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Use of chest CT for diagnosis of SARS-CoV-2 infection in preoperative patients - A rapid review of the evidence

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COVID19 Canberra Health Service and ANU College of Health and Medicine – Use of CT for diagnosis in preoperative patients

LKIRK, 10 April 2020

Acronyms:

- CFR: case fatality rate, ARDS: acute respiratory distress syndrome, ICU: intensive care unit, WHO: World Health Organization, CDNA: Communicable Diseases Network Australia, PPE: Personal protective equipment, HCW: Healthcare worker, IMV: invasive mechanical ventilation, NIV: non-invasive ventilation, HFNC: high-flow nasal cannula, PP: prone position

Summary:

- *This summary provides information from current international guidelines regarding use of CT for diagnosis of SARS-CoV-2 infection, particularly in pre-operative patients, and in contrast to rt-PCT. It does not intend to cover typical CT findings of COVID19 patients, or the use of CT for stratification of disease severity, or monitoring of disease progression in a known case. It also provides some insight into if pre-operative testing is recommended or required in all cases.*
- **Should we test all pre-operative patients for COVID-19?**
 - o **At this stage, NO** – we should *not* screen all pre-operative patients for COVID-19
 - o Isolate and test if the patient meets the definition for a probable or suspect case, or if there is high clinical suspicion
 - Consider clinical presentation and epidemiological risk factors (see current version of the CDNA SoNG for more info)
- **If I am wanting to test a patient for COVID-19, should I use CT or RT-PCR?**
 - o It is recommended that CT should NOT be routinely used for screening or diagnosis of COVID19 → for assessing complications in positive cases
 - o If time permits, a PCR is more appropriate
 - o If there is high clinical suspicion and information is needed urgently, this may be appropriate → discuss with radiology
 - However, a normal chest CT cannot rule out COVID19 – particularly in the pre-symptomatic or first few days of symptom onset
 - And an abnormal chest CT does not necessarily mean it is due to COVID19
- **If a patient tests positive for COVID-19, what next?**
 - o Follow college and local guidelines and advice regarding if surgical intervention is required, and if it is required immediately
 - o If surgery is required, ensure local infection prevention protocols are followed
 - o There is some evidence for viral RNA being found in blood and GIT secretions, however, it appears as though these are non-infectious
 - Treat any procedure requiring laparoscopy, high speed tools, or electrocautery as an AGP → AEROSOL PROCAUTIONS
- **Other considerations?**
 - o Some guidelines in the UK do recommend that determining patient COVID19 status before operating is important, other systems are treating all AGPs as though the patient has COVID19 (ie. Intubation in all patient requiring airborne precautions), particularly for high risk groups (eg. ENT, anaesthetics, maxillofacial)
 - o ANZCA is working with CICM, ANZICS, ACEM, ASA and AHPPC to create a consensus statement on the appropriate use of PPE

