

CASE REPORT

Exercise capacity following a percutaneous endoscopic gastrostomy in a young female with cystic fibrosis: a case report

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Adolescence, exercise testing, respiratory disease, risk factors.

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Abstract

Cystic fibrosis (CF) is a genetic condition affecting the respiratory and gastrointestinal systems, with patients experiencing problems maintaining weight, especially during rapid growth periods such as puberty. The aim of this case report was to monitor the effect of gastrostomy insertion and implementation of overnight supplemental feeding upon clinical outcomes, including body mass index (BMI), lung function (FEV₁), and exercise-related variables (maximal oxygen uptake [VO_{2max}] and ventilatory efficiency [V_E/VO₂]) in an 11-year-old female with CF. Combined incremental and supramaximal exercise testing to exhaustion was performed at four time points: 5 months prior to the procedure (T1), 2 days prior to (T2), 4 months (T3), and 1 year following the procedure (T4). Improvements following gastrostomy insertion were observed at the 1 year follow-up with regards to BMI (+20%); whereas absolute VO_{2max} remained stable and lung function fluctuated throughout the period of observation. Declines in function with regards to body weight relative VO_{2max} (−16.3%) and oxygen uptake efficiency (+7.5%) were observed during this period. This case report is the first to consider exercise-related clinical outcomes in assessing the effect of implementing gastrostomy feeding in CF. The varied direction and magnitude of the associations between variables shows that further investigations are required.

Introduction

Cystic fibrosis (CF) is a genetically inherited, life-shortening disease characterized by respiratory and digestive problems which manifests in a decreased exercise capacity (Saynor et al. 2014) and malnutrition (Panagopoulou et al. 2014). Increased mortality risk is reported when patients exhibit decreased lung function and poor nutritional status (Liou et al. 2001). However, exercise-related predictors of mortality, including maximal oxygen uptake (VO_{2max}) (Pianosi et al. 2005a) and peak ventilatory equivalent ratio for oxygen (a measure of ventilatory efficiency; V_E/VO₂) (Hulzebos et al. 2014), are also reported in this patient group.

Patients with CF are encouraged to increase their exercise levels (Swisher et al. 2015) and daily caloric intake

(Stallings et al. 2008) to improve clinical outcomes, in line with clinical practice guidelines (Cystic Fibrosis Trust, 2011). However, nutritional targets are not always met despite a high level of caloric intake relative to non-CF controls (Woestenenk et al. 2014). When patients fail to gain weight as predicted and conservative dietary interventions fail, invasive support through the insertion of a percutaneous endoscopic gastrostomy (PEG) may be required. This procedure has been shown to improve nutritional status (Williams et al. 1999) and stabilize lung function (Bradley et al. 2012).

Exercise testing is a valuable tool for evaluating interventions and profiling the clinical status of patients with CF (Cystic Fibrosis Trust, 2011), but has yet to be utilized to assess the effectiveness of this procedure. Therefore,

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American Diabetes Association Guide to Nutrition Therapy for Diabetes Marion J. Franz, Alison Evert, 2012-06-05 Diabetes greatly affects how people's bodies manage the food they eat. It is essential that people with diabetes follow a carefully structured meal plan and learn specific skills in order to better control their blood glucose levels. The tactics for helping people manage their diabetes through how they eat is called medical nutrition therapy (MNT). Here the American Diabetes Association presents all of the key information and strategies for effectively teaching patients how to manage their diets. Drawing on the knowledge and expertise of dozens of experts in the field, this book covers all of the key topics for implementing successful medical nutrition therapy. Topics include: Thorough discussion of nutrients; Description of MNT for type 1 and type 2 diabetes; Discussion of providing MNT to special populations including youth and older individuals; Explanation of the different complications of diabetes such as kidney disease, celiac disease, and cystic fibrosis and how they impact MNT; Latest details on new technology used in MNT; Guidelines and strategies for teaching patients about nutrition therapy and how to use it in their daily lives; Using MNT to help prevent diabetes.

ACSM's Clinical Exercise Physiology Walter R. Thompson, Cemal Ozemek, 2023-11-16 Reflecting the unsurpassed quality and excellence synonymous with the American College of Sports Medicine, ACSM's Clinical Exercise Physiology second edition provides an evidence-based approach to exercise as intervention for more than 35 conditions commonly encountered in practice, from a host of cardiovascular disorders to immunological and hematological disorders. Condition chapters are logically organized by disease types and divided into sections that cover specific conditions from a pathological and etiological perspective, with additional coverage of important considerations and foundational elements such as screening, pharmacology, and electrocardiography, ensuring a complete view of clinical exercise physiology. Fully aligned with ACSM's Guidelines for Exercise Testing and Prescription 11th Edition and updated throughout with new content and learning tools, this second edition provides total support for success in advanced undergraduate or graduate clinical exercise physiology courses as well as the ACSM's Clinical Exercise Physiology certification exam.

