

## The impact of the COVID-19 pandemic on the assessment of autism spectrum disorder

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Limitations because of the coronavirus disease 2019 (COVID-19) pandemic have posed multiple challenges (1,2) in the diagnosis of children with suspected autism spectrum disorder (ASD) (3,4). The Autism Diagnostic Observation Schedule (ADOS), presently in its Second Edition (ADOS-2), is considered the gold standard tool for diagnosing ASD, facilitating a semi-structured and standardized assessment of socio-communication skills and interests/behaviors (5). During the COVID-19 pandemic, ADOS-2 and, in particular, its modules Toddler, 1, and 2, developed for younger subjects, could not be used because several test parameters are based on the child's interpretation of the examiner's facial expressions, which cannot be realized owing to the mandatory use of masks. Unfortunately, transparent masks are also unsuitable when using ADOS-2. Therefore, the issue of using reliable alternative tools to ADOS remains open. This issue was encountered earlier than the COVID-19 pandemic, and it is due to several reasons, including the increased commute experienced by certain patients and their families to reach the specialized centers where the diagnostic evaluation is performed (6). In this context, telehealth has enabled access to ASD diagnostic services for people living in underserved areas (7). For ASD diagnosis, telehealth includes the following two procedures: (1) a real-time method, such as video conferencing, through which the clinicians establish communication with families remotely and assess the individual; and (2) a store-and-forward method, such as the so-called Naturalistic Observation Diagnostic Assessment, in which home videos are uploaded to a web portal where the clinicians assess the child's behavior remotely (6).

In their review, Alfuraydan et al. (6) reported high diagnostic agreement between telehealth and classic (face-to-face) methods and high satisfaction of families and clinicians. Telehealth can be used to foster access to ASD diagnosis, especially for cases with definite autistic features rather than borderline features. As a further advantage, this system enables the evaluation of the child while he/she continues to perform activities in his/her natural setting, highlighting clinical elements that can be barely assessed during an outpatient assessment (6). There are several alternative diagnostic protocols proposed in the literature. In 2014, Fusaro et al. (8) reported high diagnostic accuracy for ASD by applying the ADOS algorithm (module 1) to five unstructured home videos assessed by certain non-clinical raters. We completely disagree with this approach. The ADOS algorithm has been developed in a well-defined setting that involves a series of interactions between the examiner (an experienced clinician) and the child through activities that must be conducted using certain objects and following determined procedures. The use of the ADOS-2 algorithm apart from these situations, especially by inexperienced examiners, can lead to the occurrence of gross diagnostic errors.

Based on the experience, particularly in the last 6 months, our proposal for ASD diagnosis using telehealth includes the following. First, based on an interview with caregivers, we aim to collect a detailed familial and personal anamnestic history focused on socio-communicative skills and the range of interests and activities of the children during the earlier stages of neurodevelopment (Table 1). Second, we will use the Autism Diagnostic Interview-Revised (ADI-R) for parents. ADI-R is a standardized semi-structured interview for caregivers that covers detailed

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<b>Table 1. Anamnestic interview for neurodevelopmental disorders</b>
<b>Familial anamnesis</b>
Age, educational qualification, profession, and state of health of: father..... and mother.....
Brothers/sisters (if any): age, state of health.....
Consanguinity between parents?..... Recurrent miscarriage?.....
Neurological and/or psychiatric antecedents?.....
<b>Personal anamnesis: early epochs of life</b>
.....-born (birth order)
Pregnancy: Conceived with medically-assisted procreation?..... Fetal movements..... Ultrasound scans..... Threatened abortion and premature birth?..... Taking drugs or other substances?.....
Delivery: Gestational age..... Spontaneous or assisted birth?..... Presentation..... Duration..... Fetal heartbeat..... Amniotic fluid ..... At birth: weight....., length....., and head circumference..... Neonatal adjustment ..... Apgar index ..... Thermo cot/incubator?..... Neonatal jaundice?..... Muscle tone..... Discharged after ..... days
Feeding: Breastfeeding?..... Suction..... Weaning..... Chewing..... Stature and weight development..... Food intolerances/allergies..... Selectivity..... Autonomy in feeding.....
Bowel function:..... Sleep-wake rhythm:..... Vaccinations:.....
Exanthematous or non-exanthematous infectious diseases?..... Use of antibiotics?..... Hospitalizations?..... Head trauma?..... Allergies to inhalants or drugs?.....
<b>Educational stage</b> (specify the schools attended, and if attended with a support teacher)
Nursery..... Kindergarten..... Primary school..... Secondary school..... Support teacher?.....
<b>Stages of neurodevelopment</b> (specify the age of developmental milestone acquisition)
Neuromotor development: Head upright..... Sitting position..... Crawling..... Standing position..... Autonomous gait..... Running..... Climbing the stairs..... Sphincter control.....
Socio-communicative skills: Smile..... Anticipatory reaction..... Direct gaze..... Joint attention..... Turning when called..... Pointing..... Conventional gestures (e.g., waving hello).....
Further: facial and gestural mimicry.....
Language: Lallation..... First words..... Combinatorial language..... First sentences.....
Further: level of verbal comprehension..... and (if any) verbal atypicalities.....
<b>Interests/activities/behaviors</b> (specify presence and typology)
Interest and use of games..... Sensory atypicalities..... Stereotypies..... Emotional dysregulation.....
<b>First suspicions and medical consultations</b>
Parents' first concerns: Age..... Typology.....
First specialist consultations: Age..... Diagnosis..... Suggestions.....
<b>Onset modality</b> (choose one of the following 4 options)
1) Was there a global regression or loss of some skills?..... Age.....
2) Was there a developmental delay since the first year of life?.....
3) Was there a normal development during the first year, followed by a developmental slowing/arrest (plateau)?.....
4) Was there a mild delay of preverbal phase and first words, followed by a social-communication regression during the second year of life?.....
<b>Medical exams</b> (if any), including hearing test.....
<b>Treatments</b> (if any)
Educational-habilitation interventions: which ones and at what age?.....
Pharmacological treatments: which ones and at what age?.....

aspects of socio-communication skills and behavior patterns (9). Thereafter, we aim to assess the home videos recorded by the parents as per our instructions during free activity, solitary play, interaction with the reference figures, and when the child behaves in a manner that is worrisome for the parents. For assessment of home videos, we will use a standardized tool, such as the Childhood Autism Rating Scale – Second Edition, that is a rating scale for diagnosing ASD children (10). For children up to 36 months of age, the evaluation of home videos will include the TELE-ASD-PEDS, a parent-guided screening tool developed for remote ASD assessment of the child’s behavior during a series of social activities (11). Finally, in all cases of diagnostic uncertainty, we aim to conduct a face-to-face unstructured observation of

the child’s behavior, and perform association with, if possible, certain ADOS items, such as response to one’s name.

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