Supplementary Online Content

Tatum WO, Hirsch LJ, Gelfand MA, et al; OSmartViE Investigators. Assessment of the predictive value of outpatient smartphone videos for diagnosis of epileptic seizures. *JAMA Neurol*. Published online January 21, 2020. doi:10.1001/jamaneurol.2019.4785

This supplementary material has been provided by the authors to give readers additional information about their work.

Appendix 1. Survey for Video Semiology and Quality Review

VIDEO SEMIOLOGY & QUALITY REVIEW

WHICH OF THE FOLLOWING APPLIES TO THE VIDEO?

Please choose the best fit.

- Interictal
- Ictal
- Post-Ictal
- Both Ictal and Post-Ictal

WHICH OF THE FOLLOWING APPLIES TO THE VIDEO?

Please choose the best fit.

- Convulsive
- Non-Convulsive

DIAGNOSIS FROM VIDEO:

Please choose the best fit.

- Epileptic
- Non-EpilepticPsychogenic
- Physiologic Event
- Unknown

OVERALL DEGREE OF CERTAINTY OF THE DIAGNOSIS:

Slide the dot to the number that best describes your confidence in the diagnosis. (0 - not confident to 10 - confident)

IF UNABLE TO DETERMINE DIAGNOSIS, IS IT DUE TO:

Please choose the best fit – respond as appropriate.

- Difficult Semiology
- Poor Video Recording
- Both of the Above
- Not Applicable - Diagnosis was determined

EPILEPTIC FEATURES:

Please choose the best fit – respond as appropriate.

- Generalized tonic/tonic-clonic jerking
- Focal tonic/clonic jerking
- Staring with dyscognitive features
- Prominent automatisms/mild motor
- Single brief jerks
- Drop
- Hypermotor
- Not Applicable

NON-EPILEPTIC FEATURES

Please choose the best fit – respond as appropriate.

- Generalized rhythmic tremor
- Violent flailing movements
- Staring
- Limp collapse
- Complex non-physiologic motor
- Mixed
- Limb Stiffening
- Twitch
- Not Applicable

CONSEQUENCES:

Please check all that apply.

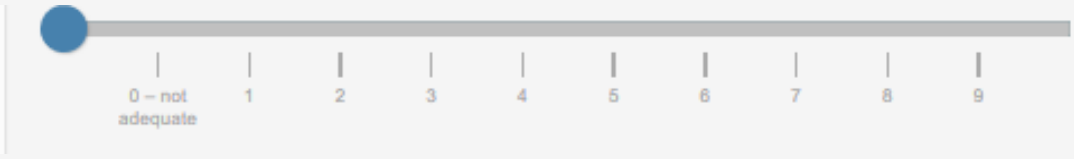
- [ ] Injury
- [ ] Breathing compromised
- [ ] Prone position
- [ ] Tongue trauma
- [ ] Bystander intensification
- [ ] Incontinence
- [ ] Fall
- [ ] Status Epilepticus
- [ ] Clusters
- [ ] Fracture
- [ ] Psychiatric
- [ ] None of the Above

WAS THE OVERALL VIDEO-QUALITY SUITABLE TO MAKE A PREDICTION?

- ( ) Yes
- ( ) No

ADEQUACY OF TECHNICAL RECORDING

Slide the dot to the number that best describes the adequacy of the smartphone video. (0 – not adequate to 10 – completely adequate)



WAS THE VIDEO SAMPLING LONG ENOUGH FOR A DIAGNOSIS?

- ( ) Yes
- ( ) No

DID A BYSTANDER ENGAGE OR INTERVENED AT ANY TIME?

- ○ Yes
- ○ No

WHAT WAS THE FOCAL POINT IN THE VIDEO?

Please choose the best fit – respond as appropriate.

- ○ Head
- ○ Body
- ○ Head & Body
- ○ Part of body
- ○ Part of head

HOW WAS THE LEVEL OF LIGHT IN THE VIDEO?

- ○ Sufficient Light
- ○ Too Light (Over Exposed)
- ○ Too Dark (Under Exposed)

HOW WOULD YOU BEST DESCRIBE THE CLARITY OF THE VIDEO?

