

Assessing the impact of telehealth on message volume in primary care physicians

James Lim, MAS, Julia Adler-Milstein, PhD

Background

COVID-19 has presented many challenges to health systems across the globe. In order to minimize potential exposure to both patients and care teams, telehealth was rapidly and widely deployed within primary care specialties. Although the technology for telehealth has been around before the pandemic, it has not been widely adopted historically, so the pandemic presented an opportunity to assess the impact of telehealth on varying aspects of health care delivery. An aspect that is important to analyze is its impact on provider’s message volume. Because telehealth introduces a novel way of interfacing with the patients and the healthcare system for the providers, it likely disrupts the way providers have traditionally communicated with their patients, leading to increased follow-up messaging. In addition, due to issues related to the novelty of virtual visits, connectivity, and hardware, providers are likely to experience an increased level of communication via messaging with both clinic staff and patients. Given the previous finding of association between message volume and provider burn-out, and particularly high prevalence of burnout in primary care providers, this study may provide crucial insight into the need for providing additional support for primary care providers as health systems continue to utilize telehealth past the immediate COVID-19 time period.

Objective

To understand the impact of telehealth on message volume in primary care providers.

Method

We used monthly EHR audit-log data of primary care attendings in internal medicine, geriatrics, pediatrics, and family medicine at UCSF using the Epic EHR system from May 2019 to July 2021. The providers in the sample had to have outcome of interest measured at least one month in both pre-intervention (May 2019 – February 2020) and post-intervention periods (July 2020 – July 2021). The total sample size was 133 unique providers. Total message volume for each provider for each month was divided by the number of appointments in each month to account for differing clinical volume. Interrupted time series analysis using mixed effects modeling was used to assess the pre and post intervention (i.e. implementation of telehealth) trend and intervention associated changes in message volume. Below represents the analysis algebraically:

$$Y_t = \alpha + \beta_1 T + \beta_2 X_t + \beta_3 TX_t + \varepsilon$$

where Y_t = message volume per appt, T = number of months since start of observation, X_t = study period (pre or post intervention), TX_t = interaction term, β_1 = pre-intervention trend, β_2 = intervention *level* change, and β_3 = post-intervention *trend* change

Method (cont.)

