

COVID-19 Scientific Advisory Group

Rapid Evidence Report

Topic: What are the evidence, feasibility and limitations of potential strategies that may be used to enhance hospital capacity (including those used in Alberta and elsewhere) in response to short and medium term pressures, particularly focusing on hospital bed capacity to care for patients with complex needs, including the elderly and those with COVID-19?

Context

- There are increasing pressures on hospital capacity, due to increasing hospital and ICU admissions related to COVID-19, as well as challenges related to isolation requirements of patients, and delays in discharge of patients being sent to long term care (LTC) due to LTC centre outbreaks (which increases ALC rates in hospitals).
- AHS ELT has identified an urgent priority to review strategies (including supportive evidence and unintended consequences) that can increase hospital, ICU and emergency department capacity.
- The intention of the literature review was to focus on field hospitals and other interventions, and information from additional AHS sources was also collated. Therefore topics such as the virtual hospital initiatives, changes to admission criteria, and ED management are addressed in the Table, but not in the literature search.

Key Messages from the Evidence Summary

- When considering how to improve hospital capacity, three sources of information can be considered:
 - AHS hospitals have developed four phase surge plans for their sites with plans to address the potential sharp rise in hospital bed demand. These reports have not been included in this rapid brief
 - The AHS Clinical Service Evidence Review, conducted to explore non-COVID specific opportunities for reducing acute care bed utilization in Alberta was utilized in this rapid brief to identify additional Alberta strategies that may be used within our current context.
 - A de novo literature search was conducted to identify COVID-specific strategies that have been used by other health systems in an attempt to improve hospital capacity
- The information gathered from the latter two sources have been briefly described in Table 1 and summarized in more detail in the Appendix of this document in the [Table: Strategies that may be used to increase hospital bed capacity](#).
- The literature search revealed numerous examples of strategies employed to try to address hospital capacity during the COVID-19 pandemic. The literature is generally descriptive in nature and does not provide specific evidence to guide the decision making process, but offers possibilities that may be considered within the Alberta context.
- When considering which strategies to implement to improve hospital capacity in their site, hospital leadership should consider the most high impact challenges in their context. These notably include staffing capacity which has proven to be a significant challenge, as well as the number of COVID admissions; social admissions to enable isolation; and issues with hospital flow due to patients on isolation. Additionally, consideration for where the patient would be most optimally managed/level of care (acute care, community, isolation facility etc.) should be assessed and reassessed to ensure best fit.
- Broadly, the COVID-specific strategies include: field hospitals, community based care approaches, repurposing of existing health care resources, and the designation of COVID-19 specific sites. The

literature highlights the use of interventions targeting the needs of individuals with high acuity, as well as isolation strategies for those with mild disease.

- While field hospitals have been widely proposed, there remains a lack of evidence of their utility, with many having had limited use thus far.
- AHS hospitals have developed four phase surge plans for their sites with plans to address the potential sharp rise in hospital bed demand. These reports have not been included in this rapid brief. It is acknowledged that the current case surge and the marked impact of numerous external factors on staffing capacity (which was not incorporated into earlier plans) will impact the feasibility of these plans.

Practical Considerations

The following are provided to assist in the management of hospital bed capacity within AHS sites.

1. Sites' access and use of existing data sources (eg: number of COVID admissions; number of people on isolation; bed capacity) should be facilitated to support understanding of regional hospital capacity issues, to allow selection of the most appropriate strategies

Rationale: Zones, and sites have varied experiences with COVID-19 patient management, and unique needs and barriers related to hospital bed capacity. Access to timely, site and region specific data on the number of COVID admissions; number of people on isolation; paired with emergency department, hospital and ICU bed capacity would enable site leaders to plan for anticipated patient care needs and improve hospital capacity through implementation of strategies that impact their site.

2. Sites should implement enhanced processes to reduce barriers to discharge including appropriate isolation discontinuation related to having a COVID-19 diagnosis.

Rationale: COVID-19 patients may have unique discharge barriers, which may impact hospital capacity and result in prolonged stays. There is a social stigma attached to a COVID diagnosis, and concern within the community regarding potential transmission from newly diagnosed patients, impacting safe transport and families/care settings willingness to accept a recently diagnosed or discharged patient in the home. This has created a challenge with safe and appropriate discharge from the acute care setting (emergency department and hospital). Barriers to returning to the community vary by site but include that patients may not have appropriate community isolation sites available. For hospitalized and emergency department patients with COVID, a 'discharge navigator' (which could be built in to existing transition coordinator / nurse clinician roles for units caring for COVID patients or emergency departments) may facilitate the return of patients to the community, while ensuring appropriate linkages with primary care and community resources. The following resources may be of greatest relevance for acute care discharge planning for patients with COVID:

- a. AHS/PCNs Presumed/Confirmed COVID-19 Positive Primary Care Pathway:
https://www.specialistlink.ca/files/COVID_PathwayV2_April62020.pdf
 - b. Resources for Primary Care to Support COVID-19 Care in Communities:
<https://www.albertahealthservices.ca/assets/info/ppih/if-ppih-covid-19-primary-care-support-in-communities.pdf> -includes links to zone specific COVID pathways, community care guidelines, specialist link, and other support contacts.
 - c. AHS COVID-19 Provincial Pandemic Flowsheet Patient Discharge from Hospital
<https://www.albertahealthservices.ca/assets/info/ppih/if-ppih-covid-19-flowsheet-patient-discharge-hospital.pdf>
 - d. AHS COVID-19 Safe Discharge Checklist:
<https://www.albertahealthservices.ca/assets/info/ppih/if-ppih-covid-19-safe-discharge-checklist-appendices.pdf>
 - e. SAG Review Safe Discharge From Hospital:
<https://www.albertahealthservices.ca/assets/info/ppih/if-ppih-covid-19-sag-criteria-for-safe-discharge-from-hospital-rapid-review.pdf>
3. Isolation recommendations for individuals with a previous diagnosis of COVID-19 need to be applied consistently, and enhanced education offered if needed. Patients who have been re-admitted after a diagnosis of COVID-19 admission at least 14 days previously do not require isolation, unless they are immunosuppressed, or have other reasons for isolation. In addition, during the hospital stay, prolonged

isolation beyond the recommended 10 days from symptom onset (unless immunocompromised or critically ill) is not required, and adversely impacts overall isolation room capacity without enhancing safety.

Rationale – Patients are no longer infectious 10 days after symptom onset and unless there are extenuating circumstances, do not require ongoing isolation. Continuing isolation for these patients uses valuable isolation resources and reduce hospital capacity. This may also be contributing to unnecessary hospital days, occupying needed isolation beds and impairing patient flow. AHS IPC recommendations for cohorting/isolation:

- [Cohorting Inpatients on Additional Precautions in Acute Care Facilities](#)
 - [Cohorting During Pandemic in ED/UCC AHS Facilities](#)
 - [Cohorting for COVID-19 in Acute Care](#)
 - [Additional COVID-19 Precautions without Walls in Shared Patient Care Space](#)
 - [Discontinuation of Contact and Droplet Precautions for Suspected or Confirmed COVID-19](#)
4. Selection of strategies will need to carefully consider implications for staffing at sites.
Rationale: Staffing is a major challenge for all health systems presently. Some of the strategies (eg: hospital or community-based ALC units) may require redeployment of staff, and others strategies (eg: rapid assessment units) may require additional staff. Careful consideration of site and zone staffing challenges will need to be considered with the implementation of any of the above listed approaches.

Strength of Evidence

This review built upon work completed within AHS to reduce avoidable admissions, ALOS/eLOS and ALC within the province. These strategies have been highlighted in the Table provided. In brief, the table outlines possible capacity saving strategies such as cohorting of patients by diagnostic group, implementation of rapid access units, admission criteria tightening and alternative admission programs, promoting early discharge/community-based care. Through this work the Avoidable Admission Working Group determined standardized practice and decision support, specialist outpatient clinics, multidisciplinary care, and crisis response teams were consistently shown to reduce hospital admissions, however the interventions may not result in cost savings. Reducing acute care length of stay for adult patients was also addressed. Early discharge planning demonstrated a significant LOS reduction for readmissions, while strategies to decrease LOS at the provider level resulted in LOS reductions of 0.12 – 7.3 days. LOS also decreased with interventions that addressed team management, interdisciplinary rounding and workflow. Reducing Alternate Level of Care (ALC) and the development of cohort guidelines was also suggested as capacity/cost saving strategies which may improve capacity by reducing the burden of ALC patients within the acute care setting. For further details on these non-COVID-19 specific strategies, please refer to the Strategic Clinical Networks document: *Working Group Report Evidence Review: Opportunities and Strategies to Improve Clinical Services Utilization at Acute Care Sites in Alberta*.

Additionally, in spring 2020 a review was completed by the Scientific Advisory Group to evaluate the possible implementation of a Centralized Voluntary Isolation/Quarantine Centers (CVICs), while mentioned briefly here, for further details please refer to the full Rapid Review (<https://www.albertahealthservices.ca/assets/info/ppih/if-ppih-covid-19-sag-voluntary-isolation-centres-rapid-review.pdf>).

A total of 40 published and/or in press articles were incorporated into this review. Given the large volume of papers, they were categorized broadly into (1) Field Hospitals; (2) Community Based Interventions; (3) Repurposing Existing Health Care Resources/Units; and (4) Dedicated COVID-19 Facilities. Below each category reviewed is a brief description of the literature, the feasibility in the Alberta context, and the impact on need for Health Care Workers (HCWs)/unintended consequences.

While the COVID-specific part of this review includes examples from the literature from 40 published (and in press) papers, it would be misleading to suggest it provides evidence to the effectiveness of the interventions. All but a few papers were limited to descriptive analysis or commentary regarding the implementation strategies employed. Those publications that provided analysis focused on descriptive information regarding patient populations served, and basic health care utilization data. As such the strength of the evidence is very limited, and this review serves as a summary of these descriptions.

Summary of Purpose

The purpose of this rapid brief was to identify possible new COVID-19 specific strategies identified in a literature review (November, 2020) that have been implemented outside of AHS and may serve as possible examples to address hospital capacity issues, and to summarize other evidence based strategies that have been used to improve hospital capacity pre-COVID and might be relevant in our current context. Consideration for where the patient would be most optimally managed/level of care (acute care, community, isolation facility etc.) should be assessed and reassessed to ensure best fit.

Field Hospitals

Description/Evidence Summary

A total of 14 articles described field hospital scenarios implemented across five countries. In France, a 30 bed military hospital was deployed to treat critically ill patients with COVID-19 associated Acute Respiratory Distress Syndrome (ARDS) and to protect caregivers (Danguy des Deserts, 2020; Pasquier, 2020). In the first 3 weeks of implementation over 40 patients were treated at the military field hospital, all of whom with severe disease requiring mechanical ventilation (Kuteifan, 2020).

