Long covid, a contemporary sequalae: Considerations for Advanced Clinical Practice (ACP).

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Abstract:

The prevalence of long covid and the requirement for the provision of long covid care is universally recognised. An understanding of the model of care delivery, the patho-physiological impact of post-covid-19 syndrome and its multisystemic effects is required by ACP's. Research identifies conditions such as long covid dysautonomia, mast cell activation syndrome and increasing allergy risks as key areas ACPs can develop their knowledge base to inform current practices. Risk factors such as occupation, menopause, gender, and age, influence evidence-based treatment options. Advancements in practice inform the assessment and chronic management of long covid and provide opportunities for ACPs to evaluate caseload acuity to improve patient related outcomes.

Key words

Long covid, Advanced Clinical Practice (ACP), service delivery, pathophysiology, diagnosis, management

Introduction

During the Covid-19 pandemic Advanced Clinical Practitioners (ACP) demonstrated their autonomy, transferrable skillset, and high levels of expertise spanning the four

pillars of advanced practice (Morley et al, 2022, HEE, 2017). Their responsiveness to change at a time when many traditional professional boundaries had dissolved was instrumental, not only in delivering patient facing care, but also educating and preparing other staff in redeployment (Scott, Orton and Daw, 2022). Evidence suggests the acute impact of Covid-19 is under control due to successful strategies such as population prevention, education, vaccination, and research (Shu-Ching, Yeur-Hu, and Shiow-Luan, 2020, Coccia, 2021). However, an estimated 6.2% of the UK population self-identify as experiencing long covid or post-covid conditions which pose a challenge for ACP's in managing the care of such individuals (Brown and O'Brien, 2021).

Background

Long covid comprises of symptomatic Covid-19, which by definition is from four to twelve weeks and post-covid-19 syndrome, occurring from twelve weeks or more after acute infection (NICE, 2020). Long covid appears to be siloed by society, despite the detrimental impacts it has on population health, including health professionals (Marshall-Andon *et al.* 2021, Rogers et al, 2022). The condition affects many organs, causing multidimensional clusters of symptoms of varying severity and duration which may unpredictably fluctuate (Brown and O'Brien, 2021) with studies suggesting that individuals with long covid may have a lower quality of life than those surviving cancer (Harada *et al,* 2022). The Office for National Statistics (2022) estimates two million people in England are experiencing long covid symptoms four weeks post infection, with one in five facing a debilitating symptom impacting on their activities of daily living. Accuracy of this data may be contentious due to major challenges associated with a long covid diagnosis and self-reported symptoms (Amin-Chowdhury and Ladhani, 2021). Wong and Weitzer (2021) identify that

patients are often referred to long covid clinics due to symptoms overlap, such as fatigue and dysautonomia which are prevalent in both myalgic encephalomyelitis (ME) and long covid. The absence of specific diagnostic criteria and a lack of adequate Covid-19 testing during the pandemic leaves a level of uncertainty among clinicians diagnosing long covid (Ward *et al.* 2021). A lack of diagnostic tools to confirm long covid, despite contemporary advancements in modern medicine, is challenging to comprehend. Therefore, effective and systematic history taking during clinical examination is crucial, as studies suggest that this will lead to eighty percent accuracy of a diagnosis with appropriate differentials (Corrao and Argano, 2022).

Long covid service delivery

NHS England (2021) has driven the development of a five-point progression long covid plan including a three-tier long covid service model of self-management, primary care, and MDT specialist teams within ninety integrated care systems. The promotion of self-management through the 'Your COVID Recovery' mobile application has been used by eleven million people for education of long covid symptoms management such as sleep, fatigue, and anxiety, and it is believed that fifty percent of patients can improve from this alone (Marshall-Andon *et al.* 2021). Lllyod-evans (2022) advises this application has effectively reduced symptoms for people of all ages however, it is indicated that patients increase self-reported symptoms with time, making this data less conclusive. Despite low health technology literacy among older patients, the NHS continues to drive the implementation of health technologies (NHS Long term Plan, 2019). Evidence-based technology such

as this requires promotion by ACP's, particularly since NHS England (2022a) identify that health professionals account for ten percent of people with long covid.