SOURCE	SUMMARY
<p>03/04/20, Guideline: National COVID-19 Living Guidelines¹ https://covid19evidence.net.au/#living-guidelines</p>	<ul style="list-style-type: none"> - Does not currently cover diagnosis
<p>11/03/20, Position statement, RANZCR: COVID19 essential role of clinical radiology services² https://www.ranzcr.com/college/document-library/position-statement-covid19-essential-role-of-clinical-radiology-services</p>	<ul style="list-style-type: none"> - Dictates that in the setting of COVID19, imaging should be used to: <ul style="list-style-type: none"> o “Evaluate disease severity and assess for complications” o “Aid in distinguishing COVID19 from other causes of similar symptoms such as community-acquired lobar pneumonia, malignancy, pneumothorax and pulmonary embolism”
<p>11/03/20, Position statement, Society of Thoracic Radiology: STR/ASER COVID-19 Position Statement³ https://thoracicrad.org</p>	<ul style="list-style-type: none"> - Direct quote of the statement: “At this time, the STR and ASER do NOT recommend routine CT screening for the diagnosis of patients under investigation for COVID-19.” - “Chest CT can be restricted to patients <u>who test positive for COVID-19</u> and <u>who are suspected of having complicating features such as abscess or empyema.</u>”
<p>27/03/20, Position statement (UK): Royal College of Radiologists position on the role of CT in patients suspected with COVID-19 infection⁴ https://www.rcr.ac.uk/college/coronavirus-covid-19-what-rcr-doing/rcr-position-role-ct-patients-suspected-covid-19</p>	<ul style="list-style-type: none"> - 12/03/20: “Our view is that there is no current role for CT in the diagnostic assessment of patients with suspected coronavirus infection in the UK” <ul style="list-style-type: none"> o However, “CT does have a well-established role in the assessment of patients presenting with severe respiratory distress...” o “The CT appearances alone will NOT obviate the need for viral testing and should NOT be viewed as equivalent to or replacing this.” - 27/03/20: In response to the UK surgical Royal Colleges guidelines on COVID19 <ul style="list-style-type: none"> o “The use of additional CT to assess for the presence of likely COVID-19 infection may have a role in stratifying risk in patients presenting acutely and requiring a CT abdomen, particularly those needing emergency surgery.” o “However, a negative scan would not exclude COVID19 infection.”
<p>22/03/20, Position statement (US): American College of Radiology Recommendations for the use of Chest Radiography and Computed Tomography (CT) for suspected COVID-19 infection⁵ https://www.acr.org/Advocacy-and-Economics/ACR-Position-Statements/Recommendations-for-Chest-Radiography-and-CT-for-Suspected-COVID19-Infection</p>	<ul style="list-style-type: none"> - ACR recommends: <ul style="list-style-type: none"> o “CT should not be used to screen for, or as a first-line test to diagnose COVID-19” o “CT should be used sparingly and reserved for hospitalised, symptomatic patients with specific clinical indications for CT.” - <i>Update on 22/03/20:</i> <ul style="list-style-type: none"> o “As an interim measure, until more widespread COVID-19 testing is available, some medical practices are requesting chest CT to inform decisions on whether to test a patient for COVID-19, admit a patient or provide other treatment. The ACR strongly urges caution in taking this approach. A normal chest CT does not mean a person does not have COVID-19 infection - and an abnormal CT is not specific for COVID-19

diagnosis. A normal CT should not dissuade a patient from being quarantined or provided other clinically indicated treatment when otherwise medically appropriate. Clearly, locally constrained resources may be a factor in such decision making.”

26/03/20, Position statement (Canada): **Canadian Society of Thoracic Radiology and the Canadian Association of Radiologists' Statement on COVID19**⁶
<https://car.ca/news/canadian-society-of-thoracic-radiology-and-canadian-association-of-radiologists-statement-on-covid-19/>

- **“A normal chest CT scan cannot exclude the diagnosis of COVID19”**
- Recommend against the use of routine chest CT for screening, diagnosis and surveillance of COVID-19
- Recommend use of CT if confirmed COVID19 and may have developed complications such as abscess or empyema

27/02/20, Editorial/review: **Essentials for radiologists on COVID-19: An update – Radiology Scientific Panel**⁷
<https://pubs.rsna.org/doi/10.1148/radiol.2020200527>

- *Does not add new information – cites other articles listed here but gives nice summary*
 - o ~50% of patients with COVID19 may have normal CT scans in days 0-2 after onset of symptoms

25/03/20, Special report/review: **Radiological Society of North America Expert Consensus Statement on Reporting Chest CT Findings Related to COVID-19**⁸
<https://pubs.rsna.org/doi/10.1148/ryct.2020200152>

- Acknowledges that a slight majority of patients had a negative CT during the first two days of Sx onset
 - o Therefore, a negative CT should not be used to exclude COVID-19 in the early stages of disease
 - o Reported sensitivity (60-98%) and specificity (25-53%) can vary wildly
 - o A relatively low negative predictive value suggests CT may not be a useful screening test for COVID-19
 - o Do not currently recommend use of CT screening for COVID-19 pneumonia

28/03/20, Preprint: **Application and optimization of RT-PCR in diagnosis of SARS-CoV-2 infection**⁹
<https://www.medrxiv.org/content/10.1101/2020.02.25.20027755v2>

- *Analysis of 87 confirmed COVID-19 cases, looking at the accuracy of a pharyngeal RT-PCR, and CT*
- RT-PCR → sensitivity 78.2%
- CT alone → sensitivity 66.7%
- RT-PCR and CT together → sensitivity 91.9%
- 34 cases had inconsistent results → 94% of those were mild infection
 - o With 62.5% of those having a positive RT-PCR
- *Study difficult to interpret and quality difficult to assess due to poorly written English*

