Video or Telephone? A Natural Experiment on the Added Value of Video Communication in Community Paramedic Responses

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Study objective: The objective of this study was to determine the effect of video versus telephonic communication between community paramedics and online medical control physicians on odds of patient transport to a hospital emergency department (ED).

Methods: This was a retrospective analysis of data from a telemedicine-capable community paramedicine program operating within an advanced illness management program that provides home-based primary care to approximately 2,000 housebound patients per year who have advanced medical illness, multiple chronic conditions, activities of daily living dependencies, and past-year hospitalizations. Primary outcome was difference in odds of ED transport between community paramedicine responses with video communication versus those with telephonic communication. Secondary outcomes were physicians' perception of whether video enhanced clinical evaluation and whether perceived enhancement affected ED transport.

Results: Of 1,707 community paramedicine responses between 2015 and 2017, 899 (53%) successfully used video; 808 (47%) used telephonic communication. Overall, 290 patients (17%) were transported to a hospital ED. In the adjusted regression model, video availability was not associated with a significant difference in the odds of ED transport (odds ratio 0.80; 95% confidence interval 0.62 to 1.03). Online medical control physicians reported that video enhanced clinical evaluation 85% of the time, but this perception was not associated with odds of ED transport.

Conclusion: We found support that video is considered an enhancement by physicians overseeing a community paramedicine response, but is not associated with a statistically significant difference in transport to the ED compared with telephonic communication in this nonrandom sample. These results have implications for new models of out-of-hospital care that allow patients to be evaluated and treated in the home. [Ann Emerg Med. 2021;77:103-109.]

Please see page 104 for the Editor's Capsule Summary of this article.

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INTRODUCTION

Emergency medical services (EMS) agencies are not typically reimbursed unless they transport to an emergency department (ED), even if patient preference or clinical condition suggests another disposition would be more appropriate and patient centered.[1] In February 2019, the Center for Medicare and Medicaid Innovation announced a demonstration model, Emergency Triage, Treat and Transport, that includes the option to treat individuals in the home setting without ED transport.[2] This model requires either in-person evaluation by a qualified clinician (generally a physician, nurse practitioner or physician assistant) at the EMS response or real-time communication between EMS personnel and a qualified clinician by 2-way video communication. However, at a time of technologic limitations and inconsistent mobile wireless video connectivity reliability, patients who might benefit from this treat-in-place option will be ineligible if video communication cannot be established.

Our advanced illness management program, which has partnered with a community paramedicine program since 2013, provides home-based primary, palliative, and acute care for older adults with advanced medical illness and multiple comorbidities. The program, an Independence at Home demonstration site, has achieved substantial reductions in hospitalization rates and costs of care while achieving high quality scores.[3] Community paramedicine with video-conferencing capabilities is used to evaluate and

Editor's Capsule Summary

What is already known on this topic

Out-of-hospital telemedicine programs will require video consultation in the near future.

What question this study addressed

Does video telemedicine change rates of emergency department (ED) transport compared with telephone consultations only?

What this study adds to our knowledge

In this 1,707-patient nonrandomized trial, video telemedicine enhanced physician perception of clinical evaluation but was not associated with a change in rates of ED transport.

How this is relevant to clinical practice

The use of video telemedicine in emerging out-of-hospital care models requires ongoing evaluation.

treat unscheduled urgent and emergency conditions in the home, with transport to the ED when necessary and desired by the patient or caregiver. Although it is our intent to provide video communication between the paramedic and the online medical control physician for every community paramedicine response, video connection cannot be established in approximately half of all responses. In these situations, paramedics use telephonic communication with the online medical control physician. This provides a natural experiment to examine outcomes of community paramedicine responses with and without video communication.

Goals of This Investigation

The goals of this investigation were to determine whether there is a difference in the rate of ED transport with video versus telephonic communication, assess whether online medical control physicians perceived that the video communication enhanced their evaluation of patients, and, if so, whether this perception was associated with differences in ED transport.

MATERIALS AND METHODS

Study Design

In this observational study of a community paramedicine program within an advanced illness management program, the primary outcome was odds of ED transport at the community paramedicine response, with secondary outcomes of physician-perceived enhancement in evaluation provided by the video communication, and odds of ED transport associated with perceived enhancement. This study was approved by the institutional review board with a waiver of informed consent.

