

# Respiratory Care: A Decade of Challenge and Progress

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As 2007 ends, I hand the Journal's reins to Dean Hess, and the editorship shifts from Seattle to Boston. This transition after my 10 years as editor in chief is a long-planned and carefully arranged process, one that should be seamless and uneventful from the perspective of RESPIRATORY CARE's readers. Quite a lot has happened in the last decade, but the Journal is healthy and in good hands.

In an editorial at the beginning of 1998, I discussed 3 distinct meanings for the words "respiratory care": a medical subject area, a distinct health care profession, and the Journal in which the editorial appeared.<sup>1</sup> After 10 years, it may be useful to review some of the things that have happened in respiratory care as defined in each of these 3 ways.

## Respiratory Care: the Subject Area

In this context, respiratory care refers to the application of the principles, skills, apparatus, and therapies used in evaluating and managing disorders that affect the respiratory system. Respiratory care includes patient assessment, airway management, the support or augmentation of oxygenation and ventilation, aerosol therapy, chest physical therapy, pulmonary rehabilitation, and numerous other modalities, all applied in the context of respiratory physiology and how it becomes deranged in patients. Depending on the health care system and clinical setting, these components are applied by different professions or combinations of professions, including pulmonologists, anesthesiologists, intensivists, physiatrists, nurses, physical therapists, and others. In the United States this subject area most directly involves respiratory therapists, working under medical direction and in concert with other professionals.

The rapid evolution of respiratory care as a subject area has continued during the last decade. In Table 1 I have listed some of the changes that have been most apparent to those working in this field. The table is not intended to be all-inclusive. A number of the trends and developments it lists were underway prior to 1998, but all of them have affected the field in important ways during this time.

In the intensive care unit, our management of acute lung injury and the acute respiratory distress syndrome, and our approach to severe exacerbations of chronic obstructive

pulmonary disease have changed quite profoundly during this time. Granted, the concept of ventilator-induced lung injury and the availability of noninvasive positive-pressure ventilation have been with us for more than 10 years, but it has been during this decade that these things have become standards of care. With an expanding evidence foundation generated by protocol-based, multicenter clinical trials of ventilatory management and other intensive care unit therapies, patient management relies more and more on protocols in everyday practice. Such management is being facilitated by the electronic medical record and other benefits of advancing health care technology.

The news is not all good. Having learned from human immunodeficiency virus and acquired immune deficiency syndrome in the 1980s that infectious diseases were far from "controlled," in the present decade we have been confronted by the emergence and spread of deadly infections both new and old. Severe acute respiratory syndrome (SARS), and the ongoing threat of a large-scale "jump" by influenza H5N1 from birds to humans, keep the prospect of caring for patients with previously unknown and highly communicable diseases clearly in our minds, and the spread of familiar but increasingly antibiotic-resistant bacteria in health care institutions has required substantial alteration of our daily routine. Ventilator-associated pneumonia is now front and center as both a clinical problem and a major administrative challenge.

On the positive side, the expanding therapeutic armamentarium for managing asthma and chronic obstructive pulmonary disease now rests on firmer scientific ground, and is guided at the practitioner level by numerous evidence-based international guidelines. With the global phase-out of ozone-depleting chlorofluorocarbons, development of alternative propellant systems and novel devices for delivering aerosol medications has accelerated in the last few years. High-flow nasal oxygen systems and portable battery-powered concentrators open up new possibilities in oxygen therapy.

Great progress has been made in the United States and some other developed countries in beating back the scourge of cigarette smoking. Fewer adult Americans smoke than in decades past, and there is already evidence of a leveling-off of some smoking-related lung diseases. However,

Table 1. Some Trends and Developments that Have Shaped Respiratory Care As a Subject Area, 1998–2007

