

Comparison of the pain experienced with anterior nasal swabs and nose and throat swabs in children

The mainstay of COVID-19 diagnosis remains the nose and throat swab for reverse transcriptase-PCR (RT-PCR).¹ Comparison between nose and throat swabs (NTS) and anterior nasal swabs (ANS) has shown a reduction in the sensitivity of RT-PCR from 99% to approximately 80%–90%.² Novel methods of molecular and antigen testing have also explored the use of alternative respiratory tract samples. An in-hospital pilot study (NCT04629157) of an antigen-based test aimed to compare the pain associated with nose and throat swabs to that experienced with anterior nasal swabs in children.


Children undergoing routine NTS for SARS-CoV-2 were consented and underwent an ANS prior to NTS. Children and their parents were asked to score the pain experienced with each swab type on a Likert scale of 0–10. Children used the Wong-Baker Faces Tool to aid this and parents were advised that 0 was no pain and 10 was the worst pain.

One hundred and seventeen children and 159 parents of children with a mean age of 7.7 years (SD 5.2 years) gave paired scores for both swab types. Using linear regression analysis we see that children and parents report a significantly lower pain score ($p < 0.0001$) for ANS compared with NTS. Parent-reported pain scores significantly reduced with increasing age with both swab types (ANS: $r^2 = -0.10$, NTS: $r^2 = -0.08$, $p < 0.001$), and child-reported pain scores for ANS reduced significantly with age ($r^2 = -0.02$, $p < 0.02$) but did not reduce for NTS ($r^2 = -0.005$, $p = 0.45$).

Children undergo testing when symptomatic within the community, when admitted to hospital as an acute or elective

admission, and as screening in transplant wards and intensive care. Testing is known to have a negative impact on children and can create aversive behaviours, particularly in those requiring repeated procedures.³

The prevalence of COVID-19 in hospitals is far lower in children compared with adults,⁴ approximately that of community levels, and therefore the likelihood of a positive test (the pretest probability) is lower. Changes in the prevalence of COVID-19 alter the positive and negative predictive values of the test, with a higher prevalence increasing the positive predictive value and reducing the negative predictive value.⁵ Modelling the data using a prevalence of 0.5% and a specificity of 99.7%, we see that a reduction in sensitivity from 100% to 80% results in a reduction in positive predictive value from 62.6% to 57.3% and a reduction in negative predictive value from 100% to 99.9%. A prevalence of 2.0% using the same parameters of sensitivity and specificity shows a reduction in positive predictive value from 87.2% to 84.5% and a reduction in negative predictive value from 100% to 99.6%.⁵ The minimal reduction in positive and negative predictive values of RT-PCR performed with ANS coupled with significantly lower pain scores with ANS means that we recommend that ANS is considered for routine mode of testing used for RT-PCR in children.

Rachel Harwood ^{1,2}, **Laura Rad**,³ **Beatriz Larru**,⁴ **Christopher Kelly**,⁵ **Simon Kenny**,^{3,6} **LAVA study team, On behalf of the LAVA study team**

¹Paediatric Surgery, Alder Hey Children's NHS Foundation Trust, Liverpool, UK

²Institute of Molecular and Integrative Systems Biology, University of Liverpool, Liverpool, UK

³Clinical Research Division, Alder Hey Children's NHS Foundation Trust, Liverpool, UK

⁴Department of Microbiology and Infectious Diseases, Alder Hey Children's Hospital Clinical Research Facility, Liverpool, UK

⁵Department of Paediatric Anaesthesia, Manchester University NHS Foundation Trust, Manchester, UK

⁶University of Liverpool, Liverpool, UK

Correspondence to Rachel Harwood, Paediatric Surgery, Alder Hey Children's NHS Foundation Trust, Liverpool, UK; Rachel.Harwood@alderhey.nhs.uk

Twitter Rachel Harwood @RachelHarwood10

Acknowledgements The lateral flow devices were donated by Public Health England, which is represented in the steering group and has been involved in the design and analysis of this study.

Collaborators LAVA study team: Ijeoma Okonkwo, Shrouk Messahel, Russell Perkins, Nicholas Gent, Hannah Williams, Thomas Finnie, Sanjay Patel, Elizabeth Whittaker, Adam Finn, Emily Adams.

Contributors RH: study design, data collection, data analysis, data interpretation, writing the manuscript.

LR, BL, CK: data collection, review of the manuscript. SK: study design, data interpretation, review of the manuscript. Study group: study design, data interpretation, review of the manuscript.

Funding Funding for the study was given by NHS Test and Trace, which has not been involved in the analysis of the results.

Competing interests None declared.

Patient consent for publication Not required.

Ethics approval Approval for the study was given by the Health Research Association with research and ethics number 290989 and using the COPI notice as issued by the secretary of state.

Provenance and peer review Not commissioned; internally peer reviewed.



OPEN ACCESS

Open access This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>.

© Author(s) (or their employer(s)) 2022. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ.



To cite Harwood R, Rad L, Larru B, *et al.* *Arch Dis Child* 2022;**107**:207.

Accepted 9 July 2021

Published Online First 2 November 2021

Arch Dis Child 2022;**107**:207.

doi:10.1136/archdischild-2021-321708

ORCID iD

Rachel Harwood <http://orcid.org/0000-0003-3440-3142>

REFERENCES

- Gov.uk. COVID-19 home test: step by step guide (adults and children), 2021. Available: <https://www.gov.uk/government/publications/testing-for-coronavirus-at-home/covid-19-home-test-step-by-step-guide-adults-and-children#test-a-child>
- Péré H, Podglajen I, Wack M, *et al.* Nasal swab sampling for SARS-CoV-2: a convenient alternative in times of nasopharyngeal swab shortage. *J Clin Microbiol* 2020;58. doi:10.1128/JCM.00721-20. [Epub ahead of print: 26 05 2020].
- Slifer KJ, Tucker CL, Dahlquist LM. Helping children and caregivers cope with repeated invasive procedures: how are we doing? *J Clin Psychol Med Settings* 2002;9:131–52.
- Swann OV, Holden KA, Turtle L, *et al.* Clinical characteristics of children and young people admitted to hospital with covid-19 in United Kingdom: prospective multicentre observational cohort study. *BMJ* 2020;370:m3249.
- RCPC. National guidance for the recovery of elective surgery in children, 2021. Available: <https://www.rcpch.ac.uk/resources/national-guidance-recovery-elective-surgery-children>