

## A REVIEW OF 4 IMPORTANT PR PAPERS FROM 2020-2021

Hello and welcome to this episode of LungFIT. This year, I was honoured to give the year's Pulmonary Rehabilitation Clinical Year-in-Review at the American Thoracic Society International Conference. For those of you who don't know, at the ATS there are a series of these Clinical Year in Review talks, and different speakers will give an overview of some of the leading papers published on that topic over the year.

I thought it would be interesting to do a podcast episode that talked about those papers, kind of a fast journal club for several papers, in the way that I presented it at ATS. So if you did listen to the Year in Review from ATS, this episode will be a repeat for you! But I encourage everyone to read these papers, I'll put the links in the show notes.

Before I begin, I would like to acknowledge that I'm presenting to you today from Vancouver, Canada, which sits on the traditional and unceded territory of the Musqueam, Squamish, Stolo, and Tsleil Waututh Nations.

When I was putting together the Clinical Year in Review and I was thinking about the papers that I would select, I was also thinking about what life has been like over the last 1-2 years. We know that this last year or so has been so challenging for us all. The COVID-19 pandemic, many political conflicts within and between countries, and numerous impacts of climate change, just to name a few, have really profoundly affected millions of people around the world. These factors, and many others, they impact our physical, our mental, our emotional and our spiritual health.

But we would be remiss if we didn't acknowledge that we don't all experience these assaults on our health in the same way, or to the same degree. There are many factors that, if present, can result in different impacts on health, and different barriers to accessing adequate health care. We don't talk about it enough in pulmonary rehabilitation, but racism and discrimination can affect people's ability to access pulmonary rehabilitation, the same as in other health care areas. Housing, educational opportunities, quality affordable health care throughout your life, the neighbourhood you're in, your food security, your income, your job, the environment that you live and work in, these are differentially distributed in society and any of them can have an impact on health as well.

And these social and economic drivers of health inequity do exist in pulmonary rehabilitation settings. They play a part in how programs get funded to begin with, compared to other kinds of rehab. They play a part in who has access to care. They even play a part in who participates in research, who are the teachers that we have, who are the clinicians that people see, who are the scientists in pulmonary rehab, and who is able to access health care and to successfully advocate for change.

Probably the most obvious example of health inequity related to pulmonary rehab is that fact that despite numerous high-quality studies showing important health and economic benefits of pulmonary rehab, few people can access it, we all know this.

In March of 2021 we had a LungFIT episode called "Who's Missing from Pulmonary Rehabilitation". I'll put that link in the show notes. And what is clear if you work in this area, and what I've mentioned many times, is that everyone is missing. In Canada, the number of available programs can only meet the needs of a tiny fraction of patients. It is estimated that even less than 2% of potential participants, in several studies this has been reported, have access to pulmonary rehab. And that is the reality in most places in the world, I expect. And then when you compare that to access and uptake of say stroke rehab (which is been estimated at 13-57%, depending on the country) or cardiac rehab (which was estimated at about 20-30% in the US). Can you imagine if we had access rates like this for pulmonary rehab? What an impact that would be.

But access to the few programs that do exist is likely is also not equitable. There are barriers to equitable access and completion of pulmonary rehab that, to date, really have not been very well-explored. We know little of the impact of discrimination, colonization, age, gender, location, costs, or other access barriers. And also, the overall stigma that is associated with lung disease, how that affects funding and access. These really have not been very well explored either.

So it is with a health equity lens that I'd like to present to you today several important papers published this last year that examined topics of impact, program delivery, transitions in care, and new populations, in pulmonary rehab. And like I said, the links to all the papers will be in the show notes.

The first study I'll discuss today is one published in Journal of the American Medical Association in 2020, with Peter Lindenauer as first author. The title of the paper is: **Association between initiation of pulmonary rehabilitation after hospitalization for COPD and 1-year survival among Medicare beneficiaries**. The purpose of this study was to investigate the association between the initiation of pulmonary rehab within 90 days of discharge from hospital after an acute exacerbation of COPD, and 1-year survival. So, looking at that relationship. We know that an acute exacerbation of COPD is really an important event in the natural history of the disease, and patients who have these exacerbations they can have a really severe decline in lung function, physical activity, and overall quality of life, and these exacerbations are associated with increased mortality. Pulmonary rehab soon after an AECOPD works to improve function and quality of life, but we don't know much about mortality, previous mortality studies have had quite small sample sizes.