Lung-protective ventilation; awareness and avoidance of ventilator-induced lung injury
Establishment of NPPV as standard of care in COPD exacerbation; spread of NPPV in other clinical settings
Further support for and spread of protocols in acute respiratory failure and other settings
Evidence-based guidelines for weaning from ventilatory support; establishment of daily spontaneous breathing trials as standard-of-care
Microprocessor-controlled ventilators; an expanding array of proprietary mode combinations and other features
Expanded use of ventilator graphics; better physiologic guidance of ventilatory support
Increasing magnitude and seriousness of healthcare-associated infections, especially ventilator-associated pneumonia
Actual and threatened epidemics of new viral respiratory infections
Tuberculosis—especially drug-resistant forms—as an increasing worldwide health problem
Evidence-based international guidelines for asthma and COPD
Increasing array of devices and other options for aerosol therapy
Turning of the tide against smoking in the United States; spread of cigarette marketing and use in other countries
Transformation of the literature of health care; instant worldwide access via the Internet
Effects of terrorism, natural disasters, war, and immigration on health care

NPPV = noninvasive positive-pressure ventilation  
COPD = chronic obstructive pulmonary disease

smoking among the young in this country is still far too prevalent, and the gains in tobacco control in North America are offset from a global perspective as cigarette sales, smoking, and tobacco-related diseases continue to increase in many other areas of the world.

As in all other areas of health care, the literature of respiratory care and our access to it have experienced a genuine transformation during this decade. We can now answer clinical questions practically in real time, in the intensive care unit, the office, or the classroom. We can search the world's primary literature via PubMed (<http://www.ncbi.nlm.nih.gov/sites/entrez>), access full-text articles there or through databases such as Ovid (<http://www.ovid.com>), instantly review topics in continuously updated electronic textbooks such as UpToDate (<http://www.uptodate.com>), and print out what we need for immediate application in teaching or in the management of the patient at hand. Compared to how we searched, accessed, and

used the literature just a decade ago, this has truly been a revolution. In addition to its transformation of clinical practice, research, and education in the subject area of respiratory care, this revolution has also impacted respiratory care the profession and *RESPIRATORY CARE* the journal, as I will mention below.

### Respiratory Care: the Profession

I pointed out in 1998 that, in most areas of the world, respiratory care as defined in the United States was practiced by health care professionals—physicians, nurses, physiotherapists, and others—other than respiratory therapists.<sup>1</sup> This remains the case at the end of 2007. However, there has been considerable expansion of the profession in some areas of the world. One impressive example is Taiwan, which has academic departments of respiratory therapy in 6 universities, licensure for respiratory therapists, and a professional association (the Taiwan Society of Respiratory Therapy) with nearly 2,000 members (personal communication, Chia-Chen Chu MSc SRRT FAARC, September 2, 2007). The International Respiratory Care Council (<http://www.irccouncil.org>), founded in 1991, now has 19 member countries. Living up to its name, the American Association for Respiratory Care (AARC) annual International Respiratory Congress has more and more participation each year by presenters and attendees from outside the United States.

In Table 2 I have listed some of the important developments in respiratory care, the profession, during the last 10 years. The entry-level requirements for working as a respiratory therapist have stiffened, as exemplified by the fact that completion of an associate-degree, 2-year program is the acceptable minimum educational preparation. In 2007 there are over 400 respiratory therapy programs in the United States, including 44 that offer baccalaureate degrees.

In respiratory care, as in other health care fields, increasing use of computers and the Internet has brought profound changes in education and credentialing. As one particularly influential example, consider how classroom teaching, staff training, clinical conferences, and continuing education have been affected by the ubiquity of the program PowerPoint (Microsoft, Redmond, Washington).

Some of the terminology has also changed. There are no more respiratory therapy technicians (CRTT), just certified (CRT) and registered (RRT) respiratory therapists. And, technically, the profession's members are no longer respiratory care practitioners (RCPs), but respiratory therapists (RTs).

