the consequences may be a reduction in staff in that department, leading to longer waiting lists and shorter services to patients, who in turn do not achieve the potential outcomes they were looking for and remain disappointed and dissatisfied with their care and the health care system.

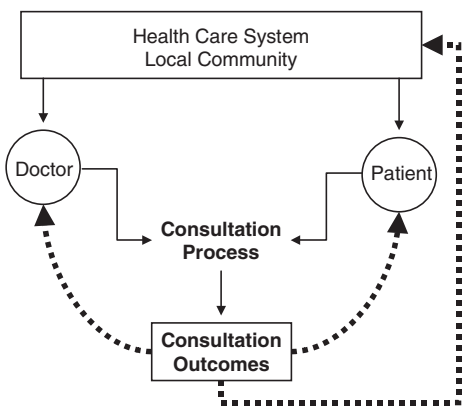

Figure 1 A systems-based concept of continuity of care.

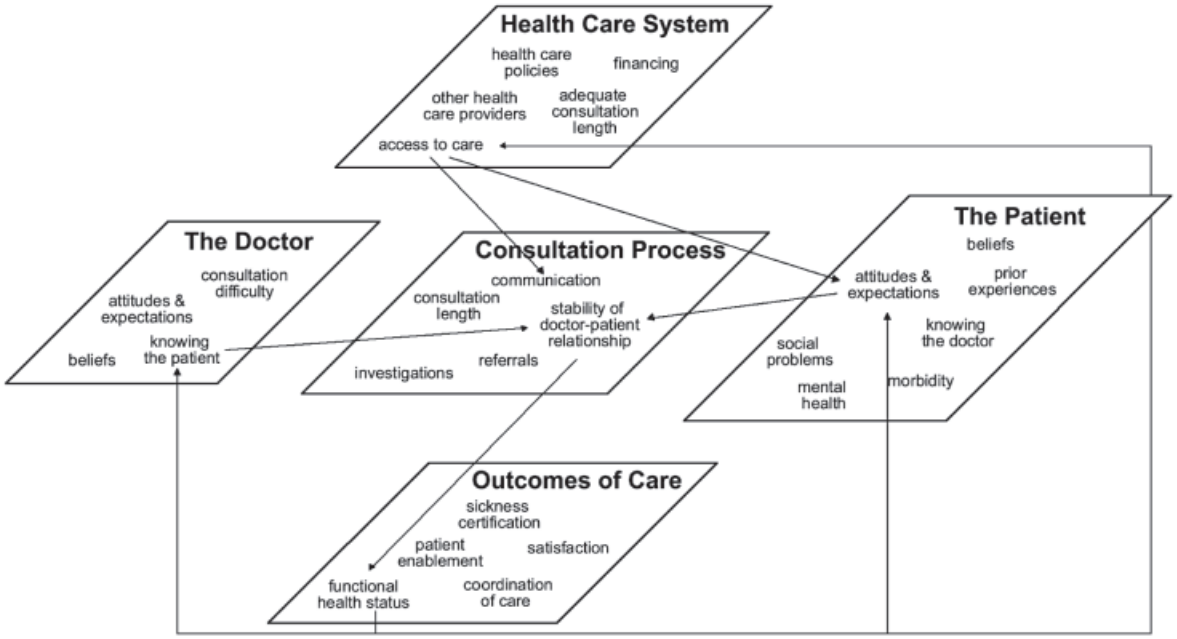

Figure 2 Illustration of some aspects of continuity of care and their interactions – access to care influences stability of the doctor–patient relationship as well as the attitudes and expectations of the patient; patient attitudes and expectations as well as the knowledge of the doctor about the patient influences stability of the doctor–patient relationship; the stability of the doctor–patient relationship influences the functional health status of the patient; the functional health status of the patient feeds back on the doctor's knowledge about the patient, the patient's attitudes and expectations and the access to care.

Describing the relationships and processes within a system

The important feature of any complex adaptive system is the interconnectedness of all its components, and the relationships between components are more important in understanding the system than the components themselves.[15,16]

As outlined above, a process that changes one component of a system will, through feedback loops, affect all other parts of the system; however, the self organizing capability of the system will maintain its overall pattern.

Using the language of cybernetics one can describe the impact of changes caused by a particular process. Changes are expressed in 'the relative direction of the change'; '+' indicates a change in the same direction, and '–' a change in the opposite direction to the initiating component. The net results of the cascade of changes are said to be self balancing (stabilizing) the system if there is an odd number of '–' links, and self reinforcing (amplifying or 'vicious circle') if there is an even number of '–' links. Figure 3 shows that improvements in communication during the consultation will improve the comprehension of a treatment plan (+), which in turn improves the understanding of the treatment plan (+), allowing for improved concordance with the same (+) which further enhances the communication in the next consultation (+); this process loop reinforces the system.