In this study, about 2700 Medicare beneficiaries in the United States with a previous AECOPD-related hospitalization **and** PR within 90 days, and they were matched 1:1 with a control group who did not attend pulmonary rehab, using what's is called a propensity model. What's a propensity model? It's a statistical tool used to match people based on a number of characteristics. If you have a large pool of people from a population, there will be some characteristics that they share, such as age, sex, and location. You can use data on their characteristics to match each person with a similar person that have received a different intervention.

So they used a propensity model to match to create two cohorts out of this large population of Medicare beneficiaries. It should be noted that those that attended pulmonary rehab within 90 days were just a small fraction of that larger sample. The analysis only included patients discharged from hospitals where pulmonary rehab was available. So that had to be a criteria, that you had to have at least a pulmonary rehab program in your city.

When looking at the characteristics of those who attended pulmonary rehab within 90 days versus those who did not, those who attended had fewer comorbidities, and they were less frail than those who did not attend, but more likely to be receiving supplemental oxygen prior to hospitalization. But their primary question was looking at 1 year survival after pulmonary rehab, in those who had been hospitalized for this AECOPD. And the results of that analysis were quite impressive. Overall, participation in PR after an acute exacerbation of COPD discharge was significantly associated with a lower risk of dying from any cause over the one-year period. And this benefit was seen across a number of subpopulations, including those with comorbidities. They looked at several subgroups, those on home oxygen, different comorbidity burdens, and those who entered pulmonary rehab at different times. The survival benefit occurred across all of those subgroups.

So this is an excellent good-news story for pulmonary rehabilitation, and shows that we need to get people into rehab after discharge. But it's worth noting though, that when looking at the full cohort, there were differences in the characteristics of those who started pulmonary rehab within 90 days compared to those that did not. Men made up a larger proportion of those who attended. Also, people who identified as "European white" made up a larger proportion of attendees, and those that lived closer to the center were also more likely to go. We don't know why all these differences occur. So using that health equity lens, and an intersectional approach to data

analysis, could help us 'unpack' why these groups differed in terms of these characteristics. For example, understanding where programs are located, or how patients are referred by physicians, or the cost of programs, that could help us understand barriers to access for different groups. A mortality benefit probably exists across many groups, but health inequities still may exist related to how much of a benefit that people are able to see.

Moving on, another important study that was published this year explored the impact of pulmonary rehab in a minimal equipment setting. Pulmonary rehab is typically associated in hospitals or medical settings and most of those programs have treadmills, stationary bicycles, and often some sort of way to train muscles, a muscle training apparatus, is part of their set up. There are benefits to using this sort of "higher resource, more expensive" equipment – a lot of us were trained on how to provide pulmonary rehab using that equipment. And that equipment often enables a standardized approach to training from session to session, you can have quite an accurate exercise prescription.

But that equipment is costly, and it is not necessarily available to every program worldwide. It cost a lot to maintain that equipment. It can also be a challenge for patients to make the transition from a high resource environment, in your hospital with all that equipment, to a home environment, after discharge, when they don't have as much equipment.

So this next paper, published in Thorax with Suhani Patel as the first author, was to determine if pulmonary rehab conducted using minimal equipment would provide similar benefits as PR using what was termed 'specialist' exercise equipment. The title of the paper is: **Supervised pulmonary rehabilitation using minimal or specialist equipment in COPD: a propensity-matched analysis**. In this study, 318 people with COPD who attended the minimal program were matched using propensity scores - so that same sort of propensity model, with 318 people with COPD who attended the higher resource program. The PR-minimal group had access to a walking course, steps, free weights and bands, whereas the PR, or what they called the PR-gym group, had the typical treadmills, cycle ergometers and fixed-weight machines. Both groups importantly received similar supervision by PR clinicians.

To give you a better idea of the exercise prescription, how they kind of handle this, in both groups the aerobic exercise prescription was based on the incremental shuttle walk test, with the target of 60-80% of peak-predicted oxygen consumption, and a 3-4 on the Borg dyspnea scale. The resistance training for the gym group was based on the 1 repetition max test, whereas for the minimal equipment group used an RPE (rating of perceived exertion) to set the initial amounts.

