Research and Publication in Respiratory Care

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This issue of RESPIRATORY CARE consists of 18 articles about carrying out, presenting, and publishing research in this field. These articles grew out of symposia convened by the Journal's Editorial Board at the last 3 annual International Respiratory Congresses of the American Association for Respiratory Care (AARC), presented by members of the Board and devoted to different aspects of these subjects.

Like other peer-reviewed science journals, RESPIRATORY CARE publishes articles of 3 general types (Fig. 1 and Table 1). Original research articles, method and device evaluations, and case reports present new data about diseases, equipment, and therapies. The purposes of publishing the information in such articles are to advance scientific knowledge and in so doing to inform and guide the evaluation and management of patients. Other types of articles, such as reviews, overviews, and updates, summarize and synthesize existing information in order to reinforce the theory and teach the principles underlying our field. Practical examples, such as those in the Journal's "Teaching Case of the Month" feature,[1] are important instructional vehicles and also belong in the category of education. The interpretations and opinions of experienced clinicians, investigators, and others in the field also compose an integral part of scientific publication. Articles in this category articulate individual points of view and seek to persuade the reader; editorials, point-of-view pieces, and letters to the editor are in this category.

Although the categories are clearly separated in the figure, not all articles are readily separable into such neat compartments. Many things we publish contain elements of 2 or all 3 types. Articles reporting the results of research studies often contain summaries of previous work and discussions of how the present findings relate to previous findings. These summaries provide useful synthesis and are excellent educational resources. Many also contain highly individual interpretations, opinions, and speculation.

Table 1 does not include all publication types. Meta-analyses of groups of previous studies generate original data and so fall under the category of new information, and a similar case could be made for other types of systematic review. The latter belong in the "education" column as well as under "new information." The table does not list clinical practice guidelines and consensus statements, which fall somewhere between education and opinion, although the AARC's clinical practice guidelines are beginning to rely increasingly on meta-analysis and other rigorous techniques for examining evidence.[2] All 3 publication types represent evidence that can be used in guiding clinical practice, although evidence from opinion pieces and educational features is not as strong as that in articles reporting new information, and among papers in this last category there exists a definite ranking in terms of the strength and quality of the evidence presented.[3]

The articles in this issue focus on the "New Information" category in Figure 1, and discuss the step-by-step process by which new knowledge in medicine is discovered, vetted, and disseminated. The steps in this process are listed in Table 2, and are discussed by the issue's contributors in 3 general subject groupings. These are the spectrum of respiratory care research, how to carry out a research project and present the results, and how to write a research paper that will be accepted for publication.

In the first group of articles, Chatburn[4] first provides an overview of respiratory care research, explaining how this is different from what we do every day in patient care, management, and education. Next come separate articles describing the 6 types of research study most commonly undertaken in this field. Fink[5] discusses device and equipment evaluations, explaining both why this type of study may be more feasible for many people in respiratory care than some of the others and also how important aspects of study design, equipment setup, and experimental protocol can determine whether the results are valid. Schwenzer and Durbin[6] next describe what most authorities consider to be the most powerful study type in terms of the evidence it can produce, the prospective clinical trial, along with important things to be considered when investigators contemplate undertaking this type of research. Retrospective studies and chart reviews are then discussed by Hess,[7] who explains both the advantages of such studies in terms of technical and logistical feasibility and their potential disadvantages in terms of interpretation and generalizability.

All respiratory care department managers are involved in quality improvement activities, and such activities can be a valuable context for research if this is done appropriately. Stoller[8] discusses the potential advantages of research on the process of care, as well as cautions and limitations of which the would-be investigator needs to be aware. Investigating the knowledge, attitudes, and interests of people involved in respiratory care can be informative and useful, whether they are patients, clinicians,

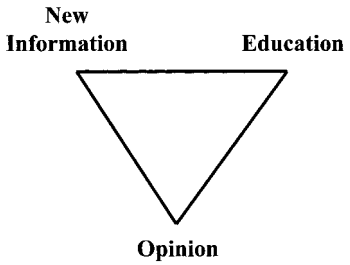

Fig. 1. The 3 general categories of original material published in journals such as RESPIRATORY CARE. As discussed in the text, they are less distinctly separated than shown here, and considerable content overlap tends to occur.

Table 2. How New Knowledge Is Established in Science: The 10-Step Sequence Involved in Research and Publication

1. Observation; current knowledge and practice
2. Hypothesis generation
3. Study design
4. Data collection
5. Data analysis
6. Abstract preparation and submission
7. Abstract presentation
8. Manuscript writing and submission
9. Peer review and revision
10. Publication

students, or educators. In his article introducing survey-based research, Rubenfeld[9] points out the pros and cons of this approach and offers helpful advice on using it appropriately. Finally, I[10] discuss the case report as a means for both generating new knowledge and teaching important lessons in respiratory care.

The next 5 articles deal with how to carry out a research project and present one's findings at a national meeting. The emphasis here is on practical advice, and the articles are written by experienced researcher-presenters in this field. First, Durbin[11] gives a brief overview of how to come up with a good research question. Generating a hypothesis that can be tested using the scientific method is a crucial first step before the would-be investigator can begin to think about how to carry out the study, but it also often appears more an obstacle than a step. This article may provide assistance in moving ahead in such circumstances.

