

## **Supplementary Materials**

### **eAppendix 1: UCSF Telemedicine Clinic Model**

In February 2020, the CDC issued guidance advising that health care facilities and providers offer clinical services through virtual means such as telemedicine. On March 6, 2020, coinciding with the U.S. Federal Government's expansion of Medicare telemedicine coverage, all non-essential in-person clinical encounters at UCSF MAC Outpatient clinic were rescheduled. Patients who resided within C.A. were scheduled for a video visit, while those outside C.A. were scheduled for a telephone encounter. By March 16, all in-person evaluations had ceased as the clinic transitioned to complete telemedicine services. By the first week of May 2020, our clinic had fully transitioned to telemedicine services and had reached our past average clinical capacity. The implementation and transition to tele-neuropsychology services were more problematic. Unlike neurology/psychiatry telemedicine, many neuropsychology telemedicine restrictions were not rescinded due to the sweeping national legislation implemented in March 2020. Accordingly, due to lack of reimbursement, interstate licensing restrictions, and an unvetted tele-neurocognitive equivalent to in-person testing, the full deployment of tele-neuropsychology services was delayed until June 2020. Subsequent data comparisons between pre-telemedicine and telemedicine clinic capacity exclude the four-month window between January and May, given that it reflected a transitioning phase unsuitable for comparison between years.

The vast majority of new and all follow-up encounters were scheduled for VTC encounters. New patient referrals were screened by a dedicated nurse practitioner who investigated their clinical record to determine whether the patient would require an expedited referral to a subspecialty clinic (e.g., rapidly progressive dementia) or could not participate in video teleconferencing. Patients who lacked access to a smartphone or computer application were required to either be seen in our small dedicated in-person urgent clinic or reschedule for video telemedicine encounters with a relative or friend who did have access to video teleconferencing. Established patients who lacked access to a smartphone or computer application required to enable telemedicine encounters were scheduled for structured (audio-only) telephone encounters. Telephone encounters were conducted with a phone. Standard in-person protocols, registrations, and patient consents were all transferred to digital equivalents using APEX tools.

Coordinators instructed patients or caregivers regarding the download of the patient Zoom smartphone application required for telemedicine encounters when appointments were scheduled. One day before the meeting, a nursing assistant called the family or caregivers to provide additional instructions about the encounter procedure to increase the likelihood of successfully accessing the patient portal. If patients did not successfully connect to the encounter within 5-10 minutes of the scheduled encounter time, then staff reached out to patients to troubleshoot. Providers reviewed resources on conducting video telemedicine neurologic examinations.

The VTC evaluation began by obtaining a medical history, including chronology and character of cognitive complaints, functional status, behavioral symptoms, and relevant medical history. The caregiver was interviewed to validate or provide additional information. A focused neurological examination, including assessment of cranial nerves, motor evaluation for tremor, coordination and some components of strength, and gait, was then conducted by a physician with the caregiver's assistance. This was followed by administering a neuropsychological battery derived from the standard in-person battery; however, the clinical provider's specific tests varied. Upon completing the evaluation, the clinical provider and/or memory care team conferred and developed a consensus diagnosis and treatment recommendations. These preliminary results were then communicated to the

patient and caregiver via VTC by the physician and appropriately documented in the electronic medical record available to the patient's primary care providers. Education and support for caregivers included providing the usual disease-specific information packet by the remote clinician with educational material, including information about a diagnosis, prognosis, treatment options, driving, and local resources.

At the time of the encounter, providers accessed the system through their UCSF encrypted/secured computer and completed documentation by accessing Epic on a computer with a remote desktop connection (Citrix Systems). Providers documented telemedicine and telephone encounters within the EHR using structured documentation templates that contained key medical data fields from typical in-person note templates. In addition, new fields were added, including the need for the encounter, identification of participants within the meeting, and appointment duration. Audio-video telemedicine encounters contained a template for a physical examination, which was not included in templates for telephone encounters.

## **eAppendix 2: MAC Telemedicine Physician Provider Satisfaction Survey**

### ***Consent:***

*We are asking you to take part in a research study being done by fellows at the Memory and Aging Center at the University of California, San Francisco. Being in this study is optional.*

*If you choose to be in the study, you will complete a brief survey. This survey will help us learn more about how telemedicine has impacted your clinical practice. The survey will take about 5 minutes to complete.*

*You can stop the survey at any time. The survey is anonymous and confidential, and no one, including the research team, will be able to link your responses back to you. Please do not include your name or other information that could be used to identify you in the survey responses.*

