LESSONS LEARNED FROM THE CORONAVIRUS PANDEMIC

Recommendations for Strategic Improvement

Abstract

During the COVID-19 pandemic Landspítali had to respond quickly and adapt its services in multiple ways in order to contain the infection, provide safe care to both infected and non-infected patients and protect the staff. The learnings from this experience are multiple and of great interest in respect to insights and inspiration on how the services of Landspítali could be developed for future purposes

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Terms of Reference

On April 1st 2020, a working group was appointed by the Chief Medical Officer (CMO) to gain oversight of the quality of the COVID-19 response at Landspítali and to accelerate scientific research work and ensure the best standards of care. The purpose of the group was to:

- Ensure a coordinated effort to improve quality in care of COVID- 19 infected patients and strengthen scientific framework for research.
- Share knowledge and most recent knowledge on COVID-19 nationally and internationally.
- Ensure collaboration of care providers for the greater good of all patients.
- Ensure that the most recent and up-to date knowledge is translated into care for our patients.
- Ensure that information on clinical management is preserved and used for improved clinical decision making in future instances.
- Create an efficient framework for scientific research.

The members of the group were:

Ólafur Baldursson, Chief Medical Officer (CMO/Chair)
Elísabet Benedikz, Chief Physician, Head of Quality and Safety
Óskar Einarsson, Internal Medicine/Pulmonary Physician
Agnar Bjarnason, Infectious Disease Consultant
Runólfur Pálsson, Director, Internal Medicine and Rehabilitation Services
Magnús Gottfreðsson, Chief Physician, Head of the Scientific Department
Torfi Magnusson, Chief Physician and Data Protection Advisor, Office of the CMO
Martin Ingi Sigurðsson, Professor of Anaesthesia and Intensive Care
Gunnar Guðmundsson, Internal Medicine/Pulmonary Physician, Professor of Pharmacology
Halla Sigrún Arnardóttir, Project Manager, Scientific Department
Elín J Hafsteinsdóttir, Project Manager, Office of the Chief Nursing Officer
Helga Jónsdóttir, Professor of Nursing, Academic Chair, Nursing Care for Chronically Ill Adults
Brynja Ingadóttir, Assistant Professor of Nursing, Clinical Nurse Specialist
Gerður María Gröndal, Chief Physician, Rheumatology
Amelia Samuel, Project Manager, Quality and Safety Department (Facilitator and Manager)

Initially the group met weekly to discuss how to achieve its purpose and to address the most pressing issues that emerged. Through this process, they gathered an understanding of the valuable learning opportunities that this pandemic presented, which if seized, would catapult the hospital to continuously deliver the highest possible standards of patient care and scientific research. This report details the methods taken by the group to structure these deliberations, describes findings and concludes with recommendations for strategic improvement.

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Summary

In January 2020, it was already evident that the SARS-CoV-2 virus outbreak in Wuhan China, was likely to evolve into a global emergency and preparations for the pandemic started in Landspítali – The National University Hospital of Iceland. It quickly became clear that the rapid spread of the infection had every potential to exhaust national healthcare resources. What followed were aggressive measures taken by public health authorities. At the same time extensive steps were taken by the hospital's Epidemic Committee and Management to reorganise clinical services in order to control the infection.

The measures were successful in protecting hospital resources, limiting spread and treating the ill. The establishment of a designated COVID-19 Telehealth Service and Outpatient Clinic was a pivotal strategy for triage and treatment of infected patients, streaming patient flow away from the Emergency Department (ED) and the inpatient wards by curtailing unnecessary admissions and ED visits. Intensive Care Unit (ICU) capacity was expanded. The frail and elderly waiting for a nursing home transfer, were given priority to be discharged to a newly built nursing home facility. Hallway admissions were abolished and boarders in the ED disappeared.

Obstacles concerning patient flow and hospital occupancy, that previously seemed impossible to overcome, were suddenly overcome. The organisation was able to radically change in record time. Staff joined forces adapting service to needs, both across specialties and across sectors. Top-down and bottom-up changes were made. The grassroot proved itself resourceful and efficient, generating ideas that were creative and smart and executing them.

The energy released during this time probably has no precedence in the history of Icelandic healthcare. Learning from the experience and applying it into future healthcare organisation is therefore of utmost importance. The motivation of the hospital's highly skilled workforce who were given the autonomy to innovate, alignment of the whole healthcare system towards a common goal and capability for technological innovation were amongst the most significant strengths demonstrated. Weaknesses were related to a culture of *Silo Mentality*.

Recommendations for strategic improvement are:

1. Accelerate the reconfiguration of care delivery models to reduce unnecessary hospital admissions by strengthening out of hospital care.
2. Use evidence-based methods to provide seamless continuity of multi-disciplinary care for our sickest patients in hospital 24/7.
3. Further develop the delivery and governance of post-graduate medical education.
4. Strengthen nursing leadership to develop and mobilise the nursing workforce across boundaries to be utilised more efficiently to meet patient needs within the hospital and in outpatient/remote care.
5. Ensure that Landpítali's strategy to enhance staff health and well-being focuses on improving the work environment and staff morale.

6. Strategize, invest in and prioritise information technology needs for frontline clinical care by fostering synergistic collaboration between clinical services, the Information Technology department, Department of Economics / Finance and Information and Directorate of Health.
7. Strengthen the hospital's epidemic and crisis preparedness plan by prioritising recommendations of the Epidemic Committee.
8. Invest in and strengthen infection control services.
9. Strengthen governance of hospital-wide clinical and ethical standards of care delivery relating to informed consent and use of off-label medications.
10. Further strengthen scientific research capability and integrate these activities into the hospital operations (scientific funding, facilities and staff time).

1. Introduction

On February 28th 2020, the first case of COVID-19 was confirmed in Iceland following the initial outbreak in Wuhan, China in January. The pace at which the series of events that took place around the world was unprecedented. The first recorded case was reported outside the People's Republic of China on January 13th, just four days after the novel coronavirus was confirmed in China by the World Health Organisation (WHO). By March 11th, the WHO had characterized COVID-19 as a pandemic, the epicentre of which was in Europe.

A significant amount of work took place to prepare for and respond to the pandemic at Landspítali. New evidence from learnings around the world was continually reviewed and translated into practice. This happened as often as several times per day. Through trial and error and applying learnings gained from previous crises and outbreaks, new ways of working emerged. A new COVID Telehealth Service and Outpatient Clinic was established, spaces were reconfigured for COVID and non-COVID related care, staff were mobilised from across the healthcare system and painstaking efforts were made to obtain equipment and various supplies from within and outside the country.

The COVID-19 Quality and Scientific Research working group for Landspítali, convened by the Chief Medical Officer, was tasked with the primary purpose of overseeing quality of COVID-19 related care and accelerating the implementation of scientific research. Through this process, learnings were gathered for future strategic improvement. This report details the methods taken by the working group, describes findings and concludes with recommendations for strategic improvement.

2. Methodology

2.1   Key definitions

The group defined **healthcare quality** as *the degree to which healthcare services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge.*[1]

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[1] *Institute of Medicine. (2001).* Crossing the quality chasm: a new health system for the 21st century. *Washington DC: National Academy Press.*

Six dimensions of quality were considered[1]:

The dimensions of quality

Safe	Timely
Avoiding harm to patients from care that is intended to help them.	Reducing waits and sometimes harmful delays.
Effective	Efficient
Providing services based on evidence and which produce a clear benefit.	Avoiding waste.
Person-centred	Equitable
Establishing a partnership between practitioners and patients to ensure care respects patients' needs and preferences.	Providing care that does not vary in quality because of a person's characteristics.

Figure 1. The dimensions of quality described by The Institute of Medicine (1990)

Scientific Research in HealthCare was defined as *the attempt to derive generalisable or transferable new knowledge to answer questions with scientifically sound methods including studies that aim to generate hypotheses as well as studies that aim to test them, in addition to simply descriptive studies.*[2]

The working group recognised that conducting a thorough evaluation of healthcare quality could be achieved using Donabedian's Model of structure-process-outcome measures.[3] This however, was not considered to be feasible nor realistic to achieve our objective due to constraints whilst the organisation was in the midst of a crisis. Nevertheless, Donabedian's model influenced the way in which we conducted this analysis.

2.2 Analysis of Good Practice and Gaps against Quality Statements

To create a structured framework by which quality and scientific research relating to COVID-19 care could be analysed, three COVID-19 related international guidelines published by the World Health Organisation (WHO) were reviewed. Quality statements were then drafted, which described what we were aspiring to achieve.

WHO guidelines:

1. Clinical management of severe acute respiratory infection (SARI) when COVID-19 disease is suspected (WHO, interim guidance, 13 March 2020)[4]

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[2] NHS Health Research Authority. (2020). *UK Policy Framework for Health and Social Care Research* (Last updated on 6 May 2020). NHS Health Research Authority. https://www.hra.nhs.uk/planning-and-improving-research/policies-standards-legislation/uk-policy-framework-health-social-care-research/uk-policy-framework-health-and-social-care-research/

[3] Berwick, D., & Fox, D. M., (2016). Evaluating the Quality of Medical Care: Donabedian's Classic Article 50 Years Later. *The Milbank Quarterly*, 94(2), 237–241. https://doi.org/10.1111/1468-0009.12189

[4] World Health Organisation. (2020). *Clinical management of severe acute respiratory infection (SARI) when COVID-19 disease is suspected: interim guidance 13 March 2020*. World Health Organisation. https://apps.who.int/iris/handle/10665/331446

2. Guidance for managing ethical issues in infectious disease outbreaks (WHO, 2016)[5]
3. COVID-19: Operational guidance for maintaining essential health services during an outbreak (WHO, interim guidance, 25 March 2020)[6]

List of quality statements:

1) Infection control practices are robust in the prevention of the spread of the coronavirus during screening, triage and treatment in hospital, keeping patients, visitors and staff safe.
2) There is early identification of those with severe illness or those at risk of deteriorating.
3) There is quick/accessible return to hospital if worsening of illness develops for patients who are being cared for at home.
4) Data and documentation relating to screening, triage, monitoring and treatment of patients with COVID-19 at home and in hospital is collected in a standardised fashion and robust for quality monitoring and scientific research purposes.
5) The best available treatments are offered to patients who are at home with moderate disease.
6) The best available pharmaceutical and non-pharmaceutical treatments are offered to patients in hospital with severe and critical disease.
7) Carefully designed and ethically conducted scientific research, which does not compromise the public health response or provision of appropriate clinical care, is being undertaken as quickly as possible to allow for proper scientific evaluation of new interventions to be tested.
8) Resources such as staffing, equipment, supplies and space are available to provide COVID-19 related services safely and effectively.
9) The impact of repurposing health system capacities is continually evaluated.
10) The well-being of hospital staff who are both directly and indirectly impacted by the pandemic is continually assessed and improved.
11) Essential steps are taken for updating a hospital disaster or pandemic preparedness management plan.
12) Mortality reviews of COVID-19 related deaths are conducted to gather learnings.

With each quality statement, the evidence available to support the statement was assessed. This enabled the group to identify good practice and gaps in quality. Themes emerged from this analysis, which the working group used to build a strategy to further engage staff and gather reflections on lessons learned in a structured way. Finally, a simple SWOT analysis (strengths, weaknesses, opportunities and threats) was conducted and an organisational

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[5] World Health Organisation. (2016). Guidance for managing ethical issues in infectious disease outbreaks. World Health Organisation. https://apps.who.int/iris/handle/10665/250580

[6] World Health Organisation. (2020). *COVID-19: operational guidance for maintaining essential health services during an outbreak: interim guidance 25 March 2020*. World Health Organisation. https://apps.who.int/iris/handle/10665/331561

learning conceptual framework was used for recommendations to be formulated, resulting in an improvement strategy for the hospital.

2.3   Self-assessments on learning

The following teams and leaders were invited to conduct self-reflections on their lessons learned. They were offered to use a self-assessment template as a guide (see Appendix I). Most teams provided reflections using the template or were interviewed by the working group's project manager. Some teams, identified in bold in the table below, created detailed lessons learned reports. Lessons were extracted from their reports, which were originally prepared for the Epidemic Committee (Farsóttanefnd) and Disaster Preparedness and Management Team (Viðbragðsstjórn).

Team or Lead	Invited	Reflections received
Infection Control Department	✓	✓
Epidemic Committee (Farsóttanefnd)	✓	✓
Intensive Care Units	✓	✓
Respiratory Medicine Inpatient Service (A6)	✓	✓
Infectious Diseases Inpatient Service (A7)	✓	✓
Ward Manager for the Orthopaedics Ward (B5)	✓	✓
Director, Internal Medicine and Rehabilitation Services		
COVID-19 Telehealth Service and Outpatient Clinic	✓	✓
Non-COVID working group	✓	✓
Head of Postgraduate Medical Education	✓	✓
Chief Nursing Officer	✓	✓
Endocrinology outpatient unit	✓	✓
Respiratory Medicine Outpatient Unit	✓	
Geriatrics Outpatient and Day Ward	✓	✓
Cardiology Outpatient Department	✓	
Project Manager for the directorate of psychiatry	✓	✓
Division of operational services (pharmacy and procurement)	✓	✓
Department of Education	✓	✓
Department of Economics / Finance and Information (Hagdeild)	✓	✓

Table 1. List of teams and leaders who were invited to and returned self-reflections on learning.

3. Description of the COVID-19 Response at Landspítali

This chapter is in 3 sections:

i.   Role and function of the Epidemic Committee and Disaster Preparedness and Management Team.
ii.   Timeline of key events.
iii.   Description of how Landspítali responded to the pandemic using the framework of the quality statements.

3.1 Role and function of the Epidemic Committee and Disaster Preparedness and Management Team

The hospital's epidemic response plan was activated on January 21st 2020 when the Epidemic Committee (Farsóttarnefnd) formally convened. On the same day, they published an alert to inform all staff about it and that they were awaiting guidance from the WHO. On January 30th, the hospital was declared at crisis level 1: "Uncertainty Phase" (óvissustig). It was upgraded to level 2 on February 28th: "Alert Phase" (hættustig) when the first person diagnosed with COVID-19 was confirmed in Iceland and admitted to Landspítali. A project manager and representative from the Executive Board were then appointed to join the Epidemic Committee. Table 2 describes the three crisis levels and what they mean operationally as defined in the hospital's crisis management plan (Viðbragðsáætlun Landspítala).

Landspítali		
Uncertainty phase (óvissustig)	**Alert Phase (hættustig)**	**Emergency phase (neyðarstig)**
Preparedness due to imminent disaster. If disaster is contained and/or manageable within the daily routine, further escalation becomes unnecessary. The Epidemic Committee is at work in collaboration with the Disaster Preparedness and Management Team and Communicable Disease Control.	The epidemic has occurred, causing increased workload as victims are admitted to the hospital. The Response Plan is activated. The Disaster Preparedness and Management Team gathers. The Epidemic Committee receives its mandate from the Disaster Preparedness and Management Team and communicates with Communicable Disease Control.	The incident exceeds the capacity of Landspítali. The Disaster Response Plan for Communicable disease is fully activated. External help is needed. Every unit in the hospital is on alert and ready to respond to needs. The Disaster preparedness and Management Team declares a state of emergency and reviews the organisation of services with the Epidemic Committee, to find solutions for the situation, as needed with external assistance. The Epidemic Committee receives its mandate from the Disaster Preparedness and Management Team and communicates with Communicable Disease Control.