- ○ Clear (In Focus)
- ○ Blurry (Out of Focus)

HOW WOULD YOU BEST DESCRIBE THE AUDIO OF THE VIDEO?

- ○ Good / Clear Audio
- ○ Poor Audio
- ○ No Audio

CHECK THE PERTINENT POINTS THAT SIGNIFICANTLY HINDERED YOUR ABILITY TO MAKE A CLINICAL DECISION:

Please check all that apply.

- ☐ Blurry Content

- [ ] Dark Environment
- [ ] Poor Audio
- [ ] Short Event Duration
- [ ] Limited/no bystander interaction or testing awareness
- [ ] Atypical semiology
- [ ] Limited Video Duration
- [ ] Limited Ictal period recorded
- [ ] Limited post-ictal period recorded
- [ ] Limited whole body view
- [ ] Limited focus on area of interest
- [ ] Home Video Adequate for Clinical Interpretation

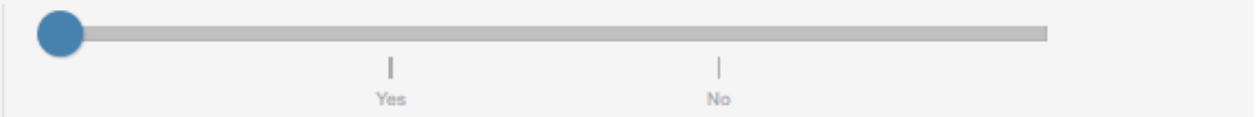
WAS THERE A KNOWN CONSEQUENCE OF TAKING THE HOME VIDEO?

- ( ) Yes
- ( ) No
- ( ) Unknown

ROLE OF PERSON ANSWERING QUESTIONS:

- ( ) Treating Physician
- ( ) Blinded Physician

FOR TREATING PHYSICIAN ONLY, WAS THE EPISODE REPRESENTATIVE OF THE OUTPATIENT EPISODE? FOR TREATING PHYSICIAN ONLY, WAS THE EPISODE REPRESENTATIVE OF THE OUTPATIENT EPISODE?



eTable 1. Measures of Diagnostic Utility of SV for Convulsive vs Non-Convulsive Events Among the 11 Reviewers Who Assessed >30 videos *

	Diagnosis	Convulsive	Non-Convulsive
Accuracy (95% CI)	***ES***	98.5% (94.8 - 99.8%)	73.2% (66.5 - 79.3%)
	PNEA	96.3% (91.6 - 98.8%)	72.7% (66.0 – 78.8%)
Sensitivity (95% CI)	***ES***	81.8% (48.2 - 97.7%)	59.3% (47.8 - 70.1%)
	PNEA	99.2% (95.5 - 100%)	76.8% (67.2 - 84.7%)
Specificity (95% CI)	***ES***	100% (97.1 – 100%)	82.9% (74.8 - 89.2%)
	PNEA	69.2% (38.6 – 90.9%)	68.7% (58.6 - 77.6%)
PPV (95% CI)	***ES***	100% (66.4 - 100%)	70.6% (58.3 – 81.0%)
	PNEA	96.8% (92.0 – 99.1%)	71.0% (61.5 - 79.4%)
NPV (95% CI)	***ES***	98.4% (94.4 - 99.8%)	74.6% (66.2 - 81.8%)
	PNEA	90.0% (55.5- 99.7%)	74.7% (64.5 - 83.3%)

Abbreviations: ES, epileptic seizure; NPV, negative predictive value; PNEA, psychogenic nonepileptic attack; PPV, positive predictive value.
*In cases where reviewer description of the smartphone video-recorded event as convulsive or non-convulsive were mixed, the more common answer for each video was used to classify the event.

eTable 2A. Measures of Diagnostic Utility of SV for ES Among the 11 Reviewers Who Assessed >30 videos