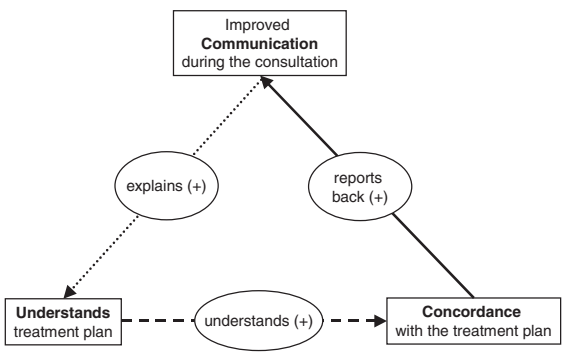

Figure 3 Example of a process in the system – improvements in communication during the consultation will improve the comprehension of a treatment plan, which in turn improves the understanding of the treatment plan, allowing for improved concordance with the same which further enhances the communication in the next consultation – this process loop reinforces (amplifies) the system.

The result of many of these processes is shown as trajectories in 'phase space', a technique that will identify 'attractors', that is, one or more components that receive direct or indirect input from most other components, and an attractor itself may influence other components of the system.

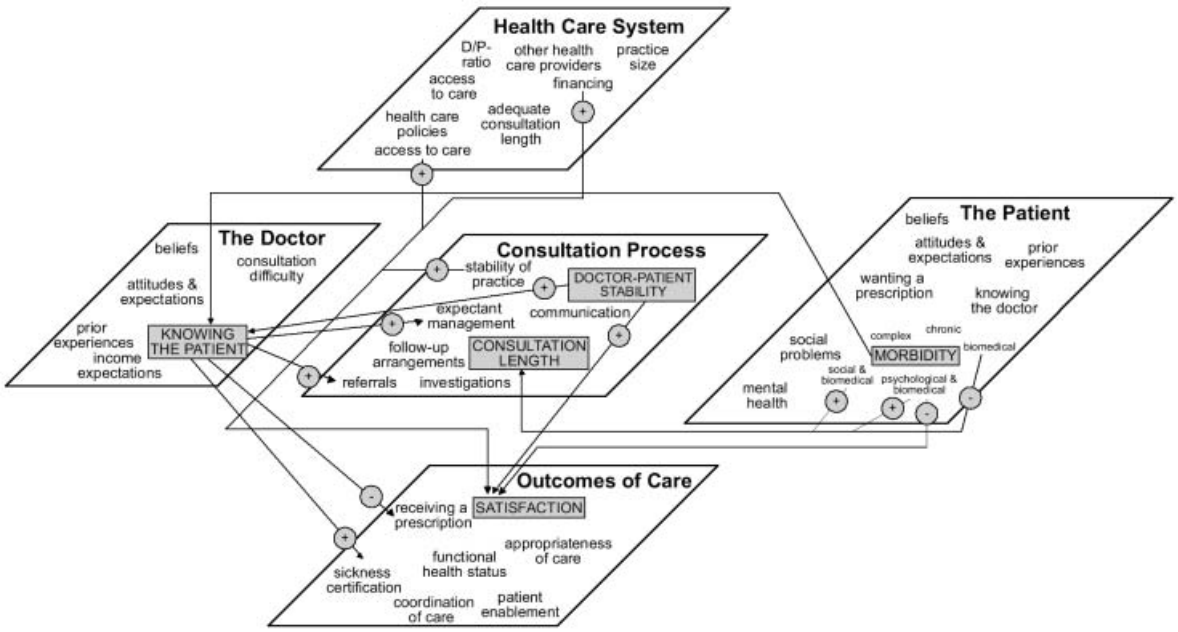

Figure 4 Impact of a stable doctor–patient relationship on the continuity of care system – Phase Space Diagram of Hjortdahl's study. Note: attractors are boxed, '+' and '–' indicate the relative change caused in the affected component relative to its attractor. D/P, doctor–patient ratio.

