# Creating a Vision for Respiratory Care in 2015 and Beyond

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**The respiratory care profession is over 60 years old. Throughout its short history, change and innovation have been the terms that best describe the development of the profession. The respiratory therapist (RT) of today barely resembles the clinicians of 60 years ago, and the future role of the RT is clearly open to debate. Medicine is continually changing, with new approaches to disease management emerging almost daily. Third-party payers are challenging payment for iatrogenic injury, manpower issues are affecting all disciplines in medicine, and the nonphysician and physician work force is aging. These factors make us question what the respiratory care profession will look like in the year 2015. To address this issue the American Association for Respiratory Care established a task force to envision the RT of the future. The goal is to identify potential new roles and responsibilities of RTs in 2015 and beyond, and to suggest the elements of education, training, and competency-documentation needed to assure safe and effective execution of those roles and responsibilities. We present the initial findings of that task force.** *Key words: respiratory care, respiratory therapist, iatrogenic injury, manpower, education, training, competency*. [Respir Care 2009;54(3):375–389. © 2009 Daedalus Enterprises]

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## Introduction

The profession of respiratory care was officially established over 60 years ago.[1] During the early years, respiratory therapists (RTs) were referred to as oxygen technicians, and most of their activities involved moving cylinders of compressed gas and administering oxygen via nasal catheter or oxygen tent.[2] Most oxygen technicians were trained on the job, although brief training programs began to appear in the late 1940s and 1950s.[3]

Today the profession hardly resembles what it was in the 1940s. RTs provide direct care, patient education, and care coordination. They practice in acute care facilities, long-term acute care facilities, skilled nursing facilities, assisted-living centers, subacute care units, rehabilitation centers, diagnostics units, and in the home.[4] RT training has also dramatically changed. Current accreditation standards require RTs to have, at minimum, an associate degree from an accredited program.[5] Legal requirements to practice respiratory therapy have also dramatically changed. All 48 contiguous states now legally recognize RTs. Limited permits or state licenses are now required in all states except Alaska and Hawaii, which have no statutory authority over the practice of respiratory therapy. Most states that have a licensure requirement also require continuing education.

The future role of the RT is clearly open to debate. Medicine is continually changing, with new approaches to disease management emerging almost daily. Third-party payers are challenging payment for iatrogenic injury and some established therapies. Manpower issues, including aging of the workforce, are affecting all medical disciplines. These factors make us question what the respiratory care profession will look like in the year 2015.

To address this issue the American Association for Respiratory Care (AARC) established a task force to "envision the RT of the future." The goal is to identify potential new roles and responsibilities of RTs in the year 2015 and beyond, and to suggest the elements of education, training, and competency-documentation needed to assure safe and effective execution of those roles and responsibilities. It was decided to hold a series of 3 conferences (Table 1). Here we present the findings of the first conference.

Table 1. Content Outline of the 3 AARC Task Force Conferences on the Future of the Respiratory Care Profession

| Conference | Objectives |
|---|---|
| 1 | To identify the emerging values of the United States' evolving health-care delivery system.<br>To define potential new roles and responsibilities of RTs in 2015 and beyond. |
| 2 | To identify the skills, knowledge, attributes, education, and competency-documentation that RTs will need for the new roles and responsibilities. |
| 3 | To determine how we get to where we'll need to be to prepare RTs for the new roles and responsibilities, with minimal impact on the workforce. |

RT = respiratory therapist

## Methods

In the spring of 2007 the AARC executive office formed a task force of 15 individuals with knowledge of the respiratory care profession, respiratory care education, and health-care policy, consumers of respiratory care, and 3 AARC executives (Appendix 1). These individuals were selected based on their long-term commitment to and knowledge of the respiratory care profession, as evidenced by the elected positions they held and their work history, their commitment to research and education, or their personal experiences receiving respiratory care. In addition, individuals were selected to represent stakeholders in the profession, which were identified as employers, employee groups, foundations, professional associations, state and federal government agencies, education institutions, health-care delivery systems, and the public. These individuals participated in a series of telephone conference calls and e-mail discussions at least monthly, culminating in a 1-day face-to-face meeting in the fall of 2007. These discussions focused on designing a 3-day conference to address these questions:

- What are the emerging values of the United States' evolving health-care delivery system?
- How does the evolving system relate to the context of diagnosis, treatment, and management of patients with respiratory disorders?
- What responsibilities should RTs assume to assure adequate access, efficiency, and quality of respiratory care services?

Dr Kacmarek has had relationships with Space Labs, Puritan Bennett, Maquet, Cardinal Health, Newport Medical, Hamilton Medical, Respironics, General Electric, and Dräger. Dr Kageler has had relationships with Nurtur. Dr O'Neil has had relationships with Genentech, National Institutes of Health, the Betty and Gordon Moore Foundation, the Californian Health Care Foundation, the California Endowment, the Blue Cross/Blue Shield Association, and the Pew Charitable Trusts. Dr Durbin has had relationships with Kimberly Clark and Masimo.