Setting and Selection of Participants

Our community paramedicine program in downstate New York operates within an integrated delivery system including an EMS system providing 911 services, air, and ground transport. Community paramedics are New York State certified, have received an additional 40 hours of in-house training, and carry a formulary of medications and diagnostic equipment.[4]

Our advanced illness management program has 9 primary care providers (physicians and nurse practitioners) who, along with social workers, registered nurses, and coordinators, annually provide home-based primary care to approximately 2,000 housebound predominantly older individuals with multiple chronic conditions, activities of daily living dependencies, and high rates of acute care use in the previous year. Advanced illness management enrollees are provided a continuous nurse-run clinical call center number at enrollment and are instructed to use it, rather than 911, when there is a change in condition. According to need, patients may receive telephonic advice from a nurse, nurse practitioner or physician, a scheduled visit with a clinician, an EMS response for expected ED transport, or a community paramedicine response to their home. Evaluation and treatment of each community paramedicine response is overseen by physicians (internists, family medicine physicians, geriatricians, and palliative caretrained physicians) credentialed to provide online medical control.

After initial in-home evaluation by the paramedic, a WebEx (Cisco Systems, Inc., San Jose, CA) conference is launched. WebEx is a Health Insurance Portability and Accountability Act–compliant system with recording capabilities that was available for deployment across mobile platforms and operating systems at program inception. With video connection, the paramedic focuses the camera on the patient and other relevant examination findings, testing results, skin wounds, etc. When video connection is unsuccessful, telephonic communication is established. In both situations, the paramedic and online medical control physician communicate verbally, and the patient, caregivers, or both are included in the conversation.

All community paramedicine responses, other than death pronouncements, between January 2015 and December 2017 were included in the study. Calls were triaged with the Advanced Medical Priority Dispatch System, with elucidation of chief complaint and acuity

ranges from Omega (nurse advice) to Echo (cardiopulmonary arrest).

After each community paramedicine response, the online medical control physician was asked to answer the question, "Did video monitoring enhance your evaluation of the patient during the community paramedicine response?" with 3 options: "yes," "no," and "video not available." Documentation for the advanced illness management program was completed in the advanced illness management electronic health record, and transport versus evaluation and treatment in place was recorded by the community paramedic in HealthEMS (Sansio, Redmond, WA). Data were extracted by a dedicated project manager, reviewed by an advanced illness management physician to ensure reliability and accuracy, and stored in Research Electronic Data Capture (Vanderbilt University, Nashville, TN).

Methods of Measurement and Outcome Measures

Our primary outcome measure was ED transport at the community paramedicine response. Among responses in which video communication was used, we assessed whether physicians perceived that the availability of video communication enhanced their clinical evaluation and whether perceived clinical enhancement was associated with ED transport.

Primary Data Analysis

We performed bivariate analyses with the Wilcoxon rank sum test and χ^2 tests or Fisher's exact tests, where appropriate, to examine differences between patients who had video communication versus those who had telephonic communication with an online medical control physician, and patients who were transported to the ED versus those who were not. Age was grouped and number of activities of daily living dependencies were categorized according to the Katz Index of activities of daily living.[5]

Two separate multivariable logistic regression models were used to assess association between video and telephonic communication and odds of ED transport, and association between physician-reported enhancement of the evaluation when video was used and odds of ED transport. The models adjust for clinically and statistically significant covariates. Variables that were significantly different between the 2 groups of patients and associated with the outcome variables of interest were considered confounders, and were included in the model-building process. Patient age and acuity level are clinically relevant variables in terms of ED transport, and thus, these 2 variables were also evaluated in the model-building process. Statistical analyses were performed with SAS (version 9.4; SAS Institute, Inc., Cary, NC).

RESULTS

During the study period (2015 to 2017), 1,068 unique patients received 1,927 community paramedicine responses. Of these 1,927 responses, 220 were excluded from the analysis (98 were death pronouncements and 122 did not answer the question that indicated whether video was used). Therefore, our analytic data set was composed of 1,707 community paramedicine responses, of which 290 (17.0%) resulted in ED transport (Figure). One hundred of the 1,417 patients who initially remained home were subsequently transported to the ED within 48 hours of the community paramedicine response (7.1%).

Table 1 presents characteristics of the study sample and characteristics of the sample stratified by online medical control physician communication method and by whether the patient was transported to the ED. Overall, median patient age was 88 years, 63.3% were women, 51.6% had dementia, 75.6% had 5 to 6 activities of daily living dependencies, 71.5% had do-not-resuscitate orders, and 37.1% had do-not-hospitalize orders at the community paramedicine response.