In the United States, Italy and Canada there are examples of field hospitals being created in large convention spaces/sporting facilities (Bazzell, 2020; Brown, 2020; Iserson, 2020; Levy, 2020; Naganathan, 2020; Sachetto, 2020; Stewart, 2020; Yuan, 2020; Peterson, 2020). One example, Boston Hope was created to treat individuals with mild disease, supporting local health care, however a need for higher levels of care, or critical care for the potential deterioration of patients recovering from COVID-19, resulted in the creation of a hybrid acute care–intensive care unit (Levy, 2020). During 54 days of operation, more than 700 COVID-19 patients were treated at Boston Hope. In Italy, a concert hall was converted to create a temporary hospital of 90 beds, with four ICU beds, 30 “sub-intensive” beds and 56 general medicine beds. There are additional examples of field hospitals (such as Spain and Singapore) being used for diagnostics/screening purposes, that are beyond the scope of this review (Diaz-Garzon, 2020 & Thangayah, 2020).

Feasibility in Alberta Context:

Within AHS, field hospitals have been implemented in Edmonton and Calgary. The Pandemic Response Unit (PRU) at the Peter Lougheed Hospital was created with the capacity of 67 beds. The PRU includes a medical unit, and a 16 bed intake unit (personal communication, Karen Foudy, AHS, November, 2020). Due to the inability to social distance patients in the emergency dept the PRU is currently being utilized as an extension of the emergency department, with about 40% of the emergency department patients are seen in this intake space (personal communication, Karen Foudy, AHS, November, 2020). The medical side of the PRU is earmarked for the stage four of our pandemic surge plan for the PLC site. The intake unit of the PRU was described as very successful, however the medical unit has not yet been required. It was suggested this may be because of existing space within the facility that may be used first (such as the influenza unit). In relation to hospital capacity, there are challenges related to staffing. The field hospital does require new infrastructure, however the PRU was deployed within 3 weeks and could be used in all zones. Of note, any additional structure being used for patient care does require approval through the Alberta Hospital Act.

Impact on Need for Health Care Workers (HCW)/Unintended Consequences

Field hospitals address physical space concerns but feasibility is affected by constraints on the healthcare workforce. Field hospitals require significant additional staff requirements (Chen, 2020). In Italy, additional HCWs were deployed from Cuba to assist (Sarchetto, 2020). Diaz-Garzon (2020) indicated that because their field hospitals staff consisted of volunteers from a variety of settings, baseline education and consistent training was important. Iserson (2020) advocated for the use of volunteers where possible, and suggested a cross-training approach to ensure staff could serve a variety of functions (within scope of practice). Additionally, Stewart (2020) suggested that key leaders need to have trained replacements available in the event that they become unwell or unable to fulfill their duties.

While there have been many examples of field hospitals specific to COVID-19 pandemic management, there is currently little evidence as to the utility, cost-benefit, and long-term use/outcomes. In the United States, several field hospitals have been built and remained empty or minimally used, including field hospital sites in New York,

Colorado, Illinois, Wisconsin, and Michigan (Naganathan, 2020). In total in the USA, over 70 field hospitals have been created, with over 27,000 beds; half have not yet been used for patient care as of publication date of August 6, 2020 (Yuan, 2020).

Community Based Interventions

Description/Evidence Summary

A total of eight papers were identified that described community based interventions to address hospital capacity in the management of COVID-19 from South Korea, Singapore, China and the United States (Attipoe-Dorcoo, 2020; Borgen, 2020; Chen, 2020; Chen(2), 2020; Goei, 2020; Park, 2020; Lee, 2020; Wang, 2020). In Korea, the Community Treatment Centre (CTC) was developed for individuals with mild disease, as a medically monitored quarantine facility (Park, 2020). At the beginning of the pandemic, all COVID-19 patients were hospitalized in Korea, however this quickly overran the health care system, and following the first death of a COVID-19 patient in the community, the CTC model was created as a strictly non-medical, monitoring/isolation facility (Park, 2020). Exclusion criteria for the CTC included: underlying chronic disease, and patients with high fever or dyspnea – all of whom likely required advanced medical treatment, not provided at the CTC (Park, 2020). A retrospective cross-sectional observational analysis was conducted, a total of 26.5% (n = 213) of all 803 COVID-19 patients in the city were admitted to the CTC (Lee, 2020). The median length of stay was 21 days (interquartile range, 12–29 days) and 191 patients (89.7%) were discharged home, with 22 (10.3%) transferred to hospital for further treatment (Lee, 2020). Singapore implemented a similar community based treatment centre for those with mild disease (as an isolation strategy), and found a low hospital transfer rate of 0.37% (Goei, 2020). In China, the well-documented Fangcang Hospitals were as temporary hospitals created within existing public venues (Chen, 2020). The Fangcang Hospitals targeted individuals with mild to moderate COVID-19 to isolate, triage, provide basic medical care, conduct monitoring and rapid referral, and to provide social interaction and everyday living (Chen (b), 2020). Admission criteria for the Fangcang Hospitals include: Positive COVID-19 test with mild signs or symptoms (mild clinical symptoms, imaging shows no signs of pneumonia) to moderate signs or symptoms (fever, respiratory tract symptoms, imaging shows pneumonia); able to ambulate independently, provide own self-care, under the age of 65 years, no mental health conditions, no significant co-morbidities, negative influenza test, SpO₂ >93% and breathing rate <30 per min in resting state (Chen, 2020). It is suggested this quarantine strategies employed led to an estimated 5148 fewer confirmed cases (P < 0.0001) (Wang, 2020). Lastly, Wang and colleagues indicated that following the implementation of the isolation field hospital strategy, the reproduction number dropped from a rate of 4.0 to 2.0.

Attipoe-Dorcoo and colleagues (2020) advocate for the use of mobile clinics for community based care, building on existing mobile clinic models in many communities. Borgen and team (2020) suggest an intensive transitional care management (ITCM) intervention to optimize hospital bed capacity by preventing admissions. They advocate for safe home discharge for appropriate patients with in-home support and tele-management. Through a matched comparison group (intervention 192, control 593) they determined a total of 481.6 hospital patient days were avoided for 78 patients in the treatment group (Borgen, 2020).

Feasibility in Alberta Context:

The examples of community based isolation and monitoring centres for mild COVID in Korea, Singapore and China are identified as a strategy to reduce community transmission, however the approach may be challenging in Alberta outside of large urban centres. However, they may address challenges of self-isolation for individuals with challenging circumstances such as crowded households, of those who would benefit from closer observation. As identified in the AHS SAG rapid review, *Centralized Voluntary Isolation/Quarantine Centers (CVICs)* 'based on limited evidence, centralized voluntary quarantine centres are recommended for use in Alberta as an outbreak control measure for specific groups of cases and contacts where home isolation or quarantine is likely to be suboptimal and AHS recommendations for self-isolation are not feasible.' Refer to the CVIC review for further details regarding practical guidance for implementation in Alberta. Adany (2020) state that there is little evidence that the isolation approach used in China (Wang, 2020) is more advantageous than at home remote monitoring.

Mobile clinics and virtual health approaches have been successfully implemented within the Alberta context (for both COVID-19 and other conditions), although scale and spread remains a possible barrier. The mobile clinics

approach focus on taking the care to the community through buses/mobile care centres and have been used in various regions for non-COVID care.

Additionally within AHS, potential strategies to increase bed capacity in the community have been identified. Home Care has a surge plan to address the increase in demand of community based patients to increase care in the community, as well as a possible increase in home-based palliative care. For example, within the Calgary Zone plans exist to consider a phased approach to bed capacity, which includes the use of non-traditional sites (beyond Phase 4) such as gymnasiums and convention facilities. Potential sites have been identified and include estimated bed numbers and may add an additional 100-1000 beds per site if implemented. Rural sites have identified potential sites that may offer up to 50 beds if required.

Impact on Need for Health Care Workers (HCW)/Unintended Consequences

The impact on HCW of implementing isolation centres would be significant. A challenge within the Alberta context is ensuring adequate staffing even within existing bed capacity.

Repurposing Existing Health Care Resources/Units

Description/Evidence Summary

A total of 11 papers were identified that described the repurposing of existing health care resources/hospital units representing four countries). In Italy, Agnoletti and colleagues (2020) described the conversion of a medical unit to a step-down unit (SDU) for post-ICU/Mechanical Ventilation (MV) weaning. A total of 44 COVID-19 patients were admitted to ICU and 8 to SDU and 14 patients were transferred from the ICU to SDU (31.8% of 44) with one readmission to the ICU recorded, which was due to a bacterial septic shock (Agnoletti, 2020). Also in Italy, COVID-19 specific units (ED, ICU, medicine, etc.) were identified as a measure to reduce possible transmission/infection control (Aliberti, 2020). In Korea, Her (2020) described multiple targeted strategies of repurposing resources to address COVID-19 pandemic including: stratified patient care, the assignment of hospitals/beds by a task force team, and the establishment of dedicated COVID-19 facilities to reduce transmission and streamline process.

Ambulance Bay Triage: Within the ED setting Baugh and team (2020) repurposed the ambulance bay to serve as a triage/intake department, separate from the existing ED. In this space patients that were non-emergent could be evaluated, tested for COVID-19, and safely discharged home, with an average 160 patients a day (Baugh, 2020). Use of PICU beds for adults, and other critical care units.: In the USA and UK paediatric ICUs were repurposed to care for adult patients (Levin, 2020; Knight, 2020; Jenkins, 2020; Phillips, 2020). The burden of severe COVID disease in the pediatric population is very low relative to that in adults. This required: institutional policies to ensure they could care for adults throughout the system; paediatric ICUs had to have (or get) accreditation for the care of adults; and clear guidelines for subspecialists regarding when adults can safely be admitted or transferred to the PICU (Jenkins, 2020). The PICU at King's College Hospital (UK) admitted 23 non-COVID adult patients, while whereas the PICU at Morgan Stanley's Children Hospital in New York admitted 46 adults, 30 of whom were COVID-19 patients (Knight, 2020). Another American paediatric hospital created a 40-bed adult COVID-19 treatment unit (Phillips). Results showed 78 (78%) required oxygen supplementation and 13 (13%) eventually were intubated. Of the first 100 patients, 14 are still admitted to a medical unit, 6 are in the intensive care unit, 74 have been discharged, six died (Phillips, 2020). . In the UK, they were able to increase ICU capacity by over 21% and increase MV capacity by over 75% by repurposing an existing NeuroICU (Raith, 2020).

Repurposing of specialized care spaces: Miller and colleagues (2020) described an orthopaedic hospital that converted to care for 148 individuals with COVID-19 in New York, as an overflow hospital with success. Sohn (2020) described how a COVID-19 recovery unit was created at a Veteran's Affairs non-acute facility

Transport/transfer protocols: Michelson and colleagues (2020) conducted simulations to determine if inter-region transfers may address any bed shortages, by identifying hospitals with capacity and sending patients from overburdened facilities. They indicated that where regions with bed shortfalls occur transfers to the nearest region with unused beds could resolve bed shortfall issues, with the exception of only the highest volume ICU scenario (Michelson, 2020). Anesi (2020) raised concerns with the modelling suggesting there needs to be careful consideration of the transport/transfer process; hospitals may not be able to function at capacity, due to staffing

and other considerations and the coordination and implementation of a timely, efficient inter-regional transfer program would require careful planning.

Feasibility in Alberta Context:

Repurposing existing units/facilities has occurred in the Alberta context with success. Paediatric ICU beds in Edmonton were allocated to provide adult care if necessary. In addition, the Load levelling Capacity Response Working Group has identified strategies for the management of surge scenarios and hospitals in Alberta have an existing surge plan particularly addressing the need for additional resources in ICU and emergency departments.