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Table 2. Conference 1 Program

| Topic | Speaker(s) |
|---|---|
| Welcome and Introductory Remarks | Sam P Giordano MBA RRT FAARC, American Association for Respiratory Care |
| Overview of Process and Introduction of Participants | Charles G Durbin Jr MD FAARC, University of Virginia, Charlottesville, Virginia<br>John R Walton MBA RRT FAARC, Resurrection Health Care, Chicago, Illinois |
| A Vision of the Health-Care System in 2015 and Beyond: Planning Assumptions and Questions To Be Addressed | Charles G Durbin Jr MD FAARC, University of Virginia, Charlottesville, VA<br>John R Walton MBA RRT FAARC, Resurrection Health Care, Chicago, Illinois |
| Current Status and Evolution of the Health Care System | Edward H O'Neil PhD MPA, Center for the Health Professions, San Francisco, California<br>Gordon D Rubenfeld MD MSc, University of Toronto, Toronto, Ontario, Canada |
| Current Status of Respiratory Care Within the Health Care System | Patrick J Dunne MEd RRT FAARC, Healthcare Productions, Fullerton, California |
| What Respiratory Patients Need | John W Walsh, COPD Foundation and Alpha-1 Foundation, Miami Florida |
| Special Considerations That Impact Health Care and Respiratory Therapy Demand in the Military | Col Michael J Morris MC USA, Brooke Army Medical Center, Fort Sam, Houston, Texas |
| Public Health | Judy Blumenthal PhD, United States Department of Health and Human Services, Washington DC |
| Current and Future Human Resource Issues | William H Dubbs MEd MHA RRT FAARC, American Association for Respiratory Care |
| The Impact of Biomedical Innovation on the Responsibilities of the RT | Neil R MacIntyre MD FAARC, Duke University, Durham, North Carolina |
| What Should RTs Be Doing in the Future? | John R Walton MBA RRT FAARC, Resurrection Health Care, Chicago, Illinois |
| Role of the Future RT Across the Spectrum of Care | Robert M Kacmarek PhD RRT FAARC, Massachusetts General Hospital, Boston, Massachusetts |
| Disease Management: What Skills Do RTs Need? | Woody V Kageler MD MBA, Tarrant County College, Hurst Texas; and Nurtur, Dallas, Texas |
| Development of a Vision of the Future Role Description for RTs in 2015 and Beyond | Charles G Durbin Jr MD FAARC, University of Virginia, Charlottesville, Virginia<br>John R Walton MBA RRT FAARC, Resurrection Health Care, Chicago, Illinois |

- What responsibilities can RTs add or expand that will improve efficient utilization of respiratory care resources and management of patients with chronic respiratory diseases?
- The first of the 3 conferences was held in Dallas, Texas, on March 3–5, 2008 (Table 2). Appendix 2 lists the stakeholders who were invited to participate. Appendix 3 lists the 35 conference attendees. At the conclusion of the conference there was a lengthy discussion involving all the attendees, to develop the preliminary outline of the conference's findings. The conferences chairs, John Walton and Charles Durbin, prepared a summary of the conference findings, which was refined by the task force via e-mail correspondence and sent to all attendees for review and comment. Based on attendee feedback, a final summary of the conference findings was developed, which was approved by the planning committee and sent to all conference participants. The results section below is written as a consensus statement about the conference findings. The referenced supporting materials are detailed in the discussion section.

## Results

### Predicted Changes in Health Care

The following are general trends in health care that will affect the respiratory care profession.

Since the United States' population continues to age, more patients will be diagnosed with chronic and acute respiratory diseases. There will be increased accuracy of diagnosis. Treatment will be aimed increasingly at outpatient management, and avoidance of hospital admission will be a goal. Increasing numbers of comorbid conditions will be identified that require management/treatment. "Health promotion" rather than illness treatment will become the goal of care.

Cost increases for care will continue, and individual, corporate, and public payers will find it increasingly difficult to meet these expenses.

Personal electronic health records will be more widely accepted and used in all care settings, including the home.

Health-care consumers will pay a greater percentage of costs and will have new options for obtaining care. Retail health clinics and other mass-marketed care centers will stimulate consumer-driven cost competition.

Hospitals will continue to provide expensive, episodic care and will house cutting-edge respiratory life-support technology, but subacute and home care providers will continue to play important roles. The delivery of acute care will move progressively from the hospital to the patient's home. Subacute and chronic care will increase in volume and complexity.

The disconnect between prevention and acute-care treatment (specifically, in hospitals) will lessen but not disappear. The increased complexity of care will heighten the need for better communication among all care providers and between the patient and family members. Telemedicine and telecare will be increasingly used in all care settings. Medical care will undergo increasing scrutiny for quality, and this will increasingly be linked to reimbursement, with initiatives such as pay-for-performance.