Table 2. Crisis phases from the hospital's crisis management plan

The Disaster Preparedness and Management Team (Viðbragðsstjórn), which eventually involved all members of Landspítali's Executive Board, met daily from March 12th and together with the Epidemic Committee overtook operational management of the hospital in accordance with the hospital's crisis management plan.

The focus of work of the Epidemic Committee during the time the hospital was at uncertainty phase was:

- Determining the status of and procuring protective personal equipment, other supplies and equipment such as respirators.

- Determining the status of and procuring necessary drugs and intravenous (IV) fluids.
- Logistic issues – designing admission routes into and within the Fossvogur location (and Hringbraut), preparing the relevant units (Emergency Department (G2, G3), Infectious Diseases (A7), Respiratory Medicine (A6) and Intensive Care Unit (ICU).
- Information for patients and staff - in writing and meetings.
- Process of the crisis management plan (viðbragðsáætlun).
- Re-organising paediatric services.
- Documentation of policies and procedures.
- Evacuation plan for rapid transfer of patients to other hospitals/nursing homes.
- Construct area for triage and management of patients with confirmed disease (container outbuildings).
- Recruit staff to the Occupational Health dDepartment for testing, screening and documentation of staff quarantined or isolated.
- Buying transport capsules for Landspítali and Akureyri.

Once the hospital shifted to alert phase, the focus gradually shifted towards re-organising the pathway of patient care to respond to the rapid increase in the number of confirmed cases in the community. This was done to actively monitor the disease progression in individual patients and carefully manage the flow into hospital. The hospital eventually downgraded its crisis response to uncertain phase on May 4th 2020 at the end of the first wave of the pandemic. The country's state of emergency was subsequently de-escalated on May 25th 2020.

3.2   Timeline of events

The following timeline describes the key events that occurred during the pandemic in Iceland and how Landspítali responded over an intense 10-week period. It is meant to illustrate the pace at which the pandemic developed and the response by the hospital from the moment the epidemic response plan was activated on January 21st. At the height of the pandemic, there were 1096[7] active infections in the country (April 5th), 596 patients were being monitored remotely per day by the telehealth service and outpatient clinic (April 6th), 43 patients were hospitalised, 13 of whom were in ICU (April 4th). By the time Landspítali had downgraded its crisis response on the 4th of May, a total of 1789[7] people had confirmed infections in Iceland and they were monitored and/or treated by Landspítali's COVID teams.

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[7] Source: https://www.covid.is/tolulegar-upplysingar-gamalt

Timeline of Events: COVID-19 Response

LANDSPÍTALI

Hospital's epidemic response plan activated
Epidemic Committee convened 21 January

Hospital's crisis level 1 activated
„uncertainty phase"
31 January

1st container with negative pressure set up outside the Emergency Department (ED) 24 February

1st COVID-19 case diagnosed & admitted to hospital in Iceland. Crisis level 2 „Alert phase" activated 28 February

State of emergency declared in Iceland 6 March

Disaster Management Team met daily from 12 March

Telehealth Service began 13 March

2nd Container & ED divided into areas for COVID and non-COVID patients 16 March

Standardised clinic charting 18 March

Decision to create COVID Outpatient Clinic (Birkiborg) 19 March

1st patient seen in COVID Outpatient Clinic 24 March

Decision to create COVID day case unit 26 March

COVID day case unit opened 3 April

Max. admissions 43 patients hospitalised for COVID-19, 13 in ICU 4 April

Non-COVID urgent day case unit begins operations in Hringbraut 8 April

SidekickHealth SmartPhone App went live 8 April

Hospital downgraded to „uncertainty" crisis level 1 4 May

5 weeks

| 24 Feb – 1 Mar Week 1 | 2 – 8 Mar Week 2 | 9 – 15 Mar Week 3 | 16 – 22 Mar Week 4 | 23 – 29 Mar Week 5 | 31 Mar – 5 Apr Week 6 | 6 – 12 Apr Week 7 | 13 – 19 Apr Week 8 | 20 – 26 Apr Week 9 | 27 Apr – 3 May Week 10 |

Number of active COVID infections in Iceland*
1 28/02 | 59 8/03 | 183 15/03 | 549 22/03 | 940 29/03 | 1096 05/04 | 766 12/04 | 399 19/04 | 152 26/04 | 37 04/05

Physician-led telephone service
26 calls 18/03 | 158 calls 06/04 | 27 calls 27/04

Nurse-led telephone service
167 calls 18/03 | 438 calls 06/04 | 33 calls 27/04

COVID outpatient clinic (in Birkiborg)
11 attendances 24/03 | 21 attendances 03/04 | 8 attendances 21/04

Fully integrated COVID-19 Telehealth Service and Outpatient Clinic

Decline in non-COVID Emergency Department attendances

*Data Source: https://www.covid.is/tolulegar-upplysingar-gamalt

**Data Source: Erla Dögg Ragnarsdóttir, COVID-19 Telehealth Service, Landspítali – National University Hospital of Iceland
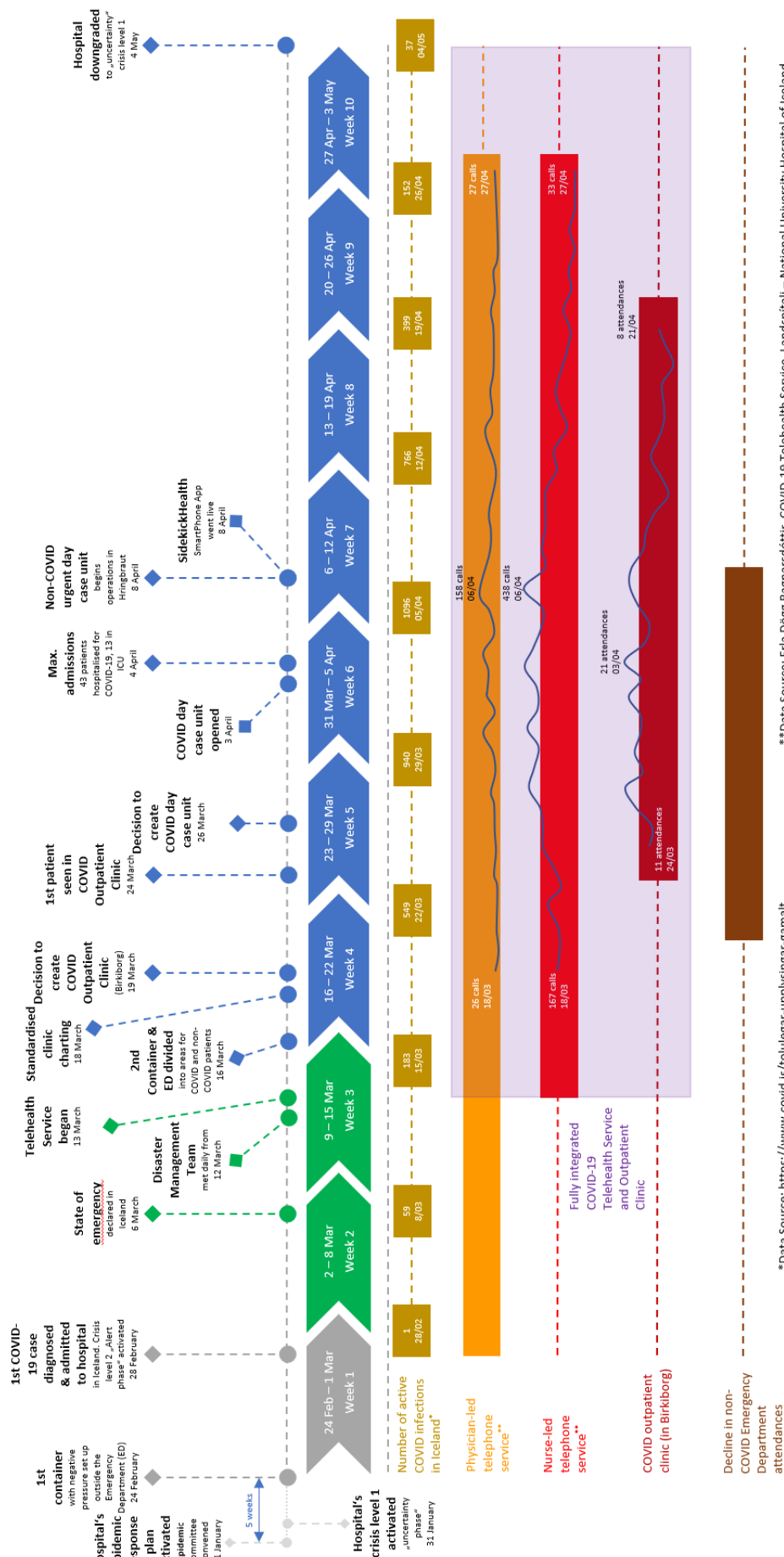
Figure 2. Time of events of the COVID-19 response at Landspítali January 21st to May 4th 2020

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3.3 Description of Landspítali's response using a framework of quality statements

Here we describe the structure and processes of COVID-19 related care at Landspítali in the framework of quality statements developed based on best available international standards.

Quality Statement 1: Infection control practices are robust in the prevention of the spread of the coronavirus during screening, triage and treatment in hospital, keeping patients, visitors and staff safe.

Best practices for infection prevention and control were designed and documented in local clinical guidelines based on European Centre for Disease Prevention and Control (ECDC), Centres for Disease Control and Prevention (CDC) and WHO guidelines. They were reviewed, developed and updated regularly by the infection control team and made available in the Quality Manual on the COVID-19 intranet page.[8] As the evidence was changing rapidly, a significant amount of effort was spent ensuring the translation of this new knowledge was shared with staff on the frontline. The COVID-19 online information gateway was a visible and easily accessible platform to all members of staff via a banner on the intranet homepage.

A single pathway for admission of COVID-19 patients was developed. The guiding principle was that patients with confirmed COVID-19 should not present unexpectedly to hospital. Another principle was to prevent as much cross infection between clinical teams as possible, so that if one clinical team got infected and needed to be quarantined, another team could step in to provide continuity of care.

The Infection Control Department (ICD) played a significant role in defining and managing infection control practices during the pandemic, this was in collaboration with Infectious Diseases Consultants and the Epidemic Committee. Other teams that also played a role were housekeeping, the procurement team and ward staff for both COVID and non-COVID services. Infection control during the pandemic was everyone's responsibility and the infection control team and Infectious Diseases Consultants were the source of expert support and guidance for ensuring all work conducted within the hospital was safe.

The structure, processes and organisation of work relating to infection prevention and control during the pandemic was multifaceted. These included:

- Control of patient flow and potential spread of infection.
- Sectioning off entire wards for infected patients and areas within wards (e.g. Emergency Department (ED), ICU and COVID-19 inpatient wards) to prevent exposure and spread.

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[8]Kórónuveiran COVID-19 http://innri.lsh.is/default.aspx?pageid=a3a5eb45-61b9-4868-9290-7c88c8015f6b

- Monitoring patients at home or via outpatient care, minimising visits to the hospital and strategic re-direction of COVID-infected patients in need of admission directly to the COVID-19 wards rather than through the ED.
- Clinical teams were split into separate teams wherever possible throughout the duration of the pandemic to minimise the spread of infection, thus ensuring that one team could continue to provide patient care if another became infected and quarantined (e.g. ICU, Operating Room, A6, Pharmacy, some outpatient clinics).
- Consultancy services provided by the Infection Control team to all services about how to organise clinical and non-clinical spaces, including all non-COVID related services. For example, clinical teams that did not provide direct COVID-19 outpatient care designed protocols through guidance from the Infection Control team to bring patients safely into hospital when necessary (e.g. Respiratory Medicine Outpatient Unit).
- Instruction of appropriate use of personal protective equipment (PPE), including written and visual instruction material, e.g. quality manual, training videos, infographics and posters.
  Surveillance and rigorous contact tracing when infection was transmitted within hospital among staff.

Quality Statement 2: There is early identification of those with severe illness or those at risk of deteriorating.

Quality Statement 3: There is quick/accessible return to hospital if worsening of illness develops for patients who are being cared for at home.

The two quality statements were reviewed together and are described jointly. They also link inextricably with the first quality statement, which describes infection control practices, and should be read in tandem.

The structure by which COVID-19 care was organised was based on the principle of creating a single pathway for patients to access the care that they needed. This single pathway enabled the clinical services to manage the flow of patients into hospital in a structured and organised way. The staff in Internal Medicine Services played an important role in organising patient care in response to COVID-19, both in the inpatient and outpatient setting.

At first, the Infectious Diseases physicians were responsible for keeping in contact with patients with confirmed COVID-19 via telephone, but as the number of cases grew rapidly in the community, this became unfeasible. Physicians from other specialties (predominantly Acute Internal Medicine) were recruited to monitor patients remotely. However, within several days, as the number of confirmed cases continued to surge, a task force was urgently established to create a structured ~~COVID-19~~ telehealth service led by internists and trainees in internal medicine. Experienced nurses from other clinical specialities (predominantly Surgery) were recruited to create an effective multi-professional team. Additionally, as the need quickly arose to monitor the number of confirmed coronavirus cases, the space and capacity for face-to-face

patient care created in the negative pressure container buildings outside the Emergency Department were deemed to be insufficient. This urgency to run outpatient and remote services in a separate space and in a more structured way emerged. The guiding principle set forth at this critical moment was efficient triage of patients (initially into risk groups labelled a green, yellow and red, based on severity of clinical manifestations and underlying conditions) combined with early intervention if symptoms emerged, allowing for effective patient management. Once patients entered the hospital, multi-specialty oversight of care was made possible as some patients progressed from severe to more critical stages of disease. The Infectious Diseases physicians were then able to act as consultants in all areas of patient care: outpatients, inpatient wards, the ICU, advising the authorities, etc.

1. The COVID Telehealth Service and Outpatient Clinic

Under the explicit direction of the Epidemic Committee, a task force was established to set up the COVID-19 Outpatient Service. A multi-disciplinary professional team was assembled to establish a telehealth service and convert the lower floor of a building that had formerly housed part of the IT Department into a new outpatient unit on the Fossvogur site (Birkiborg). Later as the need arose, a day case unit for patients requiring longer treatments or evaluation was created on the upper floor. Each patient's condition was tracked remotely while they remained at home with the aid of communication devices. The purpose of this was to keep patients at home as much as possible and to bring only those patients who needed hospital care in safely.