Fitness Professional's Handbook Barbara A. Bushman, 2024-04-09 With a newly restructured framework that strongly emphasizes real-world application, *Fitness Professional's Handbook* Eighth Edition With HKPropel Access provides current and aspiring fitness professionals the road map for working with clients. The text translates key concepts into practical application by guiding the reader through screening participants, conducting fitness testing, evaluating the major components of fitness, and prescribing appropriate exercise. This eighth edition reflects the most up-to-date research, position stands, guidelines, and standards from the American College of Sports Medicine, ACSM, other professional societies, and government agencies. New case studies reflecting a diverse array of clients offer real-world applications, and Research Insight sidebars cover a wide range of applicable scientific topics. Significant updates, changes, and additions have been made throughout, including these:

- An updated overview of assessment that provides practical

understanding of preparatory steps such as obtaining informed consent taking steps to maximize client safety and explaining test results in a way that will be meaningful and relevant A new chapter on how to combine assessment results with a client's personal goals to create a comprehensive exercise program readers will learn how to develop the optimal training stimulus and to balance activity level and nutritional requirements to optimize outcomes and safety for clients Expanded content on working with clients who are pregnant covering the benefits of exercise during and after pregnancy contraindications and signs that warrant stopping exercise and new content on pelvic floor training Updated content on chronic diseases featuring the latest information on cardiovascular disease pulmonary disease diabetes osteoporosis and cancer Additional new information includes two new muscular fitness tests a section on pharmacology that covers major drug categories and offers insights into how medications can affect heart rate blood pressure and physiological responses to exercise and coverage of neuromotor fitness The engaging full color textbook is further enhanced by 26 related online videos delivered through HKPropel facilitating a deeper understanding of techniques in the book and development of practical skills Comprehensive yet practical in nature Fitness Professional's Handbook is designed to prepare students for professional certification and empower current fitness professionals to work with various populations to improve health fitness and quality of life through appropriate screening testing and exercise prescription Note A code for accessing HKPropel is not included with this ebook but may be purchased separately

ACSM's Exercise Management for Persons With Chronic Diseases and Disabilities, 4E American College of Sports Medicine, Moore, Geoffrey, Durstine, J. Larry, Painter, Patricia, 2016-03-30

Developed by ACSM this text presents a framework for optimizing patients and clients' functionality by keeping them physically active It provides evidence informed guidance on devising individualized exercise programs for persons with chronic and comorbid conditions

Cardiovascular and Pulmonary Physical Therapy, Third Edition William DeTurk, Lawrence Cahalin, 2018-01-12 A comprehensive up to date textbook spanning the entire scope of cardiovascular and pulmonary practice A Doody's Core Title for 2021 Cardiovascular and Pulmonary Physical Therapy Third Edition reflects the broadest possible spectrum of cardiovascular and pulmonary practice and draws upon the expertise of a carefully selected team of world renowned contributors This internationally acclaimed text reviews must know background knowledge thoroughly explains exercise principles cites the best evidence and integrates the American Physical Therapy Association's approved practice patterns into the chapter content Learn how to apply principles to practice in any setting with The Guide to Physical Therapy Practice integrated throughout with an entire chapter devoted to its history and use Preferred practice patterns for cardiovascular and pulmonary physical therapy form the core of eight chapters are used as springboards to describe interventions and outcomes Case studies in practice pattern chapters allow you to experience the proper application of the practice patterns The patient/client management model is used in the case studies with appropriate test measures and interventions selected from the practice patterns and applied to the patient International Perspectives provide a way to gain

insight into the global practice of physical therapy Evidence based and peer reviewed published material is included to help you develop specific intervention regimens Online access to case based exercises video clips illustrating technical psychomotor skills and demonstrations of cardiac and pulmonary physical exams *ACSM's Resource Manual for Guidelines for Exercise Testing and Prescription* American College of Sports Medicine, Jeffrey L. Roitman, 2001 This complementary book to ACSM's Guidelines for Exercise Testing and Prescription elaborates on the Knowledge Skills and Abilities KSAs you need to study for any of the American College of Sports Medicine certification exams It also serves as a valuable professional resource behind the Guidelines New content includes updated research throughout and a reorganization of the KSAs to correspond with the sixth edition of ACSM's Guidelines Significantly revised chapters include Epidemiology of Physical Activity Physical Fitness and Selected Chronic Diseases Diet and Chronic Disease Medical and Invasive Interventions in the Management of Coronary Artery Disease Comprehensive Cardiovascular Risk Reduction in Patients with Coronary Artery Disease Smoking Cessation Policies and Procedures for Clinical Programs Both the clinical and health fitness tracks are covered in an attractive design that highlights the KSAs for each level of certification The book features both theoretical and practical physiological concepts and relates the examples to exercise testing training and programming thus providing a complete perspective on clinical exercise physiology and fitness A Brandon Hill recommended title *Chronicle Financial Aid Guide 2009-2010* Chronicle Guidance Publishers, 2009 **Directory of Published Proceedings**, 1995 **Pulmonary Rehabilitation** John Elliott Hodgkin, Bartolome R. Celli, Gerilynn Long Connors, 2000 This updated edition addresses the need for team care of patients with chronic obstructive pulmonary disease and demonstrates how to organize and manage an effective pulmonary rehabilitation program A guide for each member of the inpatient and home care pulmonary rehabilitation team this book combines theory with resources for practice Topics include patient assessment smoking cessation pharmacologic therapy nutrition support aerosol oxygen therapies guidelines for marketing administering a rehabilitation program in the United States and abroad and forms protocols and schedules New to the edition are eight chapters covering ventilatory muscle training outcomes measurement sleep disorders surgical intervention of COPD rehabilitation for patients with neuromuscular disease rehabilitation in nonobstructive lung disease and European mechanical ventilation methods international approaches to pulmonary rehabilitation from Canada Europe Japan South America the Philippines and the United States enhanced tables boxes and section headings and chapter outlines objectives **Strathmore's Who's Who, 1998-1999**, 1999 **A Parent's Guide to Cystic Fibrosis** Burton L. Shapiro, 1991 *Cystic Fibrosis* David M. Orenstein, 2004 Explains the how and why behind the disease process outlines the fundamentals of diagnosis and screening and addresses the challenges of treatment for those living with CF **Cystic Fibrosis** David M. Orenstein, Jonathan E. Spahr, Daniel J. Weiner, 2012-03-28 This one of a kind guide offers easy to understand explanations advice and management options for patients or parents of patients with cystic fibrosis The book