20/02/20, Research article: **Chest CT findings in Coronavirus Disease-19 (COVID-19): Relationship to duration of infection**¹⁰
<https://pubs.rsna.org/doi/10.1148/radiol.2020200463>

- *Retrospective review of chest CTs of 121 symptomatic COVID19 patients (previously confirmed by rRT-PCR)*
- All patients had a positive RT-PCR at some point during the course of disease
- Patients were subdivided into when they first presented → rate of initial PCR+
 - o For patients presenting within 0-2 days since symptom onset: 92% initially PCR+
 - o 3-5 days since symptom onset: 85% initially PCR+
 - o 6-12 days since symptom onset: 92% initially PCR+
- Below is the rate of having a *normal* CT scan, subdivided by time since symptom onset:
 - o 0-2 days since symptom onset: 56%
 - o 3-5 days: 9%

26/02/20, Article: **Correlation of Chest CT and RT-PCR testing in Coronavirus Disease 2019 (COVID-19) in China: A report of 1014 cases**¹¹

<https://pubs.rsna.org/doi/10.1148/radiol.2020200642>

- 6-12 days: 4%
- **“Chest CT therefore has limited sensitivity and negative. Predictive value early before symptom onset, and is thereby unlikely a reliable standalone tool to rule out. COVID-19 infection.”**
- The longer the time after symptom onset, the increased frequency of CT findings

- *Analysis of RT-PCR (throat swab) and chest CT of 1014 patients suspected to have COVID-19 in Wuhan, China*
- Two radiologists independently reviewed the chest CTs, blind of the PCR results
- **59% of patients had a positive RT-PCR, whilst 88% had a positive CT scan for characteristics of COVID-19**
 - 580 (57% of total) patients → positive RT-PCR and positive CT
 - 308 (30%) → negative RT-PCR and positive CT
 - 21 (2%) → positive RT-PCR and negative CT
 - 105 (11%) → negative RT-PCR and neg CT
- **In patients with neg PCR, 75% had pos chest CT findings → 48% considered highly likely, 33% probably cases**
- With PCR as standard, calculated sensitivity of chest CT was 97% (95CI,95-98), but a specificity of 25% (22-30)
- Mean interval time between initial negative to positive PCR was 5.1 +/- 1.5 days
- The sensitivity of this study was higher than previously found
 - **“Patients were in the largest hospital in Wuhan, and radiologists may have been more likely to make a diagnosis of COVID-19 when typical CT features were found”**
 - Article considers that there is overlap between COVID-19 findings and other types of viral pneumonia, and that those who had a negative PCR, but a positive CT, may have been false positives
 - **ie. Sensitivity overestimated**

26/03/20, Letter: **CT screening for early diagnosis of SARS-CoV-2 infection**¹²

[https://www.thelancet.com/journals/laninf/article/PIIS1473-3099\(20\)30241-3/fulltext](https://www.thelancet.com/journals/laninf/article/PIIS1473-3099(20)30241-3/fulltext)

- “However, from an epidemiological perspective, interpretation of CT for early identification of SARS-CoV-2 infection needs to be done with caution.”
- Points out that many of the studies do not include suspected cases that were SARS-CoV-2 negative on PCR, and that some studies have shown that a proportion of asymptomatic patients will have a positive PCR before a positive CT.
- “Therefore, we have adequate reason to doubt whether CT is suitable for screening asymptomatic infections.”
- “... the use of CT for screening and diagnosing COVID-19 might have disproportionate risk-benefit ratio.”
 - Increased radiation exposure
 - Difficult to properly disinfect the CT scanner and can be a cause of cross-infection

01/04/20, Comment: **COVID-19 pneumonia: what has CT taught us?**¹³

[https://www.thelancet.com/journals/laninf/article/PIIS1473-3099\(20\)30134-1/fulltext](https://www.thelancet.com/journals/laninf/article/PIIS1473-3099(20)30134-1/fulltext)

- Whilst some studies have shown early CT changes in asymptomatic and presymptomatic patients, other studies have shown positive RT-PCR in patients with normal CT.
- Could be used as a screening tool together with RT-PCR if a patient has a high epi risk
 - CT may be particularly important in cases where there is high clinical suspicion, but PCR is negative