Very few people in respiratory care are employed as researchers. Nearly all have other things—caring for patients, teaching students, managing a department—as their main work activity. Ward and Plevak[12] have extensive experience with generating research ideas and carrying out investigations, and teaching students to accomplish these things, in the context of doing other things for a living. They identify the problems most often encountered and offer practical advice for avoiding and overcoming them.

Next come 3 articles that cover submission and presentation of an abstract at a national professional meeting of one's peers, an important intermediate stage in the life of a research project, between a study's completion and its publication. The first of these[13] explains the functions and components of a research abstract and offers advice on preparing each part. It also gives some practical tips on writing and on avoiding problems in the submission process, using as examples several actual submissions to last year's RESPIRATORY CARE OPEN FORUM. Shelledy[14] next describes the different elements of a research poster, and discusses ways to make one's poster both effective and attractive. Drawing on years of experience both in presenting posters and in moderating poster discussions, Campbell[15] then offers practical advice on how to most-effectively summarize, discuss, and defend one's poster at the meeting.

The last group of articles addresses the subject of how to write a research paper that will be accepted for publication. Branson[16] first gives an overall description of the components and purposes of a paper reporting original research. The subsequent 3 articles go into greater detail on a research paper's methods, results, and discussion sections. Kallet[17] discusses how to write the methods section, considered by many to be the most important section of a manuscript in terms of potential suitability for publication. Durbin[18] focuses on figures and tables and how to use these most effectively to display results. Hess[19] then reviews the purposes of the discussion section, points out common problems with this section in many papers, and offers practical guidelines for keeping the discussion within

Table 1. Categories of Publication in RESPIRATORY CARE

	New Information	Education	Opinion
Examples	Original study	Review article	Editorial
	Method or device evaluation	Overview	Point of view article
	Case report	Update	Letter to editor
		Teaching case of the month	
Functions	Advance scientific knowledge	Teach principles	Interpret
	Guide practice	Synthesize complex or difficult material	Articulate point of view
		Illustrate with practical examples	Persuade

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bounds and making it most effective. Finding the right references and using them effectively are then discussed by Rau,[20] emphasizing the use of electronic databases and other sources. Finally, I offer a "Top 10 List" for prospective authors,[21] considering the most common reasons for rejection of submitted manuscripts and suggesting ways to avoid them.

RESPIRATORY CARE last published an issue devoted to research and publication nearly 25 years ago.[22] That issue was put together by the Clinical Research Membership Section of the American Association for Respiratory Therapy (AART), as the AARC was then called. Included were articles on several of the topics in the present issue, including searching the literature,[23] identifying a clinical problem,[24] designing and carrying out a clinical study,[25] and preparing a manuscript for submission to a journal.[26] However, several issues addressed in the 1980 Clinical Research Guide—such as sources of grant funds[27] and how to write a grant application[28]—are beyond the scope of the present project and therefore omitted. Although statistical methods are discussed briefly in several of the present articles, the general subjects of research methodology and biostatistics—nicely addressed in an article by Pilbeam[29] in the 1980 issue—are now too broad for inclusion in this issue.

In the interval since the AART Clinical Research Guide appeared, several books have been published that can help prospective respiratory care investigators design, carry out, and publish research studies. These include reference works intended for a general medical readership[30–32] and also publications specifically directed at those working in respiratory care.[33,34]

A frequent discussion topic among members of the Journal's Editorial Board over the years has been, "Where will the next generation of respiratory therapist researchers come from?" The experienced researchers and authors who contributed to this special issue do not have the answer to this question, but all of us consider it a matter of great concern. The clinical, regulatory, and technological contexts in which respiratory care is carried out today are different from those initially confronted by the profession's "old guard" of seasoned investigators. Conceiving, performing, and publishing research studies in our field are in some ways more difficult today. Nonetheless, good research *can* be carried out in respiratory care, and its results successfully presented and published.

The articles in this issue aim to promote and facilitate this process. They are directed primarily at the first-time researcher, although more experienced investigator-authors may also find useful information in them. Although they differ in length and comprehensiveness, and as symposium papers contain variable amounts of overlap, these articles all share the goals of making research accessible to people working in respiratory care, enabling them to carry it out correctly and with valid results, facilitating proper interpretation and clear presentation of their findings, and increasing the likelihood that their manuscripts will be accepted for publication in a peer-reviewed journal.

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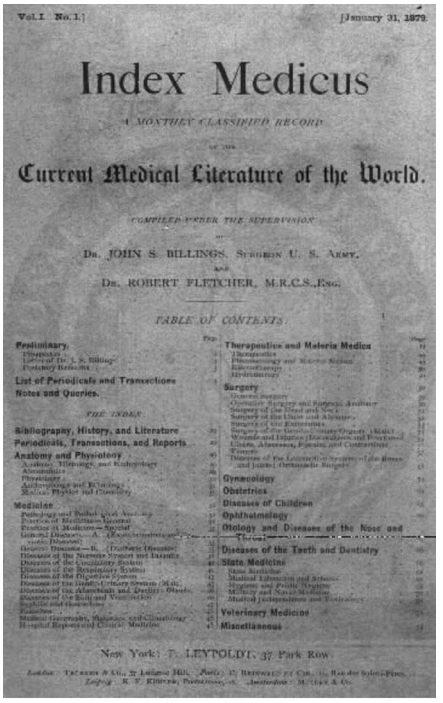

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