

The Functional Impacts of the Covid-19 Pandemic: A Rapid Review

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Abstract

Background: The Covid-19 pandemic is having a severe and unprecedented impact on human functioning, due to its influence on bodily functions and structures, the activities we participate in and the environments in which we live. The aim of this rapid review is to inform health services planning and decision making, by identifying and synthesizing the potential functional impact of the Covid-19 pandemic on human health and wellbeing.

Methods: This rapid review was completed within four weeks during April – May 2020. The review focused on primary sources describing and evaluating the functional impact of the SARS, MERS and Covid-19 coronavirus pandemics, published since January 2000 in peer reviewed journal articles. All included sources were evaluated for quality, and the International Classification of Function provided a theoretical structure for synthesizing the available evidence.

Results: A total of 65 sources met the inclusion criteria for this review. The majority (n=42, 61.6%) were related to the SARS pandemic, and originated from Asia for North America. Almost half of the reviewed sources (n=32, 49.2%) investigated the impact of coronavirus pandemics on the community, with smaller evidence bases related to people with coronaviruses and their families (n=19, 29.2%) and healthcare workers (n=17, 26.1%). Of the research sources available, the majority utilized descriptive quantitative methods via cross sectional data collection.

The functional impact of the Covid-19 pandemic is likely to spread far beyond infected patients, to influence the wellbeing of healthcare workers and the entire community in both positive and negative ways. The findings of this review indicate that health services must engage with the inter-sectionality of pandemic experiences, collaborate with other sectors as part of society-wide responses and prioritize function as a key outcome.

Conclusions:

Based on the experience of past coronavirus pandemics, and the experience to date of the current Covid-19 outbreak, every health service in all health systems must be prepared to prevent and manage the functional impacts of the Covid-19 pandemic, possibly for decades to come. This review highlights the multitude of avenues available for health service prioritization and planning, and emphasized that a multi-dimensional, multi-service (and ideally multi-systems) approach is needed.

Background

The Covid-19 pandemic is having a severe and unprecedented impact on the lives of people around the world. Our daily lives have rapidly transformed in response to new standards and restrictions, with these changes having a pervasive impact on health and wellbeing. Pandemics have a significant effect on human functioning, due to their influence on bodily functions and structures, the activities we participate in and the environments in which we live (1). All health services, regardless of their scope, will need to respond to the functional impact of the Covid-19 pandemic.

While similar disruptions have previously occurred in the context of local events (such as war or natural disaster), never before has this been experienced on a global scale. A novel pneumonia was first reported in Wuhan, China in December 2019, with the World Health Organization (WHO) declaring a Public Health Emergency of International Concern at the end of January 2020 (2). As cases began to spread globally, the WHO declared a pandemic on 12th March, 2020 (3). Since then, Covid-19 cases have been recorded in 185 countries around the world (4).

There have been two previous pandemics due to novel coronaviruses this century. Severe Acute Respiratory Syndrome (SARS) was first reported in Guangdong, China in February 2003, and eventually spread to 26 countries in North and South America, Europe and Asia (5). Cases were recorded in all age groups, with 8,422 people infected and 916 deaths resulting (6). A further novel coronavirus emerged in Saudi Arabia in 2012, known as Middle Eastern Respiratory Syndrome (MERS) (7). The MERS pandemic resulted in 2,494 cases across 27 countries and 858 deaths (8). The mortality rates of SARS and MERS were 9.6% and 34.3% respectively (9, 10). In comparison, at the time of writing (22nd May 2020) Covid-19 has infected 5,102,573 people worldwide and led to 332,924 deaths, with a mortality rate of 6.5% (4).

Functioning, Disability and Health

The International Classification of Functioning, Disability and Health (ICF) was developed by the WHO to provide a standard, cross sectoral language and framework for health and health-related states (1). The impact of interactions between individual, activity and environmental factors on health and wellbeing has long been recognized (11), and the ICF emphasizes their multidimensional and interactive nature (1).

Function is defined as the positive or neutral outcome of interactions between diseases, disorders and injuries and contextual factors, while *disability* refers to the negative outcomes of these relationships (1).

Health, wellbeing and the contextual factors which impact upon it are described in the ICF across five domains (1). *Body functions, body structures and activities* refer to the function of individuals. *Participation*

refers to the ways that individual's function within a community or society, and the *environment* encompasses external influences on function. Dysfunction may occur within the body (as an *impairment*), within the individual (as an *activity limitation*) or within the person's social context (as a *participation restriction*). Environmental barriers may also contribute to dysfunction (1).

The ICF has been applied extensively within health research, particularly in regards to functional outcomes (e.g. (12-14)). However, to date it has not been utilized as widely in epidemic and pandemic research. The ICF was chosen to explore the pervasive impact of Human Immunodeficiency Virus / Acquired Immune Deficiency Syndrome in Africa by van Egeraat et al. (15) for its ability to provide a holistic approach. It has also been utilized in a study of people with obesity (16), to describe the impact of functional limitations on quality of life for this population.

Rationale

The Covid-19 pandemic presents a rapidly evolving challenge for health services. As in previous pandemics decisions around resource allocation and prioritization are being made without an established evidence base (17), as our knowledge of the latest novel coronavirus remains nascent. While not all coronaviruses are alike, evidence about the functional impact of previous pandemics may still be relevant to evidence based practice in the context of our emerging understanding of Covid-19. While acknowledging the existing limitations of our knowledge, the rapid review that follows synthesizes the best evidence which is currently available (18, 19).

Modern health services aspire to deliver quality and affordable care across the full spectrum of human health and wellbeing (20). This breadth mirrors the far-reaching consequences of pandemics, which are characterized by their worldwide (or widespread) occurrence and impact on large numbers of people (21). Reviewing such an extensive field presents considerable challenges to the management of diverse sources of evidence. The ICF is founded on underlying principles that include universal relevance to all people and contexts, and neutrality in its approach to both positive and negative aspects of function and disability (1). These characteristics enable the application of the ICF as a suitable and relevant framework within this rapid review.

The aim of this rapid review is to inform health services planning and decision making, by identifying and synthesizing the potential functional impact of the Covid-19 pandemic on human health and wellbeing.

Methods

The goal of rapid reviews is to influence clinical decision making, health policies and systems by providing actionable evidence for translation (22). These reviews differ from traditional systematic reviews by omitting or abbreviating methodological steps, in the interests of producing a useable synthesis in a timely manner (23). Despite their brevity, rapid reviews are perceived as a useful interim source of evidence (24), and usually arrive at similar conclusions to subsequently published systematic reviews (25).

While there is no agreed methodology for conducting rapid reviews, the review presented here drew upon recommendations from Tricco et al. (19) and Haby et al. (25) to ensure comprehensive reporting. This review commenced 20th April and concluded 18th May 2020, with a total duration of four weeks. An informal protocol was developed by the research team, which specified the definition of key terms, search strategy, inclusion and exclusion criteria, theoretical framework and quality appraisal process.

Search Strategy

The evidence included was limited to peer review journal articles, to ensure all sources had undergone formal assessment of their quality and rigor. The review focused on primary sources describing and evaluating the functional impact of the SARS, MERS and Covid-19 coronavirus pandemics, and included multiple forms of published evidence (i.e. qualitative, quantitative, mixed methods, quality assurance and narrative or commentary). This inclusive approach to evidence was intended to capture promptly produced and published sources, given the need for timely information in the current pandemic.

Other recent pandemics (e.g. Ebola, H1N1 influenza, influenza outbreaks) were excluded, to ensure evidence was relevant to the challenges presented by widespread coronavirus infections. However, the research team acknowledges that other pandemics may also provide useful evidence for health service decision-making. Sources published between January 2000 and April 2020 was included, and only English language publications were considered due to language limitations within the research team. Sources that synthesized other primary sources were excluded, although any primary sources they reviewed which met the criteria for this rapid review were evaluated. The reference lists of included sources were also reviewed, and one author contacted directly to clarify the data presented in their source.

The review commenced with a search of the 63 databases on the EBSCOhost platform. This platform was chosen due to its inclusion of databases from a range of sectors, in recognition that evidence about the functional impacts of coronavirus pandemics may not appear exclusively in health journals. Limiters aligned to the inclusion and exclusion criteria were applied, with the abstract field searched initially.

The key terms utilized in the search were covid-19, 2019-ncov, “severe acute respiratory syndrome”, SARS, “middle eastern respiratory syndrome”, MERS, “occupational therapy”, “occupational therapist”, “activit* of daily living”, ADL, “occupational performance”, participation, engagement, rehabilitation, pandemic and epidemic. The term “function” was too non-specific for an effective search, and the researchers were already aware there were no relevant sources based on the ICF. Occupational therapy was selected due to its functional expertise, while rehabilitation was also deemed particularly relevant to function (26). All databases included in the search, and full search histories are provided in Supplementary Material 1.

A total of 498 articles were identified, with a further two potential sources located during preliminary literature searches. Two researchers (DH, EA) independently completed the screening and full text review process, with 100% agreement. As shown below in Figure 1, 81 sources progressed to full text review following screening, with a further 16 sources then excluded.