*Questions? Please contact Elena Tsoy, PhD at [elena.tsoy@ucsf.edu](mailto:elena.tsoy@ucsf.edu) or James Rini, MD, MPH at [james.rini@ucsf.edu](mailto:james.rini@ucsf.edu). If you have questions or concerns about your rights as a research participant, you can call the UCSF Institutional Review Board at 415-476-1814.*

*If you want to participate in this study, click the [Agree] button to start the survey.*

### **Please select your primary specialty:**

- 1) Neurology => route to Neurology survey
- 2) Neuropsychology => route to Neuropsychology survey
- 3) Psychiatry => route to Neurology survey
- 4) Geriatric Medicine => route to Neurology survey
- 5) Other (please specify): [free text] => route to Neurology survey

### **Please select your level of training/position title:**

- 1) Resident
- 2) Fellow
- 3) Assistant professor
- 4) Associate professor
- 5) Professor
- 6) Other (please specify): [free text]

### **Please select your gender:**

- 1) Female
- 2) Male
- 3) Transgender
- 4) Gender non-binary
- 5) Prefer not to answer

**Please select your age group:**

- 1) 34 or younger
- 2) 35-44
- 3) 45-54
- 4) 55-64
- 5) 65 or older

**In this survey, you will be asked questions about your experience with telemedicine. For the purposes of this study, telemedicine is defined as the use of videoconferencing technology (e.g., Zoom) to provide remote clinical health care. Phone-based clinical care delivery is not included in the definition of telemedicine within the context of this study. Also, please provide your responses based on services provided only in the context of clinical evaluations, not research evaluations.**

- 1. Have you had any experience in providing clinical services via telemedicine (video visits) prior to COVID-19?**

- 1) Yes

If Yes => Approximately what percent of your clinical services was provided via telemedicine prior to COVID-19? [drop down menu of 0-100%]

- 2) No

- 2. Over the last 3 months, approximately what percent of your weekly clinical services was provided via telemedicine?** [drop down menu of 0-100%]

- 3. Compared to in-person evaluations, how satisfied are you with providing clinical services via telemedicine?**

-3	-2	-1	0	1	2	3
very dissatisfied	moderately dissatisfied	slightly dissatisfied	about the same	slightly satisfied	moderately satisfied	very satisfied

- 4. Compared to in-person evaluations, how confident do you feel in the quality of the history you gather via telemedicine?**

-3	-2	-1	0	1	2	3
much less confident	moderately less confident	slightly less confident	about the same	slightly more confident	moderately more confident	much more confident

- 5. Compared to in-person evaluations, how confident do you feel in the quality of your physical exam via telemedicine?**

-3	-2	-1	0	1	2	3
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much less confident	moderately less confident	slightly less confident	about the same	slightly more confident	moderately more confident	much more confident
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**5a. Compared to in-person evaluations, how confident do you feel in the quality of the mental status assessment via telemedicine?**

-3	-2	-1	0	1	2	3
much less confident	moderately less confident	slightly less confident	about the same	slightly more confident	moderately more confident	much more confident

**5b. Compared to in-person evaluations, how confident do you feel in the quality of the cranial nerve assessment (including oculomotor) via telemedicine?**

-3	-2	-1	0	1	2	3
much less confident	moderately less confident	slightly less confident	about the same	slightly more confident	moderately more confident	much more confident

**5c. Compared to in-person evaluations, how confident do you feel in the quality of the motor assessment (including parkinsonism) via telemedicine?**

-3	-2	-1	0	1	2	3
much less confident	moderately less confident	slightly less confident	about the same	slightly more confident	moderately more confident	much more confident

**5d. Compared to in-person evaluations, how confident do you feel in the quality of the sensory assessment via telemedicine?**

-3	-2	-1	0	1	2	3	NA
much less confident	moderately less confident	slightly less confident	about the same	slightly more confident	moderately more confident	much more confident	I do not do the sensory exam

**5e. Compared to in-person evaluations, how confident do you feel in the quality of the coordination assessment via telemedicine?**

-3	-2	-1	0	1	2	3
much less confident	moderately less confident	slightly less confident	about the same	slightly more confident	moderately more confident	much more confident

**5f. Compared to in-person evaluations, how confident do you feel in the quality of the gait assessment via telemedicine?**

<b>-3</b>	<b>-2</b>	<b>-1</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>
much less confident	moderately less confident	slightly less confident	about the same	slightly more confident	moderately more confident	much more confident

**5g. If you would like to add any comments or clarifications to your responses to questions 5a-5f, please provide them below:** [free text box]

**6. Compared to in-person evaluations, how confident do you feel diagnosing new patients via telemedicine?**

<b>-3</b>	<b>-2</b>	<b>-1</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>
much less confident	moderately less confident	slightly less confident	about the same	slightly more confident	moderately more confident	much more confident