Impact on Need for Health Care Workers (HCW) and HCW training

Agnoletti and colleagues (2020) indicated that 75% of the nursing staff working on a newly converted SDU did not have ICU experience, suggesting a high need for education and training. In some instances (Raith, 2020) a reduction in elective surgeries may have created opportunity to reallocate existing staff, although this model generally requires an educational component for deployed teams. In some instances, a clear process for emergency credentialing and privileging may be required and should be addressed early in the planning (Jenkins, 2020).

Dedicated COVID-19 Facility

Description/Evidence Summary

A total of seven papers were reviewed representing five countries (India, USA, Australia, Korea & China). In addition to the described Community Treatment Centres in Korea, an entire main hospital building in the 'red zone' was converted into a dedicated COVID-19 hospital (Kim, 2020). As of the end of June, over 1000 COVID-19 patients had been admitted to the hospital, of which 22 patients died and five patients were receiving ongoing inpatient treatment (Kim, 2020). In Australia (Ferguson, 2020) a thorough review of the feasibility, strengths and challenges of establishing a dedicated COVID-19 hospital was conducted. Through a review of the literature, consultations of clinical teams and discussion, they concluded that in their context, all hospitals should be prepared to manage COVID-19 patients with appropriate IPC protocols in place, with the transfer of patients to hospitals providing critical care when required (Ferguson, 2020). The disadvantage may be that patient distribution across the region may make allocation of resources more challenging (Ferguson, 2020). In India the decision was made to dedicate a specific secondary site as the COVID Hospital (D'Souza, 2020). They selected this option with an intent to protect the vulnerable patients receiving care, safety of hospital staff, reduce staff stress, reduce the burden on the hospital revenues, avoid disruption training and save on the cost of PPE (D'Souza, 2020). The developed COVID – 19 Hospital has a bed capacity of 120 beds, which includes 8 intensive care beds and 12 high dependency beds (D'Souza, 2020). A COVID specific hospital would require a patient transfer strategy, as patients will seek care at all facilities, which may lead to unanticipated exposures at non-COVID sites.

Feasibility in Alberta Context:

Within Alberta larger urban hospitals provide support to smaller centres continually. With a large provincial health care system it is more feasible to move patients to alternate sites. However, as described by Anesi (2020) an inter-regional transfer program would be complex and the process of safely transferring patients would be need to be carefully developed. Through RAAPID North and South and using current EMS protocols, Alberta is well positioned to transfer patients between hospitals. The challenge may be having the available units and resources to transfer patients depending on what the other concurrent demands are on EMS resources.

Impact on Need for Health Care Workers (HCW)/Unintended Consequences

A total of 906 health-care personnel worked in the designated hospital in Korea, of whom 402 were regular hospital staff and 504 were dispatched health-care workers (Kim, 2020). In the Korean context, volunteers were requested from locations outside of the 'red zone' and the federal government provided funding for housing costs, expenses, hazard pay and other costs (Kim, 2020). Therefore, the demand for additional hospital staff was over 50%. A dedicated facility would however allow for targeted education and training of staff and may reduce the overall exposure of the health care work force. Nursing staff in India were provided training, infection control guidance, and counseling and shifts were scheduled following temporal separation, (D'Souza, 2020). Their considerations would be important in assessing the feasibility of this intervention.

Table 1: Strategies That May be Considered to Increase Hospital Capacity in AHS in the Short to Medium Term

Strategy	Brief Description	Evidence In Literature and AHS
COVID SPECIFIC STRATEGIES		
Cohorting non-COVID inpatients on isolation* for other laboratory confirmed pathogens	Cohorting non-COVID inpatients on isolation together (eg: C. diff)	(https://www.albertahealthservices.ca/assets/healthinfo/ipc/if-hp-ipc-cohorting-isolation-patients.pdf)
Cohorting COVID inpatients*	Cohorting patients admitted to hospital with COVID	
Community Based Isolation Centres for outpatients	Have been used to isolate individuals with mild-moderate COVID-19 in the community to reduce community transmission through a controlled isolation process, rather than active acute care treatment.	This has been used as a primary strategy in Asia, isolating individuals with mild/moderate confirmed COVID-19 primarily to reduce community transmission
Cohorting inpatients on isolation for suspected COVID*	Cohorting inpatients on isolation for suspected COVID together.	Used in some Alberta hospitals
Optimizing COVID patient flow, removal from isolation (when appropriate), use of repeat testing, and discharge planning	COVID patients have unique discharge needs, and there is hesitancy to have individuals return to their home. A discharge navigator role may assist with discharge and community referrals. Clear guidelines for removal of COVID patients from isolation should be well socialized	Nurse navigators have been successful for other diagnosis.
Increase access to modeling data and site-specific prevalence/incidence information	To improve planning capacity, provide site specific modelling data	
COVID hospitals (eg: Military style field hospitals)	Used widely for emergency response.	Ranged from use of isolation centres with medical monitoring, providing diagnostic services, to mobile critical care facilities.
Repurposing Existing Health Care Resources/Units	A common strategy to cope with the increase demand for beds	Examples include using Pediatric ICUs for adult patients, reallocating units experiencing reduced use, and using non-acute facilities for COVID-19 recovery.
Dedicated COVID-19 Facility	In some countries specific health care facilities were designated as COVID-19 hospitals (hub and spoke model)	These facilities use existing hospital beds, rather than creating new sites (such as at a field hospital).

Strategy	Brief Description	Evidence In Literature and AHS
Altered Admitting Processes for known and unknown COVID cases	Dedicated COVID admitting: admitting service with/without COVID ward to facilitate rapid admission of confirmed/pending COVID patients and minimize debates about appropriate admitting service and prolonged or unnecessary touchdowns in ER	
Strategies to reduce outbreaks	Current SAG reviews evaluating: strategies to reduce outbreaks including: 1) forecasting the occurrence of outbreaks based on community case numbers; 2) thresholds for enhanced PPE use	SAG review ongoing
Cancel elective surgeries that require longer LOS	Elective surgeries are cancelled (based upon criteria of prioritization, focusing on those with longer length of stay) to free up hospital beds and staff.	Used in AB -AHS has created the 'Slowdown of Scheduled Services-Provincial Plan by Zone' (November, 2020) and can be referred to for further details of this strategy.
NON-COVID SPECIFIC STRATEGIES		
Virtual hospital/Complex Care Hub/Home Hospital/Community Paramedic Programs	Virtual hospital are being established across several larger hospitals to both reduce and shorten hospital admissions. This is being scaled / spread as quickly as possible.	Used in AB -Operational in Edmonton and Calgary zone, for patients that would otherwise require hospitalization and outpatients who require specialist consult.
Hospital ALC units	Acute transition units: cohorting of ALC patients with staffing to support lower intensity care than general medical/surgical unit	Used in AB -Adjusting staffing rates to reflect needs of ALC cohort and restructure discharge process to focus on education and checklists (Level of Evidence (LoE) 4-5) ⁱ
Destination Home	Destination home: care and services planned at admission with the goal to help people return to or remain in their homes. It is a philosophy to support all patients to return to their home as feasible	Used in AB -Upon admission, promote and plan for adequate resources to be in place to support the patient to ultimately return home upon discharge (LoE 3) ⁱⁱ
Community ALC units**	Community cohorting: off-site care based on a medical rehabilitation model, using a non-hospital site such as a temporary Long Term Care until they are able to be placed in an appropriate facility	Used in AB -The intervention group spent a median of 11d less in hospital than the control group, and took longer to be admitted to permanent care (LoE 1b) ⁱⁱⁱ
Measures to improve continuity and efficiency	Patient flow interventions: strategies to address how patients flow through the hospital	Used in AB - Strategies including patient fast-tracking for testing, rapid infection screening, improving patient transitions, and use of triage management systems were found to decrease LOS by 1.1-1.9d (LoE 1b-5) ^{iv}

Strategy	Brief Description	Evidence In Literature and AHS
	Elder-friendly care: care model focused on preventing decline and restoring previous level of function to allow patients to return home	Used in AB- Bundle of practices to enable the protection and recovery of function among older patients. Changes in LoS include a decrease of 7.3d for delirium education/treatment, 2.1d for early mobilization, and 0.6d for care planning for ongoing mobility (LoE 1b-5) v
	Repeat screening: assessment of admission appropriateness at regular intervals to trigger discharge services	Identify when discharge is medically appropriate and address factors within hospital/staff control to promote discharge (LoE 4) vi
	End of life conversation: conversation on goals of care	Used in AB- Initiation of conversation regarding end of life in frail older adults and goals of care (LoE 2c) vii
	Single physician model: “physician of the week”	Rotation of single physician for 1-wk duration to reduce length of stay on adult medical wards (LoE 2b) viii
	Daily medication ward rounds: family medicine physician (resident) and pharmacist	Daily co-location of family medicine physician (resident) and pharmacist to improve discharge efficiency and reduce discharge delay (LoE 2b) ix
Overcapacity Protocols for Hospital Access Block	ED Inflow and Hospital Inflow is managed with a specific protocol and plan of action for patient management	Overall hospital length of stay was reduced 3% (from 7 days to 6.8 days). No impact in sites already meeting 8 hour target for admission from ED.
Rapid Access Clinics	Urgent Access Clinics for rapid follow up of ED patients who are borderline regarding admission decisions.	Used in AB- Urgent access clinics exist GIM and Neurology at UofA Hospital.
Tightening admission criteria (eg: second physician approval)	Developing standardized decision support tools to standardize care and support care in the community may reduce variation in care.	Used in AB -There is little evidence base that standardized rules could be based on, although there have been programs in Alberta for seniors that have reduced admissions with a similar strategy
Additional Strategies – no published studies		
Optimizing Rural Hospital Use	This may include: repatriating rural patient currently admitted in urban centres, and sending ALC patients to rural hospitals	May free up tertiary hospital beds for higher acuity medical patients
ALC alternative sites	ALC care for patients admitted for social (non-medical reasons). Patients are often admitted for non-medical support due to a lack of resources in the community.	Creating a community based space for individuals that require non-medical care may free up beds.
Focus on disposition of complex discharges	Patients who are admitted to hospital that do not have a medical reason for ongoing admission have complex discharges.	Creating a community based space for individuals that require non-medical care may free up beds.

Strategy	Brief Description	Evidence In Literature and AHS
Trial discharges	Lower the threshold for readmission for patients who would be unlikely to significantly worsen if they failed a discharge	
Short-stay units	Observation units are based on the idea that some ED patients may require additional tests or observation, but not enough to merit an inpatient admission.	Has been trialed in Alberta, although has been challenging to limit the stays to prescribed timelines. A Canadian environmental scan documents that short stay units are diverse and may not reduce time patients spend in hospital.
Enhanced ambulatory care/ family medicine access care (parallel to ED – decant people from ED)	Ambulatory clinics ... for anyone who may not need a bed but otherwise would require an admission. These clinics can be used to divert or quickly discharge patients who have chronic disease or a sub-acute (urgent) complaint.	Previously trialed and discontinued at UAH ED.