Reviewer	Accuracy (95% CI)	Sensitivity (95% CI)	Specificity (95% CI)	PPV (95% CI)	NPV (95% CI)
Resident 1	75.8% (57.7 – 88.9%)	22.2% (2.81 – 60.0%)	95.8% (78.9 – 99.9%)	66.7% (9.43- 99.2%)	76.7% (57.7 – 90.1%)
Resident 3	71.4% (53.7 – 85.4%)	10.0% (0.253 – 44.5%)	96.0% (79.6 - 99.9%)	50.0% (1.26 – 98.7%)	72.7% (54.5 - 86.7%)
Resident 4	76.7% (57.7 – 90.1%)	28.6% (3.67 - 71.0%)	91.3% (72.0 – 98.9%)	50.0% (6.76 - 93.2%)	80.8% (60.6 - 93.4%)
Resident 5	72.7% (54.5 – 86.7%)	50.0% (18.7 – 81.3%)	82.6% (61.2 – 95.0%)	55.6% (21.2 – 86.3%)	79.2% (57.8 – 92.9%)
Resident 6	87.5% (71.0 - 96.5%)	81.8% (48.2 – 97.7%)	90.5% (69.6 – 98.8%)	81.8% (48.2 – 97.7%)	90.5% (69.6 – 98.8%)
Expert 2	85.3% (68.9 – 95.0%)	100% (66.4 - 100%)	80.0% (59.3 - 93.2%)	64.3% (35.1 - 87.2%)	100% (83.2 - 100%)
Expert 3	95.0% (75.1 – 99.9%)	100% (59.0 - 100%)	92.3% (64.0 - 99.8%)	87.5% (47.3 - 99.7%)	100% (73.5 - 100%)
Expert 4	94.7% (74.0 – 99.9%)	75.0% (19.4 – 99.4%)	100% (78.2 - 100%)	100% (29.2 - 100%)	93.8% (69.8 - 99.8%)
Expert 6	87.5% (71.0 - 96.5%)	75.0% (34.9 – 96.8%)	91.7% (73.0 - 99.0%)	75.0% (34.9 – 96.8%)	91.7% (73.0 - 99.0%)
Expert 7	87.9% (71.8 – 96.6%)	70.0% (34.8 – 93.3%)	95.7% (78.1 – 99.9%)	87.5% (47.3 - 99.7%)	88.0% (68.8 - 97.5%)
Expert 8	93.8% (79.2 – 99.2%)	85.7% (42.1 – 99.6%)	96.0% (79.6 - 99.9%)	85.7% (42.1 – 99.6%)	96.0% (79.6 - 99.9%)
All 11 Reviewers	83.5% (79.1 - 87.3%)	62.0 % (51.2 - 71.9%)	91.7% (87.5 - 94.9%)	74.0% (62.8 - 83.4%)	86.3% (81.5 - 90.3%)

Abbreviations: ES, epileptic seizure; NPV, negative predictive value; PNEA, psychogenic nonepileptic attack; PPV, positive predictive value.

eTable 2B. Measures of Diagnostic Utility of SV for PNEA Among the 11 Reviewers Who Assessed >30 videos

