

Pandemic changes in healthcare utilisation: a protocol for a systematic review

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BACKGROUND

As the covid-19 pandemic continues, increasing numbers of studies are reporting major changes in utilisation of healthcare services, including large drops in services during certain periods,¹⁻³ as well as some increases, such as the use of telemedicine.⁴ While many people have missed much needed care, such as vaccination or life-saving interventions,² others may be avoiding unnecessary or inappropriate care which would have caused them more harm than good.³ A large and growing evidence base suggests the problem of too much medicine is widespread, including low value care which may carry no benefit, and overdiagnosis, which can cause more harm than good.⁵⁻¹¹ Multiple global campaigns are attempting to address this challenge, such as Choosing Wisely, which is active in more than 20 nations.¹² As nations are forced to do more with less, post-pandemic, learning from this “natural experiment” in less care may help health systems address the challenges of unnecessary care, and move towards more sustainability.^{13,14}

Understanding the impact of these large changes in healthcare utilisation, on health outcomes and costs, will present a great methodological challenge. First, there are many

¹ non-first/last authors are indicative order only

reasons why people have missed care, including fear of visiting hospitals during the pandemic, inability to visit due to lockdown circumstances, or the unavailability of a service such as suspended elective surgery. Second, disentangling those groups who have missed needed care, from those who have avoided unnecessary care, will require sensitive and sophisticated analysis, considering multiple potentially confounding variables. Moreover, simply showing no adverse outcomes from missed care – such as a missed visit to a general practitioner – does not automatically mean that episode of missed care was unnecessary. Notwithstanding these challenges, understanding the unprecedented recent changes in utilisation and their impact, may help health systems, and the societies which fund them, optimise resource-use post-pandemic.

As a first step to that understanding, we aim to conduct a systematic review of studies which have reported on pandemic-induced changes in healthcare utilisation. We aim to examine the extent and nature of changes, particularly any reported changes in the severity of symptoms of people seeking or receiving care.³ The broader purpose is to inform any future investigations of the impact of this natural experiment in less care on health outcomes and costs.

METHODS

We aim to find, appraise, and synthesise studies that assessed the impact of the covid-19 pandemic on the utilisation of healthcare services, compared to a corresponding period of time prior to the pandemic. This systematic review will be reported following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement.¹⁵ The review protocol was developed prospectively and was registered on the Open Science Framework (<https://osf.io/>) and on Prospero (<https://www.crd.york.ac.uk/prospero/>). We will also follow the “2 week systematic review” (2weekSR) processes for this review.¹⁶ In relation to the PICO for this systematic review, the P will be a population of people seeking or using a service within the healthcare system, the I will be the pandemic period as defined by primary study authors, the C will be a comparable period at least one year prior to the study period, and the O will be change in utilisation (primary outcome) and change in disease severity of the people using the service, (secondary outcome).

Studies to be included

Population

We will include studies that report changes in the utilisation of healthcare services by patients and public, irrespective of age. We will exclude studies that reported on the utilisation of healthcare services by patients diagnosed with covid-19.

Interventions and Comparators

We will include studies which compare utilisation during any period within the pandemic, with a similar period in at least one year before the pandemic. We will therefore include studies which compare – for example – April 2019 utilisation with April 2020 utilisation, but due to concerns about reliable comparisons, we will exclude studies which use the immediate pre-pandemic period as a comparator, (e.g. November 2019). We will include studies which report data from national or regional sources, of more than one centre, so we will exclude studies within a single unit or single hospital, due to limitations on

generalisability.

Outcomes

The primary outcome is the extent of changes in utilisation of a healthcare service between the pre-pandemic comparison period and the pandemic period. Healthcare service will include but not be limited to *consultation healthcare services* such as presentations or admissions to hospitals or visits to primary care; *diagnostic healthcare services* such as diagnostic imaging/investigations, laboratory testing; and *therapeutic or preventive healthcare services* such as prescriptions, or surgeries or utilisation of vaccinations. These healthcare services can be broad and may include packages of, rather than single isolated, healthcare services. Therefore, in the case of a broad package, the primary outcome for the purposes of our review will be the initial indication for the healthcare services utilisation, if that data is available in the primary study, (e.g. admission due to a stroke is an initial indication for a subsequent series of healthcare services including diagnostic investigations and therapeutic services).