And the results of this study are quite interesting, it shows that when look at the shuttle walk distance, the Chronic Respiratory Disease Questionnaire with the fatigue, the total score, the emotion, and mastery sections of that questionnaire, neither setting showed an increase benefit, they both were similar in terms of the benefit that they provided.

That is great news for programs, because many health care settings simply do not have the resources to equip full gyms, yet they want to provide exercise programs that do not compromise the quality of care that they are providing. This study provides evidence that it is possible to get similar health benefits with lower cost equipment, across a number of key health outcomes. Now we don't know, of course, if the gains seen in the low resource programs have the same long-term benefits, or if people who start off using the minimal equipment have a smoother transition to continuing on with their exercise once discharge. But it is conceivable that that transition to your home or community settings after discharge may be easier for the people that just continue to use that similar equipment, but that remains to be seen.

It is worth noting in this study that a lower percentage of the people in the PR-minimal program completed the full program. They had 36% of participants in the PR-min group dropped out, compared to 27% in the gym

program. So again, that kind of further unpacking the characteristics of the group that accessed that minimal program, and understanding why they did not complete, that would help us to understand the context in which these minimal programs occur, and other challenges that may be faced with respect to program completion. Because this study did not randomized people to either those setting, those people were in those setting, so there may be important differences in other characteristics of the patient or the context that they received care that could contribute to them having lower completion rates.

The next study I'd like to discuss focuses on the important transitions in care when patients are hospitalized with an acute exacerbation of their disease. As we know, there is a number of important transitions that occur, from hospital to home, to a rehabilitation facility, transition back to the primary care practitioner and other community resources, including pulmonary rehab. There are so many places where communication and care management can break down.

For a successful transition to pulmonary rehab after an exacerbation of COPD, or asthma, or pulmonary fibrosis, for example, all members of the health care team, and the patient, and their family, have to 'be on the same page', they have to be in agreement with the key steps that are necessary in the recovery of that patient, both during the hospitalization and after discharge.

So the next paper I'd like to discuss is a clinical trial, published in the American Journal of Respiratory and Critical Care Medicine in 2021, with Ruth Barker as first author. The title of the paper is: **COPD discharge bundle and pulmonary rehabilitation referral and uptake following hospitalisation for acute exacerbation of COPD**. In this study people hospitalized with an acute exacerbation were randomized to one of two groups. In addition to the regular COPD discharge bundle, the experimental group viewed a video that featured past patients talking about the importance and benefit of pulmonary rehab after discharge from the hospital, while the control group just received that COPD discharge bundle, which consisted of verbal information about pulmonary rehab and had a leaflet. So they wanted to know, does viewing this video that had patients talking about their experiences, and what pulmonary rehab was all about, and why it was important, did that end up increasing the actual uptake of pulmonary rehab?

The primary uptake of PR was the primary outcome of the study, the % of people that actually got into PR within 28 days of discharge. Secondary outcomes included uptake within 90 days, referral, completion, adherence rates, and changes in physical performance and quality life after 90 days.

The video was viewed by the patient, but it was also created in partnership with patients, they guided the investigators in the key messages and features of the video that was felt to best reach patients. So it included patient testimonials, images of patients in hospital and at the program, and it had patients with different levels of ability.

But the results showed that despite the work in creating this video, and the success in recruiting a large sample of 196 patients, there was no difference in % uptake of pulmonary rehab within 28 days, and there was actually no difference between the groups in secondary outcomes either. The investigators wisely incorporated a qualitative element to this study, where they interviewed people in the groups, both who did and did not go to pulmonary rehab. There was some very enlightening comments that came from those interviews.

While patients had positive things to say about the video, some didn't recall seeing it at all, which raised questions from the investigators about when is the best time to introduce pulmonary rehab to patients. Should it happen in the hospital? Should it happen after? But I also thought the comments relating to going to pulmonary rehab addressed, what I think, is a key issue in this transition. Patients commented that "I couldn't do pulmonary rehab now" (because I am recovering), or I can't commit (because I am recovering), or they thought they were already doing fine, and they said "my family or my health care provider thinks I'm already doing fine."

So viewing the video did not improve pulmonary rehab uptake, or changes in other health outcomes.

The investigators also noticed that less than 50% of patients agreed to participate in the trial, and almost half were lost to follow up. So that is a huge problem with this kind of program. The feasibility of these kind of trials going forward, when we talk about having fewer than 50% of patients approached agreeing and then many not even completing the study. We really do need to think about, how are we going to be able to adequately test some of these interventions?