Tier two of the long covid model involves patients attending General Practitioners (G.P) for assessment and investigations to rule out differentials based on symptoms, suggesting if no alternative pathology is observed, only the GP can refer to long covid services (NICE, 2020). Brennan *et al* (2022) found uncertainty of symptoms and pressures on GP workload as a cause for reduced long covid service referrals. ACPs are well placed to support GPs in the assessment and identification of "red flag" symptoms which require urgent action and referral (Greenhalgh et al, 2022).

Furthermore, the World Health Organisation (2021) reveals a lack of long covid surveillance globally, particularly in European countries where long covid services have been delayed. Nevertheless, despite unsustainable NHS staffing, ninety long covid services have developed into centralised research hubs to develop community education and provide rehabilitation pathways to improve patient outcomes through physical, social, and psychiatric assessments (Parkin *et al.* 2021). The long covid multi-disciplinary team integrates various professionals such as ACP's, doctors, therapists, and psychologists, to provide targeted individualised interventions using a specific set of outcome measures such as the Borg rating of perceived exertion (NICE, 2020). Outcome measures chosen based on patient-centred symptoms are monitored at eight weeks and six months of admission onto the long covid service (NICE, 2020), this can be complex due to the two hundred and three symptoms associated with long covid (Davis *et al* 2021). The service adopts a model (see figure 1.) of shared decision making (NICE, 2020) to plan, rehabilitate and identify health needs through holistic assessment tools such as the Covid-19 Yorkshire Rehabilitation Scale tool (see figure 2.) proven to improve patient outcomes

(Lacobucci, 2022, O'connor *et al.* 2022). Tools are important to support decision making for ACPs in practice but like other guidance this depends upon the user's professional decision-making abilities and engagement with the individuals being assessed (Smyth and Mccabe, 2017).

Figure 1.

Figure 2.

Pathophysiology, diagnostics, and management

Since the covid-19 pandemic, fifty million pounds of UK government funding has been invested into long-covid research projects (NIHR, 2022). Viral persistence, organ damage, immune deregulation, autoimmunity, viral debris, reactivated virus, and a disrupted microbiome are the main pathological causes of long covid (Medinger and Altmann, 2022). For example, studies exploring gastrointestinal biopsies taken four months after acute covid-19 uncovered live virus in a third of individuals, therefore suggesting an inflammatory response through cytokine storm leading to long term sequelae (Gaebler *et al.* 2020). Long covid is often reviewed in a comparable way to the Ebola or herpes virus which also develops a chronic syndrome, harbouring reservoirs of the virus in human tissue months or years after initial infection (Proal and VanElzakker, 2021).

Neurological

Even though acute covid-19 is predominantly a respiratory disorder, long covid greatly impacts cardiovascular, immune, and neurological systems (Medinger and Altmann, 2022). Brain scans on people with long covid found decreased brain activity in the brainstem, cerebellum, the limbic regions, and the olfactory nerve

(Guedj *et al.* 2021). The neurological impact creates symptoms such as Postural orthostatic tachycardia syndrome (POTS), brain fog, palpitations, dizziness, syncope, and exercise intolerance (Dani *et al.* 2021). Long covid creates an immune mediated disruption in the autonomic nervous system of patients with predisposed stress or genetic risk resulting in hypotension, POTS, and vasovagal syncope (Medinger and Altmann, 2022). When a person stands, blood will accumulate in the lower limbs with gravity, as a result, baroreceptors in the heart detect reduced stroke volume and signal a release of adrenaline to increase volume back to the heart through tachycardia which then subsides through homeostasis (Kavi, 2022). However, in orthostatic intolerance, the release of adrenaline causes palpitations, breathlessness, and anxiety at higher levels which can reverse this sympathetic response causing activation of the vagus nerve resulting in syncope through hypotension. Unfortunately, these symptoms persist with long covid as the hypothalamus struggles to reach homeostasis creating debilitating cycles of fight versus flight for patients (Larsen, Stiles and Miglis, 2021). Additionally, according to Public Health England (2017) falls cost the NHS £4.4 billion a year and as syncope is a common symptom of long covid this figure may increase. ACPs are pivotal facilitators in falls risk management which is a key performance indicator of care driven by the NHS (2019) long term plan. Long covid symptoms of syncope and deconditioning during quarantine have increased falls in people over sixty-five (Public Health England, 2021). ACPs responded to Covid-19 across different health and care contexts and continue to work across a variety of settings in day-to-day practice, (HEE, 2020). By contemplating a patient's degree of frailty and the contribution of long covid among other risk factors, ACP's could contribute to better

outcomes and prevent harm across primary, secondary, and tertiary disease prevention (Hoogendijk et al, 2019).