The secondary outcome is the nature of the changes in relation to the people using the service, specifically changes in disease severity or diagnostic spectrum, (e.g. any changes in proportions of patients with mild or severe illness).

We will exclude studies which report utilisation for a time period less than one week in duration, because of the brevity of the time period, and the possibility of differences on different days of the week. We will exclude studies which do not include data on changes in routine healthcare utilisation, but rather only describe changes in healthcare processes, incidence/prevalence of conditions/diseases only, the nature of new practices, or the impacts of covid-19 on individual patients. We will exclude non-medical allied health services.

Study design

We will include any observational studies using clinical, hospital or health system administrative data and/or medical records reporting utilisation in a period after the pandemic was declared, and at least one corresponding period in the years prior to the pandemic. This will include before-after studies and interrupted time series studies. We will exclude surveys of healthcare practitioners, cross-sectional studies, any trials, or studies using modelling to predict impacts on utilisation.

Rational for selection and prioritisation of outcomes

We selected and prioritised the outcomes based on (i) a review of the outcomes reported in a sample of potentially included studies collected before the Systematic Review by 2 review authors (RM, LA); (ii) a discussion among the whole review team, which includes clinical advisors, methodological experts, and a patient and public (consumer) representative. Primary and secondary outcomes directly address the Systematic Review question, which is investigating the extent and nature of changes in healthcare utilisation due to the pandemic.

Search strategies to identify studies

Database search strings

We will search PubMed, Embase and the Cochrane COVID-19 Study Register and pre-print servers via Europe PMC, from inception until Monday 10th August, 2020, with an update close to date of submission. We designed a search string in PubMed that included the following concepts: Covid-19 AND Health services AND Admissions AND Impact. This search string was translated for use in other databases using the Polyglot Search Translator.¹⁷ The complete search strings for all databases are provided in Appendix 1.

Restriction on publication type

No restrictions by language or publication date will be imposed. We will include publications that were published in full, as well as letters, or pre-prints, where data on the primary outcome is sufficient for data extraction. We will seek expert advice on the existence of other public reports unavailable in peer-reviewed journals and they will be included if all inclusion criteria are met.

Other searches

We will conduct a backwards (cited) and forwards (citing) citation analysis in Scopus/Web of Science on the included studies identified by the database searches, and these will be screened against the inclusion criteria.

Study selection and screening

Pairs of review authors [RM, SS, ZM, AS, JC, EK, ET, LA] will independently screen the titles and abstracts in Endnote for inclusion against the inclusion criteria. One review author [JC] will retrieve full-text, and pairs of authors [RM, SS, ZM, AS, JC, EK, ET, LA] will screen the full-texts for inclusion. Any screening disagreements will be resolved by discussion, or reference to a third author [RM or LA]. The selection process will be recorded in sufficient detail to complete a PRISMA flow diagram and a list of excluded (full-text) studies with reasons for exclusions. A list of studies in single-centres, excluded at title and abstract screening stage, but which otherwise meet inclusion criteria, will be recorded and made available on request from authors.

Data extraction

We will develop and use a data extraction form for study characteristics and outcome data, which will be piloted on 2-3 studies in the review. Pairs of authors [RM, SS, ZM, AS, LA, EK, ET] will independently extract the following data from included studies, resolve discrepancies and refer any unresolved to a third author [LA, RM]:

1. Methods: study authors, location, nature of service, period and length of study, period of comparator/s, disease (if applicable), and whether the changes in utilised services were likely due to them being omitted, delayed (or unclear).
2. Primary Outcome(s): percentage change in utilisation of health services and 95% CI, in pre and pandemic periods, and changes in absolute numbers of utilization, where data allow for calculation of percentage of change and 95% CI. In relation to the earlier point about packages of care, including care which flows from an initial indication or admission, when the data permits, we will consider the initial indication for the healthcare services utilisation as our primary outcome.