27/03/20, Guidance statement: **Intercollegiate General Surgery Guidance on COVID-19 UPDATE**¹⁴

<https://www.rcsed.ac.uk/news-public-affairs/news/2020/march/intercollegiate-general-surgery-guidance-on-covid-19-update>

- “Consider COVID19 infection possible in every patient. We must follow guidelines and also apply common sense to at risk clinical environments.”
- 1. Acute patients are priority → COVID-19 status should be sought for any patient needing emergency surgery
 - Use: history, COVID19 test results, chest CT within the last 24hrs, or CXR
 - All patients undergoing an abdo CT should also have a chest CT
 - “Current tests for COVID19 may be false negative”
- 2. Patients for urgent planned surgery should be assessed for COVID19 as above
- 3. All theatre staff should use PPE for all operations under GA
 - Infection control practices should be according to local and national protocol based on patient risk
 - “When COVID19 status is positive or uncertain, international experience recommends full PPE be used for laparotomy”
- 4. “Laparoscopy is considered to carry some risks of aerosol-type formation and infection and considerable caution is advised. The level of risk has not been clearly defined and it is likely that the level of PPE deployed may be important.”
 - Consider laparoscopy only in individual cases where clinical benefit exceeds potential viral transmission
 - Consider non-operative management when possible and appropriate
- 5. In theatres:
 - Minimum number of staff
 - Appropriate PPE for all staff in theatres dependent on role and risk
 - Smoke evacuation for diathermy
 - Allowing for prolonged procedures and change-overs due to full PPE
 - Higher risk patients should be intubated and extubated in theatre – minimal staff present
- 6. Emergency endoscopy only → no diagnostic work, upper GI work is high risk AGPs and full PPE must be used
- 7. Consider COVID19 in other situations and act accordingly
 - Can present with GI symptoms, and consider if a post-op complication is COVID19

01/04/20, American College of Surgeons, Guidance statement: **COVID-19 – Considerations for optimum surgeon protection before, during and after operation**¹⁵

<https://www.facs.org/covid-19/clinical-guidance/surgeon-protection>

- “N95 respirators or respirators that offer a higher level of protection should be used when performing or present for an aerosol-generating procedure in COVID-19 or suspected infected patient.”
- Published PPE recommendations from The University of Kansas Health System (last updated 30/03/20)
 - Patient no suspected for COVID19 → surgical mask
 - Patient suspected or positive for COVID19 → as per droplet and contact precautions
 - Patient suspected or positive for COVID19 AND airway procedures on all patients → airborne

03/04/20, CDC, Clinical guideline: **Interim Clinical Guidance for Management of Patients with Confirmed Coronavirus Disease (COVID-19)**¹⁶

- *Only information regarding CT is presented here*
- “Because this chest CT imaging pattern. Is non-specific and overlaps with other infections, the diagnostic value of chest CT imaging may be low and dependent upon interpretations from individual radiologists.”

<https://www.cdc.gov/coronavirus/2019-ncov/hcp/clinical-guidance-management-patients.html>

20/03/20, Guidance statement: **Guidance for ENT surgeons during the COVID-19 pandemic**¹⁷

<http://www.asohns.org.au/about-us/news-and-announcements/latest-news?article=78>

Date unknown, Accepted preprint: **Protecting surgical teams during the COVID-19 outbreak: A narrative review and clinical considerations**¹⁸

27/03/20, Australian Society of Anaesthetists, Guideline: **Staff Safety Guideline Summary**¹⁹

