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ACE Screening Clinical Workflows, ACEs and Toxic Stress Risk Assessment Algorithm, and ACE-Associated Health Conditions: For Pediatrics and Adults

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Table of Contents

Pediatric ACE Screening Clinical Workflow 1
ACEs and Toxic Stress Risk Assessment Algorithm - Pediatrics 2
ACE-Associated Health Conditions: Pediatrics 3
Adult ACE Screening Clinical Workflow 5
ACEs and Toxic Stress Risk Assessment Algorithm - Adults 6
ACE-Associated Health Conditions: Adults 7
References 9

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Pediatric ACE Screening Clinical Workflow

1. **Registration** or **clinical staff** reviews patient's record to determine if PEARLS screen indicated during visit.* Staff provides PEARLS tool to caregiver (0-19 years) and/or patient (12-19 years) in private setting.

2. **Caregiver** (0-9 years) and/or **patient** completes PEARLS.

2a. If screen is incomplete: Provider provides education about how practices and interventions can affect health and offers patient opportunity to discuss and/or complete PEARLS screen. Once complete, provider moves to step 3.

2b. If screen is complete, provider moves to step 3.

3. Provider or Medical Assistant transcribes ACE score (Part 1 of PEARLS tool) into EMR.

4. Provider reviews screen with patient and follows appropriate risk assessment algorithm: incomplete or at low, intermediate, or high risk for toxic stress.

5. Provider documents ACE score, billing code†, treatment plan, and follow-up in visit note.

6. Provider reviews ACE score, treatment plan, and follow-up prior to next visit; updates as needed.

*PEARLS is recommended to be completed once per year.

†Healthcare Common Procedure Coding System (HCPCS) billing codes for ACE scores:

G9919: ACE score ≥ 4, high risk for toxic stress
G9920: ACE score of 0 – 3, lower risk for toxic stress. For purposes of coding, scores of 1-3 with ACE-Associated Health Conditions should be coded as G9920, even though patient falls into the high-risk category of the clinical algorithm.

***PEARLS to be completed once per year, and no less often than every 3 years

Adverse Childhood Experiences (ACEs) and Toxic Stress Risk Assessment Algorithm

Pediatrics

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	Low Risk	Intermediate Risk	High Risk	High Risk	Unknown Risk
ACE screen (Part 1)	Score of 0	Score of 1-3	Score of 1-3	Score of 4+	Score unknown (incomplete)
Assess for associated health conditions	↓	↓ **Without** associated health conditions	↓ **With associated health conditions**	↓ **With or without associated health conditions**	↓
Determine response and follow-up	Provide education, anticipatory guidance on ACEs, toxic stress, and buffering factors.	Provide education, anticipatory guidance on ACEs, toxic stress, and buffering factors. Assess for protective factors and jointly formulate treatment plan. Link to support services and interventions, as appropriate.	Provide education about toxic stress, its likely role in patient's health condition(s), and buffering. Assess for protective factors and jointly formulate treatment plan. Link to support services and interventions, as appropriate.	Provide education about toxic stress, its likely role in patient's health condition(s), and buffering. Assess for protective factors and jointly formulate treatment plan. Link to support services and interventions, as appropriate.	Provide education on ACEs, toxic stress, and buffering factors. Re-offer at next physical.

This algorithm pertains to the ACE score (Part 1 of PEARLS), whose associations with health conditions are most precisely known. Social determinants of health (Part 2 of PEARLS) may also increase risk for a toxic stress response and should be addressed with appropriate services, but should NOT be added to the ACE score for this algorithm. Partial completion may indicate discomfort or lack of understanding. If partial response indicates patient is at intermediate or high risk, follow the guidelines for that category.

If the ACE score is 0, the patient is at "low risk" for toxic stress. The provider should offer education on the impact of ACEs and other adversities on health and development as well as on buffering factors and interventions. If the ACE score is 1-3 without ACE-associated health conditions, the patient is at "intermediate risk" for toxic stress. If the ACE score is 1-3 and the patient has at least one ACE-associated condition, or if the ACE score is 4 or higher, the patient is at "high risk" for toxic stress. In both cases, the provider should offer education on how ACEs may lead to toxic stress and associated health conditions, as well as practices and interventions demonstrated to buffer the toxic stress response, such as sleep, exercise, nutrition, mindfulness, mental health, and healthy relationships. The provider should also assess for protective factors, jointly formulate a treatment plan, and link to supportive services and interventions, as appropriate.