New models of health-care delivery, such as "hospital at home," "medical home," and telemedicine, will emerge, with increasing emphasis on coordination of care throughout the health-care system, including patient homes. Reimbursement and costs will influence the development and success of these new models.

### Changes in the Health-Care Workforce

There will be national and regional shortages of all types of providers, including those who frequently interact directly with patients, such as physicians, nurses, and RTs, and those who have less intense patient interaction, such as diagnostic and laboratory technicians. There will be long-term competition for all advanced skilled workers throughout the United States economy. The rise in clinical demand will increase the number of jobs faster than the health-care workforce enlarges. This imbalance between the number of jobs and number of available workers will be aggravated by the aging and retirement of current providers. Less popular work hours (eg, night shift and weekends) in in-patient and other settings will dissuade some individuals from pursuing health-care careers. Shortages of teaching faculty and the limited number of programs will limit the number of entrants to and graduates from schools of allied health professions. Clinical sites are limited in number and variety. They will need to be expanded to include new venues, such as office practices and patients' homes. New information and education technologies will challenge traditional education. Care-delivery organizations will find reinvestment in education an attractive way to secure workers, reduce orientation time, and provide education and career ladders for employees.

### Changes Expected in Respiratory Care

The science of respiratory care will continue to evolve and increase in complexity. Clinical decisions will become increasingly data-driven. Respiratory care will be an important part of care in all venues. Scientifically supported algorithms (protocols) will be the most common way to deliver respiratory care. This will stimulate an even greater need for RTs to be involved in research and will require the average RT to be adept at understanding the practical ramifications of published research.

Care teams will become the standard for health-care delivery in and outside the hospital. Team members will have different roles and responsibilities at different times, but respect and collaboration will be the hallmark of effective team functioning. Patients and their families will be important members of the health-care team and must be informed, empowered, and engaged in personal health management.[6]

Cultural differences among patients will require the RT to develop new skills and adopt various approaches to care for different groups.

Information management will become an important tool in choosing therapies and evaluating their effects. New respiratory life-support technologies will be developed and deployed. Research by the respiratory community on new technologies' clinical and cost effectiveness will be necessary. Changes in the reimbursement system will be very important drivers of changes in health care and disease management. Public health issues, military, and disaster-response concerns will continue and require new skill sets for RTs. RTs' knowledge, socialization, training, and skills will need to be aligned with the factors and changes detailed above.

## Discussion

### Drivers of Health-Care Change

Five interrelated drivers will shape most of the reality for health care and respiratory care over the next decade and a half (Table 3).

**Cost of Care.** The United States' approach to organizing and delivering health-care services, more than 16% of the nation's total productive effort, is the most expensive in the world.[7] It amounts to about $2 trillion per year, making it the seventh largest economic undertaking in the world. Health care is the largest part of the public budget, and the

Table 3. Drivers of Change in Health Care

| |
|---|
| Cost of care |
| Demographics |
| Shift in the disease burden |
| Technology |
| Consumers of health care |

trust fund that pays for Medicare Part A has only about 10 years of funding remaining. On the private side, corporations, which have been the backbone of the employer-based health insurance system, are reducing coverage for employee health care. Individuals fear the loss of health insurance and direct exposure to the cost of care—a fear that often requires them to stay in jobs they don't care for or flirt with financial disaster because of lack of proper health insurance.[7] Some third-party payers are proposing to eliminate payment for iatrogenic injury. These changes will require more efficient, effective, and safe care by all caregivers.

**Demographics.** The population is aging. As more of the people born after World War II (baby boomers) reach age 65, more clinical and financial stress will be placed on the health-care system. The good news is that the United States is aging at a slower rate than most of the nations we will compete with internationally,[8] but those nations have already brought their citizens into health-care-payment plans that incorporate some form of cost control.[9] Tension is building between the cost of health care and the increasing need for health care by the baby-boom generation. Another demographic trend that is easily missed is population growth. Between 2000 and 2025 the United States population is projected to grow by almost 20%.[9] This is already generating a growing demand for new capacity, from hospital beds to new providers.

