

# **SYSTEMIC PARAMETER ESTIMATION FOR THE DIAGNOSIS AND TREATMENT OF DEVELOPMENTAL DYSPLASIA OF THE HIP IN CHILDREN**

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## **ABSTRACT**

The human being is a complex entity as such has a set of features that makes it different compared to other living beings. The bio -psycho- social conception of the human being is part of systems thinking: a totality organized by a number of interrelated and interdependent entities.

From its origins science has tried to explain reality and seek control of those natural and transcendental phenomena that take place in it: the life, illness and death.

Disease and / or medical conditions affecting the health of people for settlement have developed models, techniques and tools to use the response time decreases. These have evolved into a transition aimed not only significantly prolong the years of life and survival of a patient, but also the well-being or quality of life related to health, which refers to the consequences of disease or treatment on physical , emotional and social wellbeing of a person. The change in the health model allows reviewing the definition of health and health care.

Practically, this model argues that health systems should consider this continuum of biological, psychological and social factors at diagnosis and establishment of treatment which will help to effectively manage the process of health and illness in a person, covering the evolution, the course of illness and recovery and/or rehabilitation of the individual.

As medicine has evolved, have been discovered diseases that affect the health of people and produce both partial and total in these conditions, preventing the development of skills and attitudes within society.

Within the range of diseases and/or conditions are those that damage the lower or hind limb of the human body (hip).

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One of these conditions is Developmental Dysplasia of the Hip (DDH) in children, which is presented as a condition of uncertain origin, evolution insidious and discouraging treatment if your diagnosis is not made early. The surgical procedure is often very invasive for the patient, since the bone composition is not fully formed and can cause secondary conditions that diminish their ability to lead a normal adult life.

From a mono-disciplinary approach may provide a solution to this problem, but not entirely. With the implementation of Systemic Methodologies and Tools we address this problem holistically, because with this implementation, we can obtain the factors affecting our study and thus provide a solution to diminish entirely side effects.

It is for this that comes a Systemic Methodology which consists of Soft and Hard Methodologies as an option for the study of Developmental Dysplasia of the Hip (DDH) in children in order to estimate parameters to identify the factors affecting the development of this condition at the time of diagnosis and treatment, in order to make improvements in applied surgical procedures and develop options to decision- making by the specialist to reduce risks that may arise and provide quality of life for patients in their family and social environment.

Keywords: Assessment, Diagnosis, Settings, Systemic.

### **INTRODUCTION**

The human being is a complex entity as such has a set of features that makes it different compared to other living beings.

From its origins science has tried to explain reality and seek control of those natural and transcendental phenomena that take place in it: the life, illness and death. (Flores, 2009)

Disease and/or medical conditions affecting the health of people, for settlement have developed models, techniques and tools to use the response time decreases. These have evolved into a transition aimed at both prolong the years of life and survival of a patient - being or quality of life related to health. (Engel, 1977; Esteve, 1997)

Within the gamma of musculo-skeletal trunk (pelvis) disease, developmental dysplasia of the hip is (DDH) (Klasic, 1989; López, 1997; Bolaños et al., 2013), which is a disease of unknown etiology, multifactorial genetic predisposition so as intrinsic and extrinsic mechanical factors (Wilkinson, 1994). In which the acetabulum, joint capsule and the proximal femur, along with your muscles and ligaments are altered (De Luca, 2003; Mazumder, 2007; Gelfer and Kennedy, 2008; Carol, 2011; Bolaños et al., 2013).

The incidence of DDC worldwide is 1.5 per thousand newborns (Bolaños et al., 2013). In Mexico, the incidence of DDC is 2-6 per thousand live births and is the leading cause of

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hospitalization in pediatric orthopedics departments nationally (INSP, 2000; Aparicio, 2013).

In addition to early DDH, have the inveterate, which occurs in patients older than 3 years of age who have not received any previous treatment (conservative and/or surgical) (Dobashi et al., 2006; Trujillo, 2013).

In patients with inveterate DDH longstanding difficulties and DDH treatment goals facing the surgeon are not the same as in the early DDC, as there are specific morphological and biochemical changes (Trujillo, 2013).

In older children the muscles, tendons and joint capsule of the hip tighten during and after reduction of the hip, which may induce ischemia and Avascular Necrosis (AN) of the femoral head (Kelley et al., 2013).

Patients with longstanding DDH are patients with significant pain and decreased ability to perform your daily activities. Also this patient is designed to provide an early osteoarthritis of the hip, which ended by reducing their ability to carry out a regular adult life (Trujillo, 2013).