**7. Compared to in-person evaluations, have you experienced any of the following challenges in using telemedicine for clinical evaluations? Please select all that apply.**

- 1) Obtaining a good/reliable neurological physical exam
- 2) Managing technology-related disruptions (connectivity, image, or sound)
- 3) Evaluating patients with limited familiarity with technology
- 4) Evaluating patients with hearing/vision impairments
- 5) Working with interpreters
- 6) Establishing rapport and/or providing the same level of emotional support
- 7) More time-consuming
- 8) Too much personal screen time (outside of clinical evaluations)
- 9) Concern for decreased quality of care
- 10) Disruption of the multidisciplinary model (e.g., delays between neurology and neuropsychology evaluations)
- 11) Other (free text)
- 12) I have not experienced any challenges in using telemedicine for clinical evaluations (proceed to the next question)

**8. Compared to in-person evaluations, have you experienced any of the following benefits in using telemedicine for clinical evaluations? Please select all that apply.**

- 1) Increased access to care for patients (e.g., greater geographical reach, ability to evaluate patients with mobility limitations, shorter wait time, etc.)
- 2) Personal convenience in providing care from home
- 3) Greater understanding of my patients' living environment
- 4) More family members can join and participate in the visit
- 5) Bypassing rooming or registration issues
- 6) Opportunity to provide greater continuity of care to patients with limited mobility (advanced dementia)
- 7) Greater convenience for patients (e.g., decreased disruption in the daily routine)
- 8) Other (free text)

- 9) I have not experienced any benefits in using telemedicine for clinical evaluations  
(proceed to the next question)

**9. Based on your experience with telemedicine so far, which diagnoses, if any, warrant or are notably improved by an in-person evaluation? Select all that apply.**

- 1) Alzheimer's type dementia
- 2) Behavioral variant frontotemporal dementia
- 3) Corticobasal syndrome
- 4) Dementia with Lewy bodies / Parkinson's disease dementia
- 5) Mild cognitive impairment, amnesic
- 6) Mild cognitive impairment, non-amnesic
- 7) Motor neuron disease
- 8) Progressive supranuclear palsy syndrome
- 9) Primary progressive aphasia
- 10) Primary psychiatric disorder
- 11) Rapidly progressive dementia
- 12) Subjective cognitive impairment
- 13) Traumatic encephalopathy syndrome
- 14) Cognitive syndromes due to reversible causes (metabolic, substance abuse, etc.)
- 15) Other (free text)
- 16) I do not think that any diagnoses require an in-person evaluation (proceed to the next question)

**10. How interested are you in continuing to provide clinical services via telemedicine as part of your usual practice post COVID-19?**

0	1	2	3	4
not at all interested	somewhat interested	moderately interested	quite interested	very interested

If 1-4 => Approximately what percent of your clinical services would you be interested in providing via telemedicine post COVID-19? [drop down menu of 0-100%]

**11. How acceptable do you think new patient evaluations via telemedicine are as an alternative to in-person visits?**

0	1	2	3	4
not at all acceptable	somewhat acceptable	moderately acceptable	quite acceptable	very acceptable

**12. How acceptable do you think follow-up patient evaluations via telemedicine are as an alternative to in-person visits?**

0	1	2	3	4
not at all acceptable	somewhat acceptable	moderately acceptable	quite acceptable	very acceptable

**13. If you would like to add any additional comments about your experience with providing clinical services via telemedicine which were not included in this survey, please provide them below:** [free text box]

### **eAppendix 3: MAC Telemedicine Neuropsychologist Provider Satisfaction Survey**

**Consent:**

*We are asking you to take part in a research study being done by fellows at the Memory and Aging Center at the University of California, San Francisco. Being in this study is optional.*

*If you choose to be in the study, you will complete a brief survey. This survey will help us learn more about how telemedicine has impacted your clinical practice. The survey will take about 5 minutes to complete.*

*You can stop the survey at any time. The survey is anonymous and confidential, and no one, including the research team, will be able to link your responses back to you. Please do not include your name or other information that could be used to identify you in the survey responses.*

*Questions? Please contact Elena Tsoy, PhD at [elena.tsoy@ucsf.edu](mailto:elena.tsoy@ucsf.edu) or James Rini, MD, MPH at [james.rini@ucsf.edu](mailto:james.rini@ucsf.edu). If you have questions or concerns about your rights as a research participant, you can call the UCSF Institutional Review Board at 415-476-1814.*

*If you want to participate in this study, click the [Agree] button to start the survey.*

