

# Chaos in Nursing

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Complexity and

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**Fourth Edition**



## CHAOS 2000: A NEW SCIENCE OF NURSING FOR THE NEW MILLENNIUM.

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*Chaos has emerged over the latter half of the twentieth century as a new science with widespread application. It has become a basic, physical, biological, behavioral, management, leadership and organizational science. We report a Toronto experience utilizing chaos in various interdisciplinary and nursing projects, taking it beyond new meanings, models and metaphors. Chaos was used to bridge the gap between research and utilization and as a creative tool for empowerment and change for nurses and nursing. This experience with conceptual and practical applications of chaos in nursing leads us to propose an updated definition of nursing towards 2000, as we prepare to meet the challenges of a new millennium.*

The term *chaos 2000* conjures up images of an impending apocalypse. However, the meaning of chaos changed in 1975 and chaos has become a new interdisciplinary science of nature and humanity (Gleick, 1987; Briggs, 1992). Popularized by Gleick in 1987, chaos is now a basic, physical, biological, behavioral, management, leadership and organizational science (Wheatley, 1992; Rambihar, 1996). There is increasing acceptance of chaos as a science where order and disorder are dynamically intertwined (Briggs, 1992) and relevant to nursing, medicine and health (Rambihar, 1995). In various Toronto projects, *chaos* was used to go beyond meanings, models and metaphors, to become a creative tool for empowerment and change. *Chaos* was used as a bridge or translation factor between evidence-based nursing and the reality of the individual and the community. Out of this emerged a definition of nursing for the new millennium.

Derived from the mathematics of nonlinearity,

*chaos* gives new perspective to the complex dynamic interactions involved in nursing. It replaces the spell cast by Newtonian reductionism which continues to dominate our thinking 300 years later in spite of increasingly evident limitations (Goodwin, 1997). Mechanistic science does not adequately describe the wide variety, variability, diversity, uncertainty and complex dynamics of the reality experienced by the nurse.

### Nursing Literature

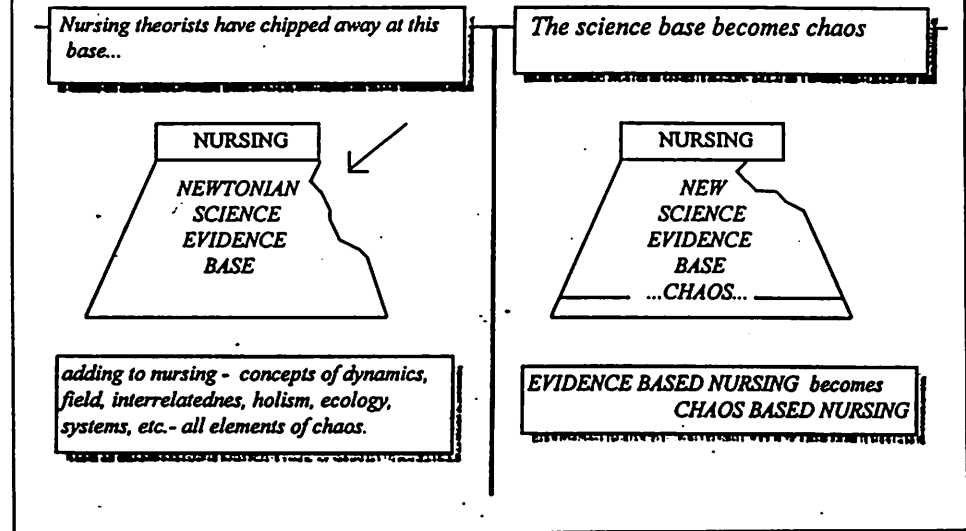
Chaos has become part of nursing literature and culture. Theorists have chipped away at the Newtonian science base, adding concepts such as field, dynamics, interrelatedness, holism, ecology and systems thinking (George, 1995). The *American Journal of Nursing* cover article "Chaos in Nursing: Make it Work for You" (Vicenzi, White & Begin, 1997), the journal *Complexity and Chaos in Nursing* and several Internet sites illustrate the validity and utility of chaos in nursing.