The outpatient service included:

- An integrated multi-professional and multi-disciplinary team that ran the telehealth service:
  - o All patients with confirmed infections in Iceland were initially contacted by a physician for a medical assessment. They were then triaged into green, yellow, red and blue categories – a triage system that determined how often patients needed to be contacted. Patients who required in-person contact with a physician were identified in this way.
  - o Patients were subsequently monitored by nurses based on their triage categories. Patients were provided with educational and psychological support. Additionally, further colour codes were used to indicate the status of the patients (white, pink, brown) who were being admitted to hospital, deceased or discharged.
- An on-call physician was involved to support cases that were of concern 24/7. This was for nurses who were running the telephone service and physicians in other parts of the country.
- All patients with confirmed disease were given a telephone number, which they could call at any time of day, if symptoms worsened or were otherwise concerned about their condition. They were encouraged to take the initiative to contact the clinical team should anything change in their condition.
- Physician-led telephone follow up of moderate cases.

- In-person outpatient clinic run by consultants from the Internal Medicine Services, doctors in postgraduate training and nurses. Direct supervision was always available by a consultant via Facetime. Admission criteria and first follow-up were defined.
- Once an App (SideKick Health®) was ready, it was used alongside usual care to enable patients to monitor their own symptoms remotely from home at the tail end of the first wave of the pandemic.
- A video-telephone system was set up in the Birkiborg COVID-19 outpatient facility to connect people infected with COVID-19 in the community with family members who are being treated in the ICU and the staff caring for them. It also enabled them to access psychological support to cope with this situation.

An extract from a publication in a peer reviewed journal about the COVID-19 outpatient service in Iceland and Figure 3 below describe the volume of work performed by this team within an intensive 6-week period:

By May 7th, 1762 patients had been enrolled into telehealth monitoring. Their median age was 42 years (IQR, 27–54) and 904 (51.3%) were women. A total of 20.919 phone calls were made from 28 February to 7 May, and the median number of calls per patient was 9 (IQR, 7–13). All patients complied with this strategy. Patients (n=36) who were diagnosed during hospitalization were not enrolled in the telehealth service. However, patients who were discharged before they had fully recovered were closely monitored following discharge.[9]

Number of Patients Monitored on the COVID-19 Telehealth Service by Day
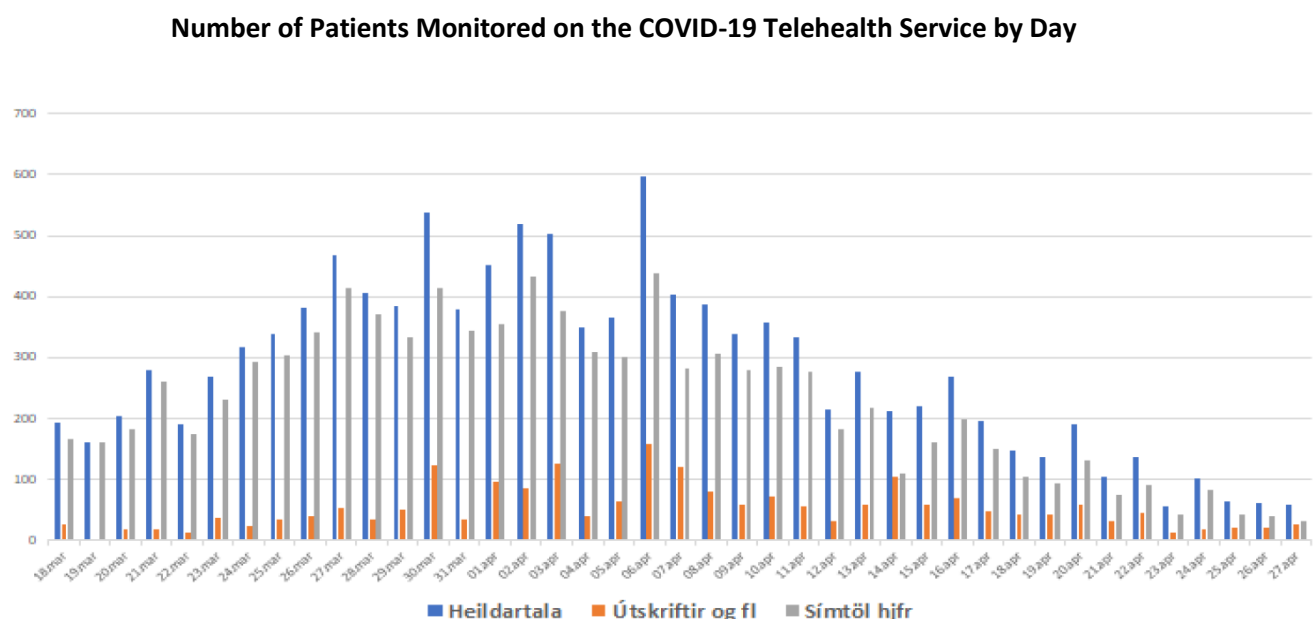
Figure 3. Number of patients in telephone follow-up at the COVID-19 outpatient clinic during March 18th – April 27th 2020.

2. Multi-disciplinary and multi-specialty model of inpatient and ICU care

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[9] Helgason, D., Eythorsson, E., Olafsdottir, L.B., Agustsson, T., Ingvarsdottir, S., Sverrirsdottir, S., … Ingvarsson, R.F., (2020). Beating the Odds with Systematic Individualized Care: Nationwide Prospective Follow-up of all Patients with COVID-19 in Iceland. *Journal of Internal Medicine.* https://doi.org/10.1111/joim.13135

There was multi-disciplinary collaboration between the A6 (Respiratory Medicine led) ward, A7 (multi-disciplinary led) ward, B5 (multi-disciplinary led) and the ICU (in Fossvogur and then later including Hringbraut) – the designated areas for direct COVID-19 care in the hospital. The intensive care team worked in close collaboration with physicians from Internal Medicine in A6, A7 and B5, allowing for immediate evaluation and management of deteriorating patients. This minimised the delay in escalating care for patients deteriorating and those who required ICU care. B5, originally an orthopaedic inpatient ward, was initially transformed into a COVID ward and admitted several patients. It was then turned into a COVID step-down ward for recovering patients. Continuity of out of hours care was made possible by in-house Internal Medicine coverage by a Consultant 24/7, which was introduced during the pandemic. Daily huddles were held between the wards regarding patients at risk of deteriorating as well as continuous individualised discussion on the risks and benefits of ICU care and ICU discharges to wards.

Quality Statement 4: Data and documentation relating to screening, triage, monitoring and treatment of patients with COVID-19 at home and in hospital is collected in a standardised fashion and robust for quality monitoring and scientific research purposes.

1. Standardised Clinical Charting

From February 29th to March 17th all daily contacts by physicians were directly entered into the patient's electronic medical record (EMR) as a physician's note in free-text format. A standardized data entry form was then created and formalised as part of the clinical documentation for the COVID-19 outpatient team and implemented on March 18th. All patients diagnosed up until this date had their free-text documentation transcribed retrospectively into this standardised format. Data was entered via the electronic health record portal, Heilsugátt. An inpatient progress form was subsequently developed to standardise data entry for the inpatient stay via Heilsugátt. In the ICU, standardised data entry sets were developed and used from the start via their standalone electronic health record system (CIS).

A systematic data quality audit was implemented on April 6th and was conducted in real-time from then onwards. Final year medical students with clinical experience were given explicit pre-defined tasks to be completed under the supervision of a physician. This ensured that clinical data was validated and complete. Data collection sheets were then modified on an ongoing basis.

2. Clinical Coding

The WHO developed a new set of standardised ICD-10 codes for the Coronavirus (International Statistical Classification of Diseases and Related Health Problems), which was disseminated to countries at the start of the pandemic. This was received by the Directorate of Health (Embætti landlæknis) and sent to the Department of Economics / Finance and Information (Hagdeild) at Landspítali for implementation on the same day the first patient was diagnosed and admitted into hospital (February 28th). After some trial and error during the first week, the best possible way of coding at admission was decided, which enabled these patients to be "seen" across

healthcare sectors. This involved efforts by the hospital's Department of Economics / Finance and Information to work with the Information Technology Department (IT/HUT) and clinical units to ensure these codes were entered in the right place on the electronic health portal. Information flowed to the main electronic health record (Saga) and eventually to the centralised clinical data warehouse. This was done so that accurate daily data could be extracted by the Department of Economics / Finance and Information and sent to Directorate of Health for monitoring purposes. This required a daily process of data entry, validation and extraction. Meanwhile in the non-COVID outpatient clinics, staff were given instructions about how to accurately code why appointments were cancelled.

Quality Statement 5: The best available treatments are offered to patients who are at home with moderate disease.

Quality Statement 6: The best available pharmaceutical and non-pharmaceutical treatments are offered to patients in hospital with severe and critical disease.

Quality Statement 7: Carefully designed and ethically conducted scientific research, which does not compromise the public health response or provision of appropriate clinical care, is being undertaken as quickly as possible to allow for proper scientific evaluation of new interventions to be tested.

At the beginning of the pandemic, there was no specific treatment for the COVID-19 viral infection and all treatment options were experimental/off-label. Since then much has changed. Remdesivir has been approved by both the US Food and Drug Administration (FDA) and the European Medicines Agency (EMA) for treatment of COVID-19. Dexamethasone has also been added to the guidelines in most countries, based on evidence from the Recovery trial[10]. Most other treatments are still either off label or within clinical trials. Due to general world-wide demand and limited stocks at the time, drug treatment for COVID-19 was mainly reserved for patients with more severe respiratory/systemic symptoms, though today select drugs such as Favipiravir taken orally, are being proposed in the early stage for mild to moderate disease in order to stop disease progression.

Timely transfer to appropriate levels of care and access to good supportive care was the primary guidance given by the WHO to be the most influential survival factor for infected patients. Healthcare institutions were encouraged to offer experimental/off-label therapies through ethically approved clinical trials to build a reliable knowledge base.

Most patients infected with the COVID virus had relatively mild disease and did not need any specific treatment and could be managed on an outpatient basis.

By the time the pandemic reached Icelandic shores there was some evidence that chloroquine/hydroxychloroquine might be beneficial through an immunomodulatory

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[10] Horby, P., Wei, S.L., Emberson, J.R., Mafham, M., Bell, J.L., Linsell, L.,... Landray, M.J. Dexamethasone in Hospitalised Patients with Covid-19 – Preliminary Report. *The New England Journal of Medicine*. doi: 10.1056/NEJMoa2021436.

mechanism. The evidence for this was weak. A few studies had demonstrated the effectiveness of azithromycin to inhibit viral replication. Also, evidence from a couple of studies suggested a possible synergy between azithromycin and hydroxychloroquine. A combination treatment of hydroxychloroquine/azithromycin was thus offered and administered to patients without contraindication in both outpatient and inpatient settings as an off-label treatment. This combination treatment is not without risk as both drugs can prolong the QT interval and cause cardiac arrythmia and death. Outcome measures in international studies have since demonstrated excessive mortality and the treatment is no longer recommended due to risk and lack of proven benefit. No serious adverse effects occurred in the Icelandic COVID-19 cohort due to the treatment.

Efforts were made to obtain remdesivir and favipiravir, but these did not become available during the first wave. They are now approved for use in clinical trials in Iceland with informed consent, information leaflets, registration of data into a central database and outside monitoring.

Tocilizumab, an IL-6 receptor inhibitor, had been approved in a clinical trial in China and was used here as an off-label treatment in 20 cases, with uncertain effect.

The established local and national procedure for research and ethics approval was capable of fast-tracking COVID-19 related projects. Doctors and nurses from multiple specialties were brought together in multi-disciplinary teams to plan and undertake their COVID-19 related scientific research projects at an accelerated pace. Nurses were encouraged to design and lead on nursing related projects.

A list of COVID-19 scientific research projects is listed in Appendix III.

Quality Statement 8: Resources such as staffing, equipment, supplies and space are available to provide COVID-19 related services safely and effectively.

1. Mobilisation of the Nursing Workforce

The COVID-19 pandemic called for the creation of new services at Landspítali (COVID-19 Telehealth Service and Outpatient Clinic) and the strengthening of current inpatient services (ICU, A6, A7 and B5) against the backdrop of a persistent shortage of long-term nurses. The response to the pandemic was not only about providing direct patient care but also managing and containing the spread of infection amongst staff and inpatients. Services that were affected quite severely with staff-infections – infections which were brought in from the community rather than from patients being treated in hospital – were ICU at Fossvogur, the geriatric hospital at Landakot and the psychiatric services. These two priorities were particularly challenging and required persistent vigilance and urgent response to ensure that the ability to provide patient care and keep staff safe was not compromised.

Nurses were also needed to strengthen the work of the ICD as well as the contact tracing team of the Department of Civil Protection and Emergency Management (smitrakningarteymi

Almannavarna). Landspítali, under the leadership of the Chief Nursing Officer, recruited nurses from non-COVID elective services such as surgery and anaesthesia, some day and outpatient clinics and private practices outside of the hospital. Those with experience of intensive care were highly sought. The response was overwhelmingly positive, which enabled the staffing of intensive care to be divided into 3 separate teams to ensure that staff within each shift had adequate knowledge and experience. Clinical nurse specialists especially in cardiology were also recruited to design a high dependency care facility (hágæslueiningu) on the A6 ward. A contingency plan was created to respond as quickly as possible if staff got infected on the wards. This included having a list of nursing staff always on stand-by, ready to step in, if staff needed to go into quarantine. Temporary employment contracts were also made with new staff who were not normally employed at Landspítali.

In total:

- New contracts of employment were made for 70 nurses and 56 nursing assistants (sjúkraliðar) from the backup list (bakvarðasveit).
- A total of 144 nurses and 24 nursing assistants were formally reassigned from their normal post to other units in the hospital (i.e. with a contract).
- Additionally, several staff were reassigned to new posts without a formal contract.
- At the height of the pandemic, 22 nurses had new assignments in the outpatient clinic in Birkiborg, 65 in the call centre and 11 with the contact tracing team of Department of Civil Protection and Emergency Management.
- 37 nurses and 4 nursing assistants were added to the ICU nursing staff and 31 nurses and 12 nursing assistants on the COVID inpatient wards.
- Additionally, 6 nurses joined the ICD and the Occupational Health team.
- In total more than 300 nurses and nursing assistants were either reassigned from their normal post within Landspítali or were signed on from outside.

This mobilisation of a new nursing workforce called for the urgent implementation of training and education. An existing online virtual platform, Eloomi was utilised and so was teaching at the simulation centre, The Ark. Twenty courses were created over one weekend, with emphasis on basic (re)training and infection control measures. This required close collaboration between the Human Resources Department, Department of Education, executive directors for the two clinical divisions, ward managers and directors of clinical services (forstöðumenn) to ensure that the right staff, with the right skills and experience, were reassigned to the right place.

A more detailed description of what the Department of Education did can be read here.

2. Mobilisation of the Medical Workforce

A significant number of consultants and doctors in postgraduate training were mobilised to enable direct COVID-19 related care to be delivered. In the ICU, the total number of consultants working at full capacity was increased by four, two consultants transferred from Hringbraut to Fossvogur, which is the main COVID-19 site, one consultant started work earlier than planned

to cover COVID care and two consultants were hired from the Backup list (bakvarðasveit). In addition, trainees with the longest experience in critical care and anaesthesia who were rotating elsewhere were moved back to the ICU.