**Shift in the Disease Burden.** Disease burden will shift from acute disorders to chronic disease and disability. The United States population now lives 35 years longer than it did 100 years ago, which increases the likelihood of chronic disease. This will be multiplied by the aging baby-boom generation.[10] The real driver here is that, while the demands of disease and population are changing, the United States health-care system is still designed to provide acute care, and not to prevent or manage chronic disease. This mismatch is no small part of the cost and dysfunction of health care in this country.[10]

**Technology.** This driver has already reshaped most of society and the economy over the past 20 years. As information and communication technologies make their way into health care, they will change administrative functions first, then clinical work, and then (the most revolutionary change) the redistribution of knowledge from the experts, directly to the consumer/patient.[11] This change will accelerate over the next few years, as information technology merges with biomedical technology to produce care-management technology. With these tools, patients and their families will be more directly connected to the specialized knowledge of health care. The future will see a growing erosion of this professional monopoly, and, as the system is held accountable for new demands, technology will create new ways to organize, deliver, evaluate, and use the specialized knowledge that is at the core of health care.[11] Telemedicine and telecare will be increasingly utilized in all care settings.[12,13]

**Health-Care Consumers.** Certainly, quality and access are 2 important drivers. However, change will most likely be forced by the consumers of health care. As costs increase and public and private payers become less likely to cover desired services, individual and new groupings of purchasers will emerge to express their desires in the market.[14] They will look at quality (as best they can judge it), convenience, price, consumer satisfaction, and a host of other qualities that will affect their decision to purchase.[14]

## Current Status of Respiratory Care Within the Health-Care System

Respiratory care is an important, integral part of the current health-care system because of the prevalence and seriousness of pulmonary disease, and because respiratory compromise is common with any severe major organ-system failure. Most respiratory care is provided in the acute care setting, the intensive care unit, and the emergency department, where necessary respiratory interventions are aggressive, often life-saving, and frequently include mechanical ventilation.[15,16] Many of these patients have comorbid conditions. In addition to treatment of exacerbations of chronic respiratory conditions, current respiratory care practice includes trauma patients and patients without a primary respiratory diagnosis but who suffer a secondary pulmonary complication.

Because of the high prevalence of several specific pulmonary conditions in the United States, the proportion of all acute-care patients with respiratory issues is large (Table 4), often involves hospitalization, and is responsible for a large majority of the respiratory care delivered.

Chronic obstructive pulmonary disease (COPD) is a very prevalent but treatable disease and has been diagnosed in at least 12–14 million individuals. Twelve million more may have undiagnosed COPD and continue to smoke despite increasing shortness of breath. This undiagnosed group will increase the need for respiratory care in the future.[27] COPD is now the forth leading cause of death in the United States. It is estimated that by 2020 it will be ranked third.[27]

Table 4. Common Respiratory Disorders and Associated Facts

| Diagnosis | Number of Diagnosed Individuals | Estimated Undiagnosed Individuals | Estimated Cost of Care ($) | Facts |
|---|---|---|---|---|
| Chronic obstructive pulmonary disease | 12 million | 12 million | $37 billion (2004) | Fourth most common cause of death.[17,18] |
| Asthma | 22 million | Unknown | $19 billion | Rising prevalence in younger individuals. Falling death rate: 4,000–5,000 deaths per year.[19] |
| Obstructive sleep apnea | 18 million | Unknown | Unknown | Drowsiness causes 100,000 accidents and 40,000 injuries per year.[20,21] |
| Lung cancer | 2.2 million | Unknown | Unknown | Falling incidence since 1994. 150,000 deaths in 2004.[22,23] |
| Interstitial fibrosis | 200,000 | Unknown | Unknown | Industrial exposure and idiopathic are common etiologies.[24,25] |
| Cystic fibrosis | 30,000 | Unknown | Unknown | Increasing diagnosis with neonatal screening.[26] |

COPD treatment in 2004 cost over $37 billion, $21 billion of which was for hospital care.[28]

Asthma affects 22 million people in the United States. Nearly a half million patients with asthma are admitted to hospitals, at a cost of over $19 billion. Although the asthma death rate is declining, 4,000–5,000 people die from asthma each year.[27]

Obstructive sleep apnea remains an underdiagnosed respiratory disorder that impacts motor-vehicle safety, costing lives (as many as 1,500 deaths a years are caused by drowsy driving and industrial accidents) and reducing productivity. There may be as many as 18 million affected individuals, 6 million of whom have moderate-to-severe obstructive sleep apnea. The interactions between obstructive sleep apnea and other organ disorders are synergistic and greatly increase the overall health impact, morbidity, and mortality.[29-34]

Education of patients, professionals, and each other is an essential skill for RTs, and is important to reducing recidivism in patients with chronic respiratory diseases. Protocolized care (best practices),[35,36] disease management,[37-39] preventive care,[40] risk-factor modulation, disease self-management,[41] and smoking cessation are recognized methods to improve health and reduce costs. However, there are substantial financial and systemic barriers to applying those methods in respiratory practice.[42-46] A change in the reimbursement system could change the emphasis from acute (high-cost and high-risk) interventions to aggressive symptom management by the patient and the RT and should decrease the need for hospitalization.[47] That is, the location of care will shift from the acute-care setting to the home and other care sites. This shift is expected to expand reimbursement criteria for care provided in the home.