Please insert Figure 1 here

Source Evaluation

Source evaluation commenced with the extraction of publication, methodology and findings information into a bespoke data form (27). Nineteen sources did not have clear research questions or appropriate data collection, and were categorised as narratives or commentaries. All research sources were evaluated with the Mixed Methods Appraisal Tool (MMAT) (28). The appraisal was completed using a set of five questions aligned to methodological approaches (qualitative, randomised controlled trials, quantitative non-randomised, quantitative descriptive and mixed methods). The number of quality criteria achieved by each source may be expressed as a star rating, which indicates its overall rigour and quality (i.e. 0 stars denotes poor quality, 5 stars denotes excellent quality). Two researchers (EA, EC, DH, TS) independently assessed the quality of all sources, with consensus achieved on 37 (80.4%) articles. The research team discussed the ratings provided for the remaining 10 (19.6%) research articles, with the final appraisal reflecting consensus agreement.

Source Analysis

The ICF provided the theoretical framework for analysis of source content, and organised the review findings. Each ICF domain and component has a standard definition, and the research team utilised the ICF Browser as a code book to enable consistent identification and classification of data (29, 30). Two researchers (EA, EC, DH, TS) also independently coded each source in relation to the ICF, with the team then reaching agreement via discussion about their final classification. These codes were compared across

sources, to look for instances of agreement and discrepancy within the ICF domain (31). This analysis forms the basis of the following synthesis.

Findings

The majority of sources reviewed (n=42, 61.6%) were related to the SARS pandemic, with only two related to the MERS pandemic. Most available evidence originates from regions affected by previous pandemics, with 58.5% (n=38) contributed by Asian authors and a further 18.5% (n=12) from North American sources. Almost half of the reviewed sources (n=32, 49.2%) investigated the impact of coronavirus pandemics on the general community. Nineteen articles (29.2%) addressed functional impacts on people with coronaviruses ('patients') and their families, and a further seventeen (26.1%) focused on healthcare workers ('HCWs').

Nineteen (29.2%) sources included in this review were in the form of narrative or commentary, which was particularly prevalent for those addressing the current Covid-19 pandemic. Descriptive quantitative (n=31, 67.4%) methods predominated amongst the research sources, with the majority adopting a cross-sectional approach. The research studies attracted a range of quality ratings, although the majority (n=29, 63.0%) met three of the MMAT criteria or more. A summary of the characteristics of all included sources is displayed in Table 1.

Insert Table 1 here

The review identified coronavirus pandemics as providing both opportunities to promote function, and challenges that may impair, limit or restrict. As shown in Figures 2 and 3, some factors influenced more than one population group.

Please Insert Figure 2 here

Please Insert Figure 3 here

Body Function & Structure

Mental Functions

Despite most body functions recovering within 6 to 24 months (32), coronavirus patients may not recover mental health and wellbeing readily or to pre-existing levels (33, 34). Two months after diagnosis, most patients report significant distress (35), poor subjective mental health (33) and psychological wellbeing (36). In the longer term, 64.0% of SARS patients experienced psychiatric morbidity after one year (37), and 42.5% met the criteria for psychiatric diagnoses after three to four years (33). A study by Siu et al (38) eight years post diagnosis also identified widespread self-reported experiences of mental dysfunction. HCWs diagnosed with coronaviruses experience similar levels of mental dysfunction as other patients (39). However, there may be some unique aspects of their experiences, with HCWs found to experience more anxiety symptoms (40, 41), greater distress and poorer quality of life than other patients (35).

Coronavirus pandemics also negatively impact on mental function in the broader community. Current evidence describes variable patterns of recovery, including initially high distress which subsides (42), ongoing fluctuations (41), new symptoms developing over time (43) and differential timelines for cognitive and emotional responses (44). Quarantine restrictions significantly impact on community mental function, with both confinement and boredom identified as particularly negative aspects of this experience (42, 45-50). Many studies (43, 47, 51-55) found community prevalence >25% for depression, anxiety, distress and generally poor mental wellbeing during the acute pandemic phase. However, lower prevalence rates for anxiety (56) and post-traumatic stress symptoms (45) were also recorded at the height of the SARS pandemic. Community members identified family health and wellbeing, social responsibility and economic impacts as their main worries during previous pandemics (53).

Mental dysfunction is also very prevalent in HCWs without coronavirus diagnoses, with two studies (41, 57) finding > 25% prevalence for distress and psychiatric morbidity. Many sources reflected upon the additional psychological burden experienced by HCWs, due to ethical tensions around not being able to meet previously expected levels of service, balancing exposure with social contact, and surge management challenges (58-65). These burdens are described as growing over time (58, 59), with HCWs who are single, female, nurses and doctors, frontline workers and close to outbreaks noted to be at particular risk (41, 57).

Cardiovascular, Haematological, Immunological & Respiratory Systems

Based on experience with Covid-19, HCWs are advised to suspend patient activity if oxygen saturation is < 95%, or their heart rate exceeds 120 beats per minute (66). A Borg dyspnea score of ≤ 3 points or signs of cardiovascular or respiratory distress have also been identified as warning signs (67). In the initial months of recovery, tachycardia may be an issue, however a study by Lau et al (36) attributed this to anxiety and deconditioning, rather than cardiac dysfunction. For the general community, maintaining as much physical activity as possible is recommended to sustain good overall health and immune system function (46, 49).

Neuromusculoskeletal & Movement Related Functions

In the initial weeks after diagnosis, patients commonly experience significant disability with regards to mobility, respiratory function, muscle strength and overall physical function (33, 34, 36). Deconditioning is raised as a particular concern in several studies (36, 68, 69), especially for patients who required prolonged hospitalization or self-isolation. Two studies (69, 70) have also flagged persistent myopathy and neuropathy as an important clinical issue. In the only treatment study within this review, a randomized controlled trial of a six-week exercise training program for SARS patients found significant improvements in mobility, respiratory and neuromuscular function (71).

Other Body Structures & Functions

More generally, maintaining good nutrition and sleep hygiene are both highlighted as important goals during coronavirus recovery (66, 67). One study has found that 27.1% of patients met the criteria for chronic fatigue syndrome, and a further 13.2% reported sub-clinical but functionally disruptive issues, three years after diagnosis (33). Other long term physical symptoms identified by patients included headache, back and hip pain (38), and hip dysfunction secondary to the use of high dose steroids (32). Personal protective equipment (PPE) practices and frequent hand washing may also lead to increased eczema and allergic reactions for HCWs (63).

Bodily Risk & Protective Factors

Several patient groups are reported to experience poorer overall bodily function outcomes from pandemic coronaviruses, including those who are older; immune-compromised; pregnant; indigenous; people with diabetes, cancer and renal failure; and those experiencing severe symptoms, intensive care unit (ICU) admissions and high dose or prolonged steroid treatment (32, 35, 40, 63, 71, 72). Patients admitted to ICU are likely to experience post intensive care unit syndrome (62, 69), including neuromuscular, cardiovascular, sensory and mental function complications from prolonged periods of immobilization and prone positioning (64). In the community, people who are older; have chronic illness; are female; unemployed or with lower educational levels have been identified as being at risk of poorer bodily function during pandemics (73, 74).

A range of individual factors are also particularly associated with poorer mental function for patients, including being a young or older adult; female gender; less education, social capital and sense of control in life; employment as HCWs; using less substances, financial stress, unemployment and experiencing stigma or discrimination (32, 33, 35, 40, 53, 55, 69, 75, 76). Identified mental health risk factors for community

members include age, gender, trait anxiety, personal or family history of mental illness, prolonged quarantine, direct contact with coronavirus patients, and inadequate food, clothing and accommodation (40, 43, 48, 49, 52, 54, 77). Community members also highlighted disruptions to expectations and life aspirations as having a particularly negative impact (78).

Some factors that were protective of mental function were also identified in this review. Patients with positive perceptions of their coping and self-care abilities, greater social capital and regular supportive contact with family and friends had generally better outcomes (40, 55, 63, 66, 79). Community members who deployed infection control practices, appropriately used avoidance strategies, and used active coping strategies such as problem solving were also found to have more positive mental function during pandemics (40, 80).

Activities and Participation

Learning & Applying Knowledge

Confusion regarding quarantine requirements, particularly across jurisdictions, may lead to non-compliance with quarantine (47). A lack of available information or discrepant information may also contribute to community distress, and the exercise of unnecessary restrictions on activity participation (50, 78). Sources of information while in quarantine may also influence community mental health and wellbeing, with both exclusive reliance on television (50) and avoiding email, text, and the Internet (77) associated with greater stress.

Access to rapid training for HCWs during coronavirus pandemics is recommended for timely acquisition of required knowledge (63, 65, 68). This training may include exposure to duties outside usual scope, and can be offered regularly to enable currency of skills (63). Negrini et al. (65) also reflect that HCWs need to use different knowledge sources during pandemics, as traditional reviews, guidelines and peer review publications are not sufficiently responsive to rapidly changing circumstances.

General Tasks & Demands

Patients experiencing prolonged hospitalization report struggles with boredom, due to restricted access to their usual activities (63). Zhao et al. (67) recommends patients participate in 15-45 minute sessions, or intermittently depending on their current health status. The upheaval of daily routines and frustration of personal goals takes a significant toll on patient wellbeing (51), but positive aspects of isolation during recovery were also identified such as the adoption of healthier habits, more time for valued

activities and greater opportunities to rest. Community quarantine requirements may result in increased sedentary activities, and the avoidance of communal participation (46). However, a study by Yang (81) found that changes to activity and participation during the SARS pandemic depended on both individual circumstances and previous routines and habits.