The Internal Medicine Services re-organized all rotations to meet the needs of COVID and non-COVID teams. Consultants from various medical sub-specialties were transferred from their usual duties to serve as COVID doctors both for out- and inpatient care. Over a hundred doctors in postgraduate training, including trainees from various specialities, were mobilised to participate in the design, planning and implementation of COVID-19 outpatient and inpatient services. This was made possible under the direction of the Head of Postgraduate Medical Education, training programme directors and department managers. This resulted in appropriate medical staffing; patients were seen by the appropriate doctor at the right time and in the right setting. This junior medical workforce actively participated in deciding how clinical information was documented, use of electronic solutions for telemedicine (e.g. FaceTime and iPads) and daily organisation of the work.

The medical workforce consisted mostly of doctors in postgraduate training supported by the aforementioned consultant physicians. They were mobilised to provide medical care within the COVID-19 Telehealth Service and Outpatient Clinic and the COVID-19 inpatient wards. At the height of the pandemic:

- 37 doctors were actively enrolled in the telehealth services, specifically;
    - o 7 foundation year trainees (kandídatar)
    - o 15 trainees from various specialties
    - o 15 Consultants from various specialties
- 31 trainees and 6 consultant physicians were mobilised to provide the outpatient service, specifically;
    - o 21 trainees from Internal Medicine
    - o 1 trainee from child-and adolescent Psychiatry
    - o 1 trainee from Radiology
    - o 4 trainees from General Surgery
    - o 1 trainee from Obstetrics and Gynaecology
    - o 1 trainee from Ophthalmology
    - o 1 trainee from General Psychiatry
    - o Consultants were mobilised from Acute Medicine, Nephrology, Rheumatology, Geriatric Medicine, Neurology and Gastroenterology.
- Medical cover was provided 24/7 by five teams each consisting of two trainees and a consultant physician for the COVID-19 inpatient wards.
- In addition to staffing the dedicated COVID-19 wards, specific measures were taken when patients developed COVID-19 within the geriatric services with further relocation of trainees.

Over-all, the proactive mobilisation or relocation of these doctors was made possible by the broad cross-specialty oversight and communication pathways created during the development of postgraduate training at Landspítali.

3. Equipment and Supplies

Various kinds of equipment were required to manage COVID-related care such as ventilators and consumables associated with them, transport capsules, oximeters, mobile X-ray devices, appropriate viral laboratory diagnostic equipment, personal protective equipment, hand sanitizers and environmental disinfectants, to name but a few.

- With the generous help of private companies and individuals, ventilators were obtained and brought into the country, which increased the number of devices from 26 to 55. Not all of them needed to be used during the pandemic.
- Analysis of samples was conducted in the hospital's Department of Clinical Microbiology (sýkla- og veirufræðideild) with the aid of deCODE Genetics, a commercial biopharmaceutical company, to keep up with the volume of testing.
- Two transport capsules were available at the start of the pandemic, which were obtained in preparation for possible Ebola infections in 2014. They were both used for the first time during the pandemic. Both were damaged and one needed to be replaced. New responsibilities were assigned for the safe storage, use and maintenance of the repaired and new capsules. There are now 8 transport capsules available, some were purchased and shipped from abroad and some were made by Össur, a non-invasive orthopaedics manufacturing company based in Reykjavík.
- A significant amount of work was done to ensure the amount of available personal protective equipment (PPE) was adequate and to bring in adequate supplies from within the country and abroad. This was managed by the hospital's Procurement team in collaboration with the Directorate of Health and eventually the hospital's Procurement team took over responsibility for this on a national level.
- The availability of hand sanitizer and environmental disinfectants were assessed and deemed to be adequate. The only limitation in supply were bottles and pumps for the locally produced hand sanitizer. Empty containers were collected and disinfected for re-use while stock from abroad was being imported.

4. Medications

The procurement of medications was led jointly by the Procurement Department (Innkaupadeild) and the Pharmacy Services Department (Lyfjaþjónusta). By the end of January, before the first case of the coronavirus was diagnosed in Iceland, work was well underway to ensure that enough pharmaceuticals could be obtained. A COVID-19 medicines working group was established (COVID -19 lyfjahópur), involving the representatives of the multi-disciplinary clinical teams that were delivering direct COVID-19 related care, to ensure that efforts were

made to obtain drugs based on the best available emerging evidence. This required daily contact, and oftentimes, multiple times per day.

Drugs were obtained mostly through the usual route, which was through the main distributors and agents of the main pharmaceutical companies. The pharmacist in the Procurement Department was the contact person for sourcing all additional drugs and then they were ordered by the pharmacy as usual. This work was done in constant communication with the Chief of Pharmaceutical Services, clinical teams and the COVID-19 Medicines Working Group. The types of drugs needed were varied. In addition to the COVID off-label treatments, drugs for anaesthesia, sedation, IV fluids, analgesics and antibiotics needed to be increased by several fold.

Regarding off-label drugs for COVID treatment, HIV products and Tamiflu were obtained. There was interest within the hospital for obtaining remdesivir, but the supply of the medication quickly ran dry except for use in clinical trials. The producer of the drug, Gilead decided to close their compassionate use program in order to prioritise clinical trial work. This was later reconfigured into an Expanded Access Program (EAP) in which Landspitali participated and the drug was delivered to the hospital when the first wave had subsided. In addition, favipiravir, a Japanese influenza drug which had shown some encouraging results in early trials conducted in China, was obtained though the Japanese government as a gift. However, the drug became available for use in Iceland when the first wave had subsided and therefore was not used.

Constant surveillance was implemented about what stock of medications were available and proactive communication within Landspítali and with distributors, agents and other suppliers about potential delays in receiving the supplies. The Icelandic Medicines Agency, distributors and sales and marketing companies for pharmaceuticals, pharmaceutical manufacturing companies and other private entities all pulled together to help the hospital get the drugs that were needed. In the end, despite the closing of boarders and halting of air traffic, enough supplies of drugs were obtained for patients in Iceland.

5. Space

Space needed to be managed and reconfigured to provide safe and appropriate patient care and to prevent the spread of infection. There were many shared and open spaces on existing units, with limited negative pressure rooms and toilet and bathing facilities. As described in more detail in previous sections, here is a summary of how space was managed:

- 2 negative pressure containers were installed outside the Emergency Department prior to and at the start of the pandemic.
- Plastic walls were installed in the Emergency Department to divide space for patients with and without confirmed infections.
- The Paediatric Emergency Department contains no negative pressure rooms. Plastic walls were installed to divide space for confirmed or suspected cases.

- A building on the hospital's property that formerly housed part of the IT Department, was converted into a designated COVID-19 outpatient and day care unit as the pandemic was escalating. A total of 8 clinic rooms were created and toilets were installed outside the building.
- COVID-19 designated wards were divided into separate isolation areas (A6, A7 and B5).
- In the ICU, heavy duty plastic walls were constructed to create COVID and non-COVID ICU rooms as well as a potential COVID room. There was also reconstruction with plastic walls to generate donning and doffing rooms in front of the COVID areas.
- Patients were first admitted into the Infectious Diseases ward (A7). When A7 was filled and reconfigured to its maximum capacity, patients were then admitted into the Respiratory Medicine ward (A6). B5 was the third COVID ward for a brief period, before converting to a step-down ward for recovering COVID patients.
- Plastic walls were installed in the Orthopaedic ward (B5) as it became designated for COVID care and in the Rheumatology and Internal Medicine ward (B7) as a contingency plan.
- Surge planning for the ICU: patients were first admitted into Fossvogur ICU, and then Hringbraut ICU. Both of these sites were used during the first wave. If the number of patients increased and further capacity was required, the Fossvogur Operating Room and Hringbraut Operating Room were prepared for this.
- Bed space planning for non-COVID patients was according to plan by an appointed workgroup to manage the non-COVID patient flow.

Quality Statement 9: The impact of repurposing health system capacities is continually evaluated.

1. Cancellation of elective surgical care

Elective surgery was cancelled across the hospital. Only emergency surgery or cancer related surgery continued. This was to free up as much capacity in the ICU as possible to make room on the inpatient wards to treat patients with COVID-19 and to limit the transmission of infection. This also enabled staff, especially scrub nurses, to be repurposed for COVID related work. The Surgery Department functioned at "Summer capacity" during the period of the pandemic (March - April), meaning that surgical capacity was dropped by >50% during this time, which is routinely done over every summer period. Surgical services gradually re-opened in the first week of May and reached full capacity by the beginning of June. By the end of June, the department will return to Summer capacity again until the middle of August.

2. Non-COVID outpatient services

When the pandemic hit, staff in outpatient services across the hospital needed to decide how to maintain essential health services. Learnings were gathered from 4 specialties who had high risk patient groups: Endocrinology, Respiratory Medicine, Geriatrics and Psychiatry. Each team decided whether they should reschedule appointments, continue with telephone/video calls or

identify patients who needed to be seen face to face based on the staff that they had in their departments.

In geriatrics, all outpatient and Day Unit appointments held in L0 and L2 were cancelled because staff needed to be dispatched and re-purposed to other areas e.g. a new geriatric rehabilitation ward (L5), the opening of which was accelerated due to the pandemic. For those patients who needed to attend appointments (e.g. diagnostics tests) in the hospital, the infection control team was consulted for guidance about the safest way to do this to prevent the spread of infection.

When appointments needed to be cancelled, staff spent a considerable amount of time calling patients (>260 in geriatrics alone). The response from patients was mixed – they usually understood the situation, however felt anxious as they had waited for months for their appointments. Their family members were usually more concerned. The phone calls took longer than anticipated because time was spent answering patients' questions and alleviating their worries.

For clinical teams that had the staff to continue running outpatient services:

- They set criteria for the needs of each patient group.
- Patients who were able to get blood tests and were being monitored using medical devices such as insulin pumps were offered one-to-one video calls (Endocrinology).
- One-to-one video calls were also conducted in psychiatry's depression and anxiety team and the children's and adolescent's psychiatric teams (BUGL).
- Group video calls were used in the Eating Disorders team.
- Older patients generally preferred a telephone call because they did not feel they had the technical competencies to connect to the video calls and in practice, the calls from the patient's end proved too complicated (Endocrinology).
- The response from patients who received telephone appointments during the pandemic was generally positive. Most expected that their appointments were going to be cancelled and were relieved and even prepared with the information on hand at home for the telephone consultations.
- The teams were able to experience first-hand that a lot of patient care can be done remotely and that old models of face-to-face outpatient care is becoming more and more unnecessary.
- Despite the large amount of general information that was published by the clinical teams on websites or social media (e.g. Endocrinology), patients preferred to discuss their questions over the telephone in consultation with a healthcare professional.

3. Non-COVID essential care

One of the urgent and most pressing matters that needed to be addressed was the Emergency Department attendances at the hospital for non-COVID related care during the time of the pandemic. The Epidemic Committee recognised this at the very beginning of the pandemic

and appointed a working group to find solutions to this problem. They were tasked with defining where to admit patients who would in normal circumstances be admitted to the Infectious Diseases (A7), Respiratory Medicine (A6), and Orthopaedics (B5) wards, which were repurposed for COVID care. Normally 180-200 patients attend the Emergency Department per day. The working group projected that this number would continue with additional COVID-19 related attendances. They sought the help of other specialty services within the hospital to see if these patients could receive care in other areas. The group constructed a plan, which was to divert patients to other departments after an initial evaluation in the Emergency Department.

Contrary to what was expected, once the pandemic hit, significantly fewer patients attended the Emergency Department. Attendances reduced from circa. 180 contacts per day pre-pandemic (January and February 2020) to 115 by the end of March, which was at the height of the pandemic (36% reduction). At the same time, the number of inpatient admissions did not decrease as significantly (24 admissions out of 180 attendances (13% admission rate) to 17-20 admissions out of 115 attendances (14-17% admission rate)). This meant that patients with more acute conditions were presenting to the Emergency Department and those with less urgent conditions were either keeping away from the hospital or seeking treatment elsewhere. It was feared that this could lead to a flood into the system later, when the pandemic was in full force, when patients with less urgent conditions progressed into acute conditions (ebb and tide effect). The working group thus focussed their efforts on preventing future Emergency Department attendances and hospital admissions by making less urgent care accessible in other ways. They expanded the role of the General Medicine Day Care Unit (dagdeild, B7) and promoted its function across the hospital and Primary Care across the country.

From April 8th, after the height of the pandemic, patients with less urgent conditions were referred to the B7 day clinic. For example, patients who required intravenous antibiotic treatments, fluids or further investigations that could not be done within a Primary Care setting. Patients were referred from family practitioners across the country, the Emergency Department and consultants from within the hospital.

Seven additional patients attended this service per day, which has gradually increased to ten patients post-pandemic without the need for extra staff. This service was run primarily by trainees in Internal Medicine. Of all the referrals, 62% resulted in face to face hospital visits and the rest were reviewed virtually over the telephone.

Quality Statement 10: The well-being of hospital staff who are both directly and indirectly impacted by the pandemic is continually assessed and improved.

Information was kept up to date as much as possible on the COVID-19 intranet site to ensure frontline staff were aware of latest developments about how to use PPE and keep themselves safe.

Nevertheless, there were outbreaks of the coronavirus amongst staff and patients in COVID and non-COVID designated inpatient wards (Geriatric Hospital, the ICU in Fossvogur and the

Psychiatric Hospital). These infections were community transmitted infections brought in by staff. This resulted in a significant amount of work by the ICD, in collaboration with the Occupational Health team, to conduct contact tracing, take samples from staff and to reorganise units to contain the spread.

The well-being of staff was largely overseen by the operational managers responsible for the clinical services.

Quality Statement 11: Essential steps are taken for updating a hospital disaster or pandemic preparedness management plan.

The hospital's Disaster Management Plan was up to date at the time of the pandemic (last updated in October 2019) and it has been routinely kept up to date by an appointed team. The plan describes in detail about how a disaster such as an unexpected event/accident that involves large numbers of casualties should be managed within a relatively short period of time. It discusses how an epidemic should be managed in terms of its governance (role of the Epidemic Committee and involvement of the Disaster Preparedness and Management Team), however it does not detail specifically how each epidemic should be managed because each contagion is different and requires a tailored response e.g. the approach to managing Ebola would differ from how Flu would be managed.

The hospital managed the pandemic in accordance with the broad framework described in its Disaster Management Plan.