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Furthermore, Pediani (1996, p. 645) stated that "The theory of chaos may allow for better understanding of research processes and the design of research tools for complex environments". He suggested that "The emerging theory of chaos and the consideration of evolutionary theory in the context of ideas opens up new and exciting views on nursing practice and research". Coppa (1993, p. 990) advised that "The theory of chaos opens up new insights into the study of human systems which are the object of nursing practice and nursing science."

FIGURE 1. *Chaos Based - Evidence Based Nursing*



### Historical Origins to Modern Application

The word *chaos* is enshrined in ancient Eastern philosophy and recorded in the creation myths of many civilizations including Greek cosmogony, where it was conceptualized as a gap from which everything arose (Abraham, 1994; Wheatley, 1992). Modern, scientific chaos has developed since its discovery independently, by Ueda, Lorenz and Mandelbrot around 1961. It was named in the title of a paper by Li and York in 1975 (Rambihar, 1996) and now describes the mathematics and science of order and disorder dynamically intertwined. The meaning of chaos has changed from confusion and disarray and the 17th century thermodynamic notion which described decay.

The ideas of chaos have now been applied across many disciplines, from literature and language to physics and philosophy (Hayles, 1991). As a leadership, management and organizational science, it provides a model for change. Sensitive dependence illustrates the power of the individual and that small inputs can change outcomes. Self-criticality, self-organization and emergence have been proposed as models for the origin of the universe, life, humanity, multiple universes, the mind, consciousness, and virtually everything else from quarks to quasars and Cos to cosmos (Rambihar, 1998).

### Nursing

Nursing, which deals with the complex dynamics of community, diversity, and the interdisciplinary art and science of caring, can benefit from the more realistic, holistic and human science of chaos. In 1859, Nightingale defined nursing as the interaction of the nurse, the patient and the environment to improve the health of the patient (George, 1995). Vicenzi (1994) proposed redefining health, nursing and community in chaos terms, suggesting that this may transform many facets of nursing science and practice. The relevance of *chaos 2000* to nursing invites an updating of Nightingale's definition of nursing as — The complex, dynamic interaction of the nurse, the patient and the entire environment in the art and science of caring.

The new science of chaos provides a scientific basis for the hypothesis that each nurse has the power and responsibility for shaping the future. Rogers (1997) illustrates this outcome by using desired scenarios and futures thinking. She proposes selecting a desired scenario for nursing, taking positive steps in that direction, and recognizing the need for adjustments in an unpredictable world. *Chaos* provides the science and the means to achieve this vision, preparing nurses and nursing for the challenges of a new millennium.

### Toronto Nursing Projects

Chaos concepts were utilized in three Toronto-based interrelated, interdisciplinary nursing projects — (1) Annual Valentine's Day Event, 1985-2000, (2) Ethnicity and Heart, 1990-2000 and (3) Diversity and Health 1994-1996 (Rambihar, 1996).

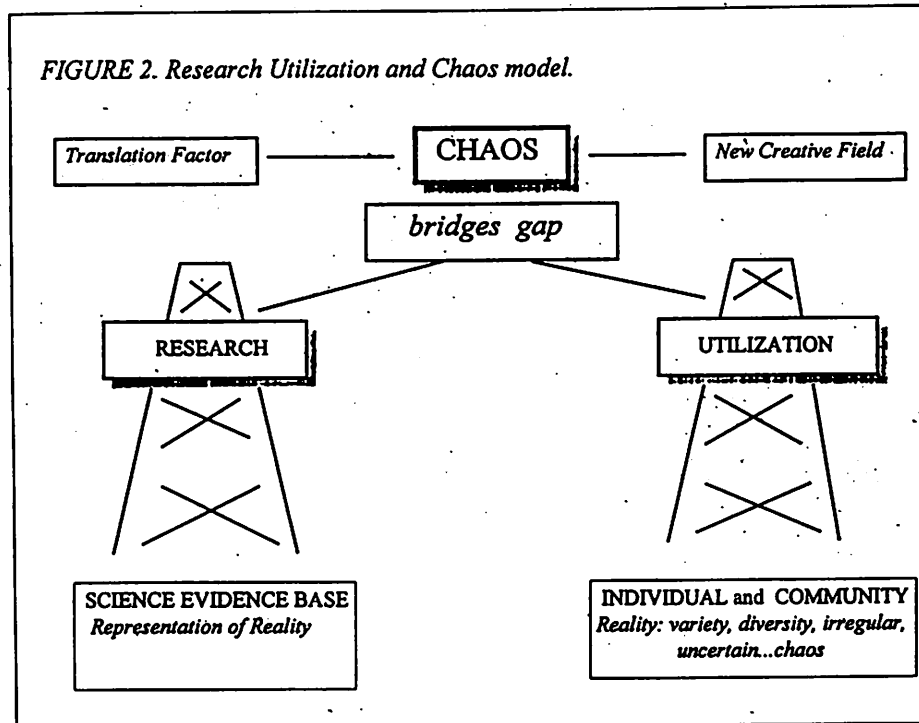
The features of chaos designed into each project included:

agenda was audience driven and follow-up community outreach programs were developed according to the specific needs identified.

**Ethnicity and Heart** explored ethnic variation in cardiovascular disease, and focussed on the nonlinear, complex and dynamic interactions of lifestyle and environment. A five-year retrospective analysis of hospital admissions for myocardial

infarction demonstrated ethnic variation. Compared to whites, there was excessive and earlier coronary artery disease (CAD) among South Asians and less, as well as later, CAD among the Chinese. The multiple, interacting factors that produced this outcome were examined and strategies for change designed and implemented. Community outreach included health fairs, interactive sessions, the creation of community and international networks, the preparation of health promotion materials, and lobbying for change.

**The Diversity and Health Project** was a two-year series of meetings held monthly and special events continuing quarterly. The format was interactive and the agenda,



- From a management, organizational and leadership science — a contextual and subjective perspective, open, interactive, interdisciplinary and audience driven;
- As a fractal model for society — diversity, networks with dynamic interconnections, systems thinking, self-organization and sensitive dependence on initial conditions influencing outcomes;
- As a strange attractor — outlines determined but details left uncertain and unpredictable.

The Annual Valentine's Day Event was a series of self-organizing discussions and interactive displays on the prevention and treatment of heart disease held on Valentine's Day. Participants included the public, health professionals, neighborhood schools, community and heart health agencies and hospital groups. Facilitators included physicians, nurses, pharmacists, dieticians, social workers and exercise and fitness consultants. The

direction and outcome allowed to self-organize. Health professionals, patients and the public participated equally in the events. There were no lectures but a facilitator provided guidance. Discussions continued beyond the time and space of meetings, extending the fractal patterns of overlapping dynamic networks.

An ever-changing, non-hierarchical, complex dynamic group interaction emerged. Information was disseminated and education provided in a shared-learning, rather than a teaching environment. Initial hesitation with the format and content changed to open, comfortable and sensitive discussions on all subjects and enthusiasm for the project increased. Participants spontaneously assumed leadership, ownership and responsibility for the process and outcomes. Consequently, changes in thinking influenced clinical practice. For example, community events, further research, publications and lobbying for change ensued.

A wide range of topics were discussed: the utility and validity of diversity in health research, women and health, the homeless, traditional healing, diet across cultures, smoking and young women, ethics, support systems, culture, customs and belief systems impacting on health, global issues and individual responsibility. The complex dynamics of ethnicity which represent imperfectly only one face of a person's identity were explored. The term 'race,' increasingly used interchangeably with 'ethnicity,' was considered an outdated concept with little biologic validity (Bhopal, 1997).

*Chaos* research utilization included education, disseminating research, effecting change in practice, policy, leadership, management and organization. Our experience using *chaos* was presented as a symposium at the University of Toronto Faculty of Nursing — First International Research Utilization Conference in April 1998.

### Summary

As we approach 2000, the evidence-base of science now includes the science of chaos. This perspective now influences nursing, medicine and health, enriching the probabilistic and Newtonian scientific approach with the complex dynamics of reality. An updated definition of nursing which includes chaos, provides each nurse with the creative energy for involvement. It keeps nursing current with rapid change as we prepare to meet the challenges of a new millennium. Conceptual and practical applications of chaos were described for three interdisciplinary Toronto projects. There *chaos* was taken beyond new meanings, models and metaphors, to become a creative tool for empowerment and change, for both the individual and for nursing. *Chaos* becomes a new science of nursing for the new millennium.

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