Video communication was successful in 899 of 1,707 (52.7%) community paramedicine responses. When available, online medical control physicians endorsed that video communication enhanced their clinical evaluation 85.0% of the time, particularly for high-acuity patients, who were more frequently transported to the ED.

Table 2 provides frequencies and proportions of patients transported and not transported to the ED, as well as unadjusted absolute differences between these groups of patients. Also shown in Table 2 are the adjusted odds of

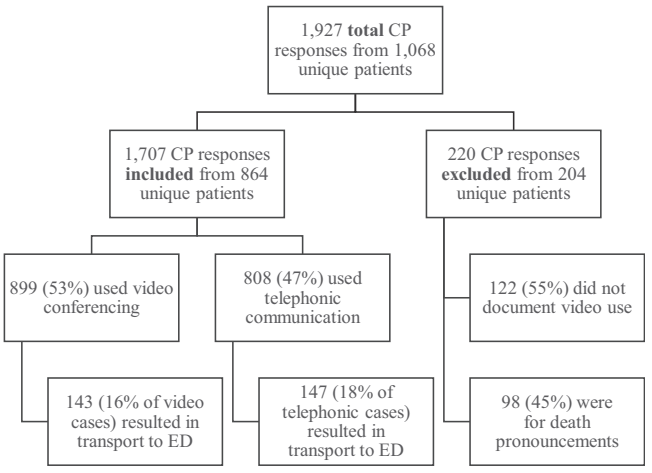

Figure. Flow chart of community paramedicine responses included in the study. *CP,* Community paramedicine.

ED transport associated with video communication and the odds of ED transport associated with physician-reported enhanced evaluation when video was used. Controlling for age, dispatch acuity levels, and do-not-hospitalize status, video communication compared with telephonic communication was not associated with a significant difference in the odds of ED transport overall (odds ratio 0.80; 95% confidence interval 0.62 to 1.03). Likewise, there was no association between physicians' report that video enhanced their clinical evaluation and ED transport (odds ratio 1.06; 95% confidence interval 0.62 to 1.80). Additionally, there was no difference in subsequent ED transport rate at 48 hours between visits that used video versus telephonic communication, regardless of whether physicians reported that the video enhanced their evaluation (data not shown).

LIMITATIONS

Our study took place in a home-based primary care setting in which the goal is to allow individuals with advanced illnesses to age in place, avoiding hospitalization and long-term institutional care. Our online medical control physicians are primary care providers who have access to the patient's medical record, which, in and of itself, can aid in medical decisionmaking. Our results therefore may not be generalizable to other settings. Additionally, there may have been unmeasured geographic and socioeconomic variation among patients that influenced the availability of video or differences in disposition. Process improvement work was initiated during the study period to elucidate and improve geographic variation in video connectivity and is still under way. Physicians may have overvalued video communication, and the question of whether video enhanced the clinical evaluation is likely subject to bias; it takes a thoughtful respondent to answer that a telephone call would have been sufficient. Finally, as with other observational studies, lack of randomization could have influenced our results.

DISCUSSION

With video communication used in approximately half of community paramedicine responses, a natural experiment was created that allowed comparison of ED transport rates between responses using video communication and those using telephonic communication. We found that, although online medical control physicians overwhelmingly reported that availability of video communication enhanced their clinical evaluation of the patient, the presence of video communication compared with telephonic communication was not associated with odds of ED transport.

Out-of-hospital care is experiencing a paradigm shift toward evaluation and treatment of patients in the most clinically appropriate setting, including the home, instead of transport to the ED. Indeed, community paramedicine and other mobile integrated health care programs show promise in a variety of clinical settings.[4,6,7] Although out-of-hospital care has traditionally relied on telephonic communication with the online medical control physician, an increasing number of studies have incorporated the use of telemedicine with variable success.[8] Without reimbursement for services, however, most community paramedicine programs across the country have remained small and are lacking rigorous evaluation, particularly in relation to the telemedicine component. In an era in which many areas of the country do not have access to reliable broadband and the digital divide between young and old, urban and rural, and rich and poor affects access to the video component of telemedicine, it is important to address the question of whether video is a necessary component of decisionmaking during communication between EMS personnel and online medical control physicians.[9]