<https://asa.org.au/covid-19-updates/>

- **“Given the variability in chest imaging findings, chest radiograph or CT alone is not recommended for the diagnosis of COVID-19.”**
- Otolaryngologists are a high-risk group for COVID-19 infection
- Reports **“current US advice is that pre-operative COVID19 status should be prioritised for all procedures involving the upper and lower respiratory tract, and eventually all patients requiring endo tracheal intubation.”**
- “Elective airway surgery patients should be tested for COVID-19, where and when available, and should be shown to be negative before proceeding...”
 - o This includes: sinonasal, nasopharyngeal, oropharyngeal, laryngeal and tracheal surgery
- Postpone cases in patients: COVID19 positive, recent travel history, any potential symptoms of COVID19, or if any COVID19 contacts
- **“The highest regime for PPE for negative COVID-19 tested patients would be a fluid resistant surgical mask, single-use impermeable disposable gown, gloves and eye. Protection if blood or body fluid contamination to the eyes or face is anticipated.”**
- **“P2/N95 masks are recommended for COVID-19 positive patients/suspected positive patients requiring AGP**
 - o AGP includes intubation, open suctioning, tracheostomy, high speed drilling, bronchoscopy
- Notes that viral particles have been found in a range of body fluids including gastrointestinal tissue, blood and stool → can form aerosols and fomites and survive on surfaces for days
 - o Previous study of other viruses have found viral particles even in surgical smokes
- **1. Structured and frequent communication before key events** → bring together the whole team including security and infection control → anyone involved in getting a COVID19 case to theatre
- **2. Assume the entire theatre will be contaminated** → assume all surfaces are contaminated → leave all personal belongings and unnecessary items outside → have a runner to obtain supplies as needed
- **3. Choose protective equipment effective against aerosolised particles** → consider all surgery to be an AGP and use PPE as recommended → this includes use of electrocautery or laparoscopy
- **4. Adapt surgical techniques to reduce exposure risks** → “it is unclear if laparoscopy increases surgeon risk of exposure to aerosolized viral particles → concern regarding CO2 insufflation and then release of the pneumoperitoneum → approach that is best may be the one most familiar that reduces operating time
- **5. Use a buddy-system for donning and doffing**
- ****Notes that this information should not override local or institutional policy****
- PPE standards for Non-COVID19 patients in theatre
 - o **Screen all patients according to latest guidelines in the CDNA SoNG**
 - o Use standard PPE → hat, surgical mask, gloves, consider goggles

<p>30/03/20, Position statement: ANZCA statement on personal protection equipment during the COVID-19 pandemic²⁰</p> <p>http://www.anzca.edu.au/documents/pcu_anzca-covid-ppe-statement_20200330.pdf</p>	<ul style="list-style-type: none"> ▪ le. Low risk patients during the pandemic having elective during the pandemic should have normal droplet precautions <ul style="list-style-type: none"> - “Stocks of PPE are finite and need to be used judiciously in readiness for their required availability in the coming weeks and months.” - ANZCA is working with CICM, ANZICS, ACEM, ASA and AHPPC to create a consensus statement on the appropriate use of PPE. - <u>“The college is advised there is insufficient community transmission in the Australian and New Zealand context to justify widespread changes to the current AHPPC recommendations.”</u> - NOT suspected or confirmed COVID19 → standard precautions - Suspected or confirmed cases → contact and droplet precautions <ul style="list-style-type: none"> ○ If performing AGP or they are critically ill → contact and airborne - Please see the most recent CDNA SoNG regarding risk stratification by epi factors - <u>“Given that the incidence of community acquired infection is currently low, patients without epidemiological risk factors or symptoms should be deemed low risk. The use of standard PPE in these patients is appropriate and contributes to preserving PPE supplies.”</u> - AGPs include: <ul style="list-style-type: none"> ○ Bag and mask ventilation, tracheal intubation and extubation, ventilation via SGA, NIV use, high flow nasal oxygen therapy, surgical AGPs – where aerosolization of tissue is likely, CPR
<p>Date unknown, Guidelines: RACS guidelines for the management of surgical patients during the COVID-19 pandemic²¹</p> <p>https://umbraco.surgeons.org/media/5137/racs-guidelines-for-the-management-of-surgical-patients-during-the-covid-19-pandemic.pdf</p>	<ul style="list-style-type: none"> - “The following patients are regarded as high risk for COVID19: <ul style="list-style-type: none"> ○ Positive test for COVID19 ○ Close contact of a confirmed case ○ International travel in the last 14 days ○ And of the following: sore throat, cough, shortness of breath, fever >38dC - <u>Identify high risk COVID19 patients pre-operatively.</u> All should have a chest X-ray (or better, CT chest whenever any other CT is required, particularly CT abdomen.”
<p>31/03/20, RACS Guideline: COVID-19 Guidelines for General Surgery²²</p> <p>https://umbraco.surgeons.org/media/5160/doc-2020-03-31-covid-19-guidelines-for-general-surgery_final_updated.pdf</p>	<ul style="list-style-type: none"> - “Currently, there is no evidence that laparoscopy or robotic surgery pose any higher risk to surgical teams or patients with viral illnesses, including COVID-19, than laparotomy.” - “Surgeons should therefore choose the most appropriate approach for their patients, whether or not that involves a laparoscopic or robotic procedure. Reduction in occupational exposure to the surgical plume in both open and laparoscopic surgery should remain a priority.” - “COVID-19 testing should be carried out wherever possible in accordance with current Federal, State, and/or Territory Departments of Health guidelines.”