Communication

Technological and telecommunication aids can enable the maintenance of interpersonal relationships for patients throughout recovery (63, 64). Lim et al (63) recommended communication devices be available on request for this purpose, however Griffin et al (59) notes these conversations cannot be private when staff facilitate device use. Increased use of other communication methods (e.g. telephone, email) may also provide a coping strategy for community members during pandemics (44). Regardless of the modality utilized, all communication should be timely, balanced, consistent and clear (50, 60, 68).

The sharing of pandemic specific information may be an important support for HCWs during pandemics (39), and teams may also consider using non-traditional communication to facilitate multidisciplinary work (such as messaging platforms, social media, websites and virtual town halls) (60, 66). Health services should also support patient and family health literacy by providing pandemic information in age appropriate forms, multiple languages and diverse formats (67, 82). The need to increase education and health literacy specifically about Covid-19 in the community is a current priority (83, 84).

Mobility

The only current recommendation for patients is the use of early mobilisation wherever possible (62, 69).

Self-Care

Self-care (including dressing, toileting and bathing) has been identified as a key aspect of recovery from coronaviruses, and should be emphasized during both assessment and treatment (62, 67, 82). Self-care dysfunction is reported at all stages of recovery, usually characterized as direct consequence of bodily dysfunction (64). Lau et al (71) found 67.0% of SARS patients experienced persistent but mild difficulties with activities of daily living two months after diagnosis. Stam et al (69) asserts that at least 25.0% of patients who require ICU admission will experience significant self-care dysfunction during the first year post diagnosis. Patients should be encouraged to actively participate in self-care as much as possible, including the self-monitoring of symptoms (66).

Self-care is also an important coping strategy in the general community (44, 53). Community members (particular older people) should be encouraged to continue with existing exercise and activity programs at home, and access ongoing treatment and support via telehealth as required (49, 68). Self-care related to infection control measures may also significantly impact on food preparation and eating, particularly in cultures which practice communal dining or do not use utensils (56).

Some community members adopt new roles as 'hygiene monitors' to ensure compliance by other household members with infection control measures, which may take up significant time and provoke anxiety (78). Fewer than half the community has been found to practice infection control practices during pandemics (45), with younger men, those with less education and people who engage in risk taking behaviors the least likely to comply (56). One study (43) has also reported poorer mental health outcomes for men who practiced infection control measures (43). However, people with empathic responses to pandemics are more likely to comply with infection control measures (85). HCWs must also adopt new and extensive infection control self-care practices in their workplaces, including frequently hand washing, self-isolation if unwell and personal protective equipment (PPE) use (68).

Domestic Life

Shopping is the only domestic activity discussed in the reviewed literature, with tasks such as carrying groceries suggested as a means for maintaining physical function (46). Acquiring adequate supplies is supportive of coping during quarantine (44), however community members are unable to shop as frequently as they would prefer (78). Some groups (such as single people and students living away from home) may also have more difficulties accessing assistance with domestic tasks if required (47).

Interpersonal Interactions & Relationships

Patients and families may suddenly lose valued social roles when diagnosed, and experience a delayed or thwarted return to full participation. For example; Chan et al. (61) described the distress of parents whose children were hospitalized for treatment, including its impact on the broader family. Patients may also be reluctant to utilize established social support networks, for fear of increasing burden or stress for others (61).

Quarantine restrictions also result in forced social isolation for the community, with most social activities stopped or severely restricted (78, 84). Continued access to support from family and friends, dating, and the avoidance of crowded spaces were identified as health promoting (53, 81). For older people, a major factor for enabling wellbeing is maintaining a sense of 'community connectedness' (73). However, the avoidance

of individuals perceived as 'at risk' indicated the use of less effective coping strategies (85). Altered patterns of social participation may persist long after quarantine ceases, with Reynolds et al. (45) finding 25.7% of the community continued to avoid crowded enclosed public spaces, and 20.5% avoided public spaces in general, in the longer term.

HCWs may experience additional restrictions on social interactions than the general community due to their roles (58), including curtailment of team meetings, face to face collaboration with peers and cessation of group treatments or therapy (63). Sin et al (39) found the availability of a specific person to talk to, especially about their workplace experiences, was a significant support for rehabilitation HCWs during the SARS pandemic.

Major Life Areas

Leisure and recreation activities provide positive experiences for patients, and may include both active and passive pursuits such as communal meals, watching television, dancing, reading, tai chi, square dancing and celebrating birthdays (67, 86). The availability of play and distraction materials is recommended for younger patients (50). These activities can enable both health and social outcomes for patients, and encourage their active participation in longer term recovery (38).

Community members are more able to actively seek and schedule pleasurable activities as a stress relieving strategy (61), as they have less stringent restrictions on participation. Activities that address both physical and mental function, such as yoga, dancing, Tai Ji Quan and Tai Chi, were prevalent in the reviewed literature (46, 49, 87). Spiritual activities related to religious or faith practices have also been identified as supportive (53). Studies of ongoing participation in leisure and recreation during pandemics have identified benefits for health and wellbeing, agency, participation and social inclusion for both younger and older adults (81, 87). Outdoor recreation was also sought by the community following the SARS pandemic (88), as a means for meeting their need for contact with nature, healthy environments and social companionship.

Community, Social & Civic Life

Six weeks after diagnosis, Lau et al (71) found 39.8% of SARS patients had returned to employment, which rose to 87.0% after twelve weeks. However, nearly a third of patients with post ICU syndrome never return to work, and a further third do not resume their previous position (69). After fifteen years, Zhang et al (32) reported 12.7% of SARS patients remained on long term sick leave. Regardless of employment status, patients report disruptions to their working life have a significant impact on their health and wellbeing (35).

Disruption to economic participation and decreased financial resources was also frequently discussed as a major negative influence on community wellbeing (42, 43, 47, 77, 78, 82). However, maintaining access to cultural, recreational, leisure, political, economic and social groups and the use of a community-based perspective may mitigate the negative impact of coronavirus pandemics (55, 84). The provision of teleworking for education and employment is also a way to enhance community coping, as are the collective approaches support by the introduction and availability of government guidelines (82).

Assessing and Measuring Activity and Participation

A recent Delphi study (89) to identify a core outcome set for Covid-19 clinical trials did not recommend any specific measures of activity or participation. Data from the Functional Impairment Checklist from SARS patients correlated closely with standardized measures of mobility, muscle strength and quality of life, with the checklist combining both body and activity / participation items (90). Zhao et al (67) recommend the Barthel Index in Covid-19 rehabilitation, which is limited to mobility and self-care activities only. More broadly, Jalali et al. (82) asserts accurate data collection for all community members will be important to understanding the functional impact of the Covid-19 pandemic.

Activity and Participation Risks and Protective Factors

O'Sullivan (72) discussed the important distinction between being 'medically' at risk (which focuses on bodily function) and 'functionally' at risk (which focuses on activity and participation). People experiencing disability, older age, low health literacy, language barriers, homelessness, unemployment, poverty, substance abuse, frailty, and migration or asylum seekers are all identified in the reviewed literature as being at significant functional risk during pandemics (72, 82, 84).

Environmental Factors

Natural & Built Environment

Geographical location was highlighted as an important variable in several studies, with people located closer to outbreaks and clusters consistently reporting worse health and wellbeing (42, 44, 52, 57, 73, 74). Overcrowded community environments which offer poor housing conditions and limited access to clean water have a particularly negative impact on their residents ability to manage the impacts of pandemics (72). People living in rural and remote areas may also experience additional disadvantage, due to both travel and service restrictions (82). Both home and hospital environments are recognized as providing potentially limited space and resources for activity and participation (67, 78). The environmental

persistence of the Covid-19 virus is also relevant to the use of resources (including healthcare equipment), particularly in shared health and community environments (68).

Support & Relationships

The negative impact on health and wellbeing of isolation from social supports (beyond family and friends) is widely recognized (40, 63). In response, 'Fangcang' shelter hospitals were recently deployed in China, as communal quarantine facilities for patients with mild to moderate symptoms that provide social engagement and daily living essentials to aid recovery (86). Fung and Hung (84) found practical demonstrations of care and concern, including thank you cards, banners and compliments, had a positive community impact during the SARS pandemic. Peer support groups for home-quarantined university students were also found to make a positive contribution to their quality of life (91). For community members with other illnesses or disability, the availability and continuity of carers, barriers to transport for healthcare appointments and restrictions on obtaining other health supports are all identified as significant concerns (82, 83).

Attitudes

SARS patients and community members reported experiences of stigma and discrimination in regards to education, employment, relationships, and service access, which diminished over time but never completely ceased (84, 92). Lim et al (63) also identified experiences of stigma from community members towards HCWs, which were attributed to fear of infection.

Services, Systems & Policies

The majority of existing evidence focuses on healthcare services and systems, although other sectors are also mentioned briefly in some sources. Coronavirus pandemics have profound and rapid impacts on the function of healthcare systems, and changes implemented should be based on well-developed knowledge of the healthcare and welfare needs, awareness, communication, engagement, leadership and resources of the local community (72, 84, 87). Health system responses are also dependent on existing pathways and service structures (61), which may contribute to significant variability and adaptation. Fung and Huang (84) advocate for strengths based approaches implemented at the community level, rather than a focus on problems or victimhood.