*For AHS specific guidance on cohorting patients, please refer to the following documents:

<https://www.albertahealthservices.ca/assets/healthinfo/ipc/hi-ipc-covid-desgnd-unit.pdf>

<https://www.albertahealthservices.ca/assets/healthinfo/ipc/hi-ipc-setting-up-isoln-wo-walls-shrd-space.pdf>

<https://www.albertahealthservices.ca/assets/healthinfo/ipc/if-hp-ipc-cohorting-pandemic-ed-ucc.pdf>

<https://www.albertahealthservices.ca/assets/healthinfo/ipc/if-hp-ipc-cohorting-isolation-patients.pdf>

** Comment: there is a negative perception that ALC equates to awaiting placement to long term care, when, in reality, ALC reflects the dynamic nature of patient care needs upon discharge from acute care. There may be need to rebrand ALC, perhaps to a step-down restorative care bed, to address this misconception. A venue for discussion may be the Integrated Continuing Care Steering Committee.

*** Comment: site to site "mentorship" might be as useful as access to documentation to support operations in implementing the selected strategies

Date question received by advisory group: October 30, 2020

Date report submitted to committee: November 18, 2020

Date of first assessment: November 23, 2020

(If applicable) Date of re-assessment:

Authorship and Committee Members

This report was written by Heather Sharpe with assistance from Patrick McLane and Heather Hansen. It was scientifically reviewed by Braden Manns, Lynora Saxinger, Andrew McRae, Curt Johnston, Peter Sargious, Adrian Wagg, Karen Foudy, and Stacey Litvinchuk. The full Scientific Advisory Group was involved in discussion and revisions of the document: Braden Manns (co-chair), Lynora Saxinger (co-chair), John Conly, Alexander Doroshenko, Shelley Duggan, Nelson Lee, Elizabeth MacKay, Andrew McRae, Melissa Potestio, James Talbot, Jeremy Slobodan, Brandie Walker, and Nathan Zelyas

© 2020, Alberta Health Services, COVID-19 Scientific Advisory Group



This copyright work is licensed under the [Creative Commons Attribution-NonCommercial-NoDerivative 4.0 International license](https://creativecommons.org/licenses/by-nc-nd/4.0/). You are free to copy and distribute the work including in other media and formats for non-commercial purposes, as long as you attribute the work to Alberta Health Services, do not adapt the work, and abide by the other licence terms. To view a copy of this licence, see <https://creativecommons.org/licenses/by-nc-nd/4.0/>.

The licence does not apply to AHS trademarks, logos or content for which Alberta Health Services is not the copyright owner.

Disclaimer: This material is intended for general information only and is provided on an "as is", "where is" basis. Although reasonable efforts were made to confirm the accuracy of the information, Alberta Health Services does not make any representation or warranty, express, implied or statutory, as to the accuracy, reliability, completeness, applicability or fitness for a particular purpose of such information. This material is not a substitute for the advice of a qualified health professional. Alberta Health Services expressly disclaims all liability for the use of these materials, and for any claims, actions, demands or suits arising from such use

Appendix

List of Abbreviations

AHS: Alberta Health Services

COVID-19: Coronavirus Disease-2019

SAG: Scientific Advisory Group

KRS: Knowledge Resource Services

Methods

Literature Search

A literature search was conducted by Rachel Zhao from Knowledge Resources Services (KRS) within the Knowledge Management Department of Alberta Health Services. KRS searched databases for articles published in 2020, and included: OVID MEDLINE, TRIP Database Pro, PubMed, WHO COVID Database, CEBM Oxford COVID-19 Evidence Service, COVID-19 Primer, medRxiv and bioRxiv, COVID-19 Evidence Review, National Collaborating Centre for Methods and Tools, NICE Rapid Reviews, Google and Google Scholar.

Search Results

Search Strategies

Ovid MEDLINE(R) and Epub Ahead of Print, In-Process & Other Non-Indexed Citations, Daily and Versions(R) 1946 to October 30, 2020

1 exp Coronavirus/ or Coronavirus Infections/ or coronaviru*.mp. or corona viru*.mp. or ncov*.mp. or n-cov*.mp. or novel cov*.mp. or COVID-19.mp. or COVID19.mp. or COVID-2019.mp. or COVID2019.mp. or SARS-CoV-2.mp. or SARSCoV-2.mp. or SARSCoV2.mp. or SARSCoV19.mp. or SARS-Cov-19.mp. or SARSCov-19.mp. or SARSCoV2019.mp. or SARS-Cov-2019.mp. or 85787

Knowledge Resource Service

SARSCov-2019.mp. or severe acute respiratory syndrome coronaviru*.mp. or severe acute respiratory syndrome cov 2.mp. or 2019 ncov.mp. or 2019ncov.mp.

2 Surge Capacity/ 308

3 exp Hospital Bed Capacity/ 23831

4 (surge capacity or bed capacity).kf,tw. 1166

5 exp Hospitals/ 277573

6 exp Hospitalization/ 245025

7

(hospital or hospitals or hospitaliz* or hospitalis* or surge or length of stay or patient admission or patient discharge or patient handoff or patient readmission or patient transfer or wait* time* or wait list*).kf,tw.

1367998

8 or/5-7 1530170

9 capacity.kf,tw. 521170

10 8 and 9 20225

11 Mobile Health Units/ 3639

12 (field hospital* or mobile clinic* or mobile ward* or mobile health unit* or mobile hospital*).kf,tw. 1508

13 ((communit* adj3 (hospital* or placement*)) or (low risk adj1 patient*)).kf,tw. 33391

14 2 or 3 or 4 or 10 or 11 or 12 or 13 80376

15 1 and 14 873

16 (covid* adj (hospital* or unit*)).kf,tw. 50

17 15 or 16 919

18 limit 17 to (english language and yr="2020 -Current") 843

19 remove duplicates from 18 833

20 from 19 keep 1-833 833

TRIP Database Pro

("surge capacity" or "hospital capacity" or "hospital bed capacity" or "field hospital" or "mobile clinic" or "mobile ward" or "mobile health clinic" or "mobile hospital") AND (coronaviru* OR "corona virus" OR ncov* OR n cov* OR COVID-19 OR COVID19 OR COVID-2019 OR COVID2019 OR SARS-COV-2 OR SARSCOV-2 OR SARSCOV2 OR SARSCOV19 OR SARS-COV-19 OR SARSCOV-19 OR SARSCOV2019 OR SARSCOV-2019 OR SARSCOV-2019 OR "severe acute respiratory syndrome cov 2" OR "severe acute respiratory syndrome coronavirus*" OR "2019 ncov" OR 2019ncov OR Hcov*) from:2020

PubMed

Knowledge Resource Service

((pandemic*[tw] OR communicable diseases[mh] OR communicable[tw] OR infectio*[tw] OR contagion*[tw] OR virus[tw] OR outbreak*[tw] OR pathogen*[tw]) OR (((wuhan[tw] AND (coronavirus[tw] OR corona virus[tw])) OR Coronavirus*[ti] OR COVID*[tw] OR nCov[tw] OR 2019 ncov[tw] OR novel coronavirus[tw] OR novel corona virus[tw] OR covid-19[tw] OR SARS-COV-2[tw] OR Severe Acute Respiratory Syndrome Coronavirus 2[tw] OR coronavirus disease 2019[tw] OR corona virus disease 2019[tw] OR new coronavirus[tw] OR new corona virus[tw] OR new coronaviruses[tw] OR novel coronaviruses[tw] OR "Severe Acute Respiratory Syndrome Coronavirus 2"[nm] OR 2019 ncov[tw] OR nCov 2019[tw] OR SARS Coronavirus 2[tw]) AND (2019/12[dp]:2020[dp]))) AND (((Hospitals[mh] OR hospital medicine[mh] AND surge capacity[mh]) OR (surge capacity[tw] OR surge plan*[tw] AND hospital*[tw]))) Filters: in the last 1 year

WHO COVID-19 database

"surge capacity" or "hospital capacity" or "hospital bed capacity" or "field hospital" or "mobile clinic" or "mobile ward" or "mobile health clinic" or "mobile hospital" or "covid-19 hospital" or "covid hospital" or "covid-19 unit" or "covid unit"

Google / Google Scholar

Search string 1: COVID-19 hospital capacity strategy

Search string 2: increase hospital capacity COVID-19

MedRxiv &

Search string 1: "surge capacity" and posted between "01 Jan, 2020 and 03 Nov, 2020"

Search string 2: "hospital capacity and posted between "01 Jan, 2020 and 03 Nov, 2020"

Table: Strategies That May be Considered to Increase Hospital Capacity in AHS

Strategies/Options that can free up hospital bed capacity in the short to medium term	Brief Description of strategy	Impact on Hospital Bed Capacity	Feasibility in Alberta Context	Potential Unintended Consequences
COVID-19 Specific Strategies Note- rapid testing, if implemented, may impact the existing cohorting strategies used in Alberta.				
Cohorting non-COVID patients on isolation* for other laboratory confirmed pathogens (see https://www.albertahealthservices.ca/assets/healthinfo/ipc/if-hp-ipc-cohorting-isolation-patients.pdf)	Cohorting non-COVID patients on isolation for non-COVID infectious together (eg: C. diff)	Impact unclear but impact on hospital bed capacity likely small	This is currently occurring in Alberta	Cohorting is preferred to bedside isolation as it reduces the risk of transmission of unlike pathogens of concern – this is especially an issue at sites like RAH, MIS, FMC with ++4-bed wards, shared bathrooms, smaller size of these multi-bed rooms. In general there is a greater risk of transmission with bedside isolation.
Community Based Isolation Centres	Also may include community treatment centres that have been used in several countries to isolate individuals with mild-moderate COVID-19 in the community. The main aim of these centres is to reduce community transmission through a controlled isolation process, rather than active acute care treatment.	Impact is dependent on the number of people being admitted to local hospital as patient unable to isolate safely outside hospital	Isolation strategies have been attempted in Alberta (High River outbreak) for specific populations that may have difficulties isolating at home. The 'Isolation Hotel' was feasible, however was not well used and was not mandatory and was used primarily for Vulnerable Populations. An assessment and treatment centre was created at the University of Alberta (Butterdome). This centre (or others like it) may reduce ED visits as patients with mild disease can be treated within this alternative cohorted setting.	The primary consequence of these facilities is to reduce the likelihood of community transmission, reducing the overall health care burden. They do require staff and resources to implement successfully.
Cohorting COVID patients*	Cohorting patients admitted to hospital with COVID.	Impact on hospital bed capacity very small as hospitalized patient number for COVID still a smaller proportion of total inpatients than non-COVID patients in Alberta		If 1 patient is on continuous or intermittent AGMP & the cohorted patient is not, then Health Care Workers (HCWs) need to remember to wear N95 for both patients' care. Mask choice for visitors is currently under evaluation.