3. Secondary Outcome(s): change in the nature/characteristics of the users of health services (e.g. disease severity; disease spectrum/mix, or diagnostic yield; admissions to acute care)

Assessment of risk of bias in included studies

Pairs of review authors [RM, SS, ZM, AS, LA, EK, ET] will independently assess the risk of bias for each included study. We will use a modification of two risk of bias tools designed to assess before-after studies and interrupted time series analyses, the ROBINS-I tool¹⁸⁻¹⁹ and a tool developed by the Cochrane EPOC group.²⁰ All disagreements will be resolved by discussion or by referring to a third author [RM, LA, AS, SS]. The following domains will be assessed:

1. Bias due to confounding (extraneous events)
2. Bias due to confounding (pre-intervention trends)
3. Bias in selection of participants
4. Bias due to missing data
5. Bias in measurement of the outcome
6. Bias in selection of reported result

Each potential source of bias will be graded as low, high or unclear, and each judgement was supported by a quote from the relevant trial. If secondary review outcomes require specific assessment on risk of bias domains this will be identified during further testing of the tool. Assessments of risk of bias will be presented for individual studies and across studies and will be incorporated into the results of the systematic review.

Data synthesis

We anticipate a wide heterogeneity in the population, settings, outcome measures, and methods used in the included studies, such that we do not expect to be able to perform a formal quantitative synthesis, i.e. a meta-analysis. Therefore, we plan to summarise the results narratively by using descriptive statistics, graphical figures, and a narrative synthesis. We will summarise the findings of included studies for the primary outcome grouped by service types: e.g. visits/admissions/consultations; diagnostic investigations; therapeutic/preventive interventions. If further sub-categorisation is needed, it will be by service locations: e.g. emergency department; primary care; and/or service specialty e.g. cardiology. We will calculate the mean difference and 95% confidence intervals for the change in the primary outcomes for each included study as appropriate.

If there is a sufficient number of sufficiently similar studies with acceptable levels of heterogeneity, and the data enable it, we would then aim to conduct a meta-analysis. In that case, we will use a random-effects model as the default to incorporate the assumption of heterogeneity between studies. We will evaluate statistical heterogeneity using both Chi^2 test (i.e. P value less than 0.10 was considered to be statistically significant heterogeneity) and the I^2 statistic (i.e. I^2 value of 0-40% was considered to be low heterogeneity, 40-60% moderate heterogeneity, 60-90% substantial heterogeneity, over 90% to be considerable heterogeneity).¹⁹

We anticipate that reporting of the secondary outcomes in each of the included studies will likely be expressed in a multitude of ways, specific to each study setting, disease category, patient population and category of utilisation. However, we will aim, if possible, to develop different categories for reporting of secondary outcomes.

Data Management

We will manage data using Endnote files, word documents and excel spreadsheets.

Dealing with missing data

If any primary studies only include changes as proportions, but do not include changes in absolute numbers of services, we will contact investigators or study sponsors to provide missing data.

Subgroup and sensitivity analyses

If there is a sufficient number of sufficiently similar studies with acceptable levels of heterogeneity to quantitatively synthesise the results, and the data enable it, we aim to conduct a sensitivity analysis (i) including only studies at an overall low risk of bias (eg low risk of bias in at least four of the six domains or interrupted time series studies vs pre-post pandemic studies); and (ii) including studies of longer duration (eg >6 weeks).

Assessment of reporting or publication biases

We plan to consider the possibility of the presence of reporting and/or publication bias and will take into account its likely influence when interpreting the review findings. If ten or more studies are included in a meta-analysis, we plan to examine the possibility of publication or small study bias using funnel plots.¹⁹

Additional analyses

We considered a range of analyses to explore correlations between study outcomes and other potentially relevant variables available outside the study data, such as nation-specific data about the stage of lockdown in the host nation at the time of the primary study. However, due to complexities in the large number of variables and potential discrepancies between official policy on restrictions and actual behaviour of people, as well as complex variation in the behaviours of different entities within the healthcare systems across the world, we decided, at protocol stage, to restrict our analysis to data within the publications.

