Validation of a Suicide Risk Screening Tool for Children and Youth with Autism and Other Neurodevelopmental Conditions

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Background

Youth with autism and other neurodevelopmental diagnoses (NDD; e.g., ADHD, intellectual disability) are at elevated risk for suicide. While universal suicide risk screening is being implemented in a growing number of settings, including those that serve youth with NDD (Rybczynski et al., 2024), none of the current pediatric suicide risk screening tools have been validated in youth with NDD.

Objectives

1. Examine the validity of Ask Suicide-Screening Questions (ASQ) in youth with NDD in outpatient healthcare settings to identify suicide risk.
2. To compare candidate questions with simpler language to the standard ASQ questions to address potential barriers due to language

Methods

Youth aged 8-17 years and parent/guardian recruited from two centers for children with NDD.

- One site with four outpatient clinics caring for children with learning disorders, autism, cerebral palsy, and psychiatric concerns.
- Other site an autism center in a large urban children's hospital.

- Eligibility criteria
  - Verbal fluency in English
  - Ability of the youth to assent.

Youth and parent/guardian participated via video visit (due to COVID pandemic) answering questions verbally and encouraged to participate separately.

- The Ask Suicide-Screening Questions (ASQ; https://www.nimh.nih.gov/ASQ).
- Additional candidate screening items with simplified language
- Clinician risk assessment using the ASQ Brief Suicide Safety Assessment (BSSA; https://www.nimh.nih.gov/ASQ) as the criterion standard completed by physician or psychologist blinded to the ASQ screening results.
- All measures administered verbally with visual representation of answers to non-open-ended questions if needed (i.e. "yes", "no").
- Parent notified if youth screen indicated risk.

Analysis

- Descriptive statistics were used for sample characteristics.
- Psychometric properties including sensitivity (SE), specificity, positive predictive value, negative predictive value (NPV), positive likelihood ratio, negative likelihood ratio, and the area under the receiver operating curve (AUC, summarizing overall diagnostic accuracy) assessed.
- Analyses were conducted focusing on child self-report alone and combined report of child and parent/guardian using an "either/or" rule.
  - Three-step item selection process used to identify a parsimonious multivariable logistic regression model that preserved predictive accuracy while minimizing number of items,.
  - Clinical validity metrics were calculated for the best-fitting combination of ASQ items based on youth self-report, as well as youth and caregiver reports using 'either/or' rule.
  - Stratified analyses conducted for the effects of age (≤10 vs. 10+ years old) and diagnostic group (ASD/intellectual disability/language disability [any] vs. ADHD/ learning disability/ anxiety/ depression/ others [no ASD/ intellectual disability/ language disability) on individual ASQ items & model-driven multiple combo items.

NIMH TOOLKIT

asQ Suicide Risk Screening Tool

Ask Suicide-Screening Questions

Ask the patient:

1. In the past few weeks, have you wished you were dead? ❍ Yes ❍ No
2. In the past few weeks, have you felt that you or your family would be better off if you were dead? ❍ Yes ❍ No
3. In the past week, have you been having thoughts about killing yourself? ❍ Yes ❍ No
4. Have you ever tried to kill yourself? ❍ Yes ❍ No
   If yes, how? _____
   When? _____

*If the patient answers **Yes** to any of the above, ask the following acuity question:*

5. Are you having thoughts of killing yourself right now? ❍ Yes ❍ No
   If yes, please describe: _____

ASQ A/NDD Candidate items
6. In the past few weeks, have YOU been worried or scared a lot?
7. In the past few weeks, have YOU been sad a lot?
8. In the past few weeks, have YOU been mad or angry a lot?
9. In the past few weeks, have YOU been lonely a lot?
10. In the past few weeks, are YOU blaming yourself for bad things that happen?
11. Do YOU want to give up on life?
12. Have YOU thought your life was so bad that you didn't want to live anymore?

NIH ASQ Toolkit:

https://www.nimh.nih.gov/research/research-conducted-at-nimh/asq-toolkit-materials

Results

Child sample characteristics	
Characteristics	**Total Sample, N=271**
Age, range, mean (SD)	8-17, 12.27 (2.64)
Sex, n (%)	
Male	194 (71.6%)
Female	77 (28.4%)
Race or ethnicity, n (%)	
White	158 (58.3%)
Black	80 (29.5%)
Other	17 (6.3%)
Hispanic/Latino	14 (5.2%)
Unknown	2 (0.74%)
Clinical Diagnosis (non-exclusive), n (%)	
Autism spectrum disorder	103 (38.0%)
Intellectual disability	21 (7.8%)
Language/communication disorders	63 (23.3%)
Attention-deficit/hyperactivity disorder	234 (86.4%)
Learning disability	24 (8.9%)
Anxiety disorder	119 (43.9%)
Depression	52 (19.2%)
Other neurodevelopmental disorder	56 (20.7%)
Classic ASQ screened positive*, n (%)	65 (24.0%)
Clinician-determined suicide risk, n (%)	64 (23.6%)