But the findings from this trial, and others, also point to the need for larger-scale approaches to address this uptake issue. I find this messaging related to pulmonary rehab after hospitalization to be really inconsistent, and I really wonder how is this done in other rehab populations? It seems unlikely to me that a patient, after a stroke, would say, "oh, I couldn't do that now, the way that I am". Stroke rehab is such a given, especially for those with substantial impairment, and the message of the need for rehab is quite consistent across the whole stroke team. Whereas the messaging I hear seems to treat pulmonary rehab as an option but not important. We need a clear pathway to rehab that is reinforced by all the players in the health care team, from the acute care setting to after they get discharged, and when they are seeing their primary care practitioner, and I think that that clear pathway is really lacking.

So in essence, acute exacerbations of chronic lung disease need to be seen with the same urgency as stroke or myocardial infarction, and the lack of access to rehab for people with chronic lung disease, despite the high prevalence, burden of illness, and impact on the health care system, that's another health inequity example.

Now finally I would be remiss, of course, if I didn't include something about COVID-19 when I talked about what Clinical Year in Review papers were like for pulmonary rehab and, of course, what a year we've had. Our attention initially all focused on the prevention of infection and treating those with acute, severe disease, but we see more and more evidence about the ongoing problems people who have had COVID-19 face.

The number of studies which document these problems are staggering. Almost daily we can read a new article which characterizes a new limitation that these patients face. Rehab I think is going to be needed for many of these people, but who exactly will need it, what kind of rehab will be required, when in the process, for how long, how is it going to be delivered, and what programs are able to do this (might not necessarily be pulmonary rehab programs). These questions remain to be answered.

So for the last study I am going to talk about, it seemed appropriate to hear the patient's voice. In this study, entitled **Persistent symptoms after Covid-19: qualitative study of 114 "long Covid" patients and draft quality principles for services** with Emma Ladds as first author, they had individual interviews and focus groups and they conducted it with 114 people who had Long COVID, with the purpose of understanding the lived experience of these patients, including accessing health care, as well as getting their thoughts regarding improving services going forward.

Now a large proportion of these participants were health care professionals, so they come to these interviews with that perspective. From the interviews, several themes emerged. Participants spoke of a serious, uncertain and confusing illness, and for those of us who work with patients with Long COVID, I'm sure you've heard this even after many months after the initial infection, still new symptoms can emerge.

And so one quote was "I'm only at the point of just beginning to discover what the long term effects are, unfortunately my journey is far from over."

Patients talked about difficulty with accessing and navigating services, and this is coming from a group with a lot of experience in health care! There were comments such as having to do everything themselves and having to work the system to get the care they needed. They did not really feel that their symptoms were even believed, and that really added to their confusion, and there was a constant message of feeling emotionally and physically exhausted.

Participants also had several recommendations, which can inform us as we design and deliver rehab services. You'll see elements of health equity in all of these, with respect to access, removing the burden of navigating the system for patients, planning for transitions in care, and further developing the knowledge base, which includes of course understanding barriers to care.

And it is important because the WHO recommends that health care organizations and governments plan for rehab, and that will include increasing the capacity of the workforce to meet this demand. And is going to be so important for those of us in pulmonary rehab to thoughtfully consider what we can provide to these patients. The sheer complexity of many of these patients will likely mean additional training for us and an expansion of our teams, to meet their needs. And there are health inequities which are certainly emerging in COVID19, with respect to who is getting infected and how care is provided, and that is going to impact rehab as well.

So in summary, health equity in pulmonary rehab is not always directly expressed, but we can see in these papers that I've talked about today that elements of health equity are apparent if we look closely. I want to reinforce that while some of these papers provide indication about issues with health equity, or health inequities, it's so important to remember that what is missing is WHY. Why are there differences in enrollment, outcomes, adherence, retention? We need to explore these issues carefully, because it is too easy to just make simple categorizations of people and jump to conclusions about why health inequities exist. We do see further evidence in these papers that pulmonary rehab has an enormous impact, but these papers also raise questions about equitable access, and I think really lead us to further questions that can be addressed to ensure that everyone has the potential to realize the benefits.

I hope you enjoyed today's podcast, it's a bit of a longer one, but I do encourage you to have a read of these papers. I look forward to chatting with again on our next episode. Until then, keep moving and be happy.