Registration

We will register this protocol in the Open Science Framework, and in Prospero.

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APPENDIX 1 – DATABASE SEARCH STRINGS

PubMed

("COVID-19"[Supplementary Concept] OR "COVID-19"[tiab] OR COVID19[tiab] OR "COVID 19"[tiab] OR "SARS-CoV-2"[tiab] OR "2019-nCoV"[tiab] OR "Novel coronavirus"[tiab] OR "Coronavirus 2019"[tiab] OR "Coronavirus 19"[tiab] OR "COVID 2019"[tiab] OR "2019 nCoV"[tiab] OR "Wuhan coronavirus"[tiab])
 AND
 (((Pandemic[ti] OR Pandemics[ti] OR Outbreak[ti] OR Outbreaks[ti] OR Hospital[ti] OR Hospitals[ti] OR Emergency[ti] OR Surgery[ti] OR Surgical[ti] OR Department[ti] OR Departments[ti] OR Unit[ti] OR Units[ti] OR Clinic[ti] OR Clinics[ti] OR "Primary care"[ti])
 AND
 (Admission[ti] OR Admissions[ti] OR Visit[ti] OR Visits[ti] OR Attendance[ti] OR Attending[ti] OR Activity[ti] OR Utilization[ti] OR Utilisation[ti] OR Impact[ti] OR Impacts[ti] OR Reduction[ti] OR Reductions[ti] OR Decrease[ti] OR Decreases[ti] OR Decreased[ti] OR Decline[ti] OR Declines[ti] OR Change[ti] OR Changes[ti] OR Increase[ti] OR Increases[ti] OR Increased[ti]))
 OR
 ((Pandemic[tiab] OR Pandemics[tiab] OR Outbreak[tiab] OR Outbreaks[tiab])
 AND
 (((Hospital[tiab] OR Hospitals[tiab] OR Emergency[tiab] OR Surgery[tiab] OR Surgical[tiab] OR Department[tiab] OR Departments[tiab] OR Unit[tiab] OR Units[tiab] OR Clinic[tiab] OR Clinics[tiab] OR "Primary care"[tiab] OR Telemedicine[tiab] OR Telehealth[tiab])
 AND
 (Admission[tiab] OR Admissions[tiab] OR Visit[tiab] OR Visits[tiab] OR Attendance[tiab] OR Attending[tiab] OR Activity[tiab] OR Utilization[tiab] OR Utilisation[tiab]))
 OR
 (Prescriptions[tiab] OR Prescribed[tiab] OR Vaccinations[tiab] OR Imaging[tiab] OR Scans[tiab] OR Endoscopy[tiab] OR Endoscopic[tiab] OR Endoscopies[tiab]))
 AND
 (Impact[tiab] OR Impacts[tiab] OR Reduction[tiab] OR Reductions[tiab] OR Decrease[tiab] OR Decreases[tiab] OR Decreased[tiab] OR Decline[tiab] OR Declines[tiab] OR Changes[tiab] OR Increase[tiab] OR Increases[tiab] OR Increased[tiab])))

Embase (via Elsevier)

('coronavirus disease 2019'/exp OR COVID-19:ti,ab OR COVID19:ti,ab OR "COVID 19":ti,ab OR SARS-CoV-2:ti,ab OR 2019-nCoV:ti,ab OR "Novel coronavirus":ti,ab OR "Coronavirus 2019":ti,ab OR "Coronavirus 19":ti,ab OR "COVID 2019":ti,ab OR "2019 nCoV":ti,ab OR "Wuhan coronavirus":ti,ab)
 AND
 (((Pandemic:ti OR Pandemics:ti OR Outbreak:ti OR Outbreaks:ti OR Hospital:ti OR Hospitals:ti OR Emergency:ti OR Surgery:ti OR Surgical:ti OR Department:ti OR Departments:ti OR Unit:ti OR Units:ti OR Clinic:ti OR Clinics:ti OR "Primary care":ti)
 AND
 (Admission:ti OR Admissions:ti OR Visit:ti OR Visits:ti OR Attendance:ti OR Attending:ti OR Activity:ti OR Utilization:ti OR Utilisation:ti OR Impact:ti OR Impacts:ti OR Reduction:ti OR Reductions:ti OR Decrease:ti OR Decreases:ti OR Decreased:ti OR Decline:ti OR Declines:ti OR Change:ti OR Changes:ti