ACE-Associated Health Conditions: Pediatrics

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Symptom or Health Condition	For ≥ X ACEs (compared to 0)	Odds Ratio
Asthma[26, 33]	4	1.7 - 2.8
Allergies[33]	4	2.5
Dermatitis and eczema[39]	3*	2.0
Urticaria[39]	3*	2.2
Increased incidence of chronic disease, impaired management[25]	3	2.3
Any unexplained somatic symptoms[25] (eg, nausea/vomiting, dizziness, constipation, headaches)	3	9.3
Headaches[33]	4	3.0
Enuresis; encopresis[5]	--	--
Overweight and obesity[3]	4	2.0
Failure to thrive; poor growth; psychosocial dwarfism[5, 2, 41]	--	--
Poor dental health[16, 22]	4	2.8
Increased infections[39] (viral, URIs, LRTIs and pneumonia, AOM, UTIs, conjunctivitis, intestinal)	3*	1.4 - 2.4
Later menarche[40] (≥ 14 years)	2*	2.3
Sleep disturbances[5, 31]	5**	PR 3.1
Developmental delay[30]	3	1.9
Learning and/or behavior problems[3]	4	32.6

*Odds ratio represents at least one ACE, but also includes other adversities

**Prevalence ratio represents at least one ACE, but also includes other adversities

ACE-Associated Health Conditions: Pediatrics

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Symptom or Health Condition	For ≥ X ACEs (compared to 0)	Odds Ratio
Repeating a grade[15]	4	2.8
Not completing homework[15]	4	4.0
High school absenteeism[33]	4	7.2
Graduating from high school[29]	4	0.4
Aggression; physical fighting[28]	For each additional ACE	1.9
Depression[29]	4	3.9
ADHD[42]	4	5.0
Any of: ADHD, depression, anxiety, conduct/behavior disorder[30]	3	4.5
Suicidal ideation[28]	For each additional ACE	1.9
Suicide attempts[28]	For each additional ACE	1.9 - 2.1
Self-harm[28]	For each additional ACE	1.8
First use of alcohol at < 14 years[7]	4	6.2
First use of illicit drugs at < 14 years[10]	5	9.1
Early sexual debut[21] (<15-17 y)	4	3.7
Teenage pregnancy[21]	4	4.2

*Odds ratio represents at least one ACE, but also includes other adversities

**Prevalence ratio represents at least one ACE, but also includes other adversities

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Adult ACE Screening Clinical Workflow

1. Registration or clinical staff reviews patient's record to determine if ACE screen indicated for visit.* Staff provides ACE screening tool to patient in private setting.

2. Patient (18+ years) completes ACE screen

2a. If screen is incomplete: Provider provides education about how ACEs and buffering practices and interventions can affect health and offers patient opportunity to discuss and/or complete ACE screen.

2b. If screen is complete, provider moves to step 3.

3. Provider or Medical Assistant transcribes ACE score into EMR.

4. Provider reviews screen with patient and follows appropriate risk assessment algorithm: incomplete or at low, intermediate, or high risk for toxic stress.

5. Provider documents ACE score, billing code**, treatment plan, and follow-up in visit note.

6. Provider reviews ACE score, treatment plan, and follow-up prior to next visit; at next visit, updates as needed.

*ACE tool is recommended to be completed once per adult, per lifetime.
**Healthcare Common Procedure Coding System (HCPCS) billing codes for ACE scores:
G9919: ACE score ≥ 4, at high risk for toxic stress.
G9920: ACE score of 0 – 3, at lower risk for toxic stress (on algorithm, at either low or intermediate risk).