The pervasive changes required of healthcare systems during pandemics include alterations to workplace practices (e.g. longer shifts, expanded scopes of practice, split teams, working from home, movement

restrictions) and workforce management (e.g. absences due to school closures, staff illness) (62-64, 68, 93). Healthcare systems may need to mobilize the provision of material assistance to quarantined patients, such as supplying cleaning and infection control materials and domestic supports (84). Health service planning must therefore be comprehensive, including non-clinical areas such as food services, laundry services, and facilities management (93).

Boldrini et al. (58) advises it is not been feasible to keep Covid-19 patients isolated within designated service areas, while leaving other areas to function as normal. The management of surges and in-facility outbreaks may impact upon discharge planning for all patients, creating workload and resource consequences across multiple services or locations (58, 62, 63). Some HCWs may also experience a significant decrease in workload as resources are shifted to other services, leading to underutilization or stand downs (93).

The impact of such wholesale change on HCW health and wellbeing is extensive, and healthcare systems may need to offer additional welfare support for their workforces (59). Fatigue and distress can compound over time, leading to lapses in vigilance which could precipitate errors (63). Donning and doffing PPE takes additional time that decreases workplace efficiency, and its use may also contribute to fatigue due to increased heat and respiration effort (63)

The rapid uptake of eHealth (e.g. e-commerce and appointment platforms, video conferencing, telehealth) has also emerged during coronavirus pandemics (58, 63, 68). Telehealth may be unsuitable for some healthcare settings and practices, or limited by device availability, technical malfunctions, privacy and security concerns, the need for physical examination and variable digital literacy (62) Telehealth provision is also dependent on the availability of reliable internet infrastructure, smartphones or other connected devices (82). Koh et al. (68) cautions the evidence available for effective telehealth is relatively sparse, except for the field of stroke rehabilitation. However, some self-care rehabilitation activities and telephone based emotional support are reported to be feasible (84, 94). Electronic medical records are also supportive, allowing for rapid information access and mitigating infection risks associated with paper records (64, 93).

Restricted interpersonal activities also impact upon the community's relationship with healthcare services and systems, which some reporting a lack of consistency and personal connection with their treating team during pandemics (50, 78). Infection control procedures and communication about pandemics from health services may be perceived as both comforting and anxiety provoking by patients (50, 56, 61). While changes to healthcare services during pandemics are often described as reactive, community engagement

in planning processes and participatory governance is recommended in both the short and long term (72, 84).

Adaptations to the healthcare environment in response to coronavirus pandemics are also reported in the reviewed literature. Larger departments and therapy areas may not be available, leading to the development of smaller 'mini' treatment spaces closer to wards (62, 93), and rehabilitation and treatment equipment may also need to be redistributed to these areas (63). Detailed, locally produced guidelines to support consistency in new practices is recommended, provided they are responsive to user feedback (59, 60).

Discussion

The findings of this rapid review clearly illustrate the pervasive functional (and therefore health) consequences that may result from the current pandemic. The ripple effects of Covid-19 spread far beyond infected patients, to the wellbeing of their families, HCWs and the entire community. Based on the experience of past coronavirus pandemics, and the experience to date of the current Covid-19 outbreak, every health service in all health systems must be prepared to prevent and manage the functional impacts of the Covid-19 pandemic, possibly for decades to come.

The sources in this review emphasize that functional impacts differ between population groups, and highlights the distinction between the concepts of 'medical' and 'functional' risk (72). These risk groups are not mutually exclusive; for example, an individual may be a coronavirus patient, who is a healthcare worker and community member with both protective and risk characteristics. Health service planning and decision-making must therefore engage with the inter-sectionality inherent within the collective experience of pandemics. Health services which acknowledge inter-sectionality may gain a deeper understanding of health needs and determinants, and the ways in which they can promote social justice and inclusion (95, 96). Inter-sectionality also aligns with the individual and society aspects of the ICF, as resulting functional outcomes may occur in both these spheres (97). Service prioritization and provision on the basis of a single identity (such as diagnostic group or age range) is unlikely to provide the holistic support this review indicates is required.

The review also clearly highlights that coronavirus pandemics impact on multiple body structures and function, activities and participation. While most attention to date for the Covid-19 pandemic has been respiratory and other physical function, coronavirus pandemics have a much wider impact on mental function across the population. Mental health disorders contributed 7.0% of the global burden on disease last year (98), however this is expected to rise significantly due to the current pandemic. Early evidence suggests an eight-fold increase in positive screening results for serious mental illness in the US since the Covid-19 pandemic began (99).

Given the findings in this review about the prevalence of mental dysfunction during coronavirus pandemics, health services will need to engage in supporting the mental wellbeing of both their patients and workforce. The formation of responsive mental health services, including both timely referral to psychological services and proactive outreach to patients and families, has been recommended as an effective model for those directly impacted upon by coronavirus infection (67, 100). For healthcare workers, round the clock access to mental health professionals, social support availability, virtual mindfulness interventions, promoting self-care and enabling a sense of control and risk reduction are suggested as effective strategies (59, 62). However, few effective approaches to community mental dysfunction have been proposed to date, but should be a priority for further investigation given the length and spread of quarantine or 'lock down' measures imposed in response to Covid-19 in recent months.

In contrast to the amount of evidence around impacts on mental function, relatively little known about the influence of the environment during coronavirus pandemics. Health systems are themselves a specific environmental component, and this review included accounts of the transformative effect of pandemics on their operation. Health services can exert influence on the natural or built environment, supports and attitudes through policy, community interventions and health promotion activities. For example, the Health Stigma and Discrimination Framework (101) identifies the drivers and facilitators health services may engage with to bring about positive change. However, collaborating with other systems in pandemic planning and planning (particularly utilities, civil protection, social security and political systems) is essential for the formulation of society-wide responses to the society-wide challenges posed by coronavirus pandemics (102). During the acute phase of pandemics, health service may not have capacity to engage in these partnerships on top of their immediate duties. But without these partnerships, and an integrated approach, any planning or prioritization undertaken by health systems alone will be limited in reach and impact.

The use of the ICF to provide structure for this review has demonstrated that despite the many functional barriers identified, there is also evidence to support to the promotion of human function. The factors which protect or promote function found in this review, such as enabling interpersonal relationships, supporting mental function, promoting self efficacy and maintaining existing activity and participation as much as possible, offer opportunities for health services to prevent or mitigate the likely negative impacts of the Covid-19 pandemic. The size and scope of the current pandemic can feel overwhelming and unrelentingly negative, however the evidence reviewed here suggests there are measures that health services can take now which will make a meaningful impact on their local communities.

Overall, the findings of this rapid review have affirmed that function is a key outcome for individual and community recovery from coronavirus pandemics. These pandemics significantly restrict patients, HCWs and the community from participating in the activities that sustain their health and wellbeing. However, functional outcomes are rarely the focus of research, and relatively little is known about the post-acute phase of coronavirus pandemics. Investigations into the functional consequences of the Covid-19 pandemic for all members of the community are critical to the development of an appropriate evidence base for all health services and systems. Interventions that treat only bodily dysfunction may not automatically result in the recovery of activity and participation, leaving a persistent deficit in global health and wellbeing. Health services globally can be at the forefront of a new research and translation agenda, which truly sees health and wellbeing during the Covid-19 pandemic in terms of complete physical mental and social wellbeing (103)

Limitations

There are several limitations to this rapid review that the research team would like to acknowledge. This review has an unusually broad scope, which has included a wide range evidence sources, and focused on the expansive concept of 'function'. This scope was determined partly by the relative paucity of evidence available from past and current coronavirus pandemics, however high level syntheses enable extensive coverage of topics of relevance to systems planning and prioritization (104). As more evidence becomes available, there will be more opportunities for the completion of evidence syntheses that address more focused questions and utilized more rigorous methods.

In regards to the evidence reviewed, the majority originated from Asia or North American and may therefore not be applicable to other cultural or national contexts. The predominance of descriptive quantitative methodologies and variable levels of evidence quality, also constrain the ways in which the functional impacts of coronavirus pandemics have been investigated and confidence in the findings. The research team would encourage to deployment of the full range of research methodologies available for Covid-19 research, to improve the quality and depth of the evidence based.

Finally, this rapid review is based on the assumption that coronavirus infections and pandemics have broadly similar characteristics. However, there are genomic and clinical differences between these viruses (105), which may have an influence on the functional impact of the pandemics included in this review. Feedback from reviewers and colleagues on drafts of this rapid review suggest it is resonant with the lived experience of clinicians during the Covid-19 pandemic, however further investigations are needed to fully understand the validity of our assumption.

Conclusions

Evidence from the SARS and MERS pandemics, and emerging evidence from the Covid-19 outbreak, suggests the current pandemic will have a pervasive and unprecedented impact upon function, health and wellbeing around the world. The review highlight the multitude of avenues available for health service prioritization and planning, and emphasized that a multidimensional, multi-service (and ideally multi-systems) approach is needed. The ICF has excellent utility as a framework for understanding the complex and rapidly evolving challenges and opportunities we all face, and ensures our focus includes all aspects of health and wellbeing.