Strategies/Options that can free up hospital bed capacity in the short to medium term	Brief Description of strategy	Impact on Hospital Bed Capacity	Feasibility in Alberta Context	Potential Unintended Consequences
Cohorting those on isolation for suspected COVID*	Cohorting those on isolation for suspected COVID together. This has been used as a primary strategy in Asia-isolating individuals with mild/moderate confirmed COVID-19 primarily to reduce community transmission.	Impact potentially larger as many patients are on isolation pending testing.	Currently done in Alberta, although different approaches are used in various sites (ie some sites will cohort for symptoms but not risk factors – where risk factors are prioritized for private room options). Cohorting is to be based upon diagnosis, rather than symptoms alone which may limit applicability.	May result in hospital patient to patient transmission.
Optimize processes for COVID-19 patients: improving COVID patient flow, removal from isolation (when appropriate), minimizing repeat testing for positive patients, and discharge planning	COVID patients have unique discharge needs, and there is community perception that they may be infectious after 10 days (and after discharge) creating hesitancy for families/congregate living setting to have individuals return to their home. A discharge navigator role may help facilitate early discharge and appropriate community referrals and assist with discharge education-reducing the stigma of a COVID diagnosis. They may facilitate the use of existing pathways and provide documentation verifying a safe, appropriate discharge. Clear guidelines for removal of COVID patients from isolation should be well socialized to promote safe, consistent and timely removal of isolation protocols/space requirements Each COVID unit should ensure that their home care coordinator is aware of COVID isolation status and the relevant COVID guidelines upon discharge and local resources.	Potentially reduce LOS, unnecessary isolation bed use, and readmits for COVID patients. Literature focusing on discharge navigation (often nurse navigators) typically focus specific populations such as elderly, individuals with chronic disease or high-risk patients. There is limited data from randomized trials about the impact of navigators on length of stay. ...	A navigator role is currently implemented as a PRIHS research project for Indigenous patients with a significant role in assisting to find isolation opportunities, and with the COPD pathway PRIHS work (nurse navigator). As well, PLC has a nurse navigator role to assist with patient discharge (non-COVID specific) Would need to consider the unique population served by specific facilities and interventions would require tailoring to the site.	Discharge navigator would require a staffing commitment-likely as a component of an existing role (such as transition coordinator, home care coordinator or nurse clinician-depending on the site). May better facilitate access to community resources and reduce discharge burden for clinicians.

Strategies/Options that can free up hospital bed capacity in the short to medium term	Brief Description of strategy	Impact on Hospital Bed Capacity	Feasibility in Alberta Context	Potential Unintended Consequences
Increase access to site-specific prevalence/incidence information	To improve planning capacity, provide site detailed information on patients admitted to their site with COVID 19 (including new cases and recent cases – given that this impacts isolation)	May assist in staffing, when to shift phases of surge plan.	Some data is available within AHS from the COVID prediction modeling tool (AHS Analytics)	
COVID hospitals (eg: Military style field hospitals)	Field hospitals have been used widely for emergency response, including pandemics such as COVID-19. The use of field hospitals thus far have ranged from use of isolation centres with medical monitoring, and targeting those with mild/moderate disease, providing diagnostic services, to mobile, military based critical care facilities.	Field hospitals offers new bed capacity	At the PLC the Pandemic Response Unit (PRU) was created using a Sprung Structure to add an acute care and intake unit. Staff was allocated from the PLC. The PRU is limited to short stays and lower acuity but could be used for beginning/end of stay care.	While there are several descriptions of field hospitals in the literature, there is little evidence as to their utility compared to other interventions. At the PRU unit in Calgary the intake unit has been a well used addition, however the acute care beds of the PRU have remained vacant, due to the use of other strategies at this time.
Repurposing Existing Health Care Resources/Units	The repurposing of existing units/health care facilities is a common strategy to cope with the increase demand for beds. In the literature several examples are presented including using Pediatric ICUs for adult patients, reallocating units experiencing reduced use, and using non-acute facilities for COVID-19 recovery.	While this intervention may not increase the overall bed capacity in the facility it may reallocate resources to more effectively meet surge demands. In some instances elective surgery units may have reduced admissions and may be reallocated to COVID-19 management.	This is a common strategy and has been used within the Alberta context and is a part of surge planning. For example, PICU beds at the Stollery hospital were reallocated to adult ICU if needed. At the PLC, the influenza unit was opened to accommodate COVID-19 patients. Current surge protocols in AB have this built in based on level of activity on site. Includes reduction in services in surgical and ambulatory procedures if space needed and constraints based on oxygen/isolation spaces. Repurposing surgical beds (scheduled surgical/arthroplasty beds) for medical patients is a strategy considered within Alberta. In extreme scenarios, ambulatory care spaces can be utilized for patient care.	While the reallocation of beds is feasible and logical, it does require careful consideration for staffing. Do team members and facilities require any additional credentialling to provide care to a new population? What are the ongoing educational needs of allied health staff to provide care to COVID-19 patients? Other limitations may include equipment shortages (oxygen, IV pumps).

Strategies/Options that can free up hospital bed capacity in the short to medium term	Brief Description of strategy	Impact on Hospital Bed Capacity	Feasibility in Alberta Context	Potential Unintended Consequences
Dedicated COVID-19 Facility	In some countries specific health care facilities were designated as COVID-19 hospitals to focus the care of COVID-19 patients on one site. (hub and spoke model)	These facilities use existing hospital beds, rather than creating new sites (such as at a field hospital).	One of the proposed strengths of this model is that COVID patient care is centralized, allowing for health care providers to be specialized and allowing continuous PPE to reduce risk. Given the large geographical area of Alberta it would be challenging to have all patients in central hospitals Western Australia commissioned a report to consider this strategy (Ferguson, 2020), however determined it was not ideal as most tertiary centres were located in one city, and there is an increased risk of transmission to staff. Additionally, they identified it was advantageous to have staff across sites prepared for COVID-19 patients.	There would be significant staff implications for this approach, identifying staff to work in the COVID-19 specific site, ensuring staffing of both regular and COVID-19 facilities and a mechanism for patient transport to the sites. The use of rapid COVID tests may help facilitate the usage of these facilities. If COVID positivity can be established in the ED, then patients may be transferred to a specific location immediately.
Altered Admitting Processes for known and unknown COVID cases	Dedicated COVID admitting: admitting service with/without COVID ward to facilitate rapid admission of confirmed/pending COVID patients and minimize debates about appropriate admitting service and prolonged or unnecessary touchdowns in ER	Not known, however keeping patients with unknown status on a new unit until testing done may allow continuous PPE to be used focally rather than across the system – this may be amenable to a pilot	Could also serve as a short stay unit to quickly facilitate transfer to ISO hotel or non-COVID service or discharge of patient's home. Some sites in Alberta may already be implementing this strategy, however we have limited information on how widespread the practice currently is. FMC is admitting to early isolation spaces on contact and droplet and then moving to appropriate place once test results reported. COVID unit at PLC or use of some PRU spaces for EIP for mild COVID probable/+	Some sites have indicated they do not advocate for a direct admit to units from a patient safety perspective. This model is different than a direct consult from ED to COVID-19 specialty care. Careful consideration of staff burn-out and the mental health concerns that may arise in HCWs working exclusively on COVID-19 units for an extended period.

Strategies/Options that can free up hospital bed capacity in the short to medium term	Brief Description of strategy	Impact on Hospital Bed Capacity	Feasibility in Alberta Context	Potential Unintended Consequences
Strategies to reduce outbreaks	Current SAG reviews evaluating strategies to reduce outbreaks including: 1) forecasting the occurrence of outbreaks based on community case numbers; 2) thresholds for enhanced PPE use	SAG review ongoing	SAG review ongoing	SAG review ongoing
Cancel elective surgeries that require longer LOS	In the EZ, during recent surge in cases, elective surgeries associated with longer LOS were cancelled. AHS has created the 'Slowdown of Scheduled Services- Provincial Plan by Zone' (November, 2020) and can be referred to for further details of this strategy (contact Stacey Litvinchuk for more information).	ASI – this work is currently underway (personal communication Stacey Litvinchuk)	ASI – ASI plan is to increase surgeries to reduce wait times outside of ACATS window vs the surge capacity plans with proportional reduction in surgery when needed capacity in ICU/medical beds and staff	ASI – this work is currently underway (personal communication Stacey Litvinchuk)

Strategies to Reduce Hospital Capacity Burden (Non-COVID-19 Specific)				
Virtual hospital/Complex Care Hub/Home Hospital/Community Paramedic Programs	Virtual hospital are being established across several larger hospitals to both hospital admissions and shorten hospital admissions. This is being scaled / spread as quickly as possible. “Already established in the Edmonton and Calgary zone, the units operate virtually and admit medical inpatients (with a variety of levels of acuity and complexity) who would otherwise require hospitalization and outpatients who require specialist consult. Patient services include: Hospital at Home services (IV therapy, assessments, catheterizations, etc.), specialist linkages, and service coordination and co-managed care (specialist physicians liaising with Family	Impact could be significant but currently limited. Has the potential to reduce some admissions (especially for those with simple needs like IV fluids/antibiotics or low flow-rate oxygen) but would need to dramatically ramp up resources. The initial assessment requires more work than a hospital admission because it has to verify home safety and follow-up capacity.	At sites with virtual hospital programs, use is still relatively low. Resources are the major barrier. Would require at least 400% increase in resources (such as staffing to support the program) to substantially decant patients from inpatient settings.	

	Physicians). Virtual Ambulatory services include: specialist linkages for consult, care coordination as required and multidisciplinary team support.”			
Hospital ALC units	Acute transition units: cohorting of ALC patients with staffing to support lower intensity care than general medical/surgical unit Used in AB	Adjusting staffing rates to reflect needs of ALC cohort and restructure discharge process to focus on education and checklists (Level of Evidence (LoE) 4-5) ^x	Some hospital sites have already created designated ALC units. It is highly feasible to continue to create these at other sites	When over-capacity occurs on ALC units, lower staffing rates for less complex patients results in units not being adequately resourced to manage patients with acute care needs; needs robust hand-back strategies should patients need to return to acute care (automatic transfer back procedures)
Destination Home	Destination home: care and services planned at admission with the goal to help people return to or remain in their homes. It is a philosophy to support all patients to return to their home as feasible. Used in AB	Upon admission, promote and plan for adequate resources to be in place to support the patient to ultimately return home upon discharge (LoE 3) ^{xi}	Increased home care supports should be considered in tandem to community ALC units. Often people can be supported at home if just a bit more support. Enhancing Care in the Community (ECC) wave 1 funding has proven that home care funding increases can reduce ALC rates (from 900 to 425) in one year	AHS is losing ground on the gains made with the wave 1 ECC initiatives. There is a need for ongoing investments in homecare programming in an equitable way (funding per home care client is not equitable by zone)
Community ALC units**	Community cohorting: off-site care based on a medical rehabilitation model, using a non-hospital site such as a temporary Long Term Care until they are able to be places in an appropriate facility. Used in AB	The intervention group spent a median of 11d less in hospital than the control group, and took longer to be admitted to permanent care (LoE 1b) ^{xii}	No-capital continuing care sourcing approach to identify spaces in close proximity to hospitals. Calgary Zone has a highly functioning ALC unit that has been very successful with good outcomes.	Acquiring ongoing operations funding for new community capacity
Improving discharge efficiency and reducing length or stay (Six interventions)				
Measures to improve continuity and efficiency	Patient flow interventions: strategies to address how patients flow through the hospital Used in AB	Strategies including patient fast-tracking for testing, rapid infection screening, improving patient transitions, and use of triage management systems were found to decrease LOS by 1.1-1.9d (LoE 1b-5) ^{xiii}	Successfully trialed at PLC during first wave. Physicians compensated through sessional ARP for COVID work (even if other work is fee for service) COACT and direct admit to COVID unit processes including ADOD/CDO, hospitalist and IM admitting service.	Complicated disruptions to call schedules for “core” physicians when COVID admissions either too infrequent or too voluminous for 1 admitting physician; Default position of ER to admit “everyone” to COVID service if swab pending even if diagnosis unlikely