In 1969 the author Wictor Dega reported a series of cases in which he performed a surgery in which two procedures were performed in one time. These consisted of an osteotomy to transtrochanteric level and a acetabuloplasty in the same surgery, presenting satisfactory results in most cases, reducing the risks of carrying them out in different surgical events (Grudziak and Ward, 2001; Karlen et al., 2009; El- Sayed et al., 2012; INR, 2014).

Reports of monitoring patients receiving this treatment are few and those that exist have been performed with a diagnosis of cerebral palsy and other conditions.

Because inveterate DDH is a condition that is not described in the literature, there are no reports of long-term outcome of these patients in relation to changes in the acetabular morphology (El- Sayed et al., 2012; Francone et al., 2012; Trujillo, 2013).

The main objectives in the treatment of inveterate DDH are to achieve an adequate reduction of the hip, without increasing the pressure head within the acetabulum, make that reduction permanent. Avoiding pain, functional disability and ultimately delay the presentation of osteoarthritis, giving better patient functional outcome (Fernandez et al., 1993; Restrepo, 2000; Forlin et al., 2006; Francone et al., 2012; Ezirmik and Yildiz, 2012).

The inveterate DDH requires combining elements from different disciplines to understand and provide solutions to improve the surgical procedure used, as well as staff awareness Institutes of Health.

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The complexity of the bone structure of patients at the time that dysplasia is diagnosed (children over 3 years), influences the planning to the completion of the surgical procedure for the treatment of these patients.

Although from a medical perspective can provide a solution to this problem, the inveterate DDH is a condition that affects different aspects, is a multifactorial problem, which depends both on the treatment of hip, as psychological factors, socioeconomic, cultural etc. It is for this that we must analyze and detect elements of each discipline that positively affect our study for the developments of a model to understand from a transdisciplinary system approach the magnitude of the problem and provide a solution.

From a mono-disciplinary approach may provide a solution to this problem, but not entirely. With the implementation of Systemic Methodologies and Tools we address this problem holistically, because with this implementation, we can obtain the factors affecting our study and thus provide a solution to diminish entirely side effects.

It is for this that comes a Systemic Methodology which consists of Soft and Hard Methodologies as an option for the study of Developmental Dysplasia of the Hip (DDH) in children in order to estimate parameters to identify the factors affecting the development of this condition at the time of diagnosis and treatment, in order to make improvements in applied surgical procedures and develop options to decision- making by the specialist to reduce risks that may arise and provide quality of life for patients in their family and social environment.

### **MATERIAL AND METHODS**

To achieve the objectives of this research, we should perform a scan of best, to understand and intervene on improving technique and the solution of the problem studied disciplines.

The combination of methodologies, models and tools both Soft and Hard coupled with Surgical Techniques employed in the Institute, allowing the emergence of elements to improve the surgical procedure performed internally and staff awareness about the magnitude of the problem studied.

Regarding the surgical technique used in the Institute, information was collected about the records of patients admitted to the National Institute of Rehabilitation with early and inveterate DDH. Review of state of the art worldwide incidence of DDH (early and inveterate) plus secondary conditions associated with this. Study the anatomy, physiology and pathophysiology of articular DDH suffering patients admitted to the Institute.

Developing a Methodology for Monitoring the surgical procedure. Identification of factors affecting DDH patients and different treatments used. Development of a Systemic Model for the surgical treatment of this condition. Through statistical design and software,

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measurement and measurement acquisition scans to improve the surgical procedure was performed.

To develop the model and Systemic Methodology, concepts of general systems theory were applied such as: System, Subsystem, Inter and Transdisciplinarity, besides the use of elements of Soft Systems Methodology and Living Systems.

Phase description:

Diagnosis. This phase generally describes the situation that exists regarding the Developmental Dysplasia of the Hip in Children and development in the diagnosis and treatment of this type of condition, from its composition, the different types of existing techniques and the materials used in its manufacture.

- Skeletal system and its properties.
- Diagnosis and Treatment of Early and Inveterate Developmental Dysplasia of the Hip.
- Identification of Needs.

Design. Based on the previous phase Systemic Cyber Decision Model will develop.

- Conjunction Analysis and Systemic Models and Methodologies.
- Techniques and Tools for Different Disciplines of Knowledge.
- Feasibility and Design.

Implementation of the Model. At this stage apply each of the steps of the methodology in order to obtain information that will help us to solve our case study.

- Measurement of Axial Tomography Scans (CT 3D) of patients with this type of condition.
- Application Techniques and Tools.

