Impact of Pediatric Cardiac Rehabilitation on the Physical Condition of Children with Congenital Heart Defects

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***Abstract*—**Pediatric Cardiac Rehabilitation has the Potential to Benefit Many Children With Congenital Heart Defects (CHD). Instead of Excellent Surgical Results Most of Children Usually Present with a Depression of Physical Condition so Early Rehabilitation Program is Recommended to Avoid that Decline in Physical Tolerance and Prevent any Post Surgical Complications. Unfortunately, the Limited Experience with and Availability of these Programs has Caused the Benefits of Cardiac Rehabilitation to be Unavailable to Most Children with CHD. So It is Recommended to Study That Field in More Detail and Apply it on Wider Scale.

***Keywords*—**Pediatric Cardiac Rehabilitation, Congenital Heart Disease, Quality of Life.

I. Introduction

WHAT is Pediatric Cardiac Rehabilitation (PCR)?It's Similar to Adult Cardiac Rehabilitation, Suitable for Children 6-18 Months with Congenital or Acquired Heart Diseases. Participation in that Programs is Voluntary after Pediatric Cardiologist Approval [9].

A. Prevalence of CHD

Congenital heart disease is the number one birth defect in the world. Heart disease is second only to asthma as the leading cause of illness in children. Congenital heart defects occur in 1% of all births with the frequency of approximately 8 in 1000 newborn according to William HG et al [1],[4],[6].

B. Impairments & Functional Limitations Following Surgical Corrections of CHD

Children with Congenital Heart Defects Commonly have Ongoing Neurologic, Motor, and Developmental Deficits well after Surgical Correction. The Cause is Multifactorial and Includes Brain Injury Before, During, and After Heart Surgery. Some of These Impairments are Like:

- Incisional (Sternotomy and Donor Graft Leg) Pain and Drainage
- Continuous Pain from the Shoulders and Neck
- Thoracic Pain
- Respiratory Problems
- Feelings of Weakness
- Sleeping Difficulties Including Chest Wall Pain with Side Lying, Waking Frequently and Early, More Nightmares Than Usual
- Problems with Wound Healing
- Dissatisfaction with Postoperative Supportive Care
- Problems with Eating
- Ineffective Coping
- Depression [2],[17],[18].

C. Goals of Cardiac Rehabilitation Generally are

- Limit the adverse Physiologic Effects of Cardiac Illness
- Limit the adverse Psychological Effects of Cardiac illness
- Reduce the Risk of Sudden Death
- Control Cardiac Symptoms
- Improve Functional Capacity
- Enhance Psycho-social Status [13],[19].

D. Components of Pediatric Cardiac Rehabilitation

- Fun Exercise Programs
- Nutrition Information
- Family Involvement
- Emotional Support
- Education [12],[21].

E. Difference between Adult and Pediatric Cardiac Rehabilitation

It's Commonly said the Children are not Little Adults. Designing a Pediatric Cardiac Rehabilitation Program for them is More than Simply Copying the Adult Model. There are Special Challenges and Limitations to Consider. "Babies Can't Follow Directions," . "You have to Be Creative in How they are Getting Exercise." For Example, a Physical Therapist will have a Baby hold a Rattle and Push Down as He or She Pushes Up. With Those Youngest Patients, Therapy Comes in the Form of Positioning, Handling, Helping Infants to Sit Upright for Proper Feeding Position and Lung Function. Work with Toddlers Focuses on Developmental Play, Sitting, Standing and Walking [3].

The Exercise Physiologists at Nationwide Children's use Circuit training to Curb Boredom. The Wii is another Rehab Tool that Gets Patients Up and Moving. When the Weather is Nice Enough, they Go Outside to Play Soccer or Basketball Under Strict Supervision. Beatty Describes Rehab as Similar to What the Children would Do in a Gym Class. [5]

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F. The Candidates

Congenital Heart Defects(to be Found in Children or Even Adults) Like Atrial Septal Defects (ASD), Ventricular Septal Defects (VSD), Tetralogy of Fallot (TF4), …etc.

Acquired Cardiac Disease like Cardiomyopathy, Myocarditis , Hypertension, and Cardiac Arrest.

Arrhythmias as Wolff –Parkinson –White Syndrome [29],[24].

G. Who is the PCR Team?

The PCRP Care Team Includes Cardiac and Rehabilitation Specialists From Both Children's Hospital of Pittsburgh and The Children's Institute. As Leaders in Pediatric Health Care and Rehabilitation, Both Organizations are Specially Trained in Treating Infants, Children, Adolescents and Young Adults. PCRP Patients will have Access to All Children's Hospital and Children's Institute Healthcare Providers. Depending on the Particular Needs of Each Patient, the Care Team may Iinclude the Following Pediatric Specialists:

- Cardiac Anesthesiologist
- Cardiac Intensivist
- Cardiologist
- Cardiothoracic Surgeon
- Developmental Specialist
- Neurologist
- Neuropsychologist
- Nurse Practitioner Coordinator
- Nurses
- Nutritionist
- Occupational Therapist
- Pain Management Specialist
- Physiatrists
- Physical Therapist
- Social worker
- Speech/language Therapist [15], [16].