This rapid review also clearly illuminates the gaps in our current knowledge and potential directions for future research. Greater recognition of the fundamental roles of activity, participation and the environment in human function, health and wellbeing will be crucial to developing evidence that enables health services to achieve the best possible outcomes for their patients, workforces and communities.

List Of Abbreviations

HCWs – Healthcare workers

ICF – International Classification of Functioning, Disability and Health

ICU – Intensive Care Unit

MERS – Middle Eastern Respiratory Syndrome

MMAT – Mixed methods Appraisal Tool

PPE – Personal protective equipment

SARS – Severe Acute Respiratory Syndrome

WHO – World health Organisation

Declarations

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Not applicable

Consent for publication

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The authors have no competing interests to declare

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Authors' Contributions

MT and DH formulated the scope and search strategy of this review. DH led and coordinated the conduct of the review and writing of this manuscript. DH and EA undertook all searching and screening of sources in this review. DH, EC, EA and TS undertook all source evaluation and analysis. HN, AF and LB were major contributors to the alignment of sources with the ICF and the writing of this manuscript. All authors read and approved the final manuscript.

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Table

Table 1: Characteristics of Included Studies

Source & Location	Quality Rating	Aim Purpose	Study Sample	Method	Key Findings
Ahmed et al. China	**	To assess the mental health status of Chinese people during the Covid-19 pandemic.	Community n=1,074.	Descriptive quantitative Outcome Measures: BAI, BDI, AUDIT, WEMWBS	<ul style="list-style-type: none"> Significant community prevalence of depression (37.1%), anxiety (29.0%), harmful drinking (9.5%) and lower overall mental wellbeing (32.1%).
Blendon et al. Canada / USA	****	To compare the public's response to SARS in Toronto, the other Canadian provinces, and the United States	Community Timepoint 1 n=1501. Timepoint 2 n=1497. Timepoint 3 n=1516. Timepoint 4 n= 1001. Timepoint 5 n=251	Descriptive quantitative Outcome Measures: Bespoke surveys	<ul style="list-style-type: none"> SARS outbreak had a significant negative psychological and economic impact on approximately 25% of community. Concern rapidly grew and then subsided. People near outbreak took more precautions.
Boldrini et al. Italy	N/A	To describe the experience of HCWs of the Covid-19 pandemic.	Healthcare workers n=230 attending webinar	Narrative / Commentary	<ul style="list-style-type: none"> Comprehensive and far reaching changes required of healthcare services. Growing emotional distress reported by HCWs. Preventative rather than reactive strategies needed.
Chan, Leung et al. Hong Kong	****	To examine the needs, uncertainties, and experiences of parents during their child's hospitalization with highly suspected SARS	Parents of patients n=7	Descriptive qualitative	<ul style="list-style-type: none"> Four major themes: 1) fear of immediate isolation and infection control procedures, 2) sources of anxiety, 3) coping, and 4) communication with children and health care professionals. Treatment significantly interrupted daily family life.
Chan &	***	To describe the	Healthcare	Descriptive	<ul style="list-style-type: none"> Prevalence of

Huak Singapore		psychological impact of SARS on health care workers in a regional general hospital 2 months post-outbreak.	Workers n = 661	quantitative Outcome Measures: GHQ, IES and bespoke survey	significant mental health problems – doctors (35%) and nurses (25%). <ul style="list-style-type: none"> Prevalence of traumatic stress symptoms (20%) Clear directives, precautionary measures, management and family support, ability to talk to someone and religious convictions all supportive.
Cheng & Cheung Hong Kong	**	To examine anxiety and coping responses to SARS	Community n = 72	Descriptive cohort Outcome Measures: STAI, CFI, bespoke survey	<ul style="list-style-type: none"> State anxiety fluctuated between time points Personal hygiene practices and avoidance strategies accounted for state anxiety changes
Chen, Mao et al. International	N/A	To highlight the need to maintain regular physical activity while taking precautions.	N/A	Narrative / Commentary	<ul style="list-style-type: none"> Self-isolation is likely to lead to increased sedentary behaviour or avoidance activities. Physical activity can maintain the immune system and general health.
Cheng, Chong et al Hong Kong	***	To examine the roles of appraisal and post-traumatic growth in explaining adjustment outcomes in SARS survivors	Patients n= 57 SARS Survivors	Descriptive quantitative Outcome Measures: BAI, BDI and bespoke scales	<ul style="list-style-type: none"> Higher 'perceived impact' related to greater depression and anxiety, and poor health Higher 'coping efficacy' related to less depression and anxiety and better health 'Perceived impact', 'coping efficacy', 'personal growth', and 'relationship growth' are important

					parameters in SARS recovery
Chen, Zhang et al. International	N/A	To describe the development of Fangcang Shelter Hospitals	N/A	Narrative / Commentary	<ul style="list-style-type: none"> Fangcang hospitals offer temporary care for patients with mild to moderate symptoms Primary goals were to provide essential living and social engagement
Cheng, Sheng et al Hong Kong	***	To examine the short-term adjustment outcomes including distress, self-esteem, and quality of life among Chinese patients after 1-month recovery from SARS	Patients n= 100 SARS Survivors	Descriptive quantitative Outcome Measures: GHQ, WHOQOL-Bref and bespoke scales	<ul style="list-style-type: none"> SARS survivors had significantly more distress and poorer quality of life than the community.
Cheng, Wong et al Hong Kong	***	To examine perceived benefits and costs in the context of the SARS outbreak in Hong Kong and develop psychometrics of measure.	Patients n= 70 SARS Family n=59	Descriptive quantitative Outcome Measures: M-CSDS, RSES, ISSB and bespoke scales	<ul style="list-style-type: none"> Both costs and benefits perceived for SARS pandemic, although family less like to see benefits Perceived benefits, regardless of quantity, can promote psychological growth.
DiGiovanni et al Hong Kong	***	To cull lessons from Toronto's experiences with large-scale quarantine during the outbreak of SARS	Community n = Approximately 1544 Healthcare Workers n = 195	Mixed Methods	<ul style="list-style-type: none"> Boredom, loss of income and confusion about requirements can cause some to break quarantine Emotional difficulties with quarantine – Community (37%), HCW (39%). Stigma or discrimination – Community (39%), HCW (68%)
Dodgson et al Hong Kong	*****	To describe the experiences of women who became mothers	Community n = 8	Qualitative Phenomenology	<ul style="list-style-type: none"> Felt confined while restricted only to the home environment.

		during the outbreak and the ways in which these experiences impacted their early post-partum mothering.			<ul style="list-style-type: none"> Experienced less personal connection with health workers, and with social supports in general. Disrupted expectations of how things would be, and daily routines.
Fung & Hung Hong Kong	N/A	To describe use of community development techniques to support people during the SARS Epidemic	N/A	Narrative / Commentary	<ul style="list-style-type: none"> Communities are an important pandemic resource Services should consider taking a strengths based approach, rather than focusing on victimhood
Griffin et al. USA	N/A	To describe processes and procedures developed in one service to rapidly adapt to Covid-19.	N/A	Narrative / Commentary	<ul style="list-style-type: none"> The current pandemic will impact on a wide range of practices in health services Exhaustion and mental health issues are prevalent in the workforce
Hawryluck et al. Canada	**	To examine the psychological effects of quarantine on people in Toronto	Community n = 129 (68% HCW)	Descriptive Quantitative Outcome Measures: IES, CESDS	<ul style="list-style-type: none"> Prevalence of PTSD – 28.9% Prevalence of depression – 31.2% Longer quarantine associated with poorer mental health
Huang et al. China	0	To describe outcomes for one mild and one severe case of COVID-19	Patients n = 2	Descriptive Case Study	<ul style="list-style-type: none"> Regular family contact supports mental health Encourage patient activity where possible, within safe parameters
Jalali et al Iran	N/A	To describe challenges faced by people with disability during Covid-19 pandemic	N/A	Narrative / Commentary	<ul style="list-style-type: none"> Access to services and carers for non Covid patients may be restricted due to the pandemic Accurate collection of statistics is required for

					ongoing assessment of need
Jeong et al. South Korea	**	To examine the prevalence of anxiety symptoms and anger, and risk factors in persons isolated during the MERS epidemic	Community n = 1692 (2.13% HCW)	Descriptive Quantitative Outcome Measures: GAD scale, STAEI	<ul style="list-style-type: none"> Prevalence of anxiety – Baseline (7.6%) and 4-6 months (3.0%) Prevalence of anger – Baseline (16.6%) and 4-6 months (6.4%)
Jimenez et al. Spain	N/A	To discuss the need for exercise for older people in quarantine	N/A	Narrative / Commentary	<ul style="list-style-type: none"> Physical activity will maintain health and counter negative consequences of chronic conditions. Older people may particularly benefit from physical exercise
Jin et al. China	**	To develop a core outcome set for clinical trials on COVID-19	Scholars Initial data collection n=20 First round n = 52 Second round n= 22	Descriptive Mixed Methods	<ul style="list-style-type: none"> Pulmonary function recommended as rehabilitation outcome measure. No activity or participation outcome measures included in core outcome set
Kiekens et al. Italy	0	To describe rehabilitation and respiratory management measures in the acute and early post acute phase of Covid-19 pandemic	HCW N=7	Descriptive Qualitative	<ul style="list-style-type: none"> Contact and communication must be maintained throughout rehabilitation Workforce issues include self-isolation, shift changes and access to PPE
Kim et al. USA	N/A	To describe the response of one US service to the Covid-19 pandemic	N/A	Narrative / Commentary	<ul style="list-style-type: none"> New protocols, algorithms, policies and guidance statements must be developed Balance required between controlling outbreaks and facilitating contact