24/03/20, Position statement/recommendation:
**Western Australian ENT Recommendations for PPE
for Aerosol Generating Procedures during COVID-19
Pandemic²³**

[http://asohns.org.au/CMS/Uploads/PPE%20Recommendations%20COVID-19%20ENT%20WA%20\(3\).pdf](http://asohns.org.au/CMS/Uploads/PPE%20Recommendations%20COVID-19%20ENT%20WA%20(3).pdf)

- Acknowledges that ENT is a very high risk procedure and there are reports from overseas of many people from ENT teams in ICU and mortalities.
- “... we as a collective group in ENT Western Australia recommend that no AGP be undertaken without appropriate PPE.”
- “In all known or suspected cases of COVID-19, as well as any asymptomatic patient undergoing an AGP – we will not proceed without the following. Higher risk AGPs will require more advanced PPE and should not be undertaken without it.
 - 1. Hand hygiene
 - 2. Disposable gown +/- plastic apron
 - 3. Disposable N95 respirator
 - 4. Hood-type theatre hat
 - 5. Single use visor or goggles
 - 6. Double glove ensuring cuff of gown covered”
- “We strongly endorse the recommendation for COVID-19 testing pre-procedurally for all elective patients undergoing high-risk AGP.”

20/03/20, Guideline: **ENTUK Guidelines for changes
in ENT during COVID-19 Pandemic²⁴**

<https://www.entuk.org/entuk-guidelines-changes-ent-during-covid-19-pandemic>

- AGPs include: tracheostomy, intubation, extubation, open suctioning, bronchoscopy, surgery in which high speed devices are used, manual ventilation, NIV, high-flow nasal oxygen, induction of sputum
- Recommended PPE in different settings for ALL patients (not just suspected or confirmed COVID19 patients)
 - For AGP: mask → FFP3, gloves → Y, gown → Y, eye protection → goggles or face shield
 - SEE attached figures
- Update given on 25/03/20: <https://www.entuk.org/ffp3-respirator-usage-current-ent-uk-recommendations>
 - “To preserve FFP3 respirators, ENT UK recommends that, in the clinic and on ward rounds, one senior doctor wears one respirator for the session for all examinations and AGPs, whilst a second doctor takes all histories and makes notes from a safe distance”

13/02/20, Article: **Time course of lung changes on
chest CT during recovery from 2019 Novel
Coronavirus (COVID-19) pneumonia²⁵**

<https://pubs.rsna.org/doi/10.1148/radiol.2020200370>

- *Retrospective review of serial CTs performed on 21 laboratory confirmed cases of COVID-19*
 - Patient data was split by days since presentation of symptoms, and CTs were scored for severity
- Four (19%) of patients had no abnormalities at baseline
 - All four cases were patients who had presented within 2 days of symptom onset
 - Peak of CT abnormalities is around day 10