explains the disease process outlines the fundamentals of diagnosing and screening and addresses the challenges of treatment for those living with CF As one reviewer said this book is the only complete answer book for everyone living with the disease It is an indispensable resource for families of children with CF adolescent and adult patients and physicians nurses respiratory therapists and social workers involved in the care of CF patients **Strathmore's Who's Who, 2000-2001** Strathmore Directories, Limited,2001-05 **Action Guide for Accelerating Improvement in Cystic Fibrosis Care** Cystic Fibrosis Foundation,Dartmouth Medical School. Center for the Evaluative Clinical Sciences,Dartmouth/Hitchcock Medical Center,2006 **Guide to Diagnosis and Management of Cystic Fibrosis** National Cystic Fibrosis Research Foundation (U.S.). Professional Education Committee,1963 *Understanding Cystic Fibrosis* Karen Hopkin,2010-02-11 Cystic Fibrosis CF is the most common genetic disorder in the white population Since the discovery of the CF gene in 1989 scientists have learned a great deal about the biology of this disease which strikes one child in every 3 300 births With the gene pinpointed scientists are now working on ways to replace it and are developing better tests for early diagnosis *Understanding Cystic Fibrosis* charts the progress that has been made in identifying the mutations that cause CF and in understanding how these genetic errors cause a disease whose symptoms can range from mild respiratory distress to life threatening lung infections This book features a review of current available treatments research that can lead to therapies and perhaps a cure advice and resources for families and patients how to work best with health care providers and HMOs the history and diagnosis of CF who gets CF and why how CF affects the lungs intestines and other organs and a list of organizations support groups and resources [Guide to Diagnosis and Management of Cystic Fibrosis](#) National Cystic Fibrosis Research Foundation (U.S.),1965 **Cystic Fibrosis Care** Allison Peebles,Gary J. Connett,Judi C. Maddison,Joan Gavin,2005-06-14 Written by a team of experts in the field this unique book is a practical guide for the care of cystic fibrosis patients based on day to day experience and scientific evidence Chapters cover every aspect of care from basic daily respiratory and gastroenterology management to the more common complications in cystic fibrosis and includes problem solving more complex issues Covering all areas of clinical and psychosocial care for the cystic fibrosis patient *Cystic Fibrosis Care* is designed to allow quick access to relevant information and is an invaluable guide for physiotherapists GPs paediatricians nurses and dieticians Quick access to relevant information Boxes throughout the text to reinforce important messages Chapters to cover every aspect of care from basic daily respiratory and gastroenterology management the more common complications in CF to problem solving more complex issues **Cystic Fibrosis** Stephanie Duggins Davis,Margaret Rosenfeld,James Chmiel,2020-05-21 This book provides a comprehensive overview of the multisystem disease cystic fibrosis for both pediatric and adult patients Written by experts in the field the text outlines the progressive nature of CF as well as the impact of this autosomal recessive disease on the respiratory gastrointestinal endocrine rheumatologic and renal systems as well as the patient s mental health The book begins with a chapter describing the history of cystic fibrosis and how the

face of this life shortening disease has changed over the past several decades The following chapters elucidate the pathophysiology of how cystic fibrosis impacts each organ system Current management and therapeutics are detailed with step by step guidelines for clinicians This book is unique in that it highlights the entire person not just the respiratory system with detailed inclusion of the patient perspectives throughout informing practice standards and considerations This is an ideal guide for pediatric and adult physicians who care for patients with cystic fibrosis as well as respiratory therapists physical therapists nurses nutritionists and pharmacists who care for these patients

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