Working as a respiratory therapist now requires a license, or its equivalent, in all 48 of the contiguous United States. The number of persons employed in this capacity as of 2005 was approximately 132,000, about three fourths

Table 2. Some Key Developments in Respiratory Care, the Profession, 1998–2007

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Increased entry-level education requirements; no more 1-year programs
Licensure or its equivalent in all 48 contiguous US states
Increasing use of protocols in all practice settings
Evidence-based AARC Clinical Practice Guidelines
Continuation of effects of transition of hospital respiratory care departments from revenue generators to cost centers; restructuring; downsizing
Increased focus on quality, patient safety, and reducing medical error
HIPAA and the new risk-management environment
Impact of computerization and information technology on department management, quality improvement, and staff training; the electronic medical record
Impact of the Internet on education, credentialing, and information access; the AARC Web site
Increased AARC membership, participation, and influence
International spread of the profession; increasing international role of the AARC
Growth of the AARC annual International Respiratory Congress in scientific stature and international participation

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AARC = American Association for Respiratory Care

HIPAA = Health Insurance Portability and Accountability Act

of whom work in acute-care settings (personal communication, Bill Dubbs RRT FAARC, AARC Director of Education, September 24, 2007). Current AARC membership is more than 42,000.

Respiratory care continues to gain professional and scientific stature. Primarily through the AARC, members of the profession are increasingly appointed to editorial boards and committees in other professional societies. Respiratory therapists are sought out as advisors to government initiatives, in the development of practice guidelines, and in the setting of industry standards. A respiratory therapist has been promoted to the rank of full professor at Harvard Medical School.

Although much of what respiratory therapists do is still based on tradition, or at best on a sound physiologic rationale, the everyday practice of respiratory care continues to become more evidence-based. This is illustrated by the AARC's switch during the past decade to an evidence-based approach and format for its clinical practice guidelines. And it is facilitated by the continued expansion of protocol-directed respiratory care in all practice settings.

Finally, along with every other segment of health care, the respiratory care profession in the United States has been profoundly affected during the last decade by changes

in its regulatory, administrative, and cultural environment. The Healthcare Information Privacy and Accountability Act (HIPAA) and the changes it has brought to the handling of patient-related information have altered many aspects of day-to-day practice. Increased focus on quality improvement, patient safety, and the reduction of medical error has led to changes in both the context and the structure of respiratory care.

### RESPIRATORY CARE: the Journal

FOR RESPIRATORY CARE, the Journal, it has been an eventful decade in several respects. I will discuss five of these that I consider to be most relevant in the context of the Journal's mission and long-range goals.

#### Recognition by the Scientific and Publishing Communities

Probably the most important event of the last 10 years was acceptance of the Journal by the National Library of Medicine's *Index Medicus* Board of Editors for inclusion in its databases, prominently PubMed, in 2000. Numerous previous applications for inclusion in *Index Medicus*, going back to the 1970s, had been unsuccessful, and had been regarded as the most important impediment to wider acceptance of this Journal by the medical and scientific communities.<sup>2,3</sup> Having its articles accessible to clinicians, researchers, and educators around the world via PubMed—with full text available online, as PDF files, either through PubMed or the Journal's Web site—has unquestionably increased the impact of its contents and also prompted more authors to submit manuscripts. Speaking of impact, in 2006 RESPIRATORY CARE was also accepted by Thomson Scientific (<http://scientific.thomson.com>) for inclusion in its Web of Knowledge databases (<http://isiwebofknowledge.com>). The Journal's first Impact Factor, a product offered by Thomson Scientific based on citations of articles published in the previous 2 years, will be released soon.

#### Role in Education and Clinical Practice

Although original research articles advancing the foundations and implementation of applied respiratory science are crucial to its legitimacy, I consider RESPIRATORY CARE's most important contributions to be its themed special issues—especially those arising from the special Journal conferences convened by the American Respiratory Care Foundation specifically for this purpose.<sup>4</sup> The articles in the special issues we have published during the last 10 years (Table 3)<sup>5–31</sup> deal with most of the important trends and developments listed in Table 1. These state-of-the-art reviews address practical matters of concern to clinicians managing pa-