Reviewer	Accuracy (95% CI)	Sensitivity (95% CI)	Specificity (95% CI)	PPV (95% CI)	NPV (95% CI)
Resident 1	78.8% (61.1 – 91.0%)	100% (84.6 - 100%)	36.4% (10.9 – 69.2%)	75.9% (56.5 – 89.7%)	100% (39.8 - 100%)
Resident 3	74.3% (56.7 – 87.5%)	100% (85.8 - 100%)	18.2% (2.28 – 51.8%)	72.7% (54.5 – 86.7%)	100% (15.8 - 100%)
Resident 4	80.0% (61.4 – 92.3%)	90.5% (69.6 – 98.8%)	55.6% (21.2 - 86.3%)	82.6% (61.2 - 95.0%)	71.4% (29.0 – 96.3%)
Resident 5	69.7% (51.3 – 84.4%)	76.2% (52.8 – 91.8%)	58.3% (27.7 – 84.8%)	76.2% (52.8 – 91.8%)	58.3% (27.7 - 84.8%)
Resident 6	84.4% (67.2 – 94.7%)	80.0% (56.3 – 94.3%)	91.7% (61.5 - 99.8%)	94.1% (71.3 – 99.9%)	73.3% (44.9 - 92.2%)
Expert 2	85.3% (68.9 – 95.0%)	78.3% (56.3 – 92.5%)	100% (71.5 - 100%)	100% (81.5 - 100%)	68.8% (41.3 – 89.0%)
Expert 3	95.0% (75.1 – 99.9%)	91.7% (61.5 – 99.8%)	100% (63.1 - 100%)	100% (71.5 - 100%)	88.9% (51.8 - 99.7%)
Expert 4	94.7 % (74.0 - 99.9%)	100% (76.8 - 100%)	80.0% (28.4 – 99.5%)	93.3% (68.1 – 99.8%)	100% (39.8 - 100%)
Expert 6	78.1% (60.0 – 90.7%)	81.0% (58.1 – 94.6%)	72.7% (39.0 – 94.0%)	85.0% (62.1 - 96.8%)	66.7% (34.9 – 90.1%)
Expert 7	87.9% (71.8 – 96.6%)	95.2% (76.2 – 99.9%)	75.0% (42.8 – 94.5%)	87.0% (66.4 – 97.2%)	90.0% (55.5 - 99.7%)
Expert 8	87.5% (71.0 - 96.5%)	90.9% (70.8 – 98.9%)	80.0% (44.4 - 97.5%)	90.9% (70.8 – 98.9%)	80.0% (44.4 - 97.5%)
All 11 Reviewers	82.3% (77.7 – 86.2%)	89.1% (84.3 - 92.9%)	68.8% (59.3 – 77.2%)	84.9% (79.6 - 89.3%)	76.2% (66.7 – 84.1%)

Abbreviations: ES, epileptic seizure; NPV, negative predictive value; PNEA, psychogenic nonepileptic attack; PPV, positive predictive value.

eTable 3. Measures of Diagnostic Accuracy of Smartphone Videos for ES and PNEA with "Unknowns" Excluded Versus Included

	Diagnosis	All Reviewers	Experts Only	Residents Only
Accuracy with "Unknowns" Excluded (95% CI)	***ES***	82.7% (78.7 - 86.2%)	89.1% (84.2 - 92.9%)	75.3% (68.5 - 81.2%)
	PNEA	81.0% (76.8 - 84.7%)	85.9% (80.6 - 90.2%)	75.3% (68.5 - 81.2%)
Accuracy with "Unknowns" Included (95% CI)	***ES***	64.0% (59.7 - 68.1%)	67.6% (61.9 - 72.9%)	59.6% (53.1 - 65.8%)
	PNEA	62.6% (58.4 - 66.8%)	65.2% (59.4 - 70.6%)	59.6% (53.1 - 65.8%)

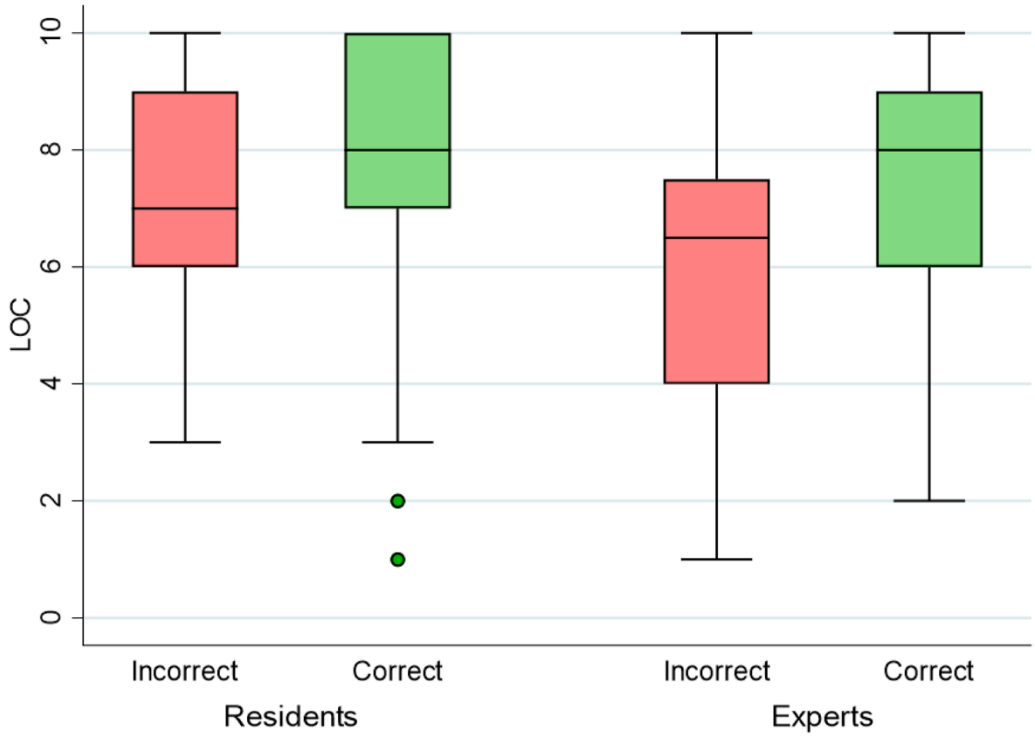
Abbreviations: ES indicates, epileptic seizure; NS, not significant; PNEA, psychogenic nonepileptic attack