To diagnose POTS causing syncope, NICE (2020) guidelines identify the importance of a tilt table test, yet patient accounts identify the distress this test can have on exacerbating dysautonomic symptoms such as anxiety, palpitations, and breathlessness. Therefore, as suggested by the NHS England (2022a) long covid framework for nurses, understanding patient journeys and preferences is crucial for ACP's when informing personalised treatment plans and future service delivery. Although treatments are unavailable to reverse long covid, symptomatic relief for POTS is available, through prevention of hypovolaemia, low dose corticosteroids to reduce inflammation, and beta blockers (Medinger and Altmann, 2022). Yet, the focus remains on vagal nerve stimulation and the concept of neuroplasticity, which is the moldability of the brain through breathing exercises, avoiding exacerbating factors (Kavi, 2022). Despite the lack of quantitative evidence, Pilcher (2022), outlines the importance of practicing cold water swimming to reduce stress by developing a sense of autonomic control. ACPs could advocate self-care approaches by utilising social prescribing and support groups, which have the potential to reduce A&E attendances by 28% (The Office for Health Improvement and Disparity, 2022).

The immune response: MCAS

Mast cells protect the body from pathogens and produce mediators that cause inflammation through the accumulation of histamine and cytokines (Medinger and Altmann, 2022). However, during long covid, viral debris within the body is thought to

reactivate mast cell development, resulting in high levels of mediator's months to years after acute infection (Glynne *et al.* 2022). Despite the inconclusive sample size, 66% of patients reported that niacin supplements, low histamine diets, and antihistamine medication alleviated these symptoms of headaches, seizures, fatigue, and changes in allergy sensitivity, including anaphylaxis caused by long covid (Afrin *et al*. 2020). Evidence suggests long covid can increase the risk of allergies which must be identified to maintain caution and patient safety, (The Royal Pharmaceutical Society, 2021, Medinger and Altmann, 2022). This is crucial information for ACP's who prescribe. They must be cognisant of people from specific groups, such as, older adults, children, women who are pregnant or breastfeeding, and have renal or hepatic impairment, in addition to long covid which requires consideration (Mitchell and Pearce, 2021).

The cardiovascular impact: Micro-clots

Recent findings by Xie *et al* (2022) identified significant cardiovascular disease in the years after acute covid-19 infection. This included arrythmias, myocarditis, heart failure and micro-clotting, in line with suggestions that long covid viral debris attacks the endothelium causing organ damage, inflammation, and imbalances in platelet formation (Castro et al, 2022). Despite the small sample size, researchers examined microscopic blood samples and discovered hyperactive platelet formation and hypercoagulation with fibrinolysis resistance (Kell, Laubscher and Pretorius, 2022). Micro-clots can inhibit oxygen exchange causing shortness of breath, poor perfusion, and anxiety with evidence suggesting anticoagulation therapy and statins as treatment preventers (Patterson *et al.* 2021; Randeria *et al.* 2019). Consequently,

cardiac related issues caused by long covid are suspected to increase demand and complexity for patients. ACP's will need to function collaboratively within proposed multispecialist models of care, to achieve the right balance between cost-effective investigations and sustainable service provision (Raman et al, 2022).

Mental health.