OR Increase:ti OR Increases:ti OR Increased:ti))
 OR
 ((Pandemic:ti,ab OR Pandemics:ti,ab OR Outbreak:ti,ab OR Outbreaks:ti,ab)
 AND
 (((Hospital:ti,ab OR Hospitals:ti,ab OR Emergency:ti,ab OR Surgery:ti,ab OR Surgical:ti,ab OR
 Department:ti,ab OR Departments:ti,ab OR Unit:ti,ab OR Units:ti,ab OR Clinic:ti,ab OR Clinics:ti,ab
 OR "Primary care":ti,ab OR Telemedicine:ti,ab OR Telehealth:ti,ab)
 AND
 (Admission:ti,ab OR Admissions:ti,ab OR Visit:ti,ab OR Visits:ti,ab OR Attendance:ti,ab OR
 Attending:ti,ab OR Activity:ti,ab OR Utilization:ti,ab OR Utilisation:ti,ab))
 OR
 (Prescriptions:ti,ab OR Prescribed:ti,ab OR Vaccinations:ti,ab OR Imaging:ti,ab OR Scans:ti,ab OR
 Endoscopy:ti,ab OR Endoscopic:ti,ab OR Endoscopies:ti,ab))
 AND
 (Impact:ti,ab OR Impacts:ti,ab OR Reduction:ti,ab OR Reductions:ti,ab OR Decrease:ti,ab OR
 Decreases:ti,ab OR Decreased:ti,ab OR Decline:ti,ab OR Declines:ti,ab OR Changes:ti,ab OR
 Increase:ti,ab OR Increases:ti,ab OR Increased:ti,ab)))

Cochrane COVID-19 Study Register

Pandemic OR Pandemics OR Outbreak OR Outbreaks
 AND
 (Hospital OR Hospitals OR Emergency OR Surgery OR Surgical OR Department OR Departments OR
 Unit OR Units OR Clinic OR Clinics OR "Primary care" OR Telemedicine OR Telehealth)
 AND
 (Admission OR Admissions OR Visit OR Visits OR Attendance OR Attending OR Activity OR Utilization
 OR Utilisation OR Prescriptions OR Prescribed OR Vaccinations OR Imaging OR Scans OR Endoscopy
 OR Endoscopic OR Endoscopies)
 AND
 (Impact OR Impacts OR Reduction OR Reductions OR Decrease OR Decreases OR Decreased OR
 Decline OR Declines OR Changes OR Increase OR Increases OR Increased)

Europe PMC preprints

(COVID-19 OR COVID19 OR "COVID 19" OR SARS-CoV-2 OR 2019-nCoV OR "Novel coronavirus" OR
 "Coronavirus 2019" OR "Coronavirus 19" OR "COVID 2019" OR "2019 ncov" OR "Wuhan
 coronavirus")
 AND
 (Pandemic[ti] OR Pandemics[ti] OR Outbreak[ti] OR Outbreaks[ti])
 AND
 (Hospital OR Hospitals OR Emergency OR Surgery OR Surgical OR Department OR Departments OR
 Unit OR Units OR Clinic OR Clinics OR "Primary care" OR Telemedicine OR Telehealth)
 AND
 (Admission OR Admissions OR Visit OR Visits OR Attendance OR Attending OR Activity OR Utilization
 OR Utilisation OR Prescriptions OR Prescribed OR Vaccinations OR Imaging OR Scans OR Endoscopy
 OR Endoscopic OR Endoscopies)
 AND
 (Impact OR Impacts OR Reduction OR Reductions OR Decrease OR Decreases OR Decreased OR
 Decline OR Declines OR Changes OR Increase OR Increases OR Increased)