



# Medical Devices for Respiratory Dysfunction: Principles and Modeling of Continuous Positive Airway Pressure (CPAP)

*Ahmed M. Al-Jumaily*

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The primary objective of this book is to present recent research and development on Continuous Positive Airway Pressure (CPAP) devices with particular focus on their use for the treatment of the most prevalent respiratory disorders: Obstructive Sleep Apnea (OSA) and Respiratory Distress Syndrome (RDS). The book introduces the reader to the basic principles of operation, development and modeling in addition to updated literature surveys of respiratory support devices with an emphasis on OSA and RDS. The book reflects more than 10 years of research and development on using electromechanical engineering principles to improve clinical outcomes in the medical community. The book consists of an introductory chapter on modeling concepts plus two parts. Part 1 consists of five chapters which focus on OSA devices. The first chapter covers basic principles of operation, functionality and an updated literature survey on development, modeling and the improvement of relevant OSA treatment devices. The remaining four chapters focus on CPAP fluid dynamics, humidification, automatic control and mask design. Part 2 focuses on the use of the Bubble CPAP system to treat RDS. The first chapter covers basic principles of operation, functionality and an updated literature survey on these devices. The remaining two chapters focus on the modeling and development of Bubble CPAP devices and modeling of the neonatal respiratory system. Bioengineering researchers and engineers involved in the field of designing medical devices, as well as practitioners and students, will find this book a helpful compilation that familiarizes the reader with practical modeling approaches to enhance the design process. This book will have widespread use in undergraduate and graduate modeling courses.

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