Dennis *et al's* (2021) large-scale study identified on MRI imaging that 70% of younger participants had impairment of multiple organs four months after initial covid infection. The effects of long covid are intensified by severe mental health outcomes, due to illness burden and damage to serotonin and dopamine levels (Attademo and Bernardini, 2021). Anxiety, depression, insomnia, and post-traumatic stress disorder (PTSD) are among patient concerns, they reported feeling distressed about attending appointments, work, and spending days in bed without social interaction (Medinger and Altmann, 2022). This emphasises that long covid can affect anyone and the seriousness of symptoms is not considered to be linked to the severity of acute infection (NICE, 2022). Davis *et al.* (2021) qualitative study examined patient experiences and the effect that long-covid has had on activities of daily living. Patients recalled distance from friends, family and employment resulting in isolation. Moreover, Bu, Mak and Fancourt (2021) identify that 45% percent of people talk to friends or family members to support their mental health through long covid. This accentuates the value of ACP-patient communications and the underlying principles and consultation frameworks utilised within clinical practice, to establish an accurate social and family history (Diamond-Fox, 2021).

Social determinants

Public health is one five healthcare priorities since the pandemic, highlighting the importance of identifying population health inequalities and advocating placed-based models of care (The Kings Fund, 2021). A safe and effective vaccination roll out during Covid-19 was essential and ACPs were part of the professional groups leading this approach (HEE, 2020). Nevertheless, the strategy for distribution has been, and still remains controversial, with many individuals and groups remaining vaccine hesitant (Wagner, Saad-Roy and Grenfell, 2022). Vaccine hesitancy is a multi-faceted issue made up of cultural, political, and personal factors, however evidence suggests prevalence is the highest among Black, Asian and Minority Ethnic communities caused by language barriers (Vergara, Sarmiento, and Lagman, 2021). Additionally, 90% of poor health outcomes come from the wider social determinants of health including social deprivation (Public Health England, 2017b). The Office for National Statistics (2022) suggests that symptoms of long covid are disproportionately impacting people in more socially deprived areas, signalled by a lack of GP attendances and inadequate public health education (Walker *et al.* 2021). ACP's can identify patient vulnerability and opportunities through tailored communication, translational services, and information leaflets, as these interventions have shown to improve patient outcomes (Hunter, Chou, and Hooper, 2021).

The identified risk factors for long covid are not exhaustive, however contributors include de-conditioning caused by quarantine, stress, pre-existing long-term conditions, social deprivation, and covid-19 vaccination hesitancy (Sudre *et al.* 2021). Whilst lockdown prevented acute Covid-19 mortalities, the impact of deconditioning during quarantine resulted in long covid prevalence among athletes and the frail elderly; qualitative research highlights returning to fitness can prove

difficult due to exercise intolerance and induced dysautonomia (Lindsay *et al.* 2021). Metabolic diseases such as diabetes have also contributed to the risk of long covid in studies, despite a lack of pathological understanding (Steenblock *et al.* 2022). Not only does this indicate the need for ongoing research into pathology, but it also highlights the impact that restrictions, chronic conditions, and social determinants can have on long covid prevalence. Such developments echo the ACP's commitment to appraising the developing evidence base which is integral to the core pillars of practice (HEE, 2017).

Conclusion

Long covid appears to be a siloed complex topic with a lack of reversible treatment options, despite the vast research and funding globally. The research highlights some key areas for the ACP role, such as managing falls associated with long covid dysautonomia, preventing health inequalities through education, and reducing circulating long covid misconceptions. Furthermore, the impact of long covid is not only focused on patients, but also NHS staff colleagues.

Additional demands increasing caused by the winter pressures, inadequate staff retention and the cost-of-living crisis, the ACP role offers the vehicle for which to support those requiring the effective management of long covid and other co morbidities to ensure that future demand is met.

Key points

1. Two million people in England are experiencing long covid symptoms with one in five facing debilitating symptoms.

2. Long covid is a multi-organ chronic condition caused by viral persistence, organ damage, immune deregulation, and disrupted microbiome.

3. Long covid impacts cardiovascular, immune, and neurological systems contributing to falls, micro-clots and allergy risks.

4. Long covid risk factors are quarantine induced de-conditioning, stress, pre-existing long-term conditions, social deprivation, and covid-19 vaccination hesitancy.

Reflective questions

1) What could be done to enhance long covid patient assessments in your clinical setting?
2) What current evidence-based tools are you aware of to support a long covid diagnosis?
3) Using knowledge gained from this article and further study write a revalidation reflection on the management of long covid.

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