Table 3. Themed Special Issues of RESPIRATORY CARE, 1998–2007

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Sleep-disordered breathing <sup>5</sup>
Pediatric acute respiratory distress syndrome <sup>6</sup>
Inhaled nitric oxide <sup>7</sup>
Artificial airways <sup>8</sup>
Thoracic imaging in the intensive care unit <sup>9</sup>
Long-term oxygen therapy <sup>10</sup>
Consensus conference on aerosols and delivery devices <sup>11</sup>
Palliative respiratory care <sup>12</sup>
Tracheal gas insufflation <sup>13</sup>
Acid-base physiology and disorders <sup>14</sup>
Evidence-based medicine in respiratory care <sup>15</sup>
Invasive mechanical ventilation in adults <sup>16</sup>
Airway clearance techniques <sup>17</sup>
Emerging technologies for liquid nebulization <sup>18</sup>
Neonatal and pediatric respiratory care <sup>19</sup>
Chronic obstructive pulmonary disease <sup>20</sup>
Computers in respiratory care <sup>21</sup>
Integrating evidence-based respiratory care into clinical practice <sup>22</sup>
Research and publication <sup>23</sup>
Ventilator waveforms and mechanics <sup>24</sup>
Ventilator-associated pneumonia <sup>25</sup>
Metered-dose inhalers and dry powder inhalers <sup>26</sup>
Heliox <sup>27</sup>
Neuromuscular disease <sup>28</sup>
Respiratory controversies in the critical care setting <sup>29</sup>
Clinical respiratory pharmacology <sup>30</sup>
Airway clearance: physiology, pharmacology, techniques, and practice <sup>31</sup>

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tients, and in some cases provide the only targeted discussions of their topics in the literature.

Two additional Journal conferences have been held in the last several months, the proceedings of which will be published in 2008: “Mechanical Ventilation in Mass-Casualty Scenarios,” and “Meeting the Challenges of Asthma.” I have listed in Table 3 only those whole-Journal issues completely devoted to the listed topics, without additional articles. We have published several other themed article series, primarily developed from symposia presented at the annual AARC International Respiratory Congresses, on such topics as pulmonary function testing,<sup>32</sup> aerosol administration during mechanical ventilation,<sup>33</sup> and tracheostomy.<sup>34</sup> Important additional contributions to education and clinical practice include many individual review articles, and the AARC’s new and updated Clinical Practice Guidelines (available at <http://www.aarc.org>).

### Publication of New Research

After an initial several-year lag, submission and publication of original research articles have picked up notably during the second half of the decade under discussion. The number of such articles published in RESPIRATORY CARE

during the last 5 years is 50% more than the average for the preceding 10 years. Submissions have substantially increased—especially during 2007—and the Journal’s 2006 and 2007 volumes contain twice as many original research articles as the previous average. Since 2003 we have also published more than twice as many case reports as in the previous 10 years, in part thanks to the Journal’s “Teaching Case of the Month” feature, introduced in 2004.

The OPEN FORUM, at which new research is presented via posters and mini-symposia at the annual AARC International Respiratory Congresses, has continued to expand during the last decade and to generate manuscripts for submission to the Journal. Like the authors of those manuscripts, the OPEN FORUM is increasingly international and multidisciplinary.

### Ethical Aspects of Research and Publication

Although for many years the Journal has published guidelines on the ethics of research and publication, in addition to explicit policies for handling conflicts of interest among authors and reviewers, during my time as editor these things have drawn to the forefront as never before. The subject matter of respiratory care, closely tied to the development and use of devices, drugs, and other aspects of the commercial side of health care, means that close partnerships among investigators, clinicians, and industry are both inevitable and desirable.<sup>35</sup> However, it also means that this Journal has had to contend directly with the furor about conflicts of interest and other ethical matters that has surrounded biomedical publication in recent years.

“The authors report no conflicts of interest.” This seemingly explicit statement could actually have a number of meanings: that the authors actually have no such conflicts; that they do not understand what is being asked and are declaring that they do not consider themselves to be biased by any existing relationships; that they have conflicts of interest but are knowingly withholding them from disclosure; that they failed to respond to the Journal’s query about conflicts of interest; or that they were never asked in the first place. With the exception of the last of these possibilities, the Journal has encountered them all during my tenure.

Even late in 2007 we have continued to receive manuscripts reporting studies for which approval by the appropriate institutional review board was not sought, and to learn after the fact of important, undeclared conflicts of interest on the part of authors and reviewers. The possibilities of undeclared sponsorship and ghost authorship continue to be of concern, particularly with certain types of manuscript. Our policies, explanations, and examples pertaining to conflicts of interest are now more carefully worded and widely promulgated than ever before, but this

is definitely an area that will continue to receive close attention in the coming years.