eTable 4. Likelihood and Odds Ratios as Measures of Diagnostic Utility of Smartphone Video for ES and PNEA

	Diagnosis	All Reviewers	Experts Only	Residents Only	*P* Values
Likelihood ratio (+) (95% CI)	***ES***	6.65 (4.49 - 9.83)	11.4 (6.35 - 20.6)	3.55 (2.03 - 6.23)	.005
	PNEA	2.58 (2.03 - 3.27)	3.99 (2.58 - 6.16)	1.82 (1.39 - 2.38)	.001
Likelihood ratio (−) (95% CI)	***ES***	0.44 (0.35 - 0.56)	0.25 (0.15 - 0.40)	0.66 (0.52 - 0.84)	<.001
	PNEA	0.18 (0.13 - 0.25)	0.13 (0.079 - 0.21)	0.26 (0.16 - 0.42)	.06
Odds ratio (95% CI)	***ES***	15.0 (8.7 – 25.9)	46.0 (19.4 - 109.0)	5.4 (2.5 – 11.3)	<.001
	PNEA	14.6 (8.8 - 24.3)	30.7 (14.3 - 66.1)	7.12 (3.5 - 14.4)	.006
ROC area (95% CI)	***ES***	0.75 (0.70 - 0.80)	0.85 (0.79 - 0.91)	0.65 (0.58 - 0.72)	---
	PNEA	0.77 (0.73 - 0.82)	0.84 (0.78 - 0.89)	0.70 (0.63 - 0.76)	---