Koh et al. International	N/A	To discuss measures for the rehabilitation community to take in preparation for Covid-19	N/A	Narrative / Commentary	<ul style="list-style-type: none"> Deconditioning of patients is a major concern Widespread impact on the function of healthcare services, requiring consistent and clear communication
Koller et al. Canada	****	To describe young people's experience of SARS outbreak and their contribution to pandemic planning.	Community n = 21	Grounded Theory Qualitative	<ul style="list-style-type: none"> Hospital isolation and poor or discrepant information were sources of distress and sadness Access to play and distraction is important
Lai et al. China	****	To describe the mental health outcomes of HCW exposed to Covid-19	HCW n = 1257	Descriptive Quantitative Outcome Measures: PHQ, GAD scale, ISI, IES	<ul style="list-style-type: none"> Prevalence of mental health issues – depression (50.4%), anxiety (44.6%), insomnia (34.0%), distress (71.5%)
Lam, Wing et al. Hong Kong	***	To describe the long-term psychiatric morbidities and chronic fatigue experienced by SARS survivors.	Patients n = 233	Descriptive Mixed Methods Outcome Measures: SF-36	<ul style="list-style-type: none"> Prevalence of mental health issues – 42.5% Prevalence of chronic fatigue – clinical (27.1%), sub clinical (13.2%)
Lam, Eva et al. Hong Kong	****	To establish the validity, reliability and responsiveness of the functional impairment checklist (FIC) as a measurement tool for physical dysfunction in SARS survivors	Patients n = 116	Descriptive Quantitative Outcome Measures: FIC, 6MWT, handgrip strengths, SGRQ, SF-36.	<ul style="list-style-type: none"> FIC has very good internal consistency, good test-retest reliability and intra-class correlation. FIC improved significantly after 6 months, while quality of life measure did not change
Lau, Lee et al. Hong Kong	**	To investigate the impact of SARS on the physical fitness and health related quality of life of SARS survivors	Patients n = 171	Descriptive Quantitative Outcome Measures: 6MWT, Chester step test, SF-36	<ul style="list-style-type: none"> Two weeks post discharge, mobility and quality of life remains significantly lower than community norms
Lau, Ng et al.	****	To evaluate effectiveness of an exercise	Patients n = 133	Randomised Controlled Trial Quantitative	<ul style="list-style-type: none"> Significant improvements after six week

Hong Kong		training program on cardiorespiratory and musculoskeletal performance and health-related quality of life of patients who were recovering from SARS		Outcome Measures: 6MWT, Chester step test, SF-36	<ul style="list-style-type: none"> exercise program in physical health indicators. No significant changes in isometric strength or quality of life.
Lau, Yu et al. Hong Kong	***	To identify possible causes for tachycardia 2 months post diagnosis	Patients n = 15	Descriptive Quantitative Outcome Measures: WHOQOL, MFTE	<ul style="list-style-type: none"> Prolonged hospitalization leads to deconditioning Mild functional difficulties and low quality of life scores were prevalent
Lau, Chi et al. International	***	To examine the impact of the SARS outbreak on the subjective wellbeing of elderly people and a younger comparative sample	Community n = 460	Descriptive Quantitative Outcome Measures: PWI	<ul style="list-style-type: none"> Community connectedness a significant support for wellbeing Age less of a risk factor than geographical closeness to outbreak
Lee, Chi et al. Hong Kong	***	To describe the psychological impact of the outbreak of SARS to understand if age and residential location were risk factors associated with post-traumatic disturbance	Community n = 146	Descriptive Quantitative Outcome Measures: CES-D, IES	<ul style="list-style-type: none"> Residents close to outbreaks experienced more post traumatic issues than those further away Older people had a significantly higher prevalence of probably PTSD cases
Lee, Wong et al. Hong Kong	***	To examine stress and psychological distress of SARS survivors 1 year after outbreak	Patients n = 175	Descriptive Quantitative Outcome Measures: PSS-10, GHQ, DASS-21, IES	<ul style="list-style-type: none"> SAR survivors (particularly HCWs) experience higher stress levels during outbreak and one year later Prevalence of psychiatric morbidity – 64.0%
Lee & Sing Hong Kong	**	To examine subjective stigma among residents of Amoy Gardens, the first officially recognized site of community	Community n = Approximately 900	Descriptive Mixed Methods Outcome Measures: Bespoke questionnaire	<ul style="list-style-type: none"> Stigma was experienced by most residents, and was associated with psychosomatic distress

		outbreak of SARS in Hong Kong			<ul style="list-style-type: none"> Stigma decreased over time, but never fully disappeared
Leung et al. Hong Kong	***	To examine the public's knowledge and perception of SARS and the extent to which various precautionary measures have been adopted.	Community n = 115	Descriptive Quantitative Outcome Measures: STAI, bespoke questions.	<ul style="list-style-type: none"> Approximately 1 in 8 participants were experiencing significant anxiety Fewer than half were practicing all recommended personal hygiene tasks for infection control
Lim et al. Singapore	N/A	To describe impact of SARS on medicine and rehabilitation	N/A	Narrative / Commentary	<ul style="list-style-type: none"> Boredom and lack of emotional support are major issues for hospitalized patients. Pervasive changes required to medical and rehabilitation services during pandemics
Main et al. China	***	To examine the main and interactive relations of stressors and coping related to SARS with Chinese college students' psychological adjustment	Community n = 381	Descriptive Quantitative Outcome Measures: Bespoke Checklist for SARS related Stress, Coping Inventory (9 subscales), SCL-90 (4 subscales), LSL	<ul style="list-style-type: none"> Active coping (i.e. modifying social situation, taking direct action, seeking social support and problem solving) positively predicts life satisfaction All forms of coping are protective against negative mental health
Mak et al. Hong Kong	***	To test the model of perceived support from medical staff and family/ friends on SARS survivors' mental health as mediated by self-care self-efficacy.	Patients n = 148	Descriptive Quantitative Outcome Measures: MHSIP, MOS-SSS, SUPPH, SF-36 (3 subscales)	<ul style="list-style-type: none"> Self care efficacy mediates the effects of health service and family support on mental health Greater self perceived self care efficacy predicts better adjustment
Marafa et al. Hong Kong	***	To describe the ways in which people engage in leisure and recreation at the time of health scare.	Patients n = 200	Descriptive Quantitative Outcome Measures: Bespoke Questionnaire	<ul style="list-style-type: none"> Participation in outdoor recreation provided people with social interactions, which were

					<ul style="list-style-type: none"> supportive of mental health Countryside provides a good venue for outdoor recreation following pandemics
McNeary et al. USA	N/A	To provide a conditions, actions and needs report for physical medicine and rehabilitation HCWs in acute inpatient rehabilitation facilities.	N/A	Narrative / Commentary	<ul style="list-style-type: none"> Many specific examples of changes required to health services during pandemics
Mihashi et al. International	*	To investigate strategies for broad mass isolation during outbreaks of infectious diseases	Community n = 187	Descriptive Quantitative Outcome Measures: GHQ	<ul style="list-style-type: none"> Prevalence of psychological disorders – 24.6% Some people experienced symptom reduction over time, while others developed new symptoms
Negrini et al. Italy	N/A	To describe the potential challenges to rehabilitation posed by the Covid-19 pandemic.	N/A	Narrative / Commentary	<ul style="list-style-type: none"> HCWs may need to utilise non-traditional sources of knowledge, as traditional reviews, guidelines and recommendations may not produce timely evidence. HCWs also need access to rapid re-training to develop new skills
O'Sullivan et al. Canada	N/A	To describe how the framing of vulnerable or high-risk populations has evolved since SARS	N/A	Narrative / Commentary	<ul style="list-style-type: none"> Community members should be included in the pandemic planning process There is a distinction between being 'medically' at risk and 'functionally' at risk
Pan et al. Taiwan	N/A	To describe a meaningful and valuable clinical experience in interacting with SARS home-	N/A	Narrative / Commentary	<ul style="list-style-type: none"> Thorough planning and expert facilitation are important to the success of

		quarantined college students in a support group			<ul style="list-style-type: none"> peer support groups Similar experiences and emotions can assist in being cohesion in these groups
Peng et al. Taiwan	***	To explore the post-crisis psychological distress among residents in Taiwan after the SARS epidemic.	Community n = 1278	Descriptive Quantitative Outcome Measures: Bespoke questions, brief symptom scale	<ul style="list-style-type: none"> Prevalence of psychiatric morbidity – 11.7% Some (9.2%) report feeling more pessimistic following the pandemic
Prada et al. Italy	N/A	To describe a case of probable Covid-19 in a case with Charcot-Marie-Tooth disease	Patient n = 1	Descriptive Case Study	<ul style="list-style-type: none"> Activities of daily living can be facilitated via telehealth No deterioration noted following move to telehealth
Puterman et al. Canada	*	To describe the perceived threats of SARS and West Nile Virus	Community n = 269	Descriptive Quantitative Outcome Measures: Bespoke survey, BWOC	<ul style="list-style-type: none"> Higher perceived threats from the pandemic are associated with more diverse coping methods Wishful thinking as a coping strategy associated with less effective outcomes
Qian et al. China	**	To explore the differences in behaviour, cognition and emotion between college students in Beijing and Suzhou, who were under different external stresses during the SARS epidemic	Community n = 268	Descriptive Quantitative Outcome Measures: Bespoke survey	<ul style="list-style-type: none"> Students closer to the outbreak perceived greater threats Emotional responses remained steady over time, but cognitive responses changed
Reynolds et al. Canada	***	To describe understanding of, difficulties and compliance with, and the psychological impact of the quarantine experience	Community n = 1057	Descriptive Quantitative Outcome Measures: IES	<ul style="list-style-type: none"> Only 15.8% reported complying with all household and community infection control measures Boredom, isolation and frustration were commonly experienced