## Potential Impact of Military and Public Heath System Changes on Respiratory Practice

The missions of the armed forces are diverse, including intervention in regional and local conflicts, provision of humanitarian aid on foreign soil,[48] responding to disasters,[49,50] and supporting nation-building. All military branches provide respiratory therapy services with medical reservists with RT credentials (or combat medical experience) or with individuals trained by their service branch. The goal of that experience is to develop a flexible individual who can deliver broad-based technical care, including respiratory care, and function in various roles, including the operating room, intensive care unit, battlefield, and the traditional hospital.[51] Few individuals with respiratory care training are regularly utilized by the armed forces. This need may expand if major conflicts emerge.

In the military health-care system, most respiratory care is delivered to dependents, noncombatants, and veterans, mostly by the Veterans Affairs hospital system, and the rest through insurance and health plans such as TRICARE[52,53] (formerly the Civilian Health and Medical Program of the Uniformed Services, or CHAMPUS), provided at civilian hospitals. An increase in the size or activity of the military would increase health-care demands and respiratory therapy opportunities.

In contrast to the armed services, the United States Public Health Service recognizes respiratory therapy as a profession and offers officer status to baccalaureate-level RTs in its commissioned corps. The United States Public Health Service, under the Department of Health and Human Services, includes over 6,000 qualified public health officials under the supervision of the Office of the Surgeon General. They provide various services to United States citizens, including responding to immediate and long-term

Table 5. Respiratory Therapist Work Force 2000–2016

| Year | Number of Active Respiratory Therapists (according to) | |
|---|---|---|
| | State Licensure Boards | Bureau of Labor Statistics |
| 2000 | 111,706 | ND |
| 2005 | 132,651 | ND |
| 2006 | ND | 122,000 |
| 2016 | ND | 145,000 |

ND = no data available

Table 6. Number of Respiratory Therapists per 100,000 Population

| | RTs/100,000 population | Rank Among the 50 States |
|---|---|---|
| Top Five | | |
| District of Columbia | 56.0 | 1 |
| Indiana | 52.7 | 2 |
| Ohio | 46.2 | 3 |
| Kansas | 46.1 | 4 |
| Nebraska | 42.4 | 5 |
| Bottom Five | | |
| Wyoming | 23.7 | 46 |
| Alaska | 22.9 | 47 |
| New Jersey | 22.8 | 48 |
| Minnesota | 22.5 | 49 |
| Utah | 20.0 | 50 |
| United States mean | 32.1 | NA |

RT = respiratory therapist
NA = not applicable

health needs, public-health promotion, disease-prevention programs, advancing public-health science, emergency-response assistance, and providing medical leadership to various components of the United States Government. The Public Health Service has 2 components: the commissioned corps, which is a career path with assignment changes and advancement; and civil service employees, who are stationary. Any change in the domestic mission of the United States Public Health Service, occurrence of a world or national disaster, or terrorist activity could increase the demand for health-care workers, alter RTs' job expectations, and create opportunities for RTs.

### Current and Future Human Resource Issues

The number of active RTs in the workforce projected by the AARC 2005 human resources study was 132,651,[54] which is 19% greater than that in the 2000 AARC human resources study.[55] The United States Bureau of Labor Statistics reported that there were 121,000 RTs employed in 2006, and predicted a 19% increase in the need for RTs (to 145,000) between 2006 and 2016 (Table 5).[56] The Center for Health Workforce Studies reported in 2004 that RTs are unevenly distributed across the country; the highest density is in the District of Columbia (56/100,000 population) and the lowest density is in Utah (20/100,000 population), and the mean for the United States is 32/100,000 population (Table 6).[57] In 2005 the highest proportion of RTs (20.1%) worked in the Atlantic mid-coast and southeast area, and the lowest proportion (4.6%) worked in New England.[54] Seventy-four percent of RTs work at least part-time in acute care.[54] Sixty-one percent of RTs work in urban areas, and 38.5% work in rural areas.[54] The number of male RTs increased from 36% to 40% between 2000 and 2005.[54,55] The mean age of active RTs in 2005 was 45 years, and the mean years of experience was 19 years.[54,55] The average age of the RT in the workforce increased by 4.6 years between 2000 and 2005.[54,55] Very few RTs older than 65 years were actively practicing in 2005.[54]

The RT vacancy rate for budgeted positions in 2005 was 8.6% (10,000 positions), which is an increase from 5.9% in 2000.[54] The 2005 AARC human resources study projected a need for 171,684 budgeted positions in 2010.[54] In 2015 the projected budgeted RT positions will exceed 200,000 if the growth in new positions continues at the 2005 rate. A severe manpower shortage will result if RT retirees are not replaced by graduates from respiratory therapy programs.