Quality Statement 12: Mortality review of COVID-19 related deaths

All COVID-19 related deaths that occurred at Landspítali were reviewed by the hospital's Head of Quality and Safety. To date a total of 10 patients died of COVID-19 in Iceland, of whom seven were patients in Landspítali. In summary, the findings of the mortality reviews were:

- All had contracted the disease sometime in March and died between the period of March 23rd to April 16th.
  - o Community acquired infection: 6
  - o Hospital acquired infection: 1 (Geriatric Hospital, Landakot)
- All had underlying diseases:
  - o Hypertensive heart disease, ischemic heart disease and/or heart failure (7)
  - o COPD/emphysema (3) - of which one also had a past history of sarcoidosis.
  - o Kidney failure (2)
  - o Immunosuppressive treatment (1)
  - o Diabetes (1)
- All except one, received azithromycin/hydroxychloroquine, four additionally received tocilizumab
- Average age at the time of death: 75 years (range: 67-87 years).
- Males: 2; females: 5

- Admitted to ICU: 4; on a ventilator: 3.
- Days on ventilator: range 3, 7 and 22 days respectively, on avg. 10,33 days.

All in-hospital deaths were elderly patients with a risk profile and a severe systemic infection. There were no unexpected deaths amongst patients treated at home, at the COVID-19 outpatient clinic or from low risk categories.

4. Findings

This section details the outcome of a SWOT analysis following:

1. Consideration of good practice and gaps in processes, structures and methods of COVID-19 related management in comparison with the quality statements and;
2. Self-reflections on learnings from staff who were involved in COVID and non-COVID services during the pandemic.

An iterative approach was taken to gather and analyse staff self-reflections on learning. The starting point was with frontline clinical teams. As more knowledge of learnings were gained, gaps in information about what happened during the COVID response at the hospital were filled through engagement with the hospital's support services such as Pharmacy and Department of Education. However, the gathering of new information and knowledge needed to be concluded for pragmatic reasons, particularly to manage the scope of the report. Staff in the IT Department, Department of Clinical Microbiology and Procurement (relating to non-pharmaceutical supplies) for example, were not approached to share their lessons learned. This has resulted in the following limitations of this findings:

- They do not represent the views of all staff and teams involved in the hospital's COVID-19 response.
- The findings are likely to weigh more towards the perspective of clinical staff who worked on the frontline.

4.1   Strengths

The response to the pandemic demonstrated the hospital's capacity to make rapid and complex changes over a very short time. The timeline of events in Chapter 3.2, shows the amount of work that was achieved in a very short time across the hospital, from various teams and departments. The success of this change was due to the following main factors:

1. The motivation of a highly skilled workforce who were given the autonomy to innovate.
2. The demonstrable power of the alignment of the whole organisation and healthcare system towards a common goal.

3. Oversight and overall organisation of doctors in postgraduate medical training.
4. Capability for technological innovation.
5. Quality management and improvement capability.

1. **Motivation of the highly skilled workforce who were given the autonomy to innovate**

The high motivation and determination shown by the skilled hospital staff was a major factor for the success of the response to the needs of the population during the pandemic. This was demonstrated by how the *new COVID-19 Telehealth Service and Outpatient Clinic* was established:

- The newly formed clinical team was given a "cart blanche" to set up the clinic.
- The unique combination of strengths, skills and experience from multi-disciplinary staff who had never previously worked together broke down long-established silos. *Physicians from Internal Medicine Services* and *nurses from Surgical Services* worked together at an unprecedented pace to set up the new service.
- They had no playbook on "how to" but learned quickly by doing. The senior nursing staff were able to utilise their varied experiences setting up new services and education as managers to establish the service. They were confident to do this work.
- They sought for the best available evidence, executed plans quickly and adapted practice accordingly without delay.
- This multi-professional and multi-disciplinary team took the initiative to structure the way the telehealth service was delivered, how triage was conducted and to perform effective medical and nursing assessments and interventions over telephone.
- Bottom-up creativity was harnessed by the interdisciplinary team, enabling technological innovations such as standardised clinical charting, FaceTime technology and a Smart Phone app to be developed to make work as efficient as possible.

Staff in the *ICD* and the *Infectious Diseases service* worked countless hours, responding to the multiple needs of the hospital and healthcare system to provide expert advice and guidance to keep both COVID and non-COVID related work safe. A similar contribution and commitment of staff was also demonstrated in the *ICU, A6, A7 and B5 wards* where services were reorganised, in accordance to the rapidly changing evidence and needs, in order to provide the best possible standard of care. They worked together to share learning and provide true multi-disciplinary care.

Similarly, staff in the *Department of Education* created twenty online courses, coupled with simulation training, over a single weekend to ensure that nurses who would be mobilised to a new area of work could acquire necessary knowledge, skill and confidence to perform effectively on the frontline. Staff in the *Procurement Department* and *Pharmacy Services Departments* worked at all times of the day to do what was necessary to obtain drugs and supplies during such an unprecedented time. With their ability to think ahead and take the initiative to do what was necessary well ahead of time, their determination, passion for their work and strong sense of urgency enabled them to achieve their goals. They utilised their skills and vast amount of experience to do this despite numerous significant obstacles, such as the closing of boarders and halting of air traffic, and worldwide competition to get limited supplies.

Staff morale was high during the pandemic. Staff were eager and ready to do the necessary work. The following examples are but a few:

- The staff in the Orthopaedic ward *(B5)*, where nurses were used to caring for an entirely different group of patients (surgery), engaged actively in the process of transforming their ward and work processes and challenged themselves to use new skills to meet the needs of patients with COVID-19 (internal medicine). This was achieved due to full staff engagement and determination, compassionate leadership of their manager and active face-to-face support from members of the Epidemic Committee. All of this contributed to high staff morale; fears were alleviated and a positive work environment was created.
- Staff in *non-COVID services* took the initiative to reorganise essential care, outpatient care and less urgent care to proactively prevent hospital admissions.
- Individual initiatives taken by staff in:
  - The *Department of Economics / Finance and Information*
  - Department of Education
  - Nurses ready to be mobilised from across the healthcare system
  - Help and support from *support services* such as the IT Department, Pharmacy, Procurement, Housekeeping and many more

The staff demonstrated how efforts, fuelled not only by the urgency of the pandemic, but also by professionalism and the ambition to provide high quality care and service, was a major contributory factor to the success of the rapid and complex changes that were made over a very short period of time.

2. Demonstrable power of the alignment of the whole organisation and healthcare system towards a common goal

The entire healthcare system was focused on the management of one disease, which enabled a significant amount of resources to be rechannelled. Within Landspítali, day to day management of the pandemic was operated by the Epidemic Committee in close collaboration with the Disaster Preparedness and Management Team. There were daily meetings and briefings with the presence of the CEO and the whole organisation could turn to one focal point for direction. Members of the executive team interacted with frontline staff who were providing direct patient care on a daily basis to ensure end-to-end alignment. When the number of confirmed cases surged exponentially in the middle of March for example, quick and decisive action was taken by key members of the hospital's Executive Team to pull together experienced clinical and medical professionals from across hospital boundaries to form new multi-disciplinary teams and they were given the autonomy to establish new ways of working.

Clinical teams were given the resources that they asked for. They were empowered to do what was necessary to provide high quality care for patients infected with COVID-19. There were more staff on the units than in normal day to day working life. There was a common goal and vision from across the healthcare system and the public, which enabled the work that had to be done. Landspítali worked with Primary Care providers to reorganise pathways of care for

sub-acute conditions. The Icelandic Medicines Agency, distributors and sales and marketing companies for pharmaceuticals, local pharmaceutical manufacturers and other private entities all pulled together and proactively enabled the hospital to obtain the drugs that were needed to provide COVID-related care. Cross-organisational boundaries were also broken in the obtaining of necessary supplies and equipment. Clinical teams within the hospital broke traditional silos to work effectively in a multi-disciplinary manner as demonstrated in the A6, A7, B5, ICU and outpatient teams. Doctors in postgraduate training and nurses were empowered to lead on developing clinical services in close collaboration with senior doctors and had their IT, human resource, training and supplies needs met. This enabled the hospital to create a single pathway of care for COVID-19 patients and align the work with the wider shared vision and goals.

The visible leadership and support of the members of the Epidemic Committee and Disaster Preparedness and Management Team cannot be underestimated as a key enabler for this alignment to have had such impact, harnessing the resourcefulness and autonomy of a diverse workforce towards achieving a common goal. It was a symbiotic process and the roles of every single person involved was indispensable.

3. Oversight and overall organisation of doctors in postgraduate training

Another strength that was demonstrated was the ability to mobilise over a hundred junior medical staff to actively participate in the COVID-19 service under close supervision of consultant physicians. The recent development and growth of postgraduate medical education in Iceland and the organisational structure for oversight, direction and coordination made it possible for an adequate number of competent doctors within the Icelandic healthcare system to respond to the needs of this challenging endeavour.

Without this broad and skilled medical workforce, it would not have been possible to provide the extensive clinical services required for the hospital's COVID-19 response. The coordinated organisation and governance of postgraduate training provided both clear communication pathways, a broad but detailed cross-specialty oversight for the number of trainees and competencies that were required and accommodating daily changes as needed. Training programme directors were tasked with identifying a number of trainees with the appropriate competence from within their programmes for possible relocation. They were then added to the pool of available trainees according to need, sometimes changing on a daily basis. Using this approach, staffing capacity remained flexible, enabling the provision of safe, fully staffed services at all times.

In addition, this oversight and coordination of trainees also provided the ability to develop, distribute and allocate appropriate training material and information for trainees to efficiently know exactly what processes to follow, make good quality clinical documentation and improve services. Teaching material and videos were quickly produced jointly between the Infectious Diseases and post-graduate medical education teams.

4. Capability for technological innovation

The pandemic response has shown how innovative technological solutions developed within and outside of Landspítali has made clinical work more efficient and effective. Standardised clinical charting, clinical oversight and communication through features on the in-house electronic health portal (Heilsugátt) were easy to design on immediate demand to meet clinical frontline needs. The utilisation of the virtual training platform Eloomi was also a valuable resource for mobilising a large nursing workforce to respond rapidly to changing conditions and patient needs. The development of the SideKick® app by a commercial company opened up the potential for making the work even more efficient by enabling patients to monitor their symptoms from home yet be in constant communication with the hospital.

5. Quality management and improvement capability

The presence of highly skilled project managers with quality improvement knowledge provided a valuable resource for the hospital to organise teams rapidly and implement plans during the pandemic. Examples include the management of work of the Epidemic Committee, development of the COVID-19 Telehealth Service and Outpatient Clinic, organising non-COVID essential services, reorganising clinical services and supporting the implementation of telephone and virtual outpatient clinics in psychiatry

The centralised database of local clinical guidelines, the Quality Manual, proved to be an effective way of managing COVID-19 related clinical guidelines. They could be easily accessed via the intranet homepage and there was effective version control. The amount of time, focus and energy spent on this to be effective cannot be underestimated. This required the active participation of the quality managers within the central team and the divisions to not only facilitate and coordinate efforts but to take a leadership role to ensure that they are developed.

A list of guidelines that were developed can be seen in Appendix II.

4.2 Weaknesses

The response of the pandemic also exposed several weaknesses within the system. When each is examined the underlying theme of siloed working or *Silo Mentality* emerges. By this it is meant that there is a culture for individual parts of the system such as departments or specialties to work in isolation from each other, they look inwards, ignore external priorities, do not share information and are not completely aligned with the greater whole. Some organisational change experts explain that silos are natural, they enable people to organise their work in various specialisms, focus on them and provide for the necessarily diverse aspects

of the organisation, but they also argue that silo behaviours are unhealthy when they stifle capability, performance, progress and innovation of the greater whole.[11,12,13]

Even though significant effort was made to overcome the *Silo Mentality* in order to act quickly during the pandemic, several challenges remained and were manifested in the following ways:

- Staff in the ICD and Infectious Diseases physicians were overwhelmed with the workload of managing the pandemic.
- Lack of timely and structured dissemination of information to the frontline about key policy decisions relating to management of the pandemic.
- Challenge of gaining oversight of the nursing workforce.
- Weak telehealth capability.
- Lack of synchronisation between the clinical frontline, IT, Department of Economics/ Finance and Information and Directorate of Health on the development of a robust electronic health record.
- Lack of governance and oversight of ethical issues.

1. The ICD and Infectious Diseases physicians were overwhelmed with the workload

The role of the ICD during the pandemic was unclear in the mind of the department's general staff despite it being a key operation in outbreaks and pandemics. The role of the ICD in a pandemic situation is not documented and there is no playbook on how the department should respond or which responsibilities they should take on. The staff, while improvising their role, were drawn into numerous projects that proved to be too much to manage.

The following problems were encountered:

- The pandemic response plan was not ready at the beginning of the epidemic but evolved rapidly. In a normal situation the responsibility of infection response lies with the ICD but in a pandemic situation the responsibility shifts to the Epidemic Committee.
- The role of the ICD was not defined in the Disaster Management Plan and how it borders with the Epidemic Committee.
- The ICD nursing manager and lead physician were members of the Epidemic Committee and were pulled into managing all aspects of the pandemic, which left the general staff in the ICD without any managerial oversight and direction of the work they were doing.

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[11] Herrero, L. (2015, May 16). Good silos, bad silos is like good cholesterol and bad cholesterol. *Daily Thoughts*. https://www.leandroherrero.com/good-silos-bad-silos-is-like-good-cholesterol-and-bad-cholesterol/

[12] Rodgers, C. (2013, September 15). Silos R Us: A natural dynamic of human interaction. *Informal Coalitions*. https://www.informalcoalitions.typepad.com/informal_coalitions/2013/09/silos-r-us.html

[13] Lewis, M. (2017). Paradoxes of Business Schools. *Global Focus*, 3(11), 14-18. https://www.globalfocusmagazine.com/wp-content/uploads/2017/10/Issue_3_2017_paradoxes_bschools.pdf

- It was difficult to obtain oversight of adequate supplies of PPE. This is because it is not possible to order new supplies in the normal manner during a pandemic and a process for providing an accurate registry of PPE in real time was not in place. This meant that a great amount of effort was spent on procurement and the staff of the ICD were drawn into this work.

- When the COVID infection emerged in areas defined as non-COVID units, ICD had to respond and supervise on isolation/quarantine and infection control measures in these units. This caused an additional and heavy workload for the ICD nurses. Initially, it was unclear who should be responsible for infectious contact tracing amongst staff, Occupational Health or the ICD. Contact tracing is cumbersome and time consuming. It requires specialised skills. The ICD was therefore pulling into this work at the beginning of the pandemic. This project was unforeseen and caused a considerable workload as many hospital staff had been exposed or infected. Later staff (nurses) from The Quality Department were relocated to help with this work.

- Effort was put into producing guidelines and instructions for the staff, both visual instruction material (videos, posters) as well as written material in the Quality Manual. Guidelines on COVID for the Quality Manual were produced rapidly and the first written guidelines were ready well before the first COVID-admission. Information was however constantly changing and quite an effort was needed for keeping up to date causing a great workload. Assistance earlier would therefore have been beneficial.

- Not all hospital staff had prior knowledge or experience with PPE and education became increasingly important in addition to guidance to alleviate the anxiety and fears of staff.