	Elder-friendly care: care model focused on preventing decline and restoring previous level of function to allow patients to return home Used in AB	Bundle of practices including delirium detection, mobilization, and least restraint strategies enable the protection and recovery of function among older patients. Changes in LoS related to components include a decrease of 7.3d for delirium education and treatment, 2.1d for early mobilization, and 0.6d for care planning for ongoing mobility (LoE 1b-5) ^{xiv}	Highly feasible, requires a structured and coordinated approach to implementation and feedback for staff/units on progress/uptake	There is a need to develop an overarching approach to implementing EFC and Collaborative Care so that these concepts and cultural practice changes do not compete with each other or create mixed messages for staff
	Repeat screening: assessment of admission appropriateness at regular intervals to trigger discharge services	Identify when discharge is medically appropriate and address factors within hospital/staff control to promote discharge (LoE 4) ^{xv}	Highly feasible, just need the right structure/architecture to implement. Discharge planning with patients should begin at initial presentation/admission. COVID discontinuance of isolation document and process	Not implemented high enough upstream in the clients acute care journey.
	End of life conversation: conversation on goals of care Used in AB	Initiation of conversation regarding end of life in frail older adults and goals of care (LoE 2c) ^{xvi}	Should already be implemented and a standard practice; Focus on revisiting and revising, as appropriate, the goals of care	Additional burden on care partners or surrogate decision makers
	Single physician model: “physician of the week”	Rotation of single physician for 1-wk duration to reduce length of stay on adult medical wards (LoE 2b) ^{xvii}	Funding structures will require navigation	Some physicians will benefit, others will not, which may create the potential for conflict to occur
	Daily medication ward rounds: family medicine physician (resident) and pharmacist	Daily co-location of family medicine physician (resident) and pharmacist to improve discharge efficiency and reduce discharge delay (LoE 2b) ^{xviii}	During ALC days, medications should be reviewed and changes made to support an optimal discharge to the community. This should be under the “appropriate prescribing” banner	May require changes in clinical functions and availability to perform complex medication changes
Overcapacity Protocols for Hospital Access Block	Overcapacity Protocol simplified: ED Inflow: 1)Arriving CTAS 2/3 patients will move within 15/30 min into an ED acute care space. 2) If no ED space available, patients will move to an ED overcapacity or intake space so care can be initiated.	Overall hospital length of stay was reduced 3% (from 7 days to 6.8 days) No impact in sites already meeting 8 hour target for admission from ED.	Previously successful in reducing ED inpatient length of stay and moderate impact on admitted patient length of stay in Alberta province wide. ^{xix}	None reported.

	Hospital Inflow: If . . . a)ED is overcapacity by 10%, and b) 35% of ED stretchers are blocked, and c)arriving patient needs stretcher-based care The most stable admitted patients go to OCP spaces on the most appropriate inpatient units.			
Reduce Avoidable Admissions Through:				
Rapid Access Clinics	Urgent Access Clinics for rapid follow up of ED patients who are borderline regarding admission decisions. Urgent access clinics exist in General Internal Medicine and Neurology at UofA Hospital and already serve this important function.	There are some opportunities for gains. Many of the potentially medically eligible patients have frailty/home safety issues that push toward admission, have had failed attempts at outpatient management.	Assessment centres and PCN COVID follow-up clinics may be examples. Need assessment of volumes and capacity o these services are not clear in current increasing activity. Physical space and staffing are current barriers. There is an existing process whereby patients can be followed up by PCN Family Practitioners at all adult sites. These units would also require a highly reliable approach to booking the appointment and communicating information to patient (Connect care facilitates this process but is not available to all sites / clinics). More importantly, there is nowhere for these patients to access expedited follow-up care, and that service would have to be created de novo.	
Tightening admission criteria (eg: second physician approval)	“Variation in care has been identified in quality improvement reports as one cause of avoidable hospital admissions, and developing standardized decision support tools to standardize care and support care in the community . . . may be considered.”	There is little evidence base that standardized rules could be based on. Existing tools tend to disregard non-medical reasons for admission, which are essential consideration in determining the viability of a	Chart audit and feedback literature advocates that this type of intervention may be beneficial, although within this specific context in Alberta has not been proven.	2-physician approval already exists in all urban EDs: the referring emergency physician and the accepting/admitting physician. Highly unlikely this would reduce inpatient admissions.

		safe outpatient management plan for a patient. An approver role would only delay eventual admission, causing further backlog.	There have been programs in Alberta for seniors that have reduced admissions by subjecting potential admits to scrutiny by geriatrician/NP led teams that try to get the patient home from the ED using aggressive assessment and home care provisions strategies. The COPD/CHF pathway work with a nurse navigator is another example.	Given that the vast majority of admissions from the ED are medically necessary, additional processes such as extra physician approvals only prolong ED length of stay, compounding issues of ED throughput and crowding and negatively impacting ED infection control measures. A Brazilian study did find some reduction in community acquired pneumonia through an admissions pathway. May require support for additional physician in ED to support triage and flow
Additional Strategies – no published studies				
Optimizing Rural Hospital Use	This may include: repatriating rural patient currently admitted in urban centres, and sending ALC patients to rural hospitals	May free up tertiary hospital beds for higher acuity medical patients	Repatriating patients already occurs, however may not be currently optimized/consistent across the province.	Moving ALC patients out of the urban centres may be controversial with families/public.
ALC alternative sites	ALC care for patients admitted for social (non-medical reasons). Patients are often admitted for non-medical support due to a lack of resources in the community.	Creating a community based space for individuals that require non-medical care may free up beds.	This has become an acute problem in Edmonton where we are admitting patients with COVID/suspected COVID who are unwilling to isolate.	Would require new staffing models, resources to support.
Focus on disposition of complex discharges	Patients who are admitted to hospital for a specific time period who do not have a medical reason for ongoing admission tend to have very complex discharges. These are often patients with behavioural issues or guardianship/trustee issues.	Creating a community based space for individuals that require non-medical care may free up beds.	This is a difficult idea to action and would require significant political will on the behalf of community and other organizations. There are often legal/funding issues that need to be sorted out – could we sort this out in a community setting and not an acute care hospital?	Would require strong linkages and activation of community resources.
Trial discharges	When patients are discharged there is a threshold for readmission that is fairly low (expecting <10% readmission). If we were to lower our threshold for readmission to around 50%, we could likely discharge a select group of patients who may have a 50/50 chance of being a successful	Would reduce LOS and likely improve bed capacity	This would be a significant cultural shift in our thinking about discharge (hospital readmission should not be thought of as failure of the medical or social team). Even if patients stayed out of hospital 2-4 weeks before readmission could help that acute	Would increase the burden of care to families and community organizations Unclear how many patients / families would be in agreement to try this.

	discharge. Patients who are willing, families who are willing, and patients who have a medical condition that would be unlikely to significantly worsen if they failed a discharge would be potential candidates.		care system. This would likely rely heavily on invested family members to help support in ways that they may not be willing to support in non-pandemic times.	
Short-stay units	“Observation units ... (also known as short stay units) are based on the idea that some ED patients may require additional tests or observation, but not enough to merit an inpatient admission. OUs often have strict inclusion and exclusion criteria and are time-limited (e.g. 23 hours, up to three midnights, etc.” Has been trialed in Alberta, although has been challenging to limit the stays to prescribed timelines.	Some potential if these units are dedicated to ensuring truly short stays. These short stays would require very strict admission criteria and very active oversight of clinician responsiveness or they risk becoming over capacity with no throughput. A Canadian environmental scan documents that short stay units are diverse and may not reduce time patients spend in hospital.	Unclear whether this strategy meets an existing need: How many patients do, in fact, have an admission <24h duration? This strategy has been successful in settings such as the US with a much lower threshold for admission for conditions such as low-risk chest pain and syncope. Most of these patients are already managed as outpatients in Alberta. Strong connections with Primary Care and PCNs would need to be considered. Currently the Calgary Zone EDs act as observation units already, commonly holding patients for extending workups and multi service consults often extending over 18 to 24 hrs. Doing this on a short stay unit would free up ED space, but the ED seems to efficiently combine this function as well as the traditional function for emergency stabilization and rapid treatment.	Beds could quickly fill up with longer term patients as hospital capacity becomes limited. This already happens at existing rapid access units.
Enhanced ambulatory care/ family medicine access care (parallel to ED – decant people from ED)	“Ambulatory clinics ... for anyone who may not need a bed but otherwise would require an admission. These clinics can be used to divert or quickly discharge	Ambulatory Care and Family Medicine access for low acuity conditions will not reduce admission.	May be helpful for a few patients with exacerbations of Chronic Obstructive Pulmonary Disorder or CHF who do not require supplemental oxygen.	Care for these patients could occur at a lower cost in a non-ED environment

	patients who have chronic disease or a sub-acute (urgent) complaint.” Previously trialed and discontinued at UAH ED.	Low acuity visits do not take much time in ED or substantially contribute to crowding. Alternate care facilities for low-acuity patients may limit risk of nosocomial COVID spread by limiting total daily ED volume. Care of chronic disease is dealt with under “Complex Care Hub/Home Hospital/Community Paramedic programs below.”	These units would have to be created de novo. Physical space and staffing are current barriers	
--	---	---	--	--

*For AHS specific guidance on cohorting patients, please refer to the following documents:

<https://www.albertahealthservices.ca/assets/healthinfo/ipc/hi-ipc-covid-desgnd-unit.pdf>

<https://www.albertahealthservices.ca/assets/healthinfo/ipc/hi-ipc-setting-up-isoln-wo-walls-shrd-space.pdf>

<https://www.albertahealthservices.ca/assets/healthinfo/ipc/if-hp-ipc-cohorting-pandemic-ed-ucc.pdf>

<https://www.albertahealthservices.ca/assets/healthinfo/ipc/if-hp-ipc-cohorting-isolation-patients.pdf>

** Comment: there is a negative perception that ALC equates to awaiting placement to long term care, when, in reality, ALC reflects the dynamic nature of patient care needs upon discharge from acute care. There may be need to rebrand ALC, perhaps to a step-down restorative care bed, to address this misconception. A venue for discussion may be the Integrated Continuing Care Steering Committee.