Model and Methodology Results. Getting Results for the Systemic Cyber Decision Model to achieve continuous improvement in our process.

- Parameter Estimation for the Diagnosis and Treatment of Early and Inveterate Developmental Dysplasia of the Hip.

For model design, we must conduct a search and analysis of the disciplines of knowledge that can help us solve the problems described above, as well as elements of each of these interact with each other and with the environment.

The importance of the model is the information resulting from this interaction and the sense that he should be given for the solution of problems in the medical field.

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## RESULTS

At present a better understanding of large complex systems, its nature and operation, as well as having a new type of model and a specific methodology for global action, complete and eventually correct the models and methodologies is necessary local, specific or special action that we have used so far. This is the purpose of Systemic and Cybernetics, whose elements evolve from some fifty years ago, in response, increasingly accurate, to questions about the operation of complex systems.

That is why the systems approach is mainly a combination of philosophy and general methodology, geared to a planning function and design. The analysis system is based on interdisciplinary methodology that integrates skills and knowledge in various fields mainly in planning and designing complex and bulky systems that perform specific functions. (Figure 1)

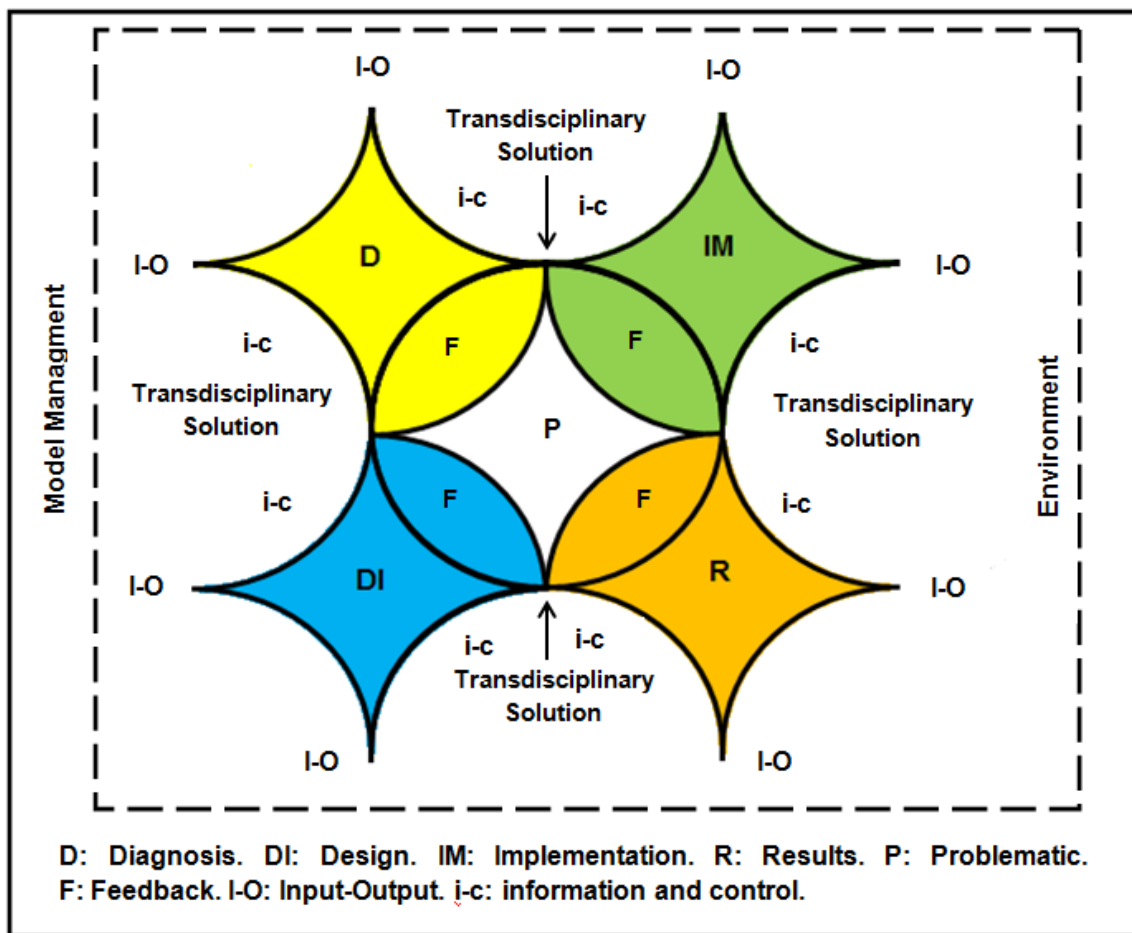
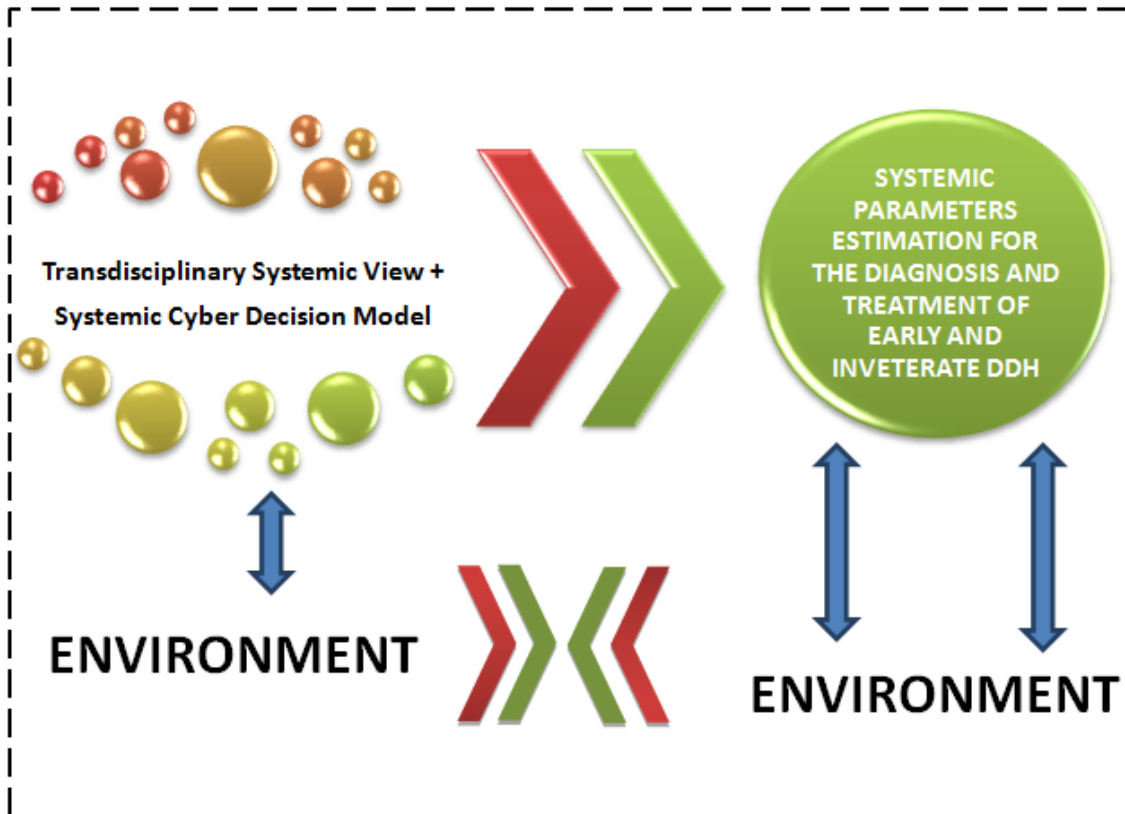


