Transforming clinical research into everyday practice: are respiratory care practitioners proactive or reactive?

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In 1949 Davies and Mackinnon examined the neurological effects of carbon dioxide (CO_2) in the presence of heart and lung disease [1]. They hypothesized that hyper-oxygenation could lead to CO_2 retention in individuals with chronic obstructive pulmonary disease (COPD). In their published findings they described "hypoxic drive" and cautioned physicians on using oxygen with COPD patients. Their work captured the attention of the medical community and other investigators [2]. Many in the medical community continued to fear oxygen administration in the presence of COPD, despite ongoing investigation in the field of oxygen therapy in the 1960s and 1970s. Those investigations include the exceptional work of Dr. Tom Petty, considered the father of home oxygen therapy [3]. Thinking began to change slowly following a significant finding by Aubier et al [4, 5] who were investigating oxygen administration in COPD with a new hypothesis; they were looking for a different mechanism as the cause of elevated CO_2 levels in the blood. They found that mechanism in the form of "hypoxic pulmonary vasoconstriction" which, like hypoxic drive, is a protective mechanism [5].

In 1988 Neff [6] explored the use of pulse oximetry in clinical practice. Neff suggested that oxygen saturation, via pulse oximetry, be considered the fifth vital sign that clinicians monitor and record routinely. At the time, as a new practitioner, I tried to integrate my knowledge of respiratory physiology, pathophysiology, arterial blood gases (ABGs), hypoxic drive, and hypoxic pulmonary vasoconstriction with the use of multicoloured oxygen venturi devices that I carried in my pocket. I would have greatly appreciated understanding how oxygen delivery devices (i.e., the open oxygen mask) used together with bedside oximetry could have facilitated prompt, safe, and effective oxygen therapy. Unfortunately, there was poor knowledge of Neff's work in the general clinical setting, and though many clinicians had access to pulse oximetry, we had little appreciation for its value. Had I recognized that value, I could have been a pioneer in clinical practice, rather than discouraging the use of pulse oximetry simply because it was new, foreign, and suspect. Respiratory therapists practiced with the belief that ABGs were the gold standard in monitoring oxygen therapy.

In 1995, the American Thoracic Society (ATS) published its consensus guidelines for the diagnosis and treatment of COPD [7]. In that document the society addressed oxygen administration and arterial oxygen saturation. Decades of research and peer-reviewed clinical evidence were required before a consensus paper could be drafted by such a prestigious body. The ATS advised clinicians not to withhold oxygen for fear of hypoxic drive; the potential harm associated with not effectively treating hypoxemia was far greater than the risk posed by hypoxic drive. Current best practice in the management of acute exacerbations of chronic obstructive pulmonary disease (AECOPD) supports the use of pulse oximetry to achieve safe and effective oxygen saturation, in the range of 88%–92% [8]. Available evidence supports that conservative use of oxygen therapy, guided by oximetry, is associated with less respiratory acidosis and better patient outcomes [8]. It is not, however, a safeguard to protect the hypoxic drive mechanism.

Some readers are probably asking, "why use old COPD issues to demonstrate delays in practice implementation?" There are far more exciting and frequently contested issues in critical respiratory care such as lung protection strategies in mechanical ventilation. Yet the case of AECOPD provides decades of observation and evidence. AECOPD is the leading cause of emergency room visits in Canada and is a leading cause of death globally [9]. After decades of evidence and practice it appears that the accurate diagnosis and management of COPD is often a topic of little interest and poor engagement for most respiratory therapists and other primary care providers.

Today, the rate of healthcare innovation exceeds the rate of implementation [10]. That brings us to another growing field of study and publication, evidence-based research on the implementation of evidence-based science. Claude Lenfant was the longest serving director of the U.S. National Heart, Lung, and Blood Institute, ending his 21-year term in 2003. Lenfant published a compelling article in the *New England Journal of Medicine*, "Clinical Research to Clinical Practice – Lost in Translation?" [11]. He identified that it may take up to 15 years for proven interventions to make their way into general, not complete, clinical practice. In fact, Lenfant noted that some important interventions never make their way into practice. Evidence suggests that the gap between investigation and implementation is growing and that extensive obstacles to progress exist such as budget restraint, multiple decision makers, knowledge translation, layers of bureaucracy, and heavy workloads to name a few [11, 12].