Sim et al. Singapore	***	To determine the prevalence of SARS-related psychiatric and posttraumatic morbidities and associated coping styles	Community n = 415	Descriptive Quantitative Outcome Measures: GHQ, IES, Brief COPE	<ul style="list-style-type: none"> Prevalence of mental health issues – psychiatric morbidity (22.9%), posttraumatic morbidity (25.8%) Major concerns included family health, social responsibly and public education, and economic impact
Simpson et al. Canada	N/A	To discuss likely impairment patterns, healthcare practitioner resilience, and organization of services to meet demand	N/A	Narrative / Commentary	<ul style="list-style-type: none"> Patients who had intensive care admissions are likely to experience post intensive care syndrome Self care important to recovery for patients, and for wellbeing for HCWs
Sin et al. Singapore	*	To provide the psychological impact of the SARS outbreak on the staff of a rehabilitative services department	HCWs n = 55	Descriptive Quantitative Outcome Measures: GHQ, IES, bespoke survey	<ul style="list-style-type: none"> Prevalence of mental health problems – Psychiatric symptoms (23.4%), PTSD (12.8%) Collegial support, precautions measures, clear directives and disease information were supportive
Siu Hong Kong	*****	To investigate the motivations for practising tai chi among SARS survivors in post-SARS Hong Kong.	Patients n = 35	Descriptive Qualitative	<ul style="list-style-type: none"> Tai chi practiced for both health and social reasons Patients continued to experience both physical and mental health issues eight years post diagnosis
Siu, Sung et al. International	****	To explore the motivations and experiences of chronically ill participants practising qigong during the SARS outbreak	Community n = 30	Descriptive Qualitative	<ul style="list-style-type: none"> Underlying motivations included cultural perceptions, deteriorating health and unpleasant

					<ul style="list-style-type: none"> treatment experiences Trigger motivations included stigma and discrimination, and seeking coping strategies
Sprang et al. USA	**	To investigate the psychosocial responses of children and their parents to pandemic disasters, and measurement development	Community n = 398	Descriptive Mixed Methods Outcome Measures: PTSD-RI, PCL-C, bespoke questions	<ul style="list-style-type: none"> Prevalence of PTSD in people isolated or quarantined – children (30.0%), parents (25.0%) Strong relationship between PTSD levels between parents and children
Stainsby et al. Canada	0	To inform practitioners of the potential pathogenesis of neuromuscular complaints in SARS survivors	Patients n = 3	Descriptive Case Study	<ul style="list-style-type: none"> Myopathy, neuropathy and increased bruising identified as a common clinical issue
Stam et al. International	N/A	To provide a call for action around post intensive care syndrome experienced by COVID-19 survivors	N/A	Narrative / Commentary	<ul style="list-style-type: none"> Longer intensive care admissions increase the risk of complications At least 25% of patients experience significant issues with function
Stillman et al. International	*	To query the international spinal cord medicine community's engagement with and response to the COVID-19 pandemic	HCWs n = 783	Descriptive Quantitative Outcome Measures: Bespoke survey	<ul style="list-style-type: none"> Service changes have included increase telehealth, limiting therapies, promoting home care. Around 60.0% participants indicated they had enough information about Covid-19 to appropriately support their patients
Xiao et al. China	**	To investigate the effects of social capital on sleep quality and the mechanisms involved in people who self-isolated at home during	Community n = 170	Descriptive Quantitative Outcome Measures: PSCS, SRAS, SASA, PSQI	<ul style="list-style-type: none"> Low social capital related to increased anxiety and stress Higher social capital associated with

		the COVID-19 epidemic.			better sleep quality
Yang et al. China	*****	To describe discretionary time activities and reasons for choosing these activities during SARS induced constraints	Community n = 16	Descriptive Mixed Methods	<ul style="list-style-type: none"> Variety of sports, leisure and social activities were engaged in by participants Some reported changes in activity participation during pandemic, but others experienced no change
Yeung et al. China	***	To examine age-related emotional responses and coping at the peak and the end of the SARS outbreak	Community n = 385	Descriptive Quantitative Outcome Measures: Selected items from COPE, bespoke questions	<ul style="list-style-type: none"> Older adults experienced less anger than younger adults Younger adults used more emotional coping skills
Yoon et al. South Korea	N/A	To discuss the example of Gyeonggi Province, which proactively intervened with residents' psychological problems caused by the large-scale outbreak of an infectious disease.	N/A	Narrative / Commentary	<ul style="list-style-type: none"> Services provided for people in quarantine, and bereaved families of deceased patients Proactive approach to providing mental health support was effective
Zhang et al. China	****	To evaluate recovery from lung damage and femoral head necrosis in an observational cohort study of SARS patients	Patients n = 71	Descriptive Quantitative Outcome Measures: Hip function questionnaires	<ul style="list-style-type: none"> Most physical recovery occurs within the first two years After 15 years, 17.5% continued to experience limited hip function and 12.7% were on long term sick leave
Zhao et al. China	N/A	To provide recommendations for respiratory rehabilitation to be offered to people with COVID-19	N/A	Narrative / Commentary	<ul style="list-style-type: none"> Personalized approaches to rehabilitation important regardless of interventions being offered Specific recommendations provided for a range of rehabilitation

Note: Abbreviations - MERS = Middle Eastern Respiratory Syndrome, MMAT = Mixed Methods Appraisal Tool, PPE = Personal Protective Equipment, SARS = Serious and Acute Respiratory Syndrome, USA = United States of America. Outcome Measures – 6MWT = Six Minute Walking Test, AUDIT = Alcohol Use Disorder Identification Test, BAI = Beck Anxiety Inventory, BDI = Beck Depression Inventory, BWOC = Brief Ways of Coping, CESDS = Centre for Epidemiological Studies Depression Scale, CFI = Coping Flexibility Index, COPE = Coping Orientation to Problems Experienced, DASS-21 = Depression and Anxiety Symptoms Scale, FIC = Functional Impairment Checklist, GADS = Generalised Anxiety Disorder Scale, GHQ = General Health Questionnaire, IES = Impact of Events Scale, ISI = Insomnia Severity Index, ISSB = Inventory of Socially Supportive Behaviours, LSL = Life Satisfaction Scale, M-CSDS = Marlowe–Crowne Social Desirability Scale, MFTE = Monitored Functional Task Evaluation, MHSIP = Mental Health Statistics Improvement Program (MHSIP) survey, PHQ = Patient Health Questionnaire, PSS – Perceived Stress Scale, PSCS = Personal Social Capital Scale, PSQI = Pittsburgh Sleep Quality Index, PTSD-RI = Posttraumatic Stress Disorder Reaction Index, PCL-C = PTSD Check List Civilian Version (PCL-C), PWI = Personal Wellbeing Index, RSES = Rosenberg Self Esteem Scale, SASR = Stanford Acute Stress Reaction, SASSTA – State Anxiety Scale of the State Trait Anxiety, SCL = Symptom Checklist, SF-36 = Medical Outcomes Study 36-Item Short-Form Health Survey, SGRQ = St. George’s Respiratory Questionnaire, SRAS = Self-Rating Anxiety Scale, STAI = State Trait Anger Expression Inventory, SUPPH = Strategies Used by Patients to Promote Health, WEMWBS = Warwick Edinburgh Mental Wellbeing Scale, WHOQOL-Bref = World Health Organisation Quality of Life Scale.