Figure 1. Stages of the Systemic Cyber Decision Model. Own realization. 2013.

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Based on the foregoing, the Systemic Cyber Decision Model is a guide to analysis/ design, intended to identify and classify elements and operating profile that integrate mechanisms for regulating and controlling the operation of resources and solutions in the field of Developmental Dysplasia of the Hip. (Figure 2 and 3)



**Figure 2. Systemic Transdisciplinary Vision. Estimating Parameters for the Diagnosis and Treatment of Developmental Dysplasia of the Hip Dysplasia in children from the National Institute of Rehabilitation. Notes: General Systems Theory. Own Modification, 2014.**

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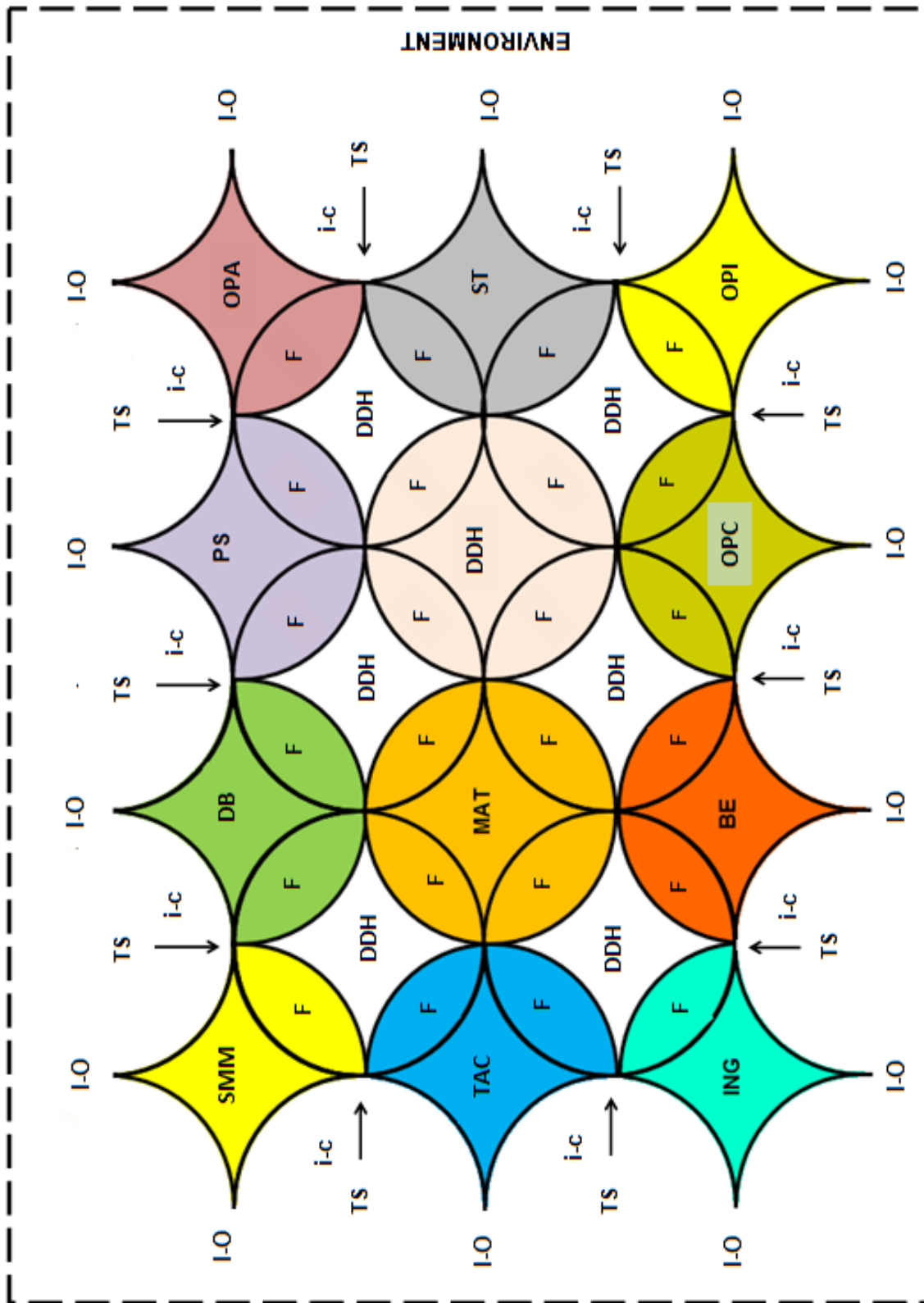


Figure 3. Systemic Cyber Decision Model. First Part. Based on Soft and Hard Methodologies, Techniques and Tools. Own realization, 2013.

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## Model Elements

DDH: Developmental Dysplasia of the Hip.  
DB: Data Base.  
SMM: Systemic Models and Methodologies.  
PS: Psychology  
OPA: Operating Processes and Administrative.  
TAC: Tomography.  
MAT: Materials.  
ST: Statistics.  
ING: Engineering.  
BE: Bioethics.  
OPC: Operating Processes in other Countries.  
OPI: Operating Processes in other Institutes.  
I-O: In-Out.  
i-c: information-control.  
TS: Transdisciplinary Solution.  
Environment.  
F: Feedback.

## CONCLUSION

From a systemic, holistic and transdisciplinary approach, we can see that the model Cyber Systemic decision is a guide to analysis / design, intended to identify and classify the elements as well as the operating profile that integrates the mechanisms for the regulation and control of resources, in addition to providing solutions in the field of Developmental Dysplasia of the Hip in Children.

Note that this part of the whole research is approached from a qualitative perspective, since the creation of this model provides the basis for the collection of information for patients and performing engineering tests to obtain the parameters.

As new contributions to knowledge as the essence and the results obtained in this type of study has not been done previously, from mono-disciplinary and interdisciplinary perspective.

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