*** Comment: site to site "mentorship" might be as useful as access to documentation to support operations in implementing the selected strategies

References

1. Agarwal, A., Nagi, N., Chatterjee, P., Sarkar, S., Mourya, D., Sahay, R. R., . . . R.R., S. (2020). Guidance for building a dedicated health facility to contain the spread of the 2019 novel coronavirus outbreak. *The Indian Journal of Medical Research*.
2. Agnoletti, V., Russo, E., Circelli, A., Benni, M., Bolondi, G., Martino, C., . . . Gamberini, E. (2020). From intensive care to step-down units: Managing patients throughput in response to COVID-19. *International Journal for Quality in Health Care : Journal of the International Society for Quality in Health Care*.
3. Aliberti, S., Amati, F., Pappalettera, M., Di Pasquale, M., D'Adda, A., Mantero, M., . . . Blasi, F. (2020). COVID-19 multidisciplinary high dependency unit: The milan model. *Respiratory Research*, 21(1), 260.
4. Andany, N., & Daneman, N. (2020). Home or cabin: Community care for coronavirus disease 2019. *Chest*, 158(3), 839-840.
5. Anesi, G. L. (2020). Hospital transfers across U.S. regions to address the "space" shortage in a pandemic: A public good. *Clinical Infectious Diseases : An Official Publication of the Infectious Diseases Society of America*.
6. Attipoe-Dorcoo, S., Delgado, R., Gupta, A., Bennet, J., Oriol, N. E., & Jain, S. H. (2020). Mobile health clinic model in the COVID-19 pandemic: Lessons learned and opportunities for policy changes and innovation. *International Journal for Equity in Health*, 19(1), 73.
7. Baugh, J. J., Yun, B. J., Searle, E., . . . Biddinger, P. D. (2020). Creating a COVID-19 surge clinic to offload the emergency department <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7169904/>.
8. Bazzell, B., Wagner, D., Durant, K. M., & Callahan, B. (2020). Insights on developing a field hospital formulary and medication distribution process in preparation for a second surge of COVID-19 cases. *American Journal of Health-System Pharmacy : AJHP : Official Journal of the American Society of Health-System Pharmacists*.
9. Borgen, I., Romney, M. C., Redwood, N., Delgado, B., Alea, P., George, B. H., . . . Shihabuddin, L. (2020). From hospital to home: An intensive transitional care management intervention for patients with COVID-19. *Population Health Management*.
10. Brown DR, Hennecke P, Nottebrock D, Dhillon P. Vancouver Convention Health Centre (COVID-19 Response): Planning, implementation, and four lessons learned. *American Journal of Disaster Medicine*. 2020 Spring;15(2):143-148. DOI: 10.5055/ajdm.2020.0365.
11. Chen, S., Zhang, Z., Yang, J., Wang, J., Zhai, X., Barnighausen, T., & Wang, C. (2020). Fangcang shelter hospitals: A novel concept for responding to public health emergencies. *Lancet (London, England)*, 395(10232), 1305-1314.
12. Chen, Z., He, S., Li, F., Yin, J., & Chen, X. (2020). Mobile field hospitals, an effective way of dealing with COVID-19 in china: Sharing our experience. *Bioscience Trends*
13. D'souza, B., Shetty, A., Apuri, N., & Moreira, J. P. (2020). Adapting a secondary hospital into a makeshift COVID-19 hospital: A strategic roadmap to the impending crisis. *International Journal of Healthcare Management*, , 1-6.
14. Danguy des Déserts, M., Mathais, Q., Luft, A., Escarment, J., Pasquier, P., Danguy des Deserts, M., . . . Pasquier, P. (2020). Conception and deployment of a 30-bed field military intensive care hospital in eastern france during the 2020 COVID-19 pandemic. *Anaesthesia, Critical Care & Pain Medicine*, 39(3), 361-362.
15. Deep, A; Knight, P; Kernie, S; D'Silva, P; Sobin, B; Best, T; Zorrilla, M; Carson, L; Zoica, B; Ahn, D. (2020). A Hybrid Model of Pediatric and Adult Critical Care During the Coronavirus Disease 2019 Surge:

The Experience of Two Tertiary Hospitals in London and New York. *Pediatric Critical Care Medicine*. Volume Publish Ahead of Print; 2020

16. Diaz-Garzon, J., Oliver, P., Crespo, G., Duque, M., Fernandez-Calle, P., Gomez, M., . . . Buño, A. (2020). Experience on how to implement a preanalytical and POCT unit in madrid's IFEMA field hospital during this unprecedented COVID-19 emergency. *Biochemia Medica*, 30(3), 30403.
17. Ferguson, C., Fletcher, R., Ho, P., & MacLeod, E. (2020). Should Australian states and territories have designated COVID hospitals in low community transmission? case study for western australia. *Australian Health Review*, 44(5), 728-732.
18. Goei, A. (2020). Community Care Facility—A Novel Concept to Deal With the COVID-19 Pandemic: A Singaporean Institutions Experience. *Journal of Public Health Management and Practice*. 26(6):613–621.
19. Her, M. (2020). Repurposing and reshaping of hospitals during the COVID-19 outbreak in South Korea. *One health (Amsterdam, Netherlands)*. Volume 10; Pages 100137.
20. Iserson, K. V. (2020). Alternative care sites: An option in disasters. *The Western Journal of Emergency Medicine*, 21(3), 484-489.
21. Jenkins, Ashley; Ratner, Leah; Caldwell, Alicia; Sharma, Niraj; Uluer, Ahmet; White, Christine (2020). Children's hospitals caring for adults during a pandemic: Pragmatic considerations and approaches. *Journal of Hospital Medicine*, 15(5), 311.
22. Kim, M., Lee, J., Park, J., Kim, H., Hyun, M., Suh, Y, Nam, S, Jin, W, Cho, Chi (2020). Lessons from a COVID-19 hospital, Republic of Korea. *Bulletin of the World Health Organization*.
23. Kuteifan, Khaldoun; Pasquier, Pierre; Meyer, Christian; Escarment, Jacques; Theissen, Odile The outbreak of COVID-19 in Mulhouse : Hospital crisis management and deployment of military hospital during the outbreak of COVID-19 in Mulhouse, France. *Annals of intensive care*. Volume 10; Issue 1; Pages 59; 2020Kim, M., Lee, J. Y., Park, J. S., Kim, H. A., Hyun, M., Suh, Y., . . . Chof, C. Lessons from a COVID-19 hospital, republic of Korea. Retrieved from https://www.who.int/bulletin/online_first/BLT.20.261016.pdf?ua=1
24. Lee, S. Y., Song, K. J., Lim, C. S., Kim, B. G., Chai, Y. J., Lee, J. K., . . . Lim, H. J. (2020). Operation and management of seoul metropolitan city community treatment center for mild condition COVID-19 patients. *Journal of Korean Medical Science*, 35(40), e367.
25. Levin, A. B., Bernier, M. L., Riggs, B. J., Zero, S. D., Johnson, E. D., Brant, K. N., . . . others. (2020). Transforming a PICU into an adult ICU during the coronavirus disease 2019 pandemic: Meeting multiple needs. *Critical Care Explorations*, 2(9).
26. Levy, N., Zucco, L., Ehrlichman, R. J., Hirschberg, R. E., Hutton Johnson, S., Yaffe, M. B., . . . Leibowitz, A. (2020). Development of rapid response capabilities in a large COVID-19 alternate care site using failure modes and effect analysis with in situ simulation. *Anesthesiology*, 133(5), 985-996.
27. McCabe, R., Schmit, N., Christen, P., D'Aeth, J., C., Løchen, A., Rizmie, D., . . . Hauck, K. (2020). Adapting hospital capacity to meet changing demands during the COVID-19 pandemic. *BMC Medicine*, 18(1), 329.
28. Michelson, K. A., Rees, C. A., Sarathy, J., VonAchen, P., Wornow, M., Monuteaux, M. C., & Neuman, M. I. (2020). Inter-region transfers for pandemic surges. *Clinical Infectious Diseases: An Official Publication of the Infectious Diseases Society of America*.
29. Miller, A. O., Kapadia, M., Kirksey, M. A., Sandhu, M., Jannat-Khah, D., Bui, T., . . . Padgett, D. E. (2020). Clinical experience with COVID-19 at a specialty orthopedic hospital converted to a pandemic overflow field hospital. *HSS Journal: The Musculoskeletal Journal of Hospital for Special Surgery*, 1-7.

30. Naganathan, S., Meehan-Coussee, K., Pasichow, S., Rybasack-Smith, H., Binder, W., Beaudoin, F., . . . Suner, S. (2020). From concerts to COVID: Transforming the RI convention center into an alternate hospital site in under a month. *Rhode Island Medical Journal* (2013), 103(6), 8-13.
31. Park, P. G., Kim, C. H., Heo, Y., Kim, T. S., Park, C. W., & Kim, C. H. (2020). Out-of-hospital cohort treatment of coronavirus disease 2019 patients with mild symptoms in Korea: An experience from a single community treatment center. *Journal of Korean Medical Science*, 35(13), e140.
32. Pasquier, P., Luft, A., Gillard, J., Boutonnet, M., Vallet, C., Pontier, J., . . . Escarment, J. (2020). How do we fight COVID-19? military medical actions in the war against the COVID-19 pandemic in France. *BMJ Military Health*.
33. Patterson, B., Marks, M., Martinez-Garcia, G., Bidwell, G., Luintel, A., Ludwig, D., . . . Brown, M. (2020). A novel cohorting and isolation strategy for suspected COVID-19 cases during a pandemic. *The Journal of Hospital Infection*, 105(4), 632-637.
34. Peterson, K. H. J., & Muckey, E. J. C. (2020). The deployment and operation of outdoor treatment tents during the COVID-19 pandemic. *Disaster Medicine and Public Health Preparedness*, 1-12.
35. Philips, K; Uong, A; Buckenmyer, T; Cabana, M.; Hsu, D; Katyal, C; O'Connor, K; Shiminski-Maher, T; Hametz, P. (2020). Rapid Implementation of an Adult Coronavirus Disease 2019 Unit in a Children's Hospital *The Journal of Pediatrics*. Volume 222; 22-27.
36. Raith, E. P., Luoma, A. M. V., Earl, M., Dalal, M., Fairley, S., Fox, F., . . . Reddy, U. (2020). Repurposing a neurocritical care unit for the management of severely ill patients with COVID-19: A retrospective evaluation. *Journal of Neurosurgical Anesthesiology*.
37. Sacchetto, D., Raviolo, M., Beltrando, C., & Tommasoni, N. (2020). COVID-19 surge capacity solutions: Our experience of converting a concert hall into a temporary hospital for mild and moderate COVID-19 patients. *Disaster Medicine and Public Health Preparedness*, , 1-10.
38. Shang, L.; Xu, J.; Cao, B. (2020). Fangcang shelter hospitals in COVID-19 pandemic: the practice and its significance. *Clinical microbiology and infection : the official publication of the European Society of Clinical Microbiology and Infectious Diseases*. Volume 26; Issue 8; 976-978.
39. Sohn, L., Lysaght, M., Schwartzman, W. A., Simon, S. R., Goetz, M. B., & Yoshikawa, T. (2020). Establishment of a COVID-19 recovery unit in a veterans affairs post-acute facility. *Journal of the American Geriatrics Society*.
40. Stewart, T., Day, S. W., Russell, J., Wilbanks, C., Likes, W., Webb, S., . . . Cashion, A. K. (2020). Development of a COVID-19 alternate care site from ground zero: A nursing perspective. *Public Health Nursing* (Boston, Mass.).
41. Thangayah, J. R., Tan, K. B. K., Lim, C. S., & Fua, T. (2020). Disease outbreak surge response: How a Singapore tertiary hospital converted a multi-story carpark into a flu screening area to respond to the COVID-19 pandemic. *Disaster Medicine and Public Health Preparedness*, 1-6.
42. Wang, Ke-Wei; Gao, Jie; Song, Xiao-Xiao; Huang, Jiang; Wang, Hua; Wu, Xiao-Long; Yuan, Qin-Fang; Li, Xiao-Shan; Cheng, Feng; Cheng, Yang Fangcang shelter hospitals are a One Health approach for responding to the COVID-19 outbreak in Wuhan, China. *One health* (Amsterdam, Netherlands). Volume 10; Pages 100167Yuan, L., Sherryn, S., Hu, P., & Chen, F. (2020). U.S. field hospitals: A study on public health emergency response to COVID-19. *medRxiv*, , 2020.08.05.20169094.
43. Zhang, Q., Cheng, S., & Cheng, Q. (2020). Experience summary of a COVID-19 designated community hospital and its operation model. *Panminerva Medica*. Apr 14. doi: 10.23736/S0031-0808.20.03908-7. Online ahead of print.