Adverse Childhood Experiences (ACEs) and Toxic Stress Risk Assessment Algorithm | Adults

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	Low Risk	Intermediate Risk	High Risk	Unknown Risk
ACE screen (top box)	Score of 0-3	Score of 1-3	Score of 4+	Score unknown (incomplete)
Assess for associated health conditions	**Without** associated health conditions	**With** associated health conditions	**With or without** associated health conditions	
Determine response and follow-up	Provide education about ACEs, toxic stress, and resilience. Assess for protective factors.	Provide education about toxic stress, its likely role in patient's health condition(s), and resilience. Assess for protective factors and jointly formulate treatment plan. Link to support services and treatment, as appropriate.	Provide education about toxic stress, its likely role in patient's health condition(s), and resilience. Assess for protective factors and jointly formulate treatment plan. Link to support services and treatment, as appropriate.	Provide education on ACEs/ toxic stress and buffering/ resilience. Re-offer at next physical.

Partial completion may indicate discomfort or lack of understanding. If partial response indicates patient is at intermediate or high risk, follow the guidelines for that category.

If the **ACE score is 0-3** without ACE-Associated Health Conditions, the patient is at "low risk" for toxic stress physiology. The provider should offer education on the impact of ACEs and other adversities on health (including reviewing patient's self-assessment of ACEs' impact on health), buffering/protective factors, and interventions that can mitigate health risks. If the **ACE score is 1-3** with ACE-Associated Health Conditions, the patient is at "intermediate risk." If the **ACE score is 4 or higher**, even without ACE-associated health conditions, the patient is at "high risk" for toxic stress physiology. In both cases, the provider should offer education on how ACEs may lead to a toxic stress response and associated health conditions, as well as practices and interventions demonstrated to buffer the toxic stress response, such as sleep, exercise, nutrition, mindfulness, mental health, and healthy relationships. The provider should also assess for protective factors, jointly formulate a treatment plan and link to supportive services and interventions, as appropriate.

ACE-Associated Health Conditions: Adults

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Symptom or Health Condition	Odds Ratio (excluding outliers)
Cardiovascular disease[21] (CAD, MI, ischemic heart disease)	2.1
Tachycardia[37]	≥ 1 ACE: 1.4
Stroke[20]	2.0
Chronic obstructive pulmonary disease (emphysema, bronchitis)[21]	3.1
Asthma[43]	2.2
Diabetes[21]	1.4
Obesity[20]	2.1
Hepatitis or jaundice[1]	2.4
Cancer, any[21]	2.3
Arthritis[32, 7] (self-reported)	3 ACEs, HR: 1.5 ≥ 1 ACE: 1.3
Memory impairment[20] (all causes, including dementias)	4.9
Kidney disease[43]	1.7
Headaches[11]	≥ 5 ACEs: 2.1
Chronic pain, any[38] (using trauma z-score)	1.2
Chronic back pain[38] (using trauma z-score)	1.3
Fibromyalgia[37]	≥ 1 ACE: 1.8
Unexplained somatic symptoms, including somatic pain, headaches[20, 2]	2.0 - 2.7
Skeletal fracture[1]	1.6 - 2.6[20]
Physical disability requiring assistive equipment[23]	1.8

Odds ratios compare outcomes in individuals with > 4 ACEs to those with 0 ACEs, except where specified

ACE-Associated Health Conditions: Adults

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Symptom or Health Condition	Odds Ratio (excluding outliers)
Depression[21]	4.7
Suicide attempts[21]	37.5
Suicidal ideation[20]	10.5
Sleep disturbance[20]	1.6
Anxiety[21]	3.7
Panic and anxiety[20]	
Post-traumatic stress disorder[37]	4.5
Illicit drug use[21] (any)	5.2
Injected drug, crack cocaine, or heroin use[21]	10.2
Alcohol use[21]	6.9
Cigarettes or e-cigarettes use[35]	6.1
Cannabis use[35]	11.0
Teen pregnancy[21]	4.2
Sexually transmitted infections, lifetime[21]	5.9
Violence victimization[21] (intimate partner violence, sexual assault)	7.5
Violence perpetration[21]	8.1

Odds Ratios for individuals with > 4 ACEs, except where specified otherwise, all compared to 0 ACEs

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