<p>19/03/20, Article: Temporal changes of CT findings in 90 patients with COVID19 pneumonia: A longitudinal study²⁶</p> <p>https://pubs.rsna.org/doi/pdf/10.1148/radiol.2020200843</p>	<ul style="list-style-type: none"> - CT scans of 90 patients were reviewed and scored for disease severity - The CT scores and number of zones involved peaked on days 6-11 - Six of 10 patients who had the first CT before symptom onset, had normal CT scans - However, 4 of 10 did have CT changes whilst asymptomatic <ul style="list-style-type: none"> o “The period from the date of abnormal CT to that of symptom onset ranged from 2 to 6 days.”
<p>17/03/20, Article: Chest CT findings in cases from the cruise ship “Diamond Princess” with Coronavirus Disease 2019 (COVID-19)²⁷</p> <p>https://pubs.rsna.org/doi/10.1148/ryct.2020200110</p>	<ul style="list-style-type: none"> - Retrospective study of 112 of RT-PCR confirmed COVID19 → CTs were scored for severity - 82 (72%) were asymptomatic → 44 (54%) had abnormal chest CT - 30 (27%) were symptomatic → 24 (80%) had abnormal chest CT
<p>12/03/20, Letter: Asymptomatic SARS-CoV-2 infected patients with persistent negative CT findings²⁸</p> <p>https://pubs.rsna.org/doi/10.1148/ryct.2020200110</p>	<ul style="list-style-type: none"> - Report of 295 patients with PCR confirmed cases of SARS-CoV-2 - 49 (17%) had a negative CT at presentation <ul style="list-style-type: none"> o 15 of the 49 showed a positive CT findings 3-6 days following the first scan o 34 showed persistent negative CT findings
<p>22/02/20, Article: Asymptomatic novel coronavirus pneumonia patient outside Wuhan: The Value of CT images in the course of the disease²⁹</p> <p>https://www.clinicalimaging.org/article/S0899-7071(20)30056-5/fulltext</p>	<ul style="list-style-type: none"> - Case report of a 61yrs asymptomatic male, but positive RT-PCR (10 days since close contact) - On admission, showed multiple CT abnormalities <ul style="list-style-type: none"> o Developed mild shortness of breath on day 11 of admission o CT abnormalities may predate symptoms occurring
<p>25/03/20, Comment: The role of CT in case ascertainment and management of COVID-19 pneumonia in the UK: insights from high-incidence regions³⁰</p> <p>https://www.thelancet.com/journals/lanres/article/PIIS2213-2600(20)30132-6/fulltext</p>	<ul style="list-style-type: none"> - Has been suggested that CT could play a role in COVID19 case ascertainment - Discusses some evidence that CT abnormalities may predate RT-PCR positivity in symptomatic patients <ul style="list-style-type: none"> o However, in some who do test positive by RT-PCR, they have a clear CT scan - Peak abnormalities have been recorded around day 10, with regression from around 2wks post symptom onset - “CT is likely to become increasingly important for the diagnosis and management of COVID-19 pneumonia, given the continuing increase in global cases.” <ul style="list-style-type: none"> o Particularly useful if 2 or more days after symptom onset o A negative after 1wk of symptom onset would have a high NPV
<p>10/03/20, Article: Performance of radiologists in differentiation COVID-19 from viral pneumonia on chest CT³¹</p>	<ul style="list-style-type: none"> - Assessment of the performance of radiologists in the US and China in differentiating COVID19 from other causes of viral pneumonia on chest CT – abnormal chest CT of 219 cases, and 205 abnormal chest CT of patients with other causes of viral pneumonia - “Radiologists in China and the United States distinguished COVID-19 from viral pneumonia on chest CT with high specificity but moderate sensitivity.”