Directors of respiratory therapy departments and schools find it difficult to fill vacant positions given the current manpower shortage of adequately prepared RTs. Accredited associate and baccalaureate/masters degree RT programs provided 24,150 graduates between 2004 and 2007 (an average of 6,048 graduates/y) (Table 7).[58] Advanced-level graduates composed 83.7% of the total in 2004, and 90.7% in 2007.[58] Only 9.5% graduated from one of the 53 baccalaureate or masters degree programs.[59] Graduates from accredited schools increased by 19% per year in 2005 and 2006, but decreased by 19% in 2007 (see Table 5).[49] Over the 10 years 2005 to 2015, 47.5% of program directors and 34.2% of directors of clinical education will retire from accredited respiratory therapy programs.[54] The loss of key program personnel in the near future is a serious problem that will require more graduates with baccalaureate and masters degrees to replace retired faculty members.

A steady influx of new respiratory therapy programs continued in 2008.[60] There are currently 34 entry-level, 341 advanced level, and 10 polysomnography programs that are accredited by the Commission on Accreditation of Allied Health Education Programs (CAAHEP) (this excludes the 48 programs that hold a Committee on Accreditation for Respiratory Care Letter of Review).[60] Of the 34

Table 7. Graduates From Associate Degree and Baccalaureate Degree CAAHEP Accredited Programs

| | Number of Graduates | | | | |
|---|---|---|---|---|---|
| Year | 2004 | 2005 | 2006 | 2007 | Total |
| Baccalaureate | 445 | 486 | 591 | 569 | 2,091 |
| Associate | 4,634 | 5,570 | 6,612 | 5,241 | 22,083 |
| Total | 5,079 | 6,056 | 7,203 | 5,812 | 24,174 |

CAAHEP = Commission on Accreditation of Allied Health Education Programs

entry-level programs, only 8 are free-standing, without an advanced-level option. Five of those 8 plan to become 200-level programs.[60] The other three 100-level programs are located in areas that also have 200-level programs.[60] The Committee on Accreditation for Respiratory Care notified sponsoring agencies that a new CAAHEP accreditation standard will address only one entry level program (98% of all CAAHEP accredited programs are at the 200 level).[60] The 2008 Coalition for Baccalaureate and Graduate Respiratory Therapy Education roster lists 54 CAAHEP-accredited respiratory therapy programs, 53 of which award baccalaureate degrees, and 3 of which award masters degrees.[59]

### The Role of the RT in Biomedical Innovation

The role of the RT and the development of biomedical innovations have advanced in parallel. The respiratory therapy profession began out of necessity. With the development of treatments for respiratory disease came the need for practitioners to administer those treatments. In the early years, RTs were referred to as oxygen technicians; they administered oxygen therapy, Schwartz rebreathing tube treatments, aerosols, and intermittent positive-pressure breathing, and performed arterial blood gas analysis and pulmonary function studies.[2]

Today, the RT's role is vastly different. RTs use sophisticated medical equipment, manage mechanical ventilators, and administer invasive and noninvasive mechanical ventilation in all care settings. RTs provide extracorporeal life support to critically ill neonatal, pediatric, and adult patients, and safely transport patients via ground and air. They perform numerous diagnostic studies, including sleep studies. They also provide the traditional forms of aerosol, oxygen, and bronchial-hygiene therapy, and patient education on these therapies. RTs have also become an integral part of care in the home and subacute settings.

The general forces that are driving change in health care also drive respiratory care, but the role of the RT in 2015 will also be driven by biomedical innovation and evidence-based medicine. The increasing sophistication of mechanical ventilators and clinical monitoring systems necessitates an even more sophisticated RT. Care of the critically ill mechanically ventilated patient will demand increased understanding of protocol-driven approaches to ventilatory support, many of which will be integrated into the mechanical ventilator.[61-64] Ventilation modes recently introduced in the United States challenge the historical approaches to ventilatory support. "Smart Care,"[61] adaptive-support ventilation,[59] proportional-assist ventilation,[63] and neurally adjusted ventilatory support[64] all require in-depth understanding of respiratory physiology and the response of the ventilator to changes in patient status. All of these modes are forms of closed-loop controlled, protocolized approaches to ventilatory support that will need to be mastered by the RT.

New bedside respiratory monitoring systems will most likely be in clinical use by 2015, and may provide data similar to that currently provided by expensive diagnostic equipment, such as computed tomography, that require patient-transport.[65] Electrical impedance tomography,[66] acoustic thoracic monitoring,[67] and optoelectronic plethysmography[68] are examples of bedside monitoring techniques that could move from the research laboratory to the bedside. RTs will need greater understanding of complex physiology and the application of these physiologic monitors.

Paralleling the development of ventilators and respiratory monitoring systems is the development of extracorporeal gas-exchange techniques. Simple, easy-to-operate life-support devices, from those that only remove $CO_2$,[69] to completely pump-less extracorporeal lung-assist devices,[70] to implantable oxygenators,[71] are being trialed today. Although extracorporeal gas exchange has been used primarily in neonates, these emerging devices and the increasing emphasis on these techniques in other age groups and diseases seem to forecast a need for all RTs to understand the physiology of extracorporeal gas exchange and the operation of these technologies.