- Collaboration with Public Relations (PR, samskiptadeild) on producing the visual instruction material was somewhat lacking. Needs from the ICD were not prioritised but at the same time some posters that were being produced were not approved by the ICD prior to publication. Clarification is needed on how PR should prioritize their services in a pandemic or crisis.

- There was not enough time to conduct surveillance or inspections on infection control practices in units treating COVID patients. There was no real assurance that use of PPE in COVID units and amongst cleaning staff was correct or adequate in all respects.

- It was not anticipated that staff in non-COVID units would need guidance on COVID as well.

- ICD prompted the Head of Housekeeping to take on the role of inspecting cleaning and disinfection procedures during the pandemic. Responsibility for this was not defined prior to the pandemic.

- Landspítali is severely lacking in isolation facilities for highly contagious diseases. A significant amount of time and effort was required to create a safe environment for staff and patients, including defined COVID zones vs. non-COVID zones within departments, group-isolation of infected patients etc.

The Infectious Diseases Service played a major role in the management of the pandemic. The Chief of Infectious Diseases is the chair of the Epidemic Committee and the lead Infectious

Diseases physician from the ICD is also a member of this committee. The roles of the ID physicians were multifaceted:

- Consultant for COVID-19 and non-COVID-19 related issues at Landspítali
- Admission co-ordinator for COVID-19 at Landspítali
- Consultant to COVID-19 Response team / COVID-19 Telehealth Service and Outpatient Clinic at Landspítali
- Consultant to Primary Healthcare Centers (Heilsugæslan) for COVID-19 related issues
- Consultant for the COVID-19 Hotline (1700)
- Consultant to Department of Civil Protection and Emergency Management regarding contact tracing (Smitrakningarteymi Almannavarnadeildar Ríkislögreglustjóra)
- Active surveillance, processing and application of COVID-19 related medical information
- General ward duties at specialised COVID-19 wards (A7, B5) at the tail-end of COVID-19
- Involvement in obtaining antiviral medications through pharmaceutical companies and preparation for clinical trial participation,

At the start of the pandemic, the Infectious Diseases physicians were also in charge of treating all patients with confirmed disease within the hospital and monitoring disease progression of patients who were at home. Once the number of cases increased, this was not sustainable and multi-disciplinary collaboration needed to be structured and defined.

2. **Lack of timely and structured dissemination of information about key policy decisions to frontline staff relating to management of the pandemic**

Feedback from frontline staff providing COVID-19 care was consistent across the board when they were asked about what their most significant challenges were: There was the lack of timely and structured distribution of information about key policy decisions relating to management of the pandemic. This was exacerbated by the rapid pace of development of the situation and solutions, no prior established channels of information dissemination and overreliance on a few key people to do the work, spreading resources too thin. Some staff, who were key decision makers in the frontline services were lacking information through formal channels. At the same time information also travelled rapidly through informal channels for example in passing from colleagues in hallways. Despite all efforts that were made to communicate as much as possible with staff, they never seemed to be enough.

3. **Challenge of gaining oversight of the nursing workforce**

It was considerably challenging to maintain effective oversight of the movement and mobilisation of nursing staff across the hospital. This was due to two main factors:

1. The fluid and unpredictable nature of the task at hand
2. The lack of clarity within the organisation about who should have oversight about staff nursing issues in general – the ward managers, directors of clinical services (forstöðumenn), executive directors of the clinical divisions or Human Resources.

The role of the ward managers is too vast and during the pandemic their roles in the organisation of COVID services were simply overwhelming. They did not have anyone to turn to who had oversight of nursing staff needs. This was evidenced by the fact that at the start of the pandemic, ward managers were calling other staff – usually their friends – from other parts of the hospital or healthcare system to come in to help. This led to nurses not always being allocated to the services where their knowledge and skills were the most useful and various other logistical issues. By the middle of March, the Epidemic Committee identified the nature of this approach to be a significant issue and appointed the Chief Nurse to gain oversight and to coordinate and manage decision making. Through this experience, it was revealed just how difficult it was to understand nursing staff needs at Landspítali and that current nursing staff models were imperfect. The networking and close collaboration of work between the different departments was vital to enable the right staff to be mobilised and carefully allocated to the right place.

4. **Weak telehealth capability**

Two different systems were used to test video/telehealth calls with non-COVID patients during the pandemic:

1. Cisco, connected to the web-based electronic health portal Heilsugátt, which was used by Psychiatry for group calls for the eating disorder team and by Endocrinology.
2. A standalone system called Kara Connect, which was used by Psychiatry – two teams were given pilot licences.

The 3rd system that is capable of secure video calls with patients is through the main electronic health record (Saga) and the national health portal for patients (Heilsuvera) developed under the direction of The Directorate of Health. Once Saga is upgraded to the latest version at Landspítali, this function will be accessible. Currently the Psychiatry service is liaising directly with Origo, the commercial IT company commissioned by the Directorate of Health, to strengthen their digital health services. Efforts have also been made by Endocrinology and Oncology on this front.

During the pandemic, the non-COVID outpatient teams experienced technical challenges with the telehealth systems, particularly those linked with Cisco. The system was not ideal from the patient end. In addition, the Endocrinology Department had in the past, just a few months before the pandemic, requested to trial the Kara Connect system for their virtual outpatient clinics, however this was not approved due to data security issues.

The learnings from this experience is that although there is a desire to move towards providing care more virtually in principle, Landspítali is not ready for virtual clinics despite years of

attempts from some of the individual clinical services, the IT Department and the Directorate of Health to move in this direction. These attempts have all been exploratory and "pilot" in nature and without crucial resources in funding and manpower. It is evident that they have moved in independent directions without coordination or oversight. Furthermore, none of the patients who received care virtually (phone or video) during the pandemic were charged for the service because payment regulations have not been set in place yet for hospitals. Therefore, the right solution from various critical perspectives - the patient, clinical care provider, cost, payment and data security - has not been systematically tested and spread throughout the organisation and healthcare system.

5. **Lack of synchronisation between the clinical frontline, IT, Department of Economics / Finance and Information and Directorate of Health on the development of a robust electronic health record.**

Despite all the success in the development of standardised clinical charting and operationalising clinical coding at an unprecedented rate during the pandemic, critical gaps, especially relating to data flow and resulting in lack of complete accessibility of data for quality monitoring and scientific research purposes, remained. Some were longstanding issues, which remain unresolved to this day. These include:

- Only data relating to COVID-19 outpatient face-to-face visits are extractable for quality monitoring and scientific research purposes, however data entered onto forms via the Heilsugátt health portal relating to telephone calls are not extractable due to lack of coding.
- It is currently not possible to export data from the CIS database relating to ICU care for real time monitoring and scientific purposes. Implementation of HealthQ, which is an extension to enable the export of data, has been delayed several times.
- The IT team had very limited time to create the standardised COVID-19 patient data entry forms in Heilsugátt, which did not include consideration of how data would flow. It was felt at the time that this could be rectified retrospectively.
- Repeat entry of clinical data had to be continuously performed especially during telephone screening in outpatients for >1000 patients, which is not only an efficiency issue but concern for patient safety because vital information gets overlooked or is outdated. This was due to two issues: the clinical team was using an old edition of Saga (>3 versions behind due to the Oracle database first needing to be updated) and within the electronic health record system there is no national common database for key patient health information such as allergies, alerts and end treatment restrictions (contained in Snjókorn), patient medication list (miðlægt lyfjakort) and past medical history (miðlæg heilsufarssaga). Although all healthcare systems in Iceland use the Saga as their electronic health record, they do not use the same versions of Saga and this key patient information is not integrated between the different Saga databases.

The reason for these critical gaps in data is because requests and needs relating to standardised clinical charting were made by the clinical frontline directly to the IT Department without collaboration with the Department of Economics / Finance and Information to ensure that data flowed correctly for reporting and monitoring purposes. To complicate the matter further, the Saga health record and data warehouses are developed under the direction of the eHealth Centre within the Directorate of Health, which is also done independently. These four protagonists do not traditionally work in synchrony and work is usually reactive where each team is always was one step behind the other especially in relation to innovation. The impact of this, however, is an electronic health record that is fragmented and not optimised for the clinical frontline, quality monitoring or scientific research purposes.

Details of the analysis of the COVID-19 outpatient clinical data can be accessed [here](#).

6. **Lack of governance and oversight of ethical issues**

Due to the need for the frontline clinical teams to keep up with the rapidly changing evidence-base of possible effective COVID treatments, there was some oversight in providing the assurance that patients who were offered off-label treatments were doing so with informed consent. This was evident because of the lack of documentation. Furthermore, although local clinical guidelines were created and documented by the clinical teams who were providing direct patient care, there was no approval procedure by which ethical or legal issues could have been picked up. The hospital's Drugs and Therapeutics Committee (Lyfjanefnd), for example, is not routinely involved in the approval of medication related guidelines; they are only involved with the approval of individual applications for the use of high cost medications and biologicals e.g. tocilizumab. These oversights could have been prevented if the hospital had an active policy on informed consent and clear governance procedures on the safe and ethical use of medications and other treatments.

There is also no protocol for the governance and management of accepting pharmaceutical gifts, for instance, the legal responsibility for accepting such items, quality assurance of the products and calculating and bearing hidden costs. 15,000 doses of chloroquine were accepted unconditionally as a gift on behalf of Landspítali, but the drug was not used.

4.3   Opportunities

The management of the COVID-19 pandemic at Landspítali has opened significant opportunities, that if strategically exploited, could transform the way in which patient care is delivered, making it safer, more timely, effective, efficient, person-centred and equitable. It acts as a *demonstration project* for how new models of working can be adopted and new organisational capabilities can be developed at larger scale.

1. **Strengthen outpatient and out of hospital care to eradicate flow problems within the hospital system.**

The COVID teams clearly demonstrated that it is possible to create a single pathway of care, use technology to assist patients from home, facilitate the controlled flow of patients who need to be seen face to face within an outpatient setting and admit only the most acutely and critically unwell patients into hospital. They have created a prototype for how services at Landspítali can be restructured imaginatively, how the system can enable staff to work collaboratively across disciplines, professions and sectors to eradicate flow problems generated from a high volume of patients needing hospital or nursing home care.

2. **Utilise evidence-based resources to improve inpatient care 24/7 e.g. Hospital at Night**

Landspítali has demonstrated that it is possible to provide true multi-disciplinary and multi-specialty care in hospital 24 hours per day, 7 days per week, for our sickest patients. There are evidence-based resources that have been tried and tested in the United Kingdom and the United States, which could be used to re-structure work and re-distribute the workforce e.g. Hospital at Night® programme.

3. **Harness strengths: The highly skilled staff, mobilisation of the workforce across traditional boundaries and IT innovation capability**

The greatest strength by far is the highly motivated and skilled workforce, the well-being of which should be a priority. It has been clearly demonstrated during this pandemic that when such a workforce is given the autonomy to innovate, results are outstanding. Landspítali is the largest employer in the country and its ambition is to be recognised as one of the best for staff morale, satisfaction and well-being by 2028. Continued investment in these aspects is necessary to achieve this goal.

Additionally, the strength of Landspítali's IT innovation capability should be exploited. There is great expertise directly on the frontline, in the IT Department and in the private sector. There is a significant amount of investment being made in digital healthcare in Iceland. Due to the smallness of the population, availability of expertise and foresight, Iceland has multiple advantages in the development of an integrated and nationwide electronic health record.

It has been demonstrated that when movement across multiple specialities is enabled and a strategy to strengthen and increase the numbers of this vital workforce is applied, Landspítali can deliver outstanding clinical care and conduct scientific research despite considerable constraints.

4. **Strengthen weaknesses: create a common vision and enhance strategic planning**

Landspítali needs to overcome the culture of siloed working. This can be achieved by creating a common vision and strategic planning,[11,14] encouraging the synthesis of contending viewpoints and embracing differences to enhance performance of the greater whole.[15] We have seen the value of the healthcare system aligning all efforts, energy and resources into achieving a common goal. Strengthening the ability to break down the traditional ways of siloed working can be achieved by making a commitment at the very top of the organisation and bringing all staff along on this journey.

4.4 Threats: continuous financial constraints and going back to our old ways

This strategic improvement plan needs to be considered in the context of continuous financial constraints, which began well before the pandemic. These constraints can be transformed into opportunities by committing to remove as much waste as possible in the way patient care is delivered and to stop doing things that do not add value to good quality patient care.

Landspítali's greatest threat may be "forgetting" the valuable lessons that were learned from the COVID experience and doing nothing to improve patient care and culture. By not doing anything drastically different now, Landspítali will go back to its' old ways of working. This unprecedented time in history presents a significant opportunity to leave a legacy that staff at Landspítali can be proud of.

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[14] Gleeson, B., & Rozo, M. (2013, October 2). The Silo Mentality: How to Break Down the Barriers. *Forbes*. https://www.forbes.com/sites/brentgleeson/2013/10/02/the-silo-mentality-how-to-break-down-the-barriers/#7939c3038c7e
[15] Rodgers, C. (2017, November 20). Getting to grips with organizational paradox. *Informal Coalitions*. https://www.informalcoalitions.typepad.com/informal_coalitions/2017/11/getting-to-grips-with-organizational-paradox.html#more

5. Recommendations for Strategic Improvement

This chapter describes several recommendations to conclude the gathering and reflections on lessons learned from responding to the coronavirus pandemic at Landspítali. An organisational learning conceptual model[16] (*see figure 4*) was used as a framework to increase the likelihood that lessons learned will be disseminated and applied effectively.
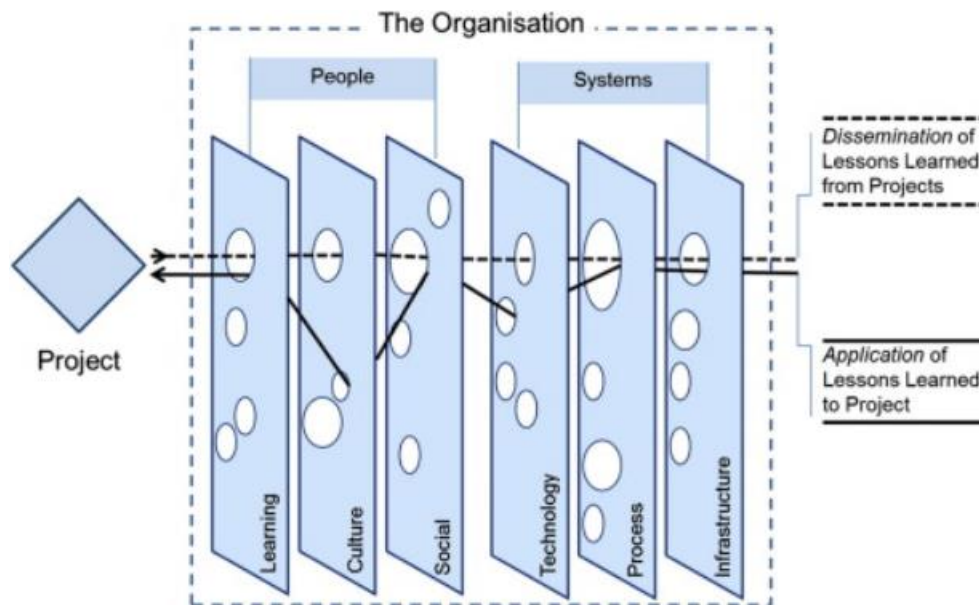

Figure 4. Systemic lessons learned knowledge (Syllk) model (Duffield S. et al. 2015)

According to the Syllk model, people, the culture, social structures and networks, technology, processes and infrastructure need to be aligned in order for lessons learned from projects to be effectively disseminated and applied in an organisation. A holistic approach is therefore recommended. These recommendations therefore need to be implemented with the following criteria:

- They should be part of a vision and 5-10 years strategic plan for Landspítali that the entire organisation is aligned to.
- All staff and stakeholders should be empowered and given the autonomy to turn these recommendations into reality.
- Leaders should promote innovation, willingness to share and learn from diverse staff groups.
- Use continuous improvement methods to test and spread innovations.
- They should be patient centred and economically viable.
- They should be documented and made available to all staff and the public.
- They should each have assigned executive sponsors.
- They should be measurable and tracked by the Executive Board of Directors.