Our findings should inform increasing federal interest in EMS programs that aim to evaluate and treat patients in the most appropriate clinical setting, including settings outside of the ED. For example, the Emergency Triage, Treat and Transport model represents a significant opportunity to extend access to acute and emergency care into the community in a patient-centered care delivery model; it also reduces transportation-related barriers to accessing the most appropriate outpatient care.[2] As a payment reform demonstration project, Emergency Triage, Treat and Transport has 3 targeted care delivery vectors: telephonic nurse advice, transport to alternative destinations outside of the ED, and treat in place without transport. In its current iteration, the treat-in-place option will be reimbursed only if there is a qualified clinician on scene during the EMS visit or if the visit includes 2-way video communication between the out-of-hospital EMS personnel who is with the patient and a qualified clinician in a remote location. Underlying the Emergency Triage, Treat and Transport model is an implicit acknowledgement that the current EMS reimbursement model has created a perverse incentive to only transport patients to EDs, which has led to increased health care costs, ED crowding, and fragmented care.[10] Additional study is needed to fully understand the effect of video conferencing on community paramedicine outcomes. If additional studies support that outcomes after telephone and video communication with an online medical control physician are equivalent, these results in totality might provide evidence for modifying policies that require 2-way video communication for reimbursement.

Table 1. Characteristics of the study sample stratified by online medical control communication method and ED transport.

		OLMC Communication Method		ED Transport	
Characteristic*	**Total Sample (n=1,707)**	**Video (n=899)**	**Telephone (n=808)**	**Yes (n=290)**	**No (n=1,417)**
Age, y					
Median (IQR)	88 (81–93)	88 (81–93)	88 (81–93)	86 (77–92)	88 (82–93)
Age groups, y					
<70	149 (8.7)	83 (9.2)	66 (8.2)	34 (11.7)	115 (8.1)
70–79	229 (13.4)	119 (13.2)	110 (13.6)	56 (19.3)	173 (12.2)
80–89	621 (36.4)	329 (36.6)	292 (36.1)	104 (35.9)	517 (36.5)
≥90	708 (41.5)	368 (40.9)	340 (42.1)	96 (33.1)	612 (43.2)
Sex					
Men	627 (36.7)	319 (35.5)	308 (38.1)	121 (41.7)	506 (35.7)
Women	1,080 (63.3)	580 (64.5)	500 (61.9)	169 (58.3)	911 (64.3)
Dispatch acuity level					
Low (alpha/omega)	421 (24.7)	186 (20.7)	235 (29.1)	43 (14.8)	378 (26.7)
Medium (bravo/Charlie)	541 (31.7)	300 (33.4)	241 (29.8)	97 (33.5)	444 (31.3)
High (delta/echo)	745 (43.6)	413 (45.9)	332 (41.1)	150 (51.7)	595 (42.0)
No. of ADL dependencies					
0	136 (8.0)	75 (8.3)	61 (7.6)	23 (7.9)	113 (8.0)
1–2	132 (7.7)	75 (8.3)	57 (7.1)	28 (9.7)	104 (7.3)
3–4	149 (8.7)	68 (7.6)	81 (10.0)	30 (10.3)	119 (8.4)
5–6	1,290 (75.6)	681 (75.8)	609 (75.4)	209 (72.1)	1,081 (76.3)
Advance care planning†					
Discussion took place	1,640 (96.1)	861 (95.8)	779 (96.4)	279 (96.2)	1,361 (96.1)
MOLST completed	1,550 (90.8)	808 (89.9)	742 (91.8)	257 (88.6)	1,293 (91.3)
DNR order completed	1,221 (71.5)	647 (72.0)	574 (71.0)	176 (60.7)	1,045 (73.8)
DNH order completed	634 (37.1)	329 (36.6)	305 (37.8)	72 (24.8)	562 (39.7)
Insurance status					
Medicaid primary	41 (2.4)	18 (2.0)	23 (2.9)	11 (3.8)	30 (2.1)
Medicare primary	1,135 (66.5)	591 (65.7)	544 (67.3)	189 (65.2)	946 (66.8)
Private	531 (31.1)	290 (32.3)	241 (29.8)	90 (31.0)	441 (31.1)
Chronic conditions†					
Hypertension	1,182 (69.2)	626 (69.6)	556 (68.8)	214 (73.8)	968 (68.3)
Dementia	881 (51.6)	454 (50.5)	427 (52.9)	128 (44.1)	753 (53.1)
Pressure ulcers	705 (41.3)	381 (42.4)	324 (40.1)	116 (40.0)	589 (41.6)
Hyperlipidemia	735 (43.1)	382 (42.5)	353 (43.7)	142 (49.0)	593 (41.9)
Depression	695 (40.7)	368 (40.9)	327 (40.5)	106 (36.6)	589 (41.6)
Heart failure	702 (41.1)	395 (43.9)	307 (38.0)	143 (49.3)	559 (39.5)
Asthma/bronchiectasis	544 (31.9)	296 (32.9)	248 (30.7)	96 (33.1)	448 (31.6)
Arthritis	652 (38.2)	349 (38.8)	303 (37.5)	109 (37.6)	543 (38.3)
Atrial fibrillation	594 (34.8)	307 (34.2)	287 (35.5)	112 (38.6)	482 (34.0)
Diabetes	496 (29.1)	265 (29.5)	231 (28.6)	108 (37.2)	388 (27.4)
Chronic kidney disease	498 (29.2)	255 (28.4)	243 (30.1)	100 (34.5)	398 (28.1)
Stroke or TIA	227 (13.3)	116 (12.9)	111 (13.7)	48 (16.6)	179 (12.6)
Cancer	152 (8.9)	91 (10.1)	61 (7.6)	32 (11.0)	120 (8.5)
Osteoporosis	156 (9.1)	77 (8.6)	79 (9.8)	24 (8.3)	132 (9.3)