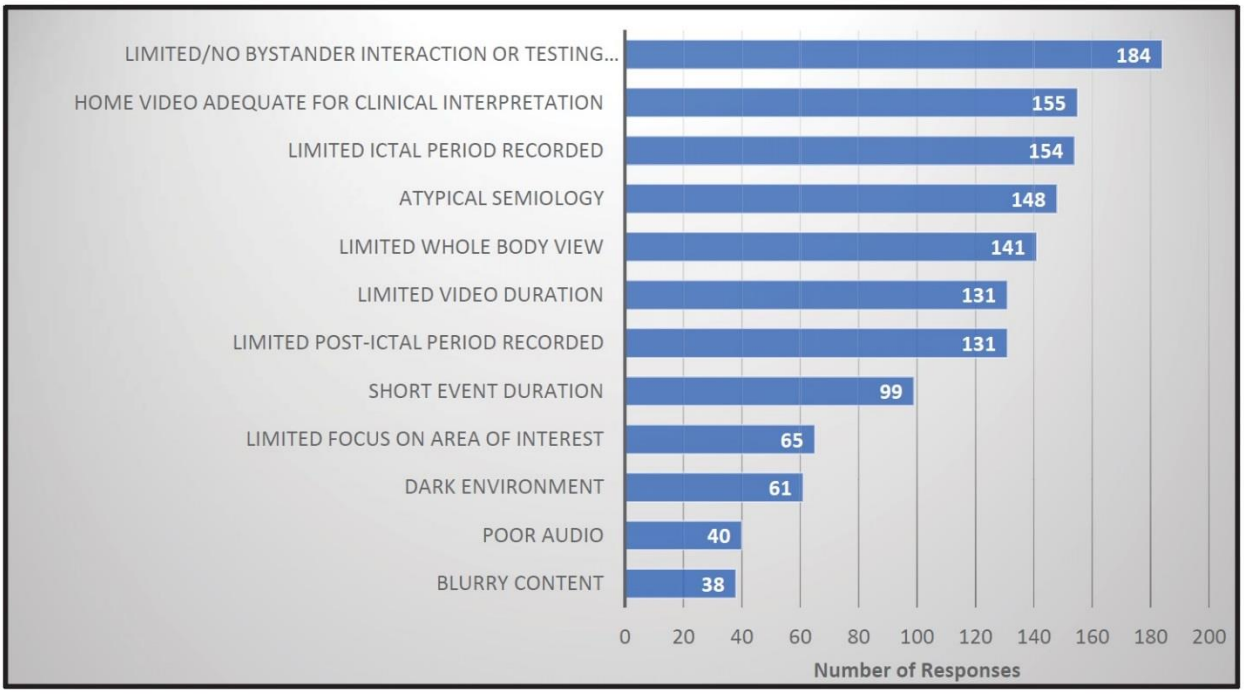
Abbreviations: ES indicates, epileptic seizure; NS, not significant; PNEA, psychogenic nonepileptic attack
P values for significance of difference between experts and PGY-4s, obtained from Mantel-Haenszel (MH) χ^2 test of homogeneity.

eFigure 1. Differences in LOC in Diagnosis from Smartphone Videos for Residents Versus Experts by Diagnostic Accuracy.



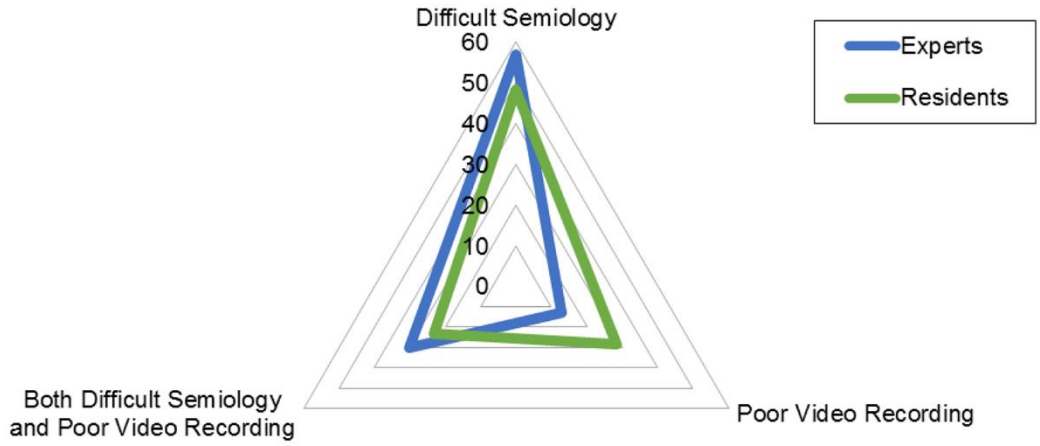
Instances when the clinician listed “Unknown” for diagnosis from smartphone videos were excluded from the above figure. LOC indicates level of confidence.

eFigure 2. Reviewer-Designated Hindrances to Diagnosis from Smartphone Video.



Responses to checkbox survey question asking smartphone video reviewers to indicate as many responses as are applicable regarding: “Pertinent Points that Significantly Hindered Your Ability to Make a Clinical Decision”, excluding the 155 responses of “Home Video Adequate for Clinical Interpretation.”

eFigure 3. Radar Plot Including Listed Reason for Difficulty with Diagnosis from Smartphone Video by Clinician Type.



For the question of reason for difficulty with diagnosis from smartphone video, answers of "Not Applicable" were excluded from this Figure.