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[16] Duffield, S., & Whitty, S.J. (2015). Developing a systemic Lessons learned knowledge model for organisational learning through projects. *International Journal of Project Management*, 33(2), 311-324.

- They should be operationalised by the directors of clinical services (forstöðumenn) and frontline staff.
- They should receive direct support from the Quality and Kaizen Promotion Office (KPO) Departments (gæðadeild og verkefnastofa), using not only project management techniques, but mentoring and coaching.
- All staff should be actively involved in achieving these goals and kept up to date about progress.

Recommendation 1: Accelerate the reconfiguration of care delivery models to reduce unnecessary hospital admissions by strengthening and redesigning out of hospital care.

This can be achieved by:

- Strategically investing in, testing and developing virtual clinics and telehealth.
- Strengthening the important role and function of Internal Medicine in the management of flow of patients into hospital in new and creative ways, e.g. telehealth and establishing an urgent care centre.
- Reassessing team-based care based on learnings from the COVID-19 experience, including redefining traditional roles and responsibilities and proliferating nurse and allied health professional-led care.
- Experiment with innovative solutions that have scaling up capability.
- Mobilise and encourage doctors in postgraduate training and junior clinical staff of other disciplines to participate in introducing innovative solutions to care models.

Recommendation 2: Enable seamless continuity of multi-disciplinary care for our sickest patients in hospital 24/7.

This can be achieved by:

- Utilising evidence-based toolkits such as the Hospital at Night® programme.
- Reconfiguring care delivery models and redefining roles and responsibilities to ensure senior physician presence in-house 24/7.
- Assess the need for creating High Dependency Units.
- Design contingencies to enable the continuous ability to mobilise the clinical workforce to meet patient needs 24/7.

Recommendation 3: Further develop the delivery and governance of post-graduate medical education.

This can be achieved by:

- Creating a clear workforce strategy.
- Securing budgeting for the specialty trainee workforce.
- Strengthening governance of post-graduate medical education in line within hospital management structures and government regulations.

Recommendation 4: Strengthen nursing leadership to enable oversight, development and mobilisation of the nursing workforce across boundaries to continually meet patient needs within the hospital 24/7 and in outpatient/remote care.

This can be achieved by:

- Conducting a thorough assessment of current nursing leadership and realigning roles and responsibilities of the current workforce to meet critical gaps.
- Drawing experience from structuring post-graduate medical education.

Recommendation 5: Prioritise implementation of frontline staff engagement in Landspítali's strategy to enhance staff health and well-being focussing particularly on improving the work environment and staff morale.

This can be achieved by:

- Active engagement with the workforce, particularly managers, to implement key priorities.
- Strengthening management capability within the organisation.
- Build a sound infrastructure that enables and empowers the workforce to engage in innovation, development and quality improvement of clinical services in line with the hospital's vision and strategy such as freeing up time and developing skills to do this.
- Continuing to invest in staff health and well-being.

Recommendation 6: Strategize, invest in and prioritise information technology needs for frontline clinical care.

This can be achieved by:

- Strengthening leadership to synergise collaboration between the clinical frontline, IT, Department of Economics / Finance and Information and Directorate of Health.
- Implement recommendations to improve COVID-19 related data flows (from the analysis led by Óskar Einarsson).

Recommendation 7: Strengthen the hospital's epidemic and crisis preparedness plan.

This can be achieved by:

- Implementing recommendations made by the Epidemic Committee.
- Defining roles and responsibilities of different teams involved in managing an epidemic.
- All departments to have contingency plans for crisis and pandemic management.

Recommendation 8: Invest in and strengthen infection control services.

This can be achieved by:

- Conducting a thorough assessment of the roles and responsibilities of the department, its current structure, identify gaps and propose improvements for strategic improvement.
- Establish an educational programme for specialisation in infection control in collaboration with the University of Iceland (HÍ).

Recommendation 9: Strengthen governance of hospital-wide clinical and ethical standards of care delivery.

This can be achieved by:

- Defining and implementing hospital-wide informed consent standards that comply with legal and ethical considerations.
- Strengthening clinical guideline development and approval procedures for the use of medications.
- Define the governance and management of pharmaceutical gifts in line with the protocol for the management of medical devices gifts.

Recommendation 10: Strengthen scientific research capability.

- Promote clinical and basic research
- Create a stronger framework for all research activities
- Update guidelines and provide assistance for research application processes
- Improve funding for clinical research intramurally and extramurally
- Strengthen research infrastructure (e.g. funding, facilities, staffing and time) by establishing additional research centres and/or coordinating existing centres (rannsóknarsetur/rannsóknarstofnun í heilbrigðisfræðum við Landspítala).

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Appendix I – Self-assessment template

Project Lessons Learned Template

Project name:	Setting up and running COVID-19 outpatient services at Landspítali
Name of staff involved in the Project:	
Date:	

This document is to assist the COVID-19 outpatient team to record the knowledge gained from the process of planning and executing the service. The purpose is to share and use the knowledge derived from experience to:

1. Repeat desirable outcomes
2. Avoid undesirable outcomes
3. Update Organisational Knowledge at Landspítali to improve on processes and procedures

Use the document to list successes and failures for activities leading to the delivery of the Project. You may want to consider thinking about the project from a number of different perspectives:

- Project Integration Management
- Project Scope Management
- Project Time Management
- Project Cost Management
- Project Quality Management
- Project Human Resource Management
- Project Communication Management
- Project Risk Management
- Project Procurement Management
- Project Stakeholder Management

1. **Describe your role in the project.**

2. **List successes and failures relating to your experience in the project and describe the key factors you believe underpin the reasons for their successes/failures. (Please list as many as possible and insert more lines if required)**

Description of Success/Failure	Factors Underpinning Success/Failure

3. **How do you think the current COVID-19 outpatient service should be improved to cope with possible surges of the pandemic until a vaccine and cure can be found?**

4. **What do you believe are the most critical lessons that Landspítali can learn to be able to quickly and effectively set up outpatient services in the event of future disasters or pandemics?**

5. **What do you believe are the most critical lessons that Landspítali can learn from your experience to transform the delivery of outpatient services in general?**

Appendix II – List of reports, locally developed guidelines and policies relating to COVID-19

Útgefið gæðaskjal: Yfirlit

Skjalnúmer: LSH-1830

Útg.dags.: 03/31/2020

Útgáfa: 3.0

COVID-19 - handbók

Meðferð vegna COVID-19

Farþegi greinist jákvæður á landamærum (nýtt skjal, 03.07.2020)

Uppvinnsla og meðferð einstaklinga með COVID-19

Sértæk lyfjameðferð vegna COVID-19 (ný útgáfa, 01.07.2020)

Sértæk lyfjameðferð með Remdesivír (í vinnslu)

Tengiliðalisti vegna Remdesivír (í vinnslu)

Remdesivír - fræðsluefni (í vinnslu)

Upplýst samþykki vegna tilraunameðferðar með Remdesivír (í vinnslu)

Blöndun og inngjöf á Remdesivír (nýtt skjal, 30.06.2020)

Innkirtlasjúkdómar

Sjúkraþjálfun (nýtt skjal, 11.05.2020)

Bein aðkoma sjúkraþjálfara (nýtt skjal, 11.05.2020)

Hreyfing og þjálfun veitt af starfsmanni deildar (nýtt skjal, 25.05.2020)

Bráð notkun ytri öndunarvélar (BiPAP V60) við grun um eða staðfest smit

Notkun svefnvéla/heimaöndunarvéla (CPAP/VPAP/AutoCS) við grun um eða staðfest smit

Notkun heimaöndunarvélar Stellar eða Astral (lífsbjargandi) við innlögn

Næring inniliggjandi sjúklings

Einkennameðferð fyrir sjúklinga með líknandi áherslur

Notkun morfínlyfja hjá sjúklingi í andnauð

Skömmtun morfínlyfja í lyfjadælu hjá sjúklingi með viðvarandi andnauð

COVID-19 - sýkingavarnir og umgengni

COVID-19 - sýkingavarnir - verklagsregla

Skimun (ný útgáfa, 11.06.2020)

Móttaka og innlögn sjúklings í einangrun

Móttaka sjúklings í sóttkví á dag- og göngudeild eða bráðamóttöku

Smitgát þegar innlagður sjúklingur er í sóttkví

Smitgát þegar innlagður sjúklingur er í einangrun

Smit greinist óvænt á deild

Smit greinist óvænt hjá starfsmanni - deild í sóttkví
Símtöl sem berast í símavakt
Einangrun aflétt
Smitrakning innan Landspítala (nýtt skjal 18.06.2020)

Sýnataka

COVID-19 - Sýnatökur og sending sýna frá sýktum eða mögulega sýktum
einstaklingum
Stroksýnataka frá öndunarfærum

Bráðamóttaka Fossvogi

COVID-19 - verklag á bráðamóttöku í Fossvogi

Hlífðarbúnaður - smitgát

Hlífðarbúnaður COVID-19 (ný útgáfa, 11.06.2020)

Flutningur sjúklings með COVID-19 milli deilda / húsa

COVID-19 - flutningur sjúklings
Flutningur í flutningshúddi
Flutningshúdd
COVID-19 - flutningur sjúklings - öryggisverðir

Stuðningur við fjölskyldur

COVID-19 - stuðningur við fjölskyldur í heimsóknarbanni

Samtal við sjúkling

COVID-19 - samtal um meðferðarmarkmið við bráðum alvarlegum veikindum
COVID-19 - samtal við sjúkling eða aðstandanda þegar horfur eru slæmar

Fræðsluefni fyrir sjúkling

COVID-19 - upplýsingar fyrir fullorðna einstaklinga í heimaeinangrun
COVID-19 - næring inniliggjandi sjúklinga

Eftirlitlit með útsettum einstaklingum (starfsmönnum og sjúklingum)

Eftirlit með útsettum einstaklingum fyrir COVID-19 (2019-nCoV kórónaveiru) á
Landspítala

Innköllun í skurðaðgerð

COVID-19 - innköllun sjúklings í skurðaðgerð (gildir um börn og fullorðna) (ný útgáfa,
29.06.2020)

COVID-19 - skimunarspurningar fyrir innköllun í skurðaðgerð

Skurðstofur og svæfing

COVID-19 - skurðaðgerð hjá sjúklingi með staðfest smit eða í sóttkví
COVID-19 - sýktur sjúklingur eða sjúklingur í sóttkví kemur til aðgerðar á skurðstofu
COVID-19 - loftvegameðferð á skurðstofu hjá sjúklingi með staðfest smit eða í sóttkví
COVID-19 - svæfingavél almenn notkun og hvernig notuð sem öndunarvél
COVID-19 - viðbúnaður við ísetningu á tracheostomiu á gjörgæslu hjá sjúklingi með staðfest smit eða í sóttkví
COVID-19 - kviðsjáraðgerðir á kvennadeild

Gjörgæsludeildir

COVID-19 - forgangsröðun innlagna á gjörgæsludeild og ákvörðun um lok gjörgæslumeðferðar
COVID-19 - gjörgæslumeðferð
COVID-19 - meðferð með ECMO (hjarta- lungnavél) vegna öndunar- og/eða hjartabilunar
COVID-19 - heimsókn á gjörgæsludeild - veggspjald
COVID-19 - loftvegameðferð sjúklinga með grun um staðfest smit á gjörgæslu

Börn

COVID-19 - ferli við innlögn og meðferð barns
COVID-19 - rannsóknir og meðferð barns með bráða og alvarlega öndunarfærasýkingu
COVID-19 - viðbragðsáætlun á Vökudeild
COVID-19 - fimm daga skoðun nýbura (Frá 4. maí 2020 er skjal ekki lengur í gildi)

Kvenlækningar

COVID-19 - viðbúnaður á Kvennadeild
COVID-19 - forgangsröðun skurðaðgerða sem tilheyra kvenlækningum
COVID-19 - móttaka bráðveikra á kvenlækningadeild 21A
COVID-19 - tilvísun til stofulækna frá kvennadeild Landspítala
COVID-19 - komur á göngudeild kvenlækningadeildar
COVID-19 - kviðsjáraðgerðir á kvennadeild
COVID-19 - símaeftirlit eftir bið- eða lyfjameðferð við fósturláti (< 12 vikur)

Meðganga, fæðing og sængurlega

COVID-19 - meðgönguvernd og bráðaþjónusta á 22A og 22B
COVID-19 - fæðing og sængurlega
COVID-19 - kona í fæðingu fer í keisaraskurð
COVID-19 - brjóstagjöf

COVID-19 - innlögn konu með staðfest smit á 22A vegna vandamála tengdum meðgöngu

COVID-19 - fóstursíritun hjá þungaðri konu í sóttkví

COVID-19 - fóstursíritun og fósturhjartsláttarhlustun hjá þungaðri konu

Geðþjónusta

COVID-19 - varnarteymi geðþjónustu

COVID-19 - Meðferð og móttaka sjúklinga á geðþjónustu (nýtt skjal, 08.05.2020)

COVID-19 - Viðbragðsáætlun réttar- og öryggisgeðdeildar (nýtt skjal, 08.05.2020)

Líknardeild og HERA sérhæfð líknarþjónusta

COVID-19 - sýkingavarnir á líknardeild

COVID-19 - vitjun í heimahús frá HERU sérhæfðri líknarþjónustu

Sértæk meðferð/aðgerð innan Landspítala

COVID-19- ábendingar fyrir maga eða ristilspeglanir samkvæmt fyrirmælum Landlæknis

Andlát

COVID-19 - andlát

Starfsmenn

Starfsmaður fær einkenni sem geta bent til COVID-19

COVID-19 - sóttkví starfsmanns - leiðbeiningar (ný útgáfa, 11.06.2020)

COVID-19 - sóttkví starfsmanna - A-B-C (ný útgáfa, 29.06.2020)