### Transition to Electronic Manuscript Submission, Peer Review, and Publication

Last but emphatically not least among events in this Journal's last 10 years has been its conversion to Scholar One's Manuscript Central for Web-based submission, peer review, and processing of all manuscripts. No mean feat for the Journal's small staff (an assistant editor and part-time copyeditor in Seattle, and an editorial assistant in Dallas) while carrying on its usual work, this transition involved rewriting all policies and procedures, revising all forms, developing and configuring the site, and migrating our entire database of reviewers and authors—and it took 2 years. The new system is now up and running via our Web site (<http://mc.manuscriptcentral.com/rcare>), and it is my hope that its benefits—including a shorter overall manuscript turnaround time for authors—will be more and more evident in the coming months and years.

### Some Parting Reflections and Acknowledgements

In 1998 I listed a number of specific goals for the Journal:

Specific goals include augmenting the number and quality of submitted and published research papers, increasing the Journal's readership among physicians and other clinicians (including respiratory therapists), increasing international participation both in reading and in contributing to the Journal, and enhancing the Journal's established role as a source for valuable teaching and reference documents.<sup>1</sup>

I further noted that:

The Journal's success will be measured by these things, and by increasing recognition by such institutions as the National Library of Medicine and its Index Medicus. Ultimately, however, this journal will succeed to the extent that it improves the care of patients, through more effective and safer devices and techniques, through more efficient use of resources, and through the better education of clinicians.<sup>1</sup>

Much remains to be accomplished in approaching these goals, but we have made definite progress. Although not every aspect of being editor in chief has been pleasant (notably, writing rejection letters and nagging delinquent reviewers), in most respects the last 10 years have been stimulating and enjoyable. My role in the planning, pre-



Fig. 1. What editors do. In addition to helping to plan and host RESPIRATORY CARE's Journal conferences, as unofficial photographer I have also taken the faculty portraits accompanying the publication of their proceedings. This typically involves some shuffling and cajoling, as at the recent "Controversies" conference in Banff.<sup>29</sup> (Photograph courtesy of Ray Masferrer RRT FAARC.)

sentation, and follow-up of the Journal conferences has been a particularly gratifying part of the job, although it has demanded a diversity of activities and skills (Figure 1).

I am indebted to the many friends and colleagues around the world who have graciously lent their time and efforts as manuscript and book reviewers. Those with the misfortune to live and work in or near Seattle—23 respiratory therapists, 14 nurses, and 172 physicians (94 of the latter as University of Washington faculty members and 25 of them as trainees in our fellowship)—have been burdened disproportionately by my requests, and I appreciate their generosity and expertise.

The Journal has been ably served by the members of its Editorial Board during my tenure as editor. I am indebted to them, and especially to my 5 Associate Editors, for their consultation, guidance, and adjudication. Things can change in unexpected ways in this business. In the last 10 years several leading medical journals have experienced disruption and turnover, with their editors either dismissed or departing abruptly, and editorial boards in open conflict with sponsoring societies and other overseers. In the context of these prominent examples, I am particularly appreciative of the easy access, unwavering support, and political firewall provided for me by Publisher Sam Giordano and Managing Editor Ray Masferrer throughout the time I have been editor in chief.

I consider RESPIRATORY CARE to be an outstanding journal in terms of its quality as a product. I know of no publication with fewer grammatical mistakes, errors in data reporting or display, technical inaccuracies, incorrectly cited references, or typographical errors. These things are not the editor's doing but are the result of the skill and diligence of everyone else involved in transforming submitted manuscripts into published articles—assistant edi-

tor, copy editor, proofreaders, and printer. It has been a privilege to work with these dedicated professionals.

Dean Hess PhD RRT FAARC, my friend and Journal colleague for more than 2 decades, is the best possible person to take over as editor in chief. He has the knowledge, the history, the chops, and the wisdom to take RESPIRATORY CARE forward, and I step aside with full confidence that the Journal will be in excellent hands as it faces the challenges to come.

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