**Please select your primary specialty:**

- 6) Neurology => route to Neurology survey
- 7) Neuropsychology => route to Neuropsychology survey
- 8) Psychiatry => route to Neurology survey
- 9) Geriatric Medicine => route to Neurology survey
- 10) Other (please specify): [free text] => route to Neurology survey

**Please select your level of training/position title:**

- 7) Resident
- 8) Fellow
- 9) Assistant professor
- 10) Associate professor
- 11) Professor
- 12) Other (please specify): [free text]

**Please select your gender:**

- 6) Female
- 7) Male
- 8) Transgender
- 9) Gender non-binary
- 10) Prefer not to answer

**Please select your age group:**

- 6) 34 or younger

- 7) 35-44
- 8) 45-54
- 9) 55-64
- 10) 65 or older

In this survey, you will be asked questions about your experience with telemedicine. For the purposes of this study, telemedicine is defined as the use of videoconferencing technology (e.g., Zoom) to provide remote clinical health care. Phone-based clinical care delivery is not included in the definition of telemedicine within the context of this study. Also, please provide your responses based on services provided only in the context of clinical evaluations, not research evaluations.

**14. Have you had any experience in providing clinical services via telemedicine (video visits) prior to COVID-19?**

3) Yes

If Yes => Approximately what percent of your clinical services was provided via telemedicine prior to COVID-19? [drop down menu of 0-100%]

4) No

**15. Over the last 3 months, approximately what percent of your weekly clinical services was provided via telemedicine?** [drop down menu of 0-100%]

**16. Compared to in-person evaluations, how satisfied are you with providing clinical services via telemedicine?**

-3	-2	-1	0	1	2	3
very dissatisfied	moderately dissatisfied	slightly dissatisfied	about the same	slightly satisfied	moderately satisfied	very satisfied

**17. Compared to in-person evaluations, how confident do you feel in the quality of the subjective/qualitative data (e.g., narrative history, behavioral observations) you gather via telemedicine?**

-3	-2	-1	0	1	2	3
much less confident	moderately less confident	slightly less confident	about the same	slightly more confident	moderately more confident	much more confident

**18. Compared to in-person evaluations, how confident do you feel in the quality of the objective cognitive data (i.e., test performance) via telemedicine?**

-3	-2	-1	0	1	2	3
much less confident	moderately less confident	slightly less confident	about the same	slightly more confident	moderately more confident	much more confident

**5a. Compared to in-person evaluations, how confident do you feel in the quality of the objective data in the domain of memory via telemedicine?**



-3	-2	-1	0	1	2	3
much less confident	moderately less confident	slightly less confident	about the same	slightly more confident	moderately more confident	much more confident

**5b. Compared to in-person evaluations, how confident do you feel in the quality of the objective data in the domain of executive functions via telemedicine?**

-3	-2	-1	0	1	2	3
much less confident	moderately less confident	slightly less confident	about the same	slightly more confident	moderately more confident	much more confident

**5c. Compared to in-person evaluations, how confident do you feel in the quality of the objective data in the domain of language via telemedicine?**

-3	-2	-1	0	1	2	3
much less confident	moderately less confident	slightly less confident	about the same	slightly more confident	moderately more confident	much more confident

**5d. Compared to in-person evaluations, how confident do you feel in the quality of the objective data in the domain of visuospatial/visuoconstructional skills via telemedicine?**

-3	-2	-1	0	1	2	3
much less confident	moderately less confident	slightly less confident	about the same	slightly more confident	moderately more confident	much more confident

**5e. If you would like to add any comments or clarifications to your responses to questions 5a-5f, please provide them below:** [free text box]

**19. Compared to in-person evaluations, how confident do you feel diagnosing new patients via telemedicine?**

-3	-2	-1	0	1	2	3
much less confident	moderately less confident	slightly less confident	about the same	slightly more confident	moderately more confident	much more confident

**20. Compared to in-person evaluations, have you experienced any of the following challenges in using telemedicine for clinical evaluations? Please select all that apply.**

- 1) Limited range of neuropsychological measures that can be administered reliably
- 2) Limited psychometric validation data (e.g., norms, reliability, etc.) on measures used via telemedicine
- 3) Managing technology-related disruptions (connectivity, image, or sound)

- 4) Lack of standardization or control over the patients' environment
- 5) Evaluating patients with limited familiarity with technology
- 6) Evaluating patients with hearing/vision impairments
- 7) Greater disparities in access to linguistically and culturally appropriate neuropsychological evaluations
- 8) Establishing rapport and/or providing emotional support
- 9) More time-consuming
- 10) Too much personal screen time (outside of clinical evaluations)
- 11) Concern for decreased quality of care
- 12) Disruption of the multidisciplinary model (e.g., delays between neurology and neuropsychology evaluations)
- 13) Other (free text)
- 14) I have not experienced any challenges in using telemedicine for clinical evaluations (proceed to the next question)