Intrinsic and Predictive Abilities of the *ASQ* and ASQ + candidate items									
Model	**N**	**%** (95% CI)		**%** (95% CI)		**LR** (95% CI)		**AUC**	**p-value**
		Sens	**Spec**	**PPV**	**NPV**	**LR +**	**LR -**		
Youth Report									
ASQ Youth Report	***271***	***0.67*** *(0.56, 0.79)*	***0.89*** *(0.85, 0.94)*	***0.66*** *(0.55, 0.78)*	***0.90*** *(0.86, 0.94)*	***6.32*** *(3.60, 9.04)*	***0.37*** *(0.24, 0.50)*	***0.783*** *(0.721, 0.844)*	*NA*
ASQ + Items 9,12	271	**0.84** (0.75, 0.93)	**0.75** (0.69, 0.81)	**0.50** (0.41, 0.60)	**0.94** (0.90, 0.98)	**3.33** (2.48, 4.18)	**0.21** (0.09, 0.33)	**0.794** (0.740, 0.848)	0.6801
Youth or Caregiver Report									
ASQ Youth or Caregiver Report	***219***	***0.85*** *(0.75, 0.95)*	***0.78*** *(0.72, 0.85)*	***0.56*** *(0.45, 0.66)*	***0.94*** *(0.90, 0.98)*	***3.92*** *(2.70, 5.13)*	***0.19*** *(0.07, 0.32)*	***0.816*** *(0.758, 0.874)*	*NA*
ASQ 2,3,4 & Item 12	219	**0.91** (0.83, 0.98)	**0.71** (0.64, 0.78)	**0.50** (0.40, 0.60)	**0.96** (0.92, 0.99)	**3.13** (2.34, 3.93)	**0.13** (0.02, 0.24)	**0.808** (0.756, 0.861)	0.6861

Age and Diagnosis Subgroup Analyses: AUCs				
Youth report alone				
	Age group		**Diagnosis Group**	
	AGE <=10yrs (n=76)	**AGE >10yrs (n=195)**	**ASD/ID/LangD* (n=157)**	**ADHD/Others (n=114)**
Model:	**AUC (95% CI)**	**AUC (95% CI)**	**AUC (95% CI)**	**AUC (95% CI)**
m4: 1, 4, 9, 12	0.76 (0.64, 0.89)	0.80 (0.74, 0.86)	0.81 (0.74, 0.88)	0.78 (0.70, 0.87)
m3: 1, 4, 9	0.74 (0.61, 0.88)	0.80 (0.74, 0.86)	0.81 (0.74, 0.88)	0.77 (0.68, 0.86)
m2: 1, 4	0.70 (0.56, 0.84)	0.80 (0.73, 0.87)	0.82 (0.74, 0.91)	0.74 (0.64, 0.83)
m1: 4	0.55 (0.45, 0.65)	0.75 (0.68, 0.82)	0.74 (0.65, 0.83)	0.68 (0.59, 0.76)
#ASQ classic 4 (1,2,3,4)	**0.76 (0.62, 0.89)**	**0.79 (0.72, 0.86)**	**0.82 (0.73, 0.90)**	**0.75 (0.66, 0.85)**
Youth | Caregiver combined responses using 'either/or' rule, AUC				
	(n=62)	**(n= 157)**	**(n-126)**	**(n=93)**
m4O: 2, 3, 10, 12	0.74 (0.63, 0.85)	0.72 (0.66, 0.79)	0.73 (0.65, 0.81)	0.72 (0.64, 0.81)
m3O: 2, 3, 12	0.84 (0.74, 0.94)	0.74 (0.67, 0.82)	0.77 (0.68, 0.85)	0.78 (0.68, 0.87)
m2O: 3, 12	0.84 (0.74, 0.94)	0.76 (0.69, 0.84)	0.78 (0.70, 0.87)	0.78 (0.69, 0.88)
m1O: 12	0.79 (0.65, 0.92)	0.74 (0.66, 0.82)	0.77 (0.69, 0.86)	0.74 (0.64, 0.84)
#ASQ classic 4 (1,2,3,4)	**0.83 (0.70, 0.95)**	**0.81 (0.74, 0.88)**	**0.82 (0.74, 0.89)**	**0.82 (0.74, 0.91)**

NOTE: The models with the highest performing test characteristics are displayed.
**Any endorsement of ASD, ID, or language disorder*

Study Limitations

- Heterogeneity of ages and diagnoses (unconfirmed) and sample size.
- Diagnoses via EMR and overlapping.
- Cognitive and communication function unmeasured.
- Sample not nationally representative.
- Performed by video/telehealth.
- Parent may have been nearby or present during the youth screenings and evaluations.

Conclusions

1. ASQ is a valid suicide risk screening tool for identification of suicide risk in youth with autism & other NDD & can be used remotely.
2. Sensitivity may improve when parent/guardian screening is added.
3. Adding questions regarding loneliness (#9) and life quality (#12) may improve sensitivity for youth with ASD/NDD.

For further investigation

- Validation on a *larger sample of youth with autism, intellectual disability, language disorders* compared to typical youth & those with other NDDs may offer better understanding of roles of language, social dev, and age in suicide ideation/ behavior.
- *In-person validation of the ASQ in ASD/NDD populations* is indicated.
- Further screening of both child and parent/guardian should be performed to assess the importance of reporter source.

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Key References

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