OLMC, Online medical control; *IQR*, interquartile range; *ADL*, activities of daily living; *MOLST*, medical orders for life-sustaining treatment; *DNR*, do not resuscitate; *DNH*, do not hospitalize; *TIA*, transient ischemic attack.

Data are provided as No. (%) unless otherwise indicated.

*All data extracted as of the community paramedicine response.

†Response options are not mutually exclusive.

Table 2. Adjusted logistic regression models of the odds of ED transport associated with video communication and physician-reported enhancement of patient evaluation.

ED Transport Associated With Video Communication (n=1,707)	Patients Not Transported, No. (%)	Patients Transported, No. (%)	Unadjusted Absolute Difference, No. (%)	Adjusted OR (95% CI)
OLMC communication method				
Telephone	661 (46.7)	147 (50.7)	514 (4.0)	1.00 [Reference]
Video	756 (53.4)	143 (49.3)	613 (4.1)	0.80 (0.62–1.03)*
ED transport associated with physician-reported enhancement (n=899)				
Physician-reported enhancement of patient evaluation				
No	115 (15.2)	20 (14.0)	95 (1.2)	1.00 [Reference]
Yes	641 (84.8)	123 (86.0)	518 (1.2)	1.06 (0.62–1.80)†

OR, Odds ratio; *CI*, confidence interval.
*Adjusted for age groups, dispatch acuity level, and do-not-hospitalize status.
†Adjusted for dispatch acuity level, do-not-hospitalize status, and do-not-resuscitate status.

In our community paramedicine program, it appears that video communication with an online medical control physician may not be essential to medical decisionmaking because we found no statistically significant difference in odds of ED transport in community paramedicine responses when telephonic versus video communication between appropriately trained EMS personnel and online medical control physicians was used. When video communication was successful, physicians largely expressed that video enhanced their clinical evaluation. There was, however, no difference in odds of ED transport associated with subjective perception of enhanced evaluation through video at the community paramedicine response or within 48 hours for individuals who were not initially transported.

Although video capability is desirable and systems should be provided incentive for developing the infrastructure to support it, given that video is not always available because of lack of broadband and Internet connectivity, particularly across certain demographics and in rural areas, failure to reimburse EMS for telephonic communication with an online medical control physician may limit the effect of out-of-hospital models, including Emergency Triage, Treat and Transport, that allow patients to be treated and remain at home.

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Author contributions: KAA, JDW, KLS, and KVR were responsible for the study concept. KAA, JDW, JZ, KLS, and KVR were responsible for interpretation of results. KAA and KVR drafted the article. JDW, KLS, and KVR were responsible for study design. JDW was responsible for supervision of data collection. TL was responsible for statistical analysis and development and revision of tables. TL, JB, and AP were responsible for interpretation of the data. JB was responsible for study supervision. AP was responsible for acquisition of the data. AP and JZ were responsible for database management and data analysis. All authors contributed to revision of the final article for important intellectual content. All authors take responsibility for the paper as a whole.

All authors attest to meeting the four ICMJE.org authorship criteria: (1) Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work; AND (2) Drafting the work or revising it critically for important intellectual content; AND (3) Final approval of the version to be published; AND (4) Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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