**21. Compared to in-person evaluations, have you experienced any of the following benefits in using telemedicine for clinical evaluations? Please select all that apply.**

- 10) Increased access to care for patients (e.g., greater geographical reach, ability to evaluate patients with mobility limitations, shorter wait time, etc.)
- 11) Personal convenience in providing care from home
- 12) Greater understanding of my patients' living environment
- 13) More family members can join and participate in the visit
- 14) Bypassing rooming or registration issues
- 15) Opportunity to provide greater continuity of care to patients with limited mobility (advanced dementia)
- 16) Greater convenience for patients (e.g., decreased disruption in the daily routine)
- 17) Other (free text)
- 18) I have not experienced any benefits in using telemedicine for clinical evaluations (proceed to the next question)

**22. Based on your experience with telemedicine so far, which diagnoses, if any, warrant or are notably improved by an in-person evaluation? Select all that apply.**

- 17) Alzheimer's type dementia
- 18) Behavioral variant frontotemporal dementia
- 19) Corticobasal syndrome
- 20) Dementia with Lewy bodies / Parkinson's disease dementia
- 21) Mild cognitive impairment, amnesic
- 22) Mild cognitive impairment, non-amnesic
- 23) Motor neuron disease
- 24) Progressive supranuclear palsy syndrome
- 25) Primary progressive aphasia
- 26) Primary psychiatric disorder
- 27) Rapidly progressive dementia
- 28) Subjective cognitive impairment
- 29) Traumatic encephalopathy syndrome
- 30) Cognitive syndromes due to reversible causes (metabolic, substance abuse, etc.)
- 31) Other (free text)
- 32) I do not think that any diagnoses require an in-person evaluation (proceed to the next question)

**23. How interested are you in continuing to provide clinical services via telemedicine as part of your usual practice post COVID-19?**

0	1	2	3	4
not at all interest	somewhat interested	moderately interested	quite interested	very interested

If 1-4 => Approximately what percent of your clinical services would you be interested in providing via telemedicine post COVID-19? [drop down menu of 0-100%]

**24. How acceptable do you think new patient evaluations via telemedicine are as an alternative to in-person visits?**

0	1	2	3	4
not at all acceptable	somewhat acceptable	moderately acceptable	quite acceptable	very acceptable

**25. How acceptable do you think follow-up patient evaluations via telemedicine are as an alternative to in-person visits?**

0	1	2	3	4
not at all acceptable	somewhat acceptable	moderately acceptable	quite acceptable	very acceptable

**26. If you would like to add any additional comments about your experience with providing clinical services via telemedicine which were not included in this survey, please provide them below: [free text box]**

eTable 1 - Confidence in Examination

**Confidence in Neurology Examination/Evaluation**

	Much Less Confident	Moderately Less Confident	Slightly Less Confident	Same or more confident
History	0 (0%)	0 (0%)	1 (4.4%)	22 (95.6%)
Physical Exam	7 (30.4%)	11 (47.8%)	5 (21.7%)	0 (0%)
Mental Status	0 (0%)	2 (8.7%)	11 (47.8%)	10 (43.5%)
Cranial Nerves	4 (17.4%)	11 (47.8%)	7 (30.4%)	1 (4.4%)
Motor	7 (30.4%)	13 (56.5%)	3 (13%)	0 (0%)
Sensory	22 (95.6%)	1 (4.4%)	0 (0%)	0 (0%)
Coordination	1 (4.4%)	10 (43.5%)	7 (30.4%)	5 (21.7%)
Gait	2 (8.7%)	4 (17.4%)	13 (56.5%)	4 (17.4%)

**Confidence in Neuropsychological Evaluation**

	Much Less Confident	Moderately Less Confident	Slightly Less Confident	Same or more confident
Qualitative Findings	0 (0%)	1 (14.3%)	4 (57.1%)	2 (28.6%)
Objective Findings	0 (0%)	2 (28.6%)	4 (57.1%)	1 (14.3%)
Memory Findings	0 (0%)	1 (14.3%)	3 (42.9%)	3 (42.9%)
Executive Findings	2 (28.6%)	5 (71.4%)	0 (0%)	0 (0%)
Language Findings	0 (0%)	0 (0%)	5 (71.4%)	2 (28.6%)
Visuospatial Findings	0 (0%)	2 (28.6%)	4 (57.1%)	1 (14.3%)