H. Family Role

Educating Patients and Families, Securing Referral, and Ultimately Increasing Participation in Outpatients CR Might Appear to be A Relatively Simple Process for Facilities that have Both Inpatient and Outpatient CR Available but Surprisingly, Even under these circumstances, can be challenging. The patient's Family Members Play an Important Role in Cardiac Rehabilitation and are Involved as Resource People in the Overall Rehabilitation. Studies Indicate that Patients with Good Family Support are More Likely to Maintain Participation in Cardiac Rehabilitation and Changes in Lifestyle than Patients without Such Support. In Addition, Family Members Often Feel Powerless and Anxious in Connection with the Illness of Close Family and have an Independent Need for Support in Coping with the Early Phase of Acute Illness in their Family[14],[27].

II. Procedure for Paper Submission

A. Review Stage

1. Phases of Cardiac Rehabilitation

- Phase I : Inpatient
- Phase II: Outpatient EKG Monitored
- Phase III: Outpatient with Decreasing Monitoring
- Phase IV: Community Based Independent Exercise [7],[8],[9].

2. When to Start?

As Soon As Possible. A Desirable Time For Beginning of Such Program is Within 24-48 Hours Post Surgery But It Can be Limited to This Interval Stating that Every Child Should have An Individually Tailored Approach [11],[14].

3. Are That Exercises Safe?

To be Safe Certain Precautions Have to Be Taken Like:

- Selection of Appropriate Patients
- Proper Monitoring
- All Professional Exercise Personnel Must be Able to Do Basic Life Support Including Defibrillators
- Emergency Procedures Must Be Specified
- Warm Up and Cool Down are Required [20].

4. Exercise Risk

- Risk of Sudden Death is Low in Cardiac Patients, But Still Higher than Healthy Individuals
- Cardiac Arrest: 1: 111,966 person-hours[21].
- Risk of Death 1: 783,972 person-hours[22].
- Vigorous & Uncontrolled Exercise Risk of Death:
- Cardiac: 1: 60,000 person-hours (1 Event for 384 People @ 3 hrs/ week)
- 1: 565,000 person-hours for healthy (1: 3122 people)[23]
- Principle Role of Cardiac Rehab is to Define Exercise mode & Intensity that are SAFE &EFFECTIVE.

5. Exercise Prescription

Patients Should be Tested on Dosage of Medication they will be Taking during Exercise
Beta-Blockade Blunts HR response, but % VO2 reserve and RPE May Be Used
Below Threshold of Angina (Use Exercise Test) [25].

6. Outcomes of Pediatric Cardiac Rehabilitation

Improved Exercise Tolerance
Improved Functional Capacity
Peak VO2 Increased + 11-66% after 3 Months Training
BP Reductions
HDL + 5-15%, no effect of LDL & Total Cholesterol
Improves Psychological Wellbeing (effect occurs with and without other counseling services)
Improved Quality of Life
Decreased Risk Factors (secondary prevention)
Weight Loss
Low Cholesterol with Dietary Changes[26].

7. Additional Effects of Exercise Training

27% Decrease in All Cause Mortality
31% Decrease Cardiac Mortality
No Effect on MI Recurrence [10].

Taylor RS, BrownA, EbrahimS, et al. (2004) Exercise-based rehabilitation for patients with coronary heart disease: Systematic review and meta-analysis of randomized controlled trials. American Journal of Medicine116(10): 682-692.

8. Utilization of Cardiac Rehab in General

15% of Qualified Patients Who have had MI or CABG Participate in Adult Cardiac Rehabilitation and Pediatric One is Much Less Than This , That May Be Due To
Lack of Enough Research Work at That Field
Lack of Physician Referral
Poor Patient Motivation
Logistics
Financial [28].

B. Future Directions of CPR

Impact of Elective and Acute PR on Health Care Costs and Survival
Effectiveness of Individual Educational Components
Best Intensity, Duration and Optimum form of Exercise Training
Best Means of Maintaining Benefits.
More Cooperation Between the Medical Team in the Delivery of that Service.

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III. Conclusion

Supervised Exercise Programs are Beneficial in Improving Exercise Tolerance in Patients with Cardiac or Vascular Disease

Other Components of Cardiac Rehabilitation also Produce Beneficial Effects on Depression, Risk Profile and Quality of Life.

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