If as a profession we fail to adopt new practices that are safer, faster, easier, and cheaper we may have a problem in our practice areas. Apathy is perhaps the most dangerous obstacle to change in the practice setting. Failure to keep pace with evidence-informed practice and best practices might even be considered neglect. Practicing in the past is more dangerous today than ever. We must use our clinical experience to guide practice and drive innovation. There is a great need to promote communication and build connections between clinical research, educational institutions, the healthcare industry, and clinical practice. If it takes on average 15 years for evidence to make its way into our practice, have we yet to implement evidence available from as far back as 2001? As a concrete example, are we consistently following best practice guidelines for the diagnosis and management of AECOPD? If not, what have we missed?

I have always guided my practice on the principle of patient- and family-focused care, as well as my personal quest for service excellence. That commitment to quality dictates that I stay current in my practice while engaging others in the practice setting. There are countless opportunities for clinicians in quality improvement. There also exists a role for bedside practitioners in closing the gap between clinical research and clinical practice. Some practice settings struggle with implementing basic changes in practice. If this sounds like you, I invite you to ask your community of practice this question: "Are we practicing in this century or the last?"

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REFERENCES

1. Davies CE, MacKinnon J. Neurological effects of oxygen in chronic cor pulmonale. Lancet 1949;2(6585):883–5. doi: 10.1016/S0140-6736(49)91459-2.
2. Donald K. Neurological effects of oxygen. Lancet 1949;16:1056–7. doi: 10.1016/S0140-6736(49)91632-3.
3. Pierson DJ, Thomas L. Petty's lessons for the respiratory care clinician of today. Respir Care 2014;59(8). doi: 10.4187/respcare.03495.
4. Aubier M, Murciano D, Fournier M, Milic-Emili J, Pariente R, Derenne JP. Central respiratory drive in acute respiratory failure of patients with chronic obstructive pulmonary disease. Am Rev Respir Dis 1980; 16:191–9.
5. Aubier M, Murciano D, Milic-Emili J, et al. Effects of the administration of O2 on ventilation and blood gases in patients with chronic obstructive pulmonary disease during acute respiratory failure. Am Rev Respir Dis 1980;16:747–54. doi: 10.1164/arrd.1980.122.5.747.
6. Neff TA. Routine oximetry. Chest 1988;94:227. doi: 10.1378/chest.94.2.227a.
7. Standards for the diagnosis and care of patients with chronic obstructive pulmonary disease.American Thoracic Society. Am J Respir Crit Care Med 1995;152(5 Pt 2):S77–121.
8. Austin MA, Wills KE, Blizzard L, Walters EH, Wood-Baker R. Effect of high flow oxygen on mortality in chronic obstructive pulmonary disease patients in prehospital setting: randomised controlled trial. BMJ 2010;341:c5462. doi: 10.1136/bmj.c5462.
9. Global Initiative for Chronic Obstructive Lung Disease. Global strategy for the diagnosis, management and prevention of chronic obstructive pulmonary disease. 2011. Available at: http://goldcopd.org/
10. Sargeant J, Hurley KF, Duffy J, Sketris I, Sinclair D, Ducharme J. Lost in translation or just lost? Ann Emerg Med 2008;52(5):575–576. author reply 576–7. doi: 10.1016/j.annemergmed.2008.05.041.
11. Lenfant C. Clinical research to clinical practice – Lost in translation? N Engl J Med 2003;349:868–74. doi: 10.1056/NEJMsa035507.
12. Balas EA, Boren SA. In: Bemmel J, McCray AT, editors. Yearbook of Medical Informatics 2000: Patient-Centered Systems. Stuttgart, Germany: Schattauer Verlagsgesellschaft mbH; 2000, pp. 65–70.