Sóttkví starfsmanna B - veggspjald

Skráning

COVID-19 - ICD-10 kóðun

COVID-19 - bókaðri komu breytt í meðferðarsímtal eða fjarmeðferð

COVID-19 - viðbótarskráning á ICD-10 og NCSP-IS kóðum við innritun í legu

Gagnlegt efni tengt COVID-19

Örugg samskipti fyrir helstu áhættuhópa á tímum COVID-19 - veggspjald

Dregið úr sýkingarhættu - veggspjald

Fjarskiptatæki (farsímar, spjald- og fartölvur) - sótthreinsun

Appendix III – List of COVID-19 scientific research projects

Published Works

1) Gudbjartsson DF, Helgason A, Jonsson H, et al. Spread of SARS-CoV-2 in the Icelandic Population. N Engl J Med. 2020;382(24):2302-2315. doi:10.1056/NEJMoa2006100 (https://pubmed.ncbi.nlm.nih.gov/32289214/)

2) Helgason, D., Eythorsson, E., Olafsdottir, L.B., Agustsson, T., Ingvarsdottir, S., Sverrirsdottir,⋯ Ingvarsson, R.F., (2020). Beating the Odds with Systematic Individualized Care: Nationwide Prospective Follow-up of all Patients with COVID-19 in Iceland. *Journal of Internal Medicine*. https://doi.org/10.1111/joim.13135

3) Kristinsson, B., Kristinsdottir, L.B., Blondal, A.T., Thormar, K.M., Kristjansson, M., Karason, S.,⋯ Sigurdsson, M.I.,, (2020). Nationwide Incidence and Outcomes of Patients With Coronavirus Disease 2019 Requiring Intensive Care in Iceland. *Critical Care Medicine*. doi:10.1097/CCM.0000000000004582

4) Eythorsson, E., Helgason, D., Ingvarsson, R.F., Bjornsson, H.K., Olafsdottir, L.B., Bjarnadottir, V.,⋯ Palsson, R., (2020). The clinical spectrum of COVID-19: A population-based cohort study in Iceland. *medRxiv* 2020.08.09.20171249; doi: https://doi.org/10.1101/2020.08.09.20171249

5) Gudbjartsson D.F., Norddahl, G.L., Melsted P., Gunnarsdottir, K., Holm, H., Eythorsson, E.,⋯ Stefansson K., (2020). Humoral Immune Response to SAFS-CoV-2 in Iceland. *N Engl J Med*. doi: 10.1056/NEJMoa2026116

Works in Progress – Approved by the Health Research Ethics Committee of Landspítali – National University Hospital of Iceland

EPISODES study: Epidemiology, severity and outcomes of children presenting to emergency departments across Europe during the SARS-CoV-2 pandemic. Valtýr Stefánsson Thors, Ásgeir Haraldsson.

Hraðgreiningar á erfðaefni SARS-CoV-2 og sýklalyfjaónæmisgena. Karl G. Kristinsson

COVID-19 in pregnancy. Eva Jónasdóttir, Halla Björg Lárusdóttir, Anna Aabakke, University of Copenhagen.

Einkenni og líðan einstaklinga sem fengu COVID-19 smit á Íslandi. Helga Jónsdóttir, Brynja Ingadóttir, Sigríður Zoëga, Katrín Blöndal, Elín J. G. Hafsteinsdóttir, Lilja Þorsteinsdóttir.

Lifrarbólga tengd COVID-19: Lýðgrunduð samanburðarrannsókn. Einar Stefán Björnsson, Runólfur Pálsson, Ólafur Guðlaugsson, Már Kristjánsson, Agnar Bjarnason. (tengist VSN 20-078)

YKL-40 as a potential biomarker for Covid-19 induced inflammation disorder. Sigurður Blöndal, Hilmar Bragi Janusson, Jón M. Einarsson, Sigrún Þorleifsdóttir, Unnur Magnúsdóttir, Genís.

Kemur meðferð með Hydroxychloroquine og-eða líftæknilyfjum gegn gigtarsjúkdómum í veg fyrir smit af völdum kórónavírus (2019-nCoV). Björn Guðbjörnsson, Aron Hjalti Björnsson, Gerður M. Gröndal, Freyja Jónsdóttir, Már Kristjánsson, Þorvarður Jón Löve.

Use of a medical device, Kerecis oral and Nasal spray, for treating the symptoms of COVID-19 via application to the naso- and oropharyngeal mucosa. Ragnar Freyr Ingvarsson, Daði Helgason, Hilmar Kjartansson, Runólfur Pálsson, Baldur Tumi Baldursson, Craig Fraser, Helga Kristín Einarsdóttir, Kerecis.

Kæfisvefn og notkun svefnöndunartækis sem áhættuþáttur fyrir alvarlegri krúnusótt (COVID-19). Gunnar Guðmundsson, Kristján Rodsk Rögnvaldsson. (tengist VSN 20-078)

Sjúkdómsframvinda COVID-19 meðal einstaklinga sem gangast undir áhættumat og umfangsmikið og skipulegt eftirlit og meðferð. Runólfur Pálsson, Magnús Gottfreðsson, Martin Ingi Sigurðsson, Ólafur Skúli Indriðason. (VSN 20-078)

COVID-19 – Ónæmissvör og einstofna mótefni gegn SARS-CoV-2 veirunni. Már Kristjánsson, Ragnar Freyr Ingvarsson, Ísleifur Ólafsson, Kári Stefánsson, Ingileif Jónsdóttir, Íslensk erfðagreining.

Faraldsfræði SARS-CoV-2 veirunnar og áhrif erfða og undirliggjandi sjúkdóma á COVID-19 sjúkdóminn sem hún veldur. Már Kristjánsson, Karl G. Kristinsson, Þórólfur Guðnason, sóttvarnalæknir, Alma Möller, landlæknir, Ingileif Jónsdóttir, Kári Stefánsson, Íslensk Erfðagreining.

Notkun gervigreindar til að áhættuflokka sjúkdómsgang COVID-19 sýkingar eftir einkennamynstri miðlað í gegnum snjallforrit. Martin Ingi Sigurðsson. Tryggvi Þorgeirsson, Lovísa Ólafsdóttir, Ragnar Freyr Ingvarsson, Sæmundur Oddsson, Ólafur Viggósson, Sidekick Health, Guðmundur Hafsteinsson.

Gjörgæslusjúklingar á Íslandi með Covid-19. Bjarki Kristinsson, Kristinn Sigvaldason, Martin Ingi Sigurðsson, Már Kristjánsson, Sigurbergur Kárason, Ásbjörn Blöndal, SAK.

The contribution of nursing to the COVID-19 outpatient clinic at Landspitali. Katrín Blöndal, Sólveig H. Sverrisdóttir, Brynja Ingadóttir, Elín Hafsteinsdóttir, Anna Hafberg, Geirný Ómarsdóttir, Erla Dögg Ragnarsdóttir, Steinunn Ingvarsdóttir and Helga Jónsdóttir.Nursing interventions provided in the COVID-19 outpatient clinic at Landspitali. Brynja Ingadóttir, Elín J.G. Hafsteinsdóttir, Katrín Blöndal, Helga Jónsdóttir. (VSN 20-078)

Clinical decision making in nursing in the COVID-19 outpatient clinic at Landspitali. Brynja Ingadóttir, Elín J.G. Hafsteinsdóttir, Katrín Blöndal, Helga Jónsdóttir (VSN 20-078).

Nursing interventions provided in the COVID-19 outpatient clinic at Landspitali. Some of the authors: Brynja Ingadóttir, Elín J.G. Hafsteinsdóttir, Katrín Blöndal, Helga Jónsdóttir (VSN 20-078).

Symptoms and well-being of individuals who became infected with the COVID-19 virus in Iceland during the outbreak period of Spring 2020. Brynja Ingadóttir, Elín J.G. Hafsteinsdóttir, Katrín Blöndal, Helga Jónsdóttir (VSN 20-078).

Nursing care for patients in isolation on hospital wards – the Infection Disease Unit and the Respiratory Medicine Ward. Marianne E. Klinke, Sigríður Heimisdóttir, Berglind Chu (VSN 20-078).

Appendix IV – Recommendations from the Farsóttanefnd

Verkefnalisti FSN/VBS 13. 05 2020 – endurskoðað og uppfært 28.08.2020

Verkefni/úrlausnarefni farsóttanefndar í samvinnu við framkvæmdastjórn	Staða/athugasemd	Flokkur
1. Endurskoða stigun spítalans á farsóttatímum og kafla um farsóttir í viðbragðsáætlun	Í sífelldri endurskoðun	Stjórnun
2. Viðbragðsstjórn á faraldurstímum sé ávallt að lágmarki skipuð aðilum skv. viðbragðsáætlun en sé sveigjanleg og taki mið af viðfangsefnum á hverjum tíma	Í gildi	Stjórnun
3. Farsóttanefnd skipuð sömu aðilum áfram (fsn ásamt GRG og VST)	Í gildi	Stjórnun
4. Ljúka húsnæðisbreytingum á A7 (tvíþætt: vinnuaðstaða og HLIU eining (verður að bíða)	Í vinnslu – HLIU eining getur ekki farið í framkvæmd fyrr en séð er fyrir einhvern enda á C19	Húsnæði
5. Áframhald framkvæmdir á stofum 11-12 á G2 (aðgengi utanfrá)	Í vinnslu, áætluð verklok byrjun okt 20	Húsnæði
6. Framkvæmdir á BH	Bíður	Húsnæði
7. Halda áfram starfsemi í Birkiborg vegna COVID smitaðra amk til áramóta	Í gangi	Framkvæmd
8. Auka strax ræstingu í almennum rýmum stofnunarinnar (snertiflataþrif) þegar sjúklingur með COVID leggst inn	Áb. SVD	Framkvæmd
9. Gera áætlun um virkjun legurýma vegna COVID	Lokið	Aðstaða
10. Gera áætlun um virkjun gjörgæslurýma vegna COVID	Lokið	Aðstaða
11. Skilgreina ábyrgð á flutningshúddum (notkun, sótthreinsun, viðhald og eftirlit) og geymslustað fyrir þau	ÓLOKIÐ	Framkvæmd
12. Tækjabúnaður veirufræðideildar	Í vinnslu	Tæki
13. Annar tækjabúnaður – gjörgæsludeildir, COVID göngudeild, legudeildir	Til staðar	Tæki

14. Öryggislager sem einnig er veltulager. Birgðastaða þarf að uppfærast við hverja afgreiðslu út af honum
   a. Skilgreina þarf lágmarksbirgðastöðu
   b. LSH þarf að bera ábyrgð á honum
   c. Geymsluhúsnæði þarf að vera undir stjórn LSH
   d. Mannskapur lagersins tilheyra LSH
   e. Pöntun úr lagernum í gegnum kerfi sem uppfærir birgðastöðu jafnóðum. Hlífðarbúnaður, handspritt og umhverfissótthreinsunarefni verði á öryggislager sem einnig verður veltulager fyrir Ísland fyrir hlífðarbúnað
   f. Lagerinn verði í húsnæði á vegum Landspítala
   g. Birgðastaða uppfærð við hverja afgreiðslu og þannig sé alltaf yfirsýn yfir stöðu lagers
   h. Sýnapinnar séu til í nægulegu magni á Landspítala fyrir allt landið til að hægt sé að bregðast við árlegum faröldrum af völdum flensu, RSV, hMPV og PIV og nokkrar umframbirgðir til að bregðast við óvæntum atburðum.
   i. Til sé nægilegt magn af hvarfefnum til að vinna þessi sýni og nokkrar umframbirgðir til að bregðast við óvæntum atburðum.
	Í vinnslu, SVD og INN/FJAR/SVL	Búnaður

15. Innlagnastjóra verði falið að halda áfram utan um öll gögn vegna innlagðra COVID sjúklinga. Hann og hagdeild (EG/AH) hafi í sameiningu tilbúna skýrslu kl. 11 alla daga á faraldurstímum. Tölur eru þá kynntar á stöðufundi spítalans kl. 11:15 og sendar SVL í framhaldi af því. FSN telur mikilvægt að gefa tölulegar upplýsingar einu sinni á sólarhring til að forðast rugling. Áfram verði á höndum tilgreindra aðila að fylgjast með andlátum og tilkynna SVL.	Er skýrt	Gögn
16. Starfsmannahjúkrunarfræðingar haldi utan um skjal vegna starfsmanna í sóttkví og einangrun, hagdeild setji þær upplýsingar inn í daglega skýrslu	Er skýrt	Gögn
17. Skráning COVID göngudeildar í Heilsugátt verði yfirfarin og tryggt að upplýsingar skili sér í sjúkraskrá sjúklinga sbr. fyrirmæli landlæknis um lágmarksskráningu vistunarupplýsinga á sjúkrahúsum (ferli)	Áb: HAG/HUT	Gögn

18. Strax þegar ljóst að nýr faraldur er farinn af stað í samfélaginu þurfa að koma fréttir á heimasíðu um að undirbúningur sé hafinn innan LSH, FSN sé að störfum og meiri upplýsingar birtist þegar faraldrinum vindur fram og aðstæður breytast. Upplýsingagjöf þarf að vera betri – spurning um þátttöku FSN í daglegum stöðufundum, streymi frá viðbragðsstjórn, fleiri leiðir til að miðla upplýsingum – helsta gagnrýnin sem FSN hefur fengið varðar upplýsingagjöf	Sífelluverk	Upplýsingagjöf
19. Skilgreina sérstakt vefsvæði á heimasíðu LSH og safna saman þar öllum upplýsingum og fréttatilkynningar. Þetta vefsvæði er alltaf virkjað þegar farsótt geisar og er flýtileið inn á það í gegnum borða á heimasíðu LSH og aðgengilegt á ytri og innri vef.	Vefsvæði er til – notast áfram fyrir C19, módel fyrir nýjan faraldur	Upplýsingagjöf
20. Um leið og spítalinn fer á hættustig vegna faraldurs skal viðbragðsstjórn/farsóttanefnd gefa út daglegar tilkynningar sem birtast á miðlum Landspítala. Þá mætti skoða að gera fréttir með reglubundnum hætti (t.d. annan hvern dag) um stöðu mála, breytingar á starfsemi, framvindu faraldursins, nýjar leiðbeiningar o.s.frv.	Í vinnslu	Upplýsingagjöf
21. Skjalfesta verklag við smitrakningu innan Landspítala og verkaskiptingu við rakningateymi almannavarna	Lokið	Framkvæmd
22. Non COVID flæði sjúklinga – áætlun tiltæk, sömu ábyrgðarmenn	Lokið	Framkvæmd
23. COVID gæðahandbók sé virk og uppfærð – myndar þannig stóran hluta hinnar raunverulegu farsóttaáætlunar þegar farsóttin er komin.	Í gildi	Framkvæmd
24. Snertilaus innstimplun alls staðar	Póstur til JHF 28.08	Aðstaða
25. Sjálfvirk hurðaropnun	Póstur til JHF 28.08.	Aðstaða
26. Aðgangsstýring alls staðar	Í vinnslu	Aðstaða