There has been an explosion of new aerosol devices and expanded applications of aerosol therapy. Several new types of aerosol device have been released and more are expected to enter the market in the near future. Increasingly there is pairing of specific drugs with specific aerosol

systems.[72,73] However, the RT's largest challenge will be the diversity of diseases in which aerosol will be used. Several antibiotics are now commonly delivered via aerosol,[74,75] and there is trialing of aerosol administration of many drugs, including heparin for fibrosis[76] and asthma,[77] furosomide[78] and opioids for dyspnea,[79] insulin for diabetes,[80] calcitonin for osteoporosis,[81] luteinizing hormone and follicle-stimulating hormone for infertility,[82] human growth hormone for growth,[83] and interferons for hepatitis.[84] These new aerosol therapies will challenge the RT and require a broader knowledge of physiology, general medicine, and pharmacology.

Paralleling the expansion of aerosol delivery is the field of genomics and gene-replacement therapy. Gene polymorphisms may explain the variable response to $\beta_2$ agonists[85] and steroids,[86] and susceptibility to acute respiratory distress syndrome[87] and its associated mortality.[88] Much work is underway to develop aerosolized gene-replacement agents for genetic diseases such as alpha-1 antitrypsin deficiency[89] and cystic fibrosis.[90] Advances in gene therapy will also challenge the RT's knowledge base.

The RT in 2015 will have to be able to understand the scientific evidence. Health care in general is increasingly driven by the concept of evidence-based medicine. By 1996 over 1,000,000 randomized controlled trials had been published, many with conflicting results, and most forgotten or disregarded.[91] RTs will need to be able to analyze studies to determine if the findings are appropriate for their practice, and be able to critique the findings and apply them when appropriate. This will require a clear understanding of research methods and statistics.

### Disease Management

With the increasing shortage of physicians[92] and nurses[93] there will be an increasing need for other providers to lead in the management of pulmonary disease. In addition, the United States population, which is currently over 300 million, is projected to be over 320 million by 2020.[94] More importantly, the population is aging,[8] so more chronic pulmonary disease (will be seen, which) will require more medical services. The ultimate drivers of the development of the health-care delivery system will probably be cost and quality.

The Disease Management Association of America defines disease management as "a system of coordinated health-care interventions and communications for populations with conditions in which patient self-care efforts are significant."[95] Disease management is an outgrowth of the managed-care model. The intent of disease management is to lower costs by educating and closely monitoring patients and reducing utilization of high-cost services such as hospital and emergency care. Three requirements of disease management are:

Table 8. Disease-Management Skills

| |
|---|
| Assessment |
| Physical examination and history |
| Family-assistance capabilities |
| Conditions in the home |
| Ability to distinguish between the important and the unnecessary |
| Ability to respond to assessment findings |
| Does the physician need to be contacted? |
| Should a protocol be initiated? |
| Critical thinking skills essential |
| Ability to communicate appropriately |
| Clarity and accuracy essential |
| Across all age groups and education levels |
| Accurate documentation is critical |
| Must have a command of the strengths and weaknesses of current research |
| Capable of applying standards and guidelines |
| Ability to deviate from guidelines when appropriate |
| Clear understanding of the financial aspects of the health-care business |

- The program must be able to identify the patient population that needs to be included in the program.
- There must be accepted standards of care the program uses in its delivery of services. In the management of respiratory disease the National Institute of Health asthma guidelines are a good example.
- The program must be able to measure outcomes and costs.

For a disease-management company to be successful it must attract professionals with a broad base of knowledge and skills, beyond a single disease or organ system. Control of diagnosis and management is still the role of the physician, but the disease-management staff must manage relations with the physician's office and establish the disease-management company's role in patient care. Success in disease management requires staff with a variety of skills (Table 8). Fitting into the disease-management model will be a challenge for RTs. Their scope of knowledge and skill will need to expand and they will need to refine their critical thinking and communication skills, receive training in finance, and increase their ability to analyze the literature.

### What Should the RT Do in the Future?

Price Waterhouse Coopers published in 2005 a report titled "HealthCast 2020: Creating a Sustainable Future,"[96] which contained the consensus opinions of 580 hospital executives, physician groups, payers, governments, medical supply companies, and employers, from 27 countries. In the principal scenario described in the report, most of the groups represented are facing rising health-care costs

Table 9. Key Points From the Price Waterhouse Coopers Health Research Institute Report "HealthCast 2020: Creating a Sustainable Future"[96]

| |
|---|
| Both private and government sources will be needed to fund health care. |
| Consumerism will change the way care is delivered. |
| Focus will shift to wellness and prevention. |
| Pay-for-performance will become the new paradigm. |
| Information technology will form the backbone of care. |
| Innovative, flexible care models will emerge. |

and diminished resources, while demand continues to grow. The report's consensus was that consumerism, wellness, prevention, pay-for-performance, information technology, and innovative flexible care models are what are needed (Table 9).