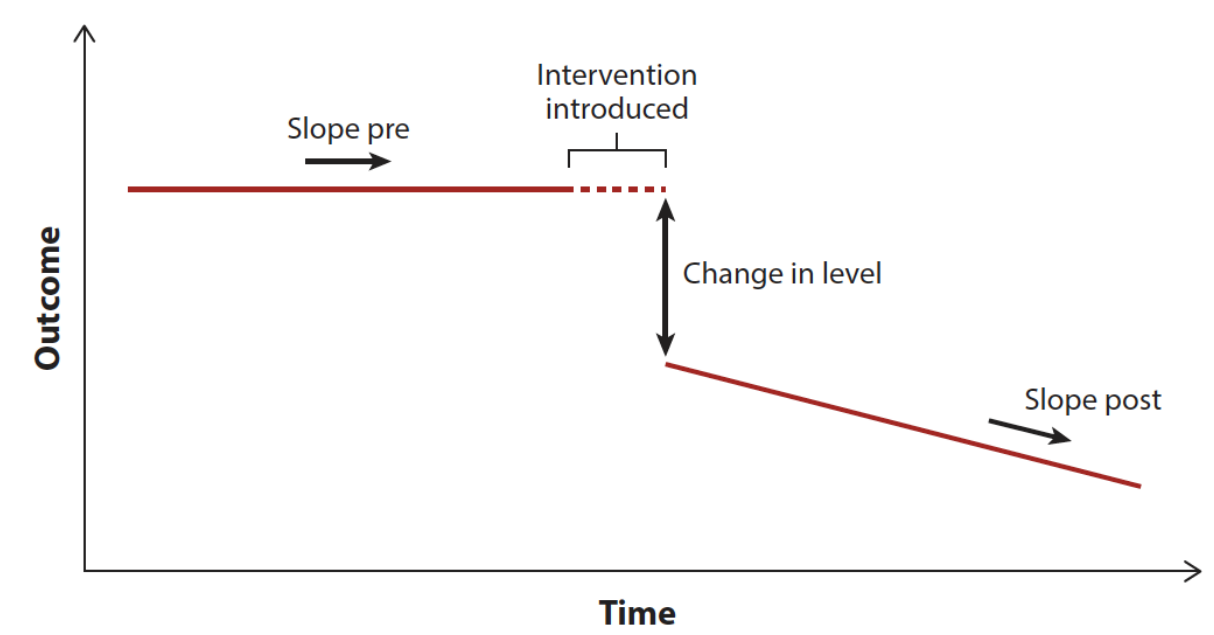


Figure 1: Graphical representation of Interrupted Time Series Analysis

Result

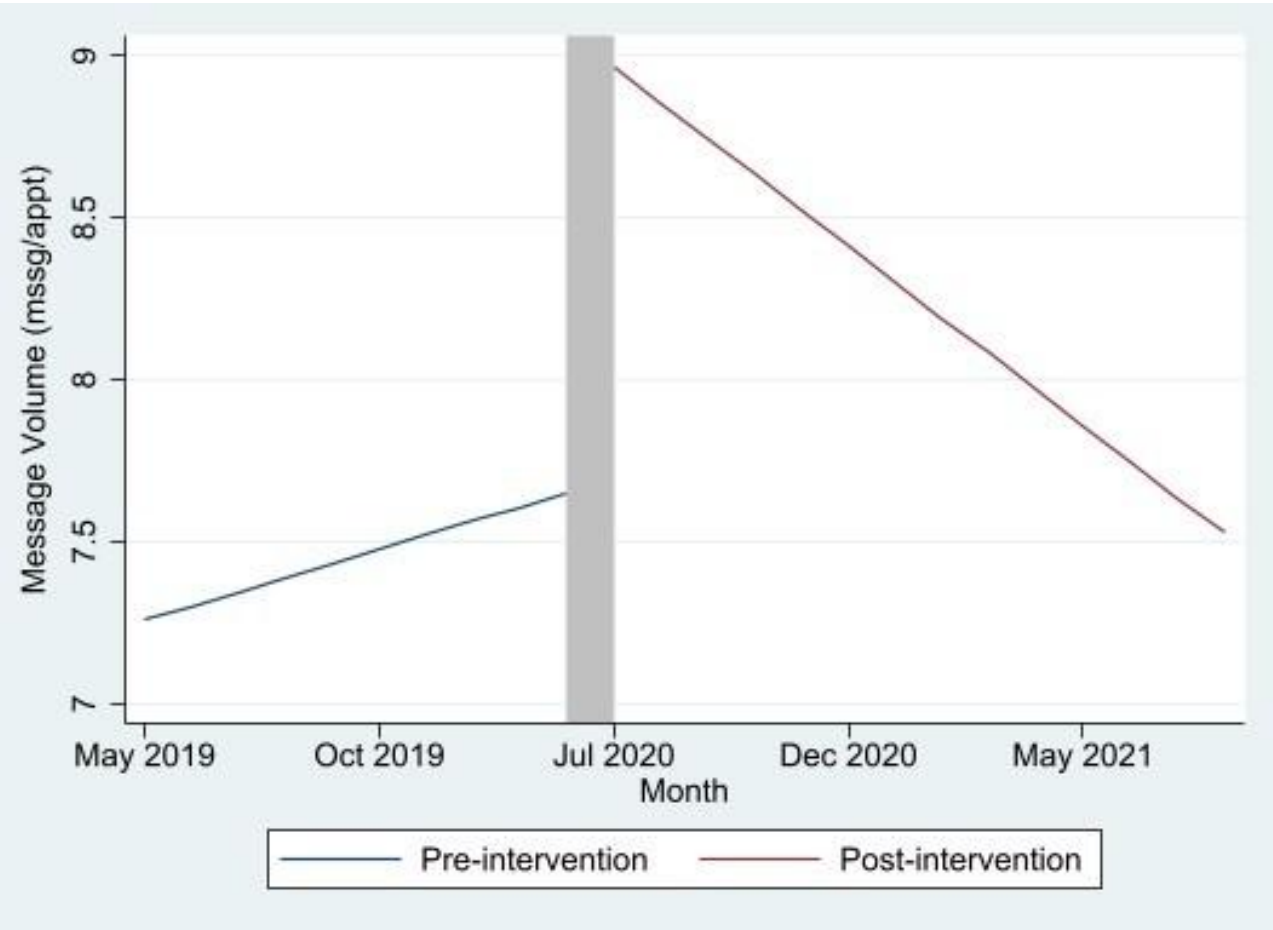


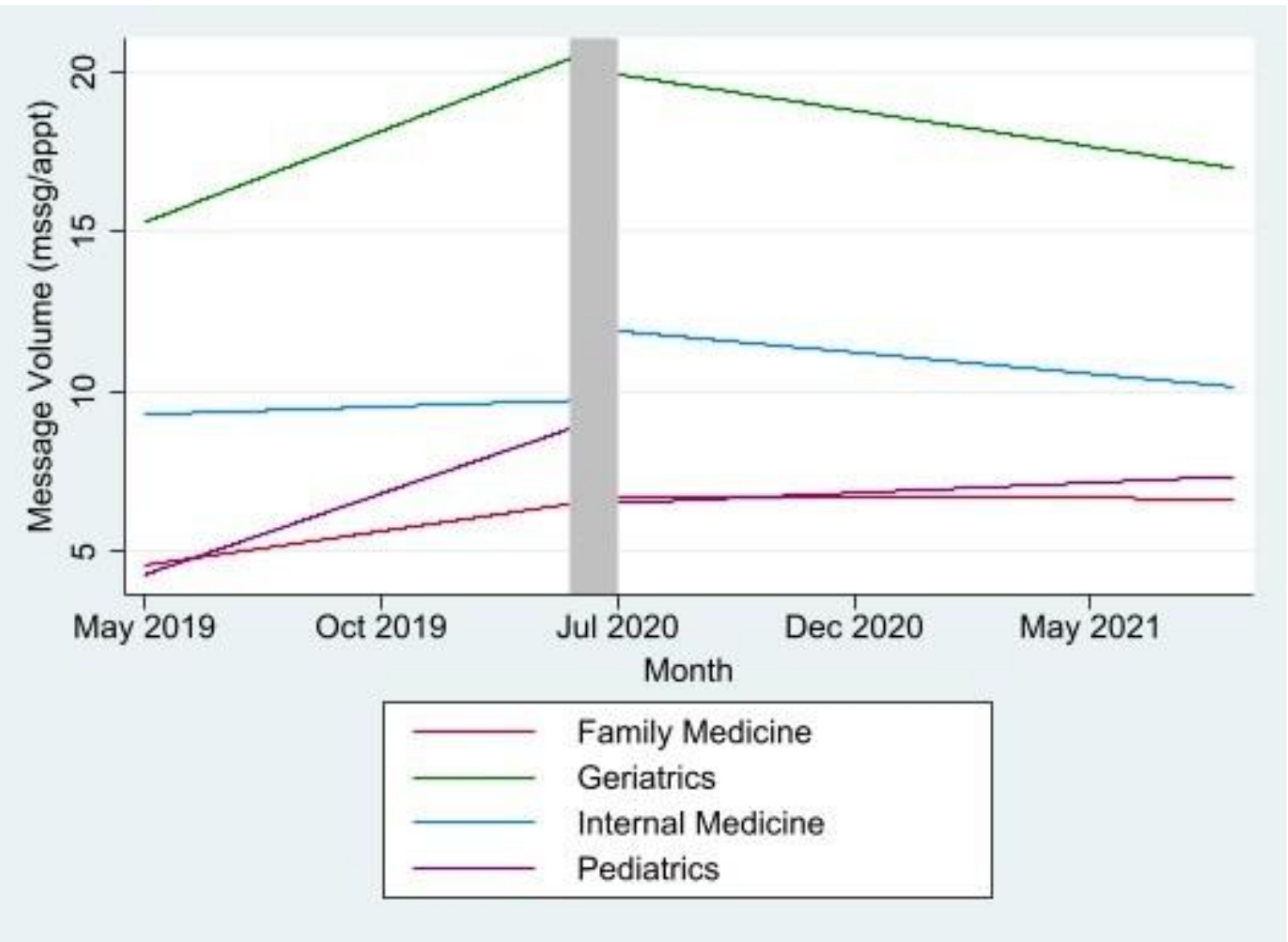
Figure 2: Piecewise graph representing the unadjusted mixed effects model of message volume. Shaded region represents transition period of April 2020 – June 2020 that was excluded from the analysis.