- ⁱ Chidwick, P., Oliver, J., Ball, D., Parkes, C., Hansen, T. L., Fiumara, F., ... & Lumsden, K. (2017). Six Change Ideas that Significantly Minimize Alternate Level of Care (ALC) Days in Acute Care Hospitals. *Healthcare Quarterly*, 20(2), 37-43.
- Penney, C., & Henry, E. (2008). Improving performance management for delivering appropriate care for patients no longer needing acute hospital care. *Journal of Health Services Research & Policy*, 13(1), 30-34.
- Manville, M., Klein, M. C., & Bainbridge, L. (2014). Improved outcomes for elderly patients who received care on a transitional care unit. *Canadian Family Physician*, 60(5), e263-e271.
- ⁱⁱ Canadian Institute for Health Information. Seniors in Transition Exploring Pathways Across the Care Continuum. Retrieved from <https://www.cihi.ca/sites/default/files/document/seniors-in-transition-report-2017-en.pdf>
- ⁱⁱⁱ Crotty, M., Whitehead, C. H., Wundke, R., Giles, L. C., Ben-Tovim, D., & Phillips, P. A. (2005). Transitional care facility for elderly people in hospital awaiting a long term care bed: randomised controlled trial. *BMJ*, 331(7525), 1110.
- ^{iv} Andersen, J. G., Grepperud, S., Kløw, N. E., & Johansen, O. (2016). Effects on length of stay and costs with same-day retransfer to the referring hospitals for patients with acute coronary syndrome after angiography and/or percutaneous coronary intervention. *European Heart Journal: Acute Cardiovascular Care*, 5(4), 375-380.
- Brendish, N. J., Malachira, A. K., & Clark, T. W. (2017). Molecular point-of-care testing for respiratory viruses versus routine clinical care in adults with acute respiratory illness presenting to secondary care: A pragmatic randomised controlled trial protocol (ResPOC). *BMC Infectious Diseases*, 17(1), 128.
- Edwards, N., & Lewis, R. (2015). *Improving length of stay: what can hospitals do?* London: Nuffield Trust.
- National Health Service. (2018). *Guide to reducing long hospital stays*. London: National Health Service.
- Pisarsky, B. K., & Pike, T. M. (2019). *Focus on care transitions brings substantial new LOS-reduction opportunities*. Healthcare Financial Management Association.
- Subbe, C. P., Kellett, J., Whitaker, C. J., Jishi, F., White, A., Price, S., Ward-Jones, J., Hubbard, R. E., Eeles, E., & Williams, L. (2014). A pragmatic triage system to reduce length of stay in medical emergency admission: Feasibility study and health economic analysis. *European Journal of Internal Medicine*, 25(9), 815-820.
- ^v Babine, R. L., Hyrkäs, K. E., Hallen, S., Wierman, H. R., Bachand, D. A., Chapman, J. L., & Fuller, V. J. (2018). Falls and delirium in an acute care setting: A retrospective chart review before and after an organisation-wide interprofessional education. In *Journal of Clinical Nursing*, 27(7-8), e1429-e1441.
- Dewitt, K., Coto, J. A., Carr, L., Ondrey, M., & Petkunas, H. (2019). Ambulation Programs: Decreasing Length of Stay and Improving Outcomes. *Medsurg Nursing*, 28(5), 293-302.
- Carratalá, J., García-Vidal, C., Ortega, L., Fernández-Sabé, N., Clemente, M., Albero, G., López, M., Castellsagué, X., Dorca, J., Verdaguier, R., Martínez-Montauti, J., Manresa, F., & Gudiol, F. (2012). Effect of a 3-step critical pathway to reduce duration of intravenous antibiotic therapy and length of stay in community-acquired pneumonia: A randomized controlled trial. *Archives of Internal Medicine*, 172(12), 922-928.
- ^{vi} Central East LHIN, (2008). Alternate level of care systems: issues and recommendations. (2008). Retrieved from https://www.google.ca/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEw9vCy-7sAhVEKH0KHf4-CzIQFjAAegQIBxAC&url=http%3A%2F%2Fwww.centraleastlin.on.ca%2F~%2Fmedia%2Fsites%2Fce%2Fuploadedfiles%2FHome_Page%2FBe_Informed%2FALC_Report_FINAL_June%25202008.pdf&usq=AOvVaw2kRFyxaAdKDYe_ovG5Aguc
- ^{vii} Redwood S, Simmonds B, Fox F, et al. Consequences of "conversations not had": insights into failures in communication affecting delays in hospital discharge for older people living with frailty. *Journal of Health Services Research & Policy*. 2020;25(4):213-219.
- ^{viii} Aziz, A., Hawkins, A., Gainer, Y., Simpson, C., Barlow, R., & Varma, C. (2020). General medicine consultant of the week model shortens hospital length of stay and improves the patient journey. *Future Healthcare Journal*, 7(3), 218.
- ^{ix} Bonk, N., Milsap, A., Goplen, A., McElray, K., & Rabago, D. (2020). Reducing Discharge Delay Through Resident-Pharmacist Colocation: A Pilot Study. *Family medicine*, 52(9), 665-667.
- ^x Chidwick, P., Oliver, J., Ball, D., Parkes, C., Hansen, T. L., Fiumara, F., ... & Lumsden, K. (2017). Six Change Ideas that Significantly Minimize Alternate Level of Care (ALC) Days in Acute Care Hospitals. *Healthcare Quarterly*, 20(2), 37-43.
- Penney, C., & Henry, E. (2008). Improving performance management for delivering appropriate care for patients no longer needing acute hospital care. *Journal of Health Services Research & Policy*, 13(1), 30-34.
- Manville, M., Klein, M. C., & Bainbridge, L. (2014). Improved outcomes for elderly patients who received care on a transitional care unit. *Canadian Family Physician*, 60(5), e263-e271.
- ^{xi} Canadian Institute for Health Information. Seniors in Transition Exploring Pathways Across the Care Continuum. Retrieved from <https://www.cihi.ca/sites/default/files/document/seniors-in-transition-report-2017-en.pdf>

- ^{xii} Crotty, M., Whitehead, C. H., Wundke, R., Giles, L. C., Ben-Tovim, D., & Phillips, P. A. (2005). Transitional care facility for elderly people in hospital awaiting a long term care bed: randomised controlled trial. *BMJ*, 331(7525), 1110.
- ^{xiii} Andersen, J. G., Grepperud, S., Kløw, N. E., & Johansen, O. (2016). Effects on length of stay and costs with same-day retransfer to the referring hospitals for patients with acute coronary syndrome after angiography and/or percutaneous coronary intervention. *European Heart Journal: Acute Cardiovascular Care*, 5(4), 375-380.
- Brendish, N. J., Malachira, A. K., & Clark, T. W. (2017). Molecular point-of-care testing for respiratory viruses versus routine clinical care in adults with acute respiratory illness presenting to secondary care: A pragmatic randomised controlled trial protocol (ResPOC). *BMC Infectious Diseases*, 17(1), 128.
- Edwards, N., & Lewis, R. (2015). *Improving length of stay: what can hospitals do?* London: Nuffield Trust.
- National Health Service. (2018). *Guide to reducing long hospital stays*. London: National Health Service.
- Pisarsky, B. K., & Pike, T. M. (2019). *Focus on care transitions brings substantial new LOS-reduction opportunities*. Healthcare Financial Management Association.
- Subbe, C. P., Kellett, J., Whitaker, C. J., Jishi, F., White, A., Price, S., Ward-Jones, J., Hubbard, R. E., Eeles, E., & Williams, L. (2014). A pragmatic triage system to reduce length of stay in medical emergency admission: Feasibility study and health economic analysis. *European Journal of Internal Medicine*, 25(9), 815-820.
- ^{xiv} Babine, R. L., Hyrkäs, K. E., Hallen, S., Wierman, H. R., Bachand, D. A., Chapman, J. L., & Fuller, V. J. (2018). Falls and delirium in an acute care setting: A retrospective chart review before and after an organisation-wide interprofessional education. In *Journal of Clinical Nursing*, 27(7-8), e1429-e1441.
- Dewitt, K., Coto, J. A., Carr, L., Ondrey, M., & Petkunas, H. (2019). Ambulation Programs: Decreasing Length of Stay and Improving Outcomes. *Medsurg Nursing*, 28(5), 293-302.
- Carratalà, J., Garcia-Vidal, C., Ortega, L., Fernández-Sabé, N., Clemente, M., Albero, G., López, M., Castellsagué, X., Dorca, J., Verdagué, R., Martínez-Montauti, J., Manresa, F., & Gudiol, F. (2012). Effect of a 3-step critical pathway to reduce duration of intravenous antibiotic therapy and length of stay in community-acquired pneumonia: A randomized controlled trial. *Archives of Internal Medicine*, 172(12), 922-928.
- ^{xv} Central East LHIN, (2008). Alternate level of care systems: issues and recommendations. (2008). Retrieved from https://www.google.ca/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwlu9vrCy-7sAhVEKH0KHf4-CzIQFjAAegQIBxAC&url=http%3A%2F%2Fwww.centraleastlin.on.ca%2F~%2Fmedia%2Fsites%2Fce%2Fuploadedfiles%2FHome_Page%2FBe_Informed%2FALC_Report_FINAL_June%25202008.pdf&usq=AOvVaw2kRFyxaAdKDYe_ovG5Aquc
- ^{xvi} Redwood S, Simmonds B, Fox F, et al. Consequences of "conversations not had": insights into failures in communication affecting delays in hospital discharge for older people living with frailty. *Journal of Health Services Research & Policy*. 2020;25(4):213-219.
- ^{xvii} Aziz, A., Hawkins, A., Gainer, Y., Simpson, C., Barlow, R., & Varma, C. (2020). General medicine consultant of the week model shortens hospital length of stay and improves the patient journey. *Future Healthcare Journal*, 7(3), 218.
- ^{xviii} Bonk, N., Milsap, A., Goplen, A., McElray, K., & Rabago, D. (2020). Reducing Discharge Delay Through Resident-Pharmacist Colocation: A Pilot Study. *Family medicine*, 52(9), 665-667.
- ^{xix} https://aci.health.nsw.gov.au/data/assets/pdf_file/0011/273737/grant-innes.pdf