Assuming that somehow our political and private agencies will find a way to resolve our financial dilemma, the following 5 trends can be viewed from the perspective of how the RT may help to solve these issues.

**Consumerism.** Several professionals have little direct patient-care contact and are seldom if ever involved in assisting patients or their families with health-care choices. This is not true for the RT, who should be able to meet the changing demands of the consumer.

**Wellness and Prevention.** A few professions focus primarily on treating the specific malady presented and currently have little training or ability to function in the role of wellness and disease prevention. This is not true for the RT. Current RT education does provide such training; however, future RT education will need to address this concern in greater scope and depth.

**Pay for Performance.** Though all professionals contribute to the expense of health care, some have little ability to modify their work patterns to provide good patient outcomes while improving efficiency. Clearly the provision of respiratory care affects patient outcomes, which has increasingly become a focus of respiratory care practice. Future RT education will need to focus more on avoiding iatrogenic injury and on improving patient outcomes.

**Information Technology.** Most professions are adapting to the advent of electronic health-care information, but few are fully prepared to embrace this new future. Respiratory care has always embraced innovation in technology and can be expected to continue to do so.

**Flexible and Innovative Care.** Those professions with a broader perspective on health care outside a specific technical arena would do well here.

Using these criteria, the RT would rank highly on meeting these objectives. Additional RT characteristics that fit especially well into these future needs include: comfort with information systems and other advanced and emerging technologies; ability to fluidly interact with patients, families, physician, and other professionals in all care sectors; availability to the consumer at all times and in many current health-care settings; flexibility in adapting to changing treatment modalities and taking on additional duties. The RT is properly positioned to assume this role in the future health-care system, but there are many challenges that must be met before the role can be assumed.

## Summary

The health-care system in the United States is on the verge of dramatic change, driven largely by pressure to decrease costs and improve quality. These same forces also drive respiratory care, but the role of the RT in 2015 will also be driven by biomedical innovation and evidence-based medicine. The RT is in a unique position in the health-care system to assume the responsibilities emerging as the health-care system changes, but great challenges confront the profession if these roles are to be assumed. It will require the dedication and commitment of the entire profession if this change is to be achieved.

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## Appendix 1

Members of the Task Force on the Future of Respiratory Care

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William H Dubbs MEd MHA RRT FAARC
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John W Walsh (patient/consumer representative)
John R Walton MBA RRT FAARC

Appendix 2

Organizations Invited to Conference 1 on the Future of Respiratory Care

Allergy and Asthma Network - Mothers of Asthmatics
Alpha-1 Advocacy Alliance
Alpha-1 Foundation
American Academy of Family Physicians
American Academy of Pediatrics
American Association for Cardiovascular and Pulmonary Rehabilitation
American Association for Homecare
American Association for Homes and Service for the Aging
American Association of Community Colleges
American College of Allergy and Immunology
American College of Chest Physicians
American Health Care Association
American Hospital Association
American Lung Association
American Respiratory Care Foundation
American Sleep Apnea Association
American Society of Anesthesiologists
American Thoracic Society
Association of Schools of Allied Health Professions
Asthma and Allergy Foundation of America
Blue Cross
California Board for Respiratory Care
California Health Care Foundation
California Quality Collaborative
Center for Disease Control
Center for Health Professions
Centers for Medicare and Medicaid Services
Commission on Accreditation of Allied Health Education Programs
Committee on Accreditation of Respiratory Care
COPD Foundation
COPD-ALERT
Department of Defense Health Affairs
Health Resources and Services Administration/Department of Health and Human Services
Disease Management Association of America
Emphysema Foundation for Our Right to Survive
Federation of American Hospitals
Genetic Alliance
Health Professions Network
Healthcare Financial Management Association
Joint Commission
Leapfrog Group
Medical Group Management Association
National Association for Home Care and Hospice
National Association for Long Term Hospitals and Acute Long Term Hospital Association
National Association for Medical Direction of Respiratory Care
National Board for Respiratory Care
National Heart Lung and Blood Institute
National Home Oxygen Patients Association
National Network for Two-Year Colleges
North Carolina Board for Respiratory Care
Ohio Board for Respiratory Care
Pulmonary Fibrosis Foundation
Society of Critical Care Medicine
United Health Care
United States Office of Personnel Management
United States Public Health Service
Veterans Affairs Administration
Veterans Health Administration

Appendix 3

Attendees at Conference 1 on the Future of Respiratory Care

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William H Dubbs RRT MHA MEd FAARC, AARC Staff
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Charles G Durbin MD FAARC, Society of Critical Care Medicine
Robert J Floro RRT, The Joint Commission
Richard M Ford RRT FAARC, AARC Management Section
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