Message Volume (mssg/appt)				
	Coef.	SE	P-value	95% CI
Pre-intervention trend	0.044	0.026	0.095	-0.008 – 0.095
Intervention level change	1.271*	0.181	0.000	0.916 – 1.627
Intervention trend change	-0.154*	0.029	0.000	-0.212 - -0.097
Post-intervention trend	-0.111*	0.020	0.000	-0.151 - -0.071

Table 1: Unadjusted analysis of time outside of scheduled hours and message volume that includes all 133 providers. Mixed effects model allowed for random intercepts and random slopes. The measurements were clustered around individual providers ∈ clinic environment. * indicates significant at p < 0.05.

- Unadjusted analysis of message volume shows no significant pre-intervention trend. After the implementation of telehealth (also accounting for transition period based on number of appointments), there is a significant sharp rise in message volume associated with telehealth implementation. This is consistent with a recent study looking at nationally represented data.
- There is a significant downward post-intervention trend. This seems to contradict recent study looking at nationally represented data that showed sustained increase in message volume. The downward post-intervention trend persisted even when a different standardization for clinical volume (i.e. number of clinic days per month) was used.

Result (cont.)



Specialty	Pre-intervention trend	Intervention level change	Post-intervention trend
Family Medicine (n = 30)	Coeff: 0.213 SE: 0.113 P-value: 0.059 95% CI: -0.008 - 0.435	Coeff: 0.087 SE: 0.912 P-value: 0.924 95% CI: -1.701 - 1.874	Coeff: -0.004 SE: 0.069 P-value: 0.959 95% CI: -0.139 - 0.132
Geriatrics (n = 7)	Coeff: 0.569* SE: 0.242 P-value: 0.019 95% CI: 0.095 - 1.043	Coeff: -1.068 SE: 2.094 P-value: 0.610 95% CI: -5.173 - 3.037	Coeff: -0.225 SE: 0.156 P-value: 0.147 95% CI: -0.531 - 0.080
Internal Medicine (n = 73)	Coeff: 0.048 SE: 0.068 P-value: 0.480 95% CI: -0.086 - 0.182	Coeff: 2.130* SE: 0.604 P-value: 0.000 95% CI: 0.947 - 3.314	Coeff: -0.134* SE: 0.046 P-value: 0.004 95% CI: -0.223 - -0.044
Pediatrics (n = 23)	Coeff: 0.509* SE: 0.116 P-value: 0.000 95% CI: 0.282 - 0.735	Coeff: -2.842* SE: 1.005 P-value: 0.005 95% CI: -4.812 - -0.872	Coeff: 0.064 SE: 0.076 P-value: 0.398 95% CI: -0.084 - 0.212

Figure 3: Piecewise graph representing the coefficients of interest from adjusted mixed effects model of message volume. Shaded region represents transition period of April 2020 – June 2020 that was excluded from the analysis.

Table 2: Adjusted analysis of total message volume. Mixed effects model allowed for random intercepts and random slopes and adjustments were made for provider specialty, patient volume, and patient complexity. All measurement units are in minutes/appointment. * indicates significant at p < 0.05.

- Adjusted analysis of message volume demonstrated varying trends and intervention associated level changes amongst four specialties.
- Significant increased intervention associated message volume change in internal medicine vs. decreased level in pediatrics; highlights differing EHR use pattern for different patient population.

Discussion

- The impact of telehealth on message volume was not uniform across four different primary care specialties. Generally, there seems to be a gradual return to baseline.
- Overall decreasing message volume may represent increasing adaptability of patients and providers in engaging with telehealth and overall digitization of care, requiring less communication via messaging compared to initial implementation of telehealth.
- Message volume, although significant, only represents one aspect of work done by primary care physicians. More research must be done to assess many facets of workflow that have shifted with the implementation of telehealth that may contribute to increased work-related burden.
- Although the measurement perfectly captures number of messages received on Epic, this does not account for text messages or emails that providers received from team members or patients.
- Single institution study, so may not be generalizable to a larger cohort, especially given that UCSF is an academic medical center.
- Unable to tease out the effect of telehealth vs effect of COVID-19 given the intervention period coincides with the start of COVID-19

Limitation

Acknowledgement

I would like to thank my mentor Dr. Julia Adler-Milstein for her unwavering support and Robert Thombley for extracting data crucial to analysis. In addition, I would like to thank Drs. Mi-Ok Kim and Kala Mehta for serving on my master’s committee. This work was made possible from NIH TL1 funding award and support from UCSF Inquiry Funding Office.

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