Figures

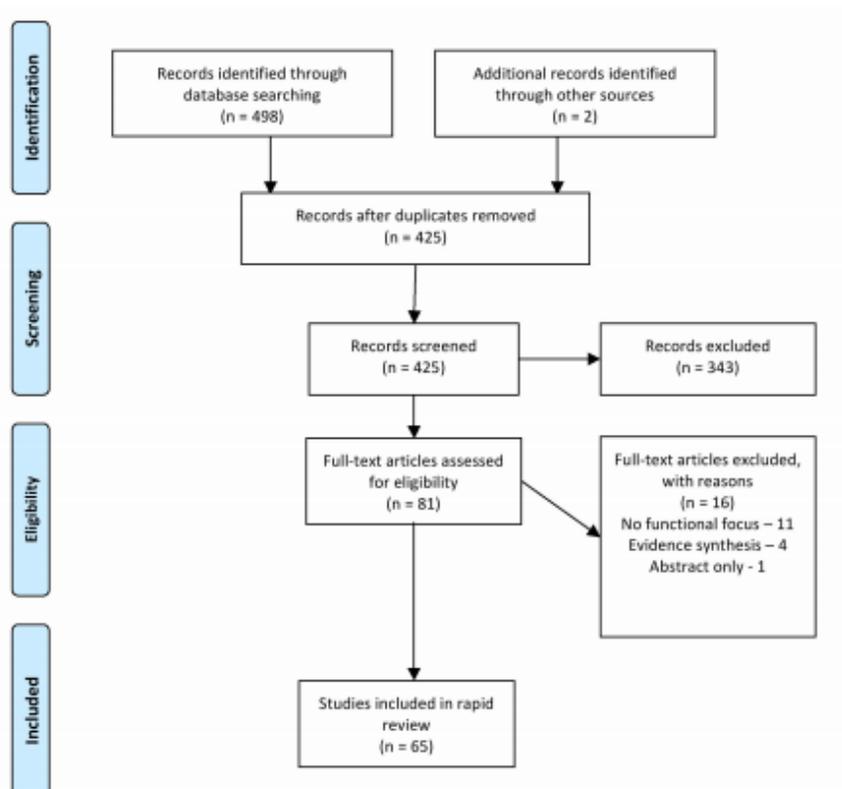


Figure 1

Screening and Eligibility Assessment

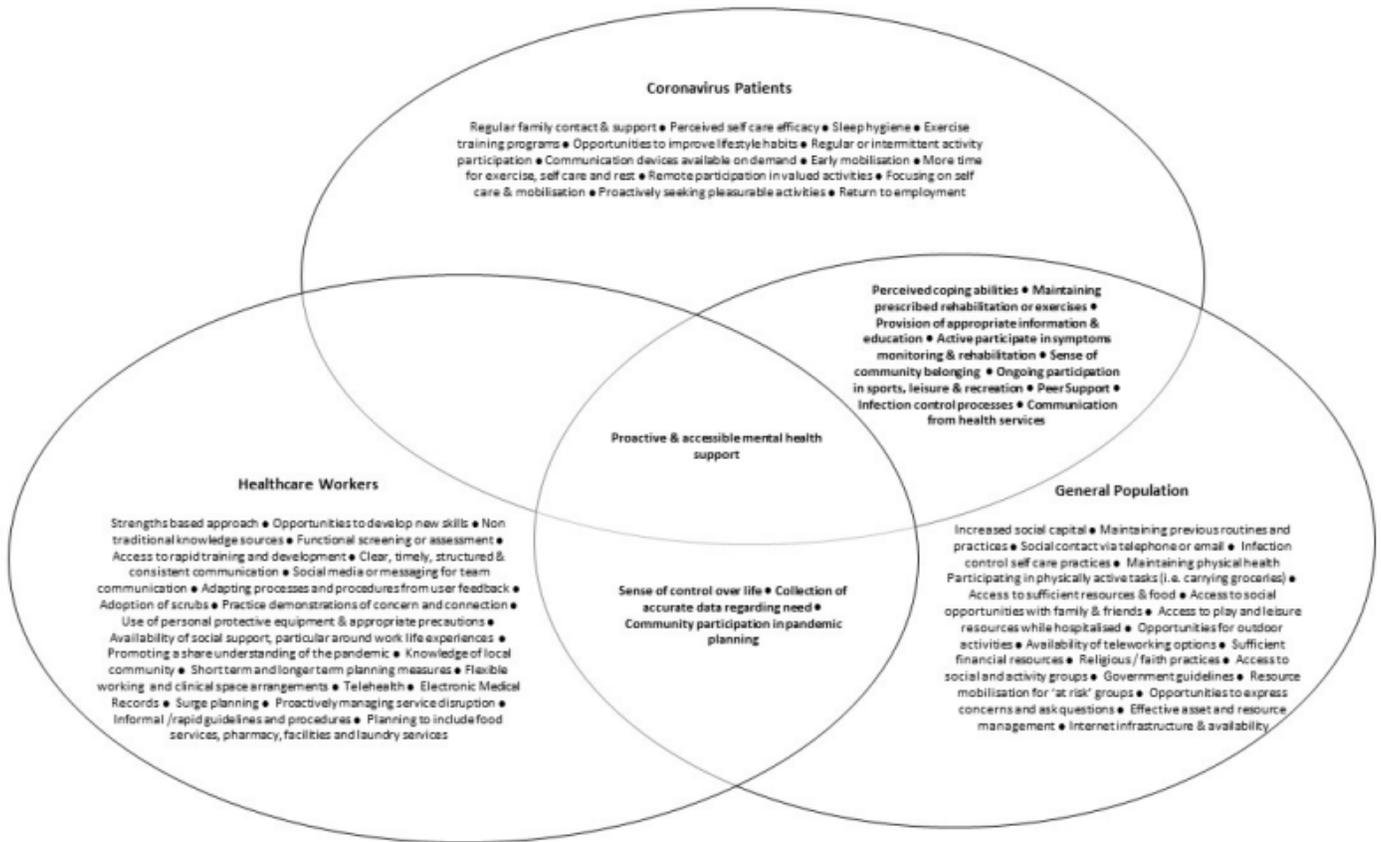


Figure 2

Opportunities to Promote Function During Coronavirus Pandemics

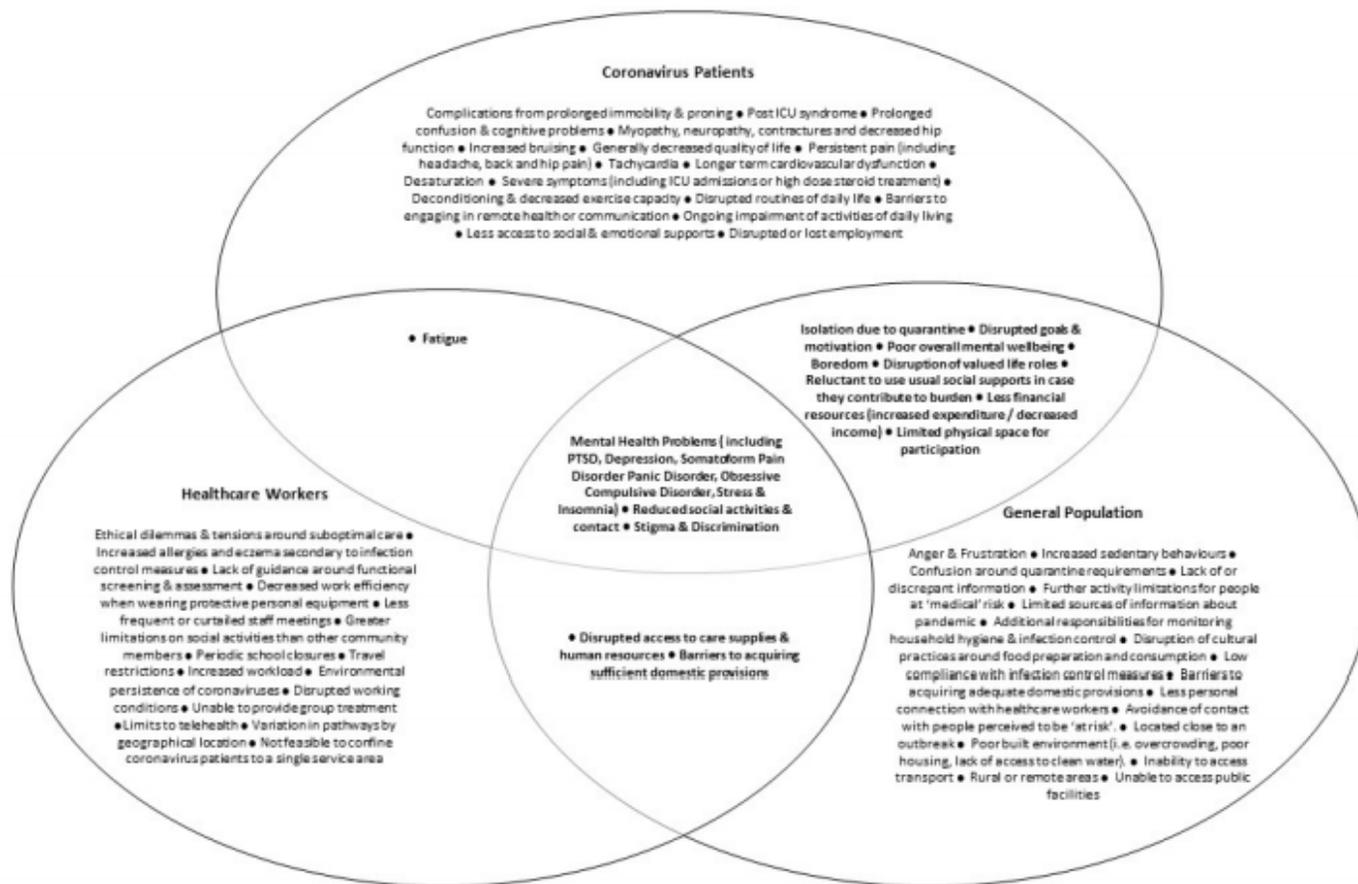


Figure 3

Potential Barriers to Function During Coronavirus Pandemics

Supplementary Files

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- [BMCHHealthServicesSupplementaryMaterials1.docx](#)