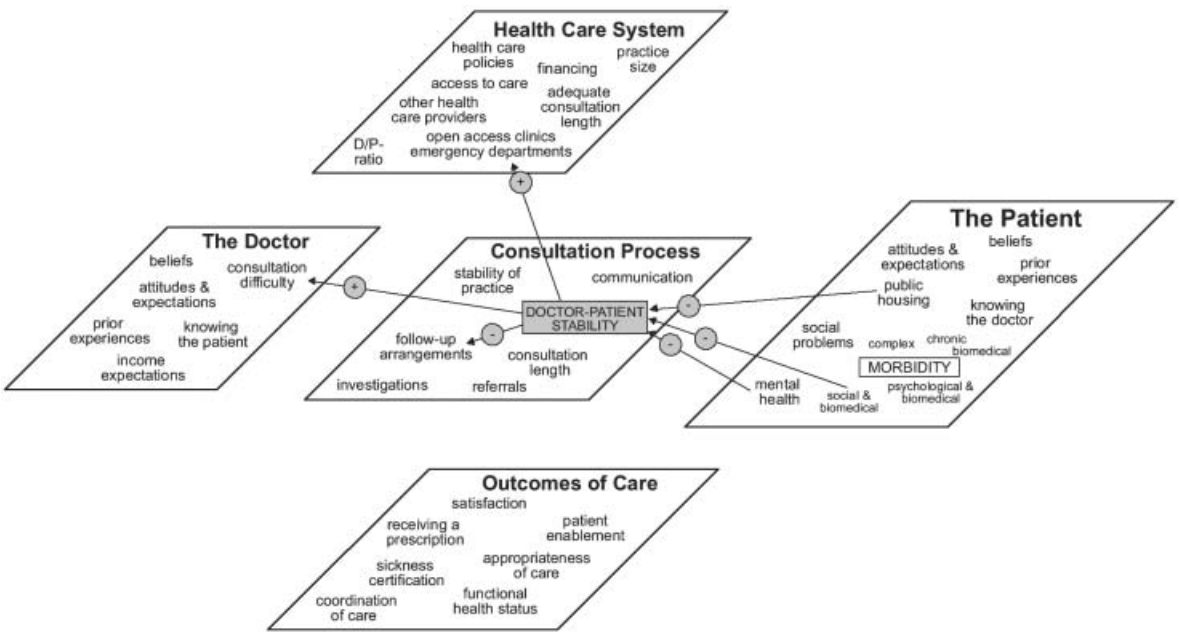

Figure 5 Components negatively impacting on doctor–patient stability, and the effect off such an unstable doctor-patient relationship on other system components – Phase Space Diagram of Sweeney and Gray's study. D/P, doctor–patient ratio.

A systems-based definition of continuity of care

Continuity of care is an *outcome*, derived from the net-result of *ongoing complex interactions* within the medical care system. The outcomes can be measured in terms of the effect on any component and are either self balancing (stabilizing) or self reinforcing (amplifying) the system.

System analysis describes outcomes in terms of directions; it should therefore be noted that '+' or '–' are not indicating 'good' or 'bad' outcomes. It is up to the analyst to make a value judgement about the

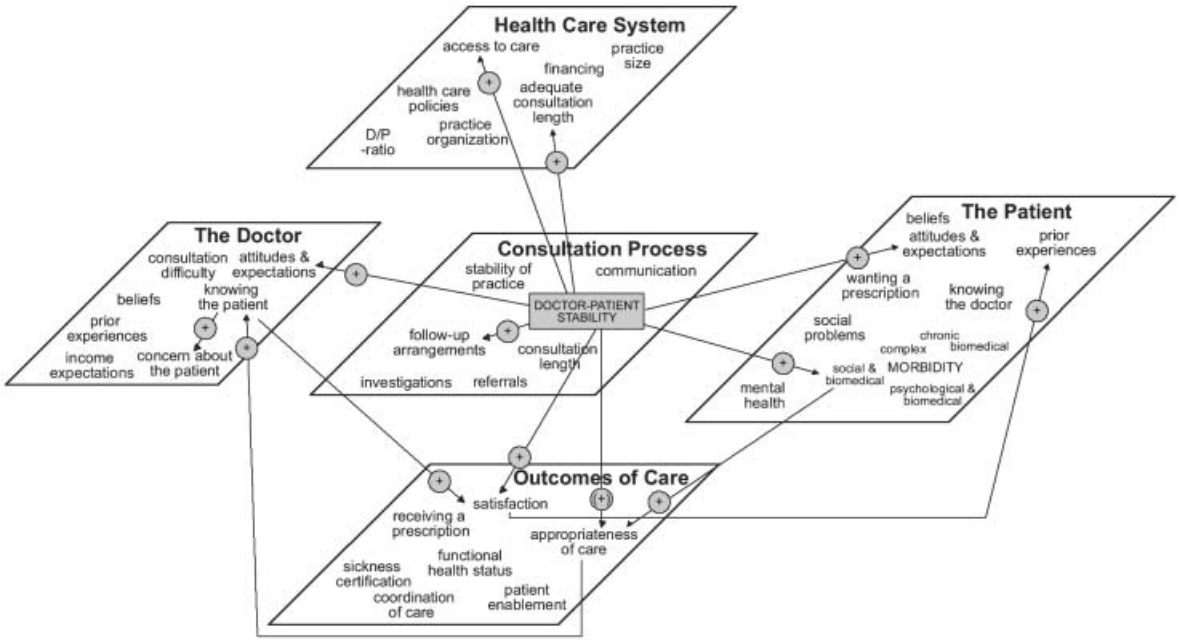

Figure 6 Impact of increasing doctor–patient stability on system components in a pediatric outpatient clinic – Phase Space Diagram of Becker *et al.*'s study '(+)' non-significant trend. D/P, doctor–patient ratio.

observed outcome for example, 'did the treatment benefit a particular patient?' or 'have limited resources been used well?' and so forth.

Illustrating the systems-based approach

To illustrate the merit of a systems approach to the understanding of continuity of care Figs 4–6 translate the findings of three previously published studies[8,10,17] into 'phase space' diagrams. It should be noted that these diagrams do not represent the full system as they only studied the correlation of a limited number of specific variables relating to 'provider continuity'. Future studies therefore will require the simultaneous collection of data of all system components to more fully understand the systems dynamics.

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