<p>https://pubs.rsna.org/doi/full/10.1148/radiol.2020200823</p>	<ul style="list-style-type: none"> - The seven radiologists had sensitivities of: 80%, 67, 97, 93, 83, 73, 70% - Specificity of: 100%, 93, 7, 100, 93, 100% - False negatives are often due to subtle changes found early in disease, or atypical findings - False positives may occur due to the fact that non-COVID19 pneumonia can have a similar appearance
<p>28/02/20, Article: Clinical Characteristics of Coronavirus Disease 2019 in China³²</p> <p>https://www.nejm.org/doi/full/10.1056/NEJMoa2002032</p>	<ul style="list-style-type: none"> - <i>Analysis of 1099 patients to RT-PCR confirmed COVID-19 from 552 hospitals in China</i> - 965 CT scans were performed at time of admission – 86.2% were abnormal <ul style="list-style-type: none"> o In those with non-severe disease, the CT was normal/negative in 157 of 877 (17.9%) o In those with severe disease, the CT was normal/negative in 5 of 173 (2.9%)
<p>03/04/20, Accepted preprint: Gastrointestinal manifestations. Of SARS-CoV-2 infection and virus load in faecal samples from the Hong Kong Cohort and Systematic Review and Meta-analysis³³</p> <p>https://www.ncbi.nlm.nih.gov/pubmed/32251668</p>	<ul style="list-style-type: none"> - Pooled analysis of 4243 patients showed prevalence of GI symptoms was 17.6% (95CI:12.3-24.5) <ul style="list-style-type: none"> o Including: Anorexia (26.8%), N&V (10.2%), diarrhoea (12.5), abdo pain/discomfort (9.2%) - Pooled analysis of prevalence of viral RNA in stool samples was 48.1% (38.3-57.9) - <i>Note: this MA excluded asymptomatic patients from analysis</i>
<p>11/03/20, Letter: Detection of SARS-CoV-2 in different types of clinical specimens³⁴</p> <p>https://jamanetwork.com/journals/jama/fullarticle/2762997</p>	<ul style="list-style-type: none"> - Included analysis of 1070 specimens of 205 patients looking for viral RNA → 19% had severe illness <ul style="list-style-type: none"> o Bronchoalveolar lavage fluid: 93% o Sputum: 72% o Nasal swab: 63% o Fibro-bronchoscope brush biopsy 46% o Pharyngeal swab 32% o Faeces 29% o Blood 1% o Urine none
<p>21/02/20, Accepted preprint: Coronavirus Disease 2019: Coronaviruses and blood safety³⁵</p> <p>https://doi.org/10.1016/j.tmr.2020.02.003</p>	<ul style="list-style-type: none"> - Review of current evidence regarding coronavirus transmission through blood products - Evidence of viremia in COVID-19 patients (ie. Viral RNA in the blood) <ul style="list-style-type: none"> o In the first 41 patients in Wuhan, 15% had blood borne viral RNA o Has been evidence for viral RNA in blood of an asymptomatic child - Must consider: <ul style="list-style-type: none"> o Viral RNA in plasma or serum has been detected in COVID-19 patients in the first 2-3 days after Sx onset o Consider that people may be asymptomatic carriers
<p>01/03/20, Accepted preprint: Virological assessment of hospitalized patients with COVID-19³⁶</p> <p>https://www.nature.com/articles/s41586-020-2196-x_reference.pdf</p>	<ul style="list-style-type: none"> - Serial samples and swabs in nine patients - Pharyngeal viral shedding was very high during first week of symptoms - Infectious virus was isolated from throat- and lung-samples - Infectious virus was NOT isolated from stool samples, despite high viral RNA - Blood and urine did not yield results

FIGURES

Figure 1. ENT UK Guidelines – Recommended PPE in different settings for all patients (not just suspected or confirmed COVID19 patients).²⁴

NB. FFP3 = class P3 mask required 99% efficiency for filtration

	AllIR for suspected/ confirmed COVID-19	Triage station/ fever room	Surveillance ward/ cubicle/ side room	Aerosol generating procedures (AGP)	Other wards	Other patient areas (outpatients/ radiology etc)	Other areas with no direct patient contact
Hand hygiene	Yes	Yes	Yes	Yes	Yes		Yes
Type of mask	FFP3	FFP3	FFP3	FFP3	FFP2		FFP2
Isolation gown	AAMI level 1 or AAMI level 3 if splashing anticipated. Or AAMI Level 1 + waterproof apron				Standard precautions +/- transmission based precautions		N
Disposable gloves	Yes	Risk assessment	Risk assessment	Yes			N
Eye protection	Goggles/ face shield	Eye visor/ goggles/ face shield	Eye visor/ goggles/ face shield	Goggles/ face shield			N
Hair cover	optional	optional	optional	optional			N

**Shoe covers not recommended*

Figure 2. ENT UK Guidelines – Recommended PPE during different procedures in ENT for ALL patients (not just suspected or confirmed COVID19 patients).²⁴

		Procedures/ examination	
	History taking	<ul style="list-style-type: none"> • Flexible laryngoscopy/ nasendoscopy • Oral, nasal & ear open suction • Change of tracheostomy tube 	<ul style="list-style-type: none"> • Endoscopic guided insertion of feeding tube • Change of tracheoesophageal prosthesis • Deep throat examinations (e.g. checking of tonsil mass, ulcer at retromolar trigone region)
Hand hygiene	Yes		
Type of mask/ respirator	FFP2	FFP3	
Isolation gown	No	AAMI level 1	
Disposable gloves	Yes. Use separate pair of gloves for each patient. The same applies to accompanying nurse. Gloves have to be appropriate to allow palpation, use of switches and fine controls (some of the polythene gloves are not suitable).		
Eye protection The eye is an important point of entry for viral infection.	Visor / Face shield*	Face shield	
Hair cover	Optional		

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