Assessment of Patient Perceptions of Technology and the Use of Machine-Based Learning in a Clinical Encounter

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BACKGROUND

Electronic health records (EHR) were implemented to improve patient care, reduce healthcare disparities, engage patients and families, improve care coordination, and maintain privacy and security.[1,2] However, the mandated use of EHR has also resulted in significantly increased clerical and administrative burden, with physicians spending an estimated three-fourths of their daily time interacting with EHR, which negatively affects within-clinic processes and contributes to burnout in primary care physicians.[3-6] In-room scribes have been associated with improvement in all aspects of physician satisfaction (i.e., face-to-face time with patients, time spent charting, chart quality/accuracy) and increased productivity (i.e., patient throughput, work relative value units, and increased revenue).[7-11] Less is known about the use of other technologies such as Google Glass, Natural Language Processing (NLP) and Machine-Based Learning (MBL) systems.[12,13] In order to optimize EHR documentation by decreasing administrative burden on clinicians, there is a need to explore patient perceptions of varying degrees of technology in the clinical encounter.

RESEARCH AIMS

Primary aim: To determine predictors of overall perception of care dependent on varying mechanisms used for documentation and medical decision-making in a routine clinical encounter.

Secondary aims:

1. Compare the perception of individual vignettes based on demographics of the participants.
2. Investigate any differences in perception questions by demographics of the participants.

METHODS

Using REDCap, random video vignettes (Table 1) were shown to approximately 500 OhioHealth Physician Group patients and to ResearchMatch volunteers during a 15-month period following IRB approval. Data includes a baseline survey to gather demographic and familiarity with different technologies, followed by a perceptual survey where patients rated the physician in the video on 5 facets using a 1 to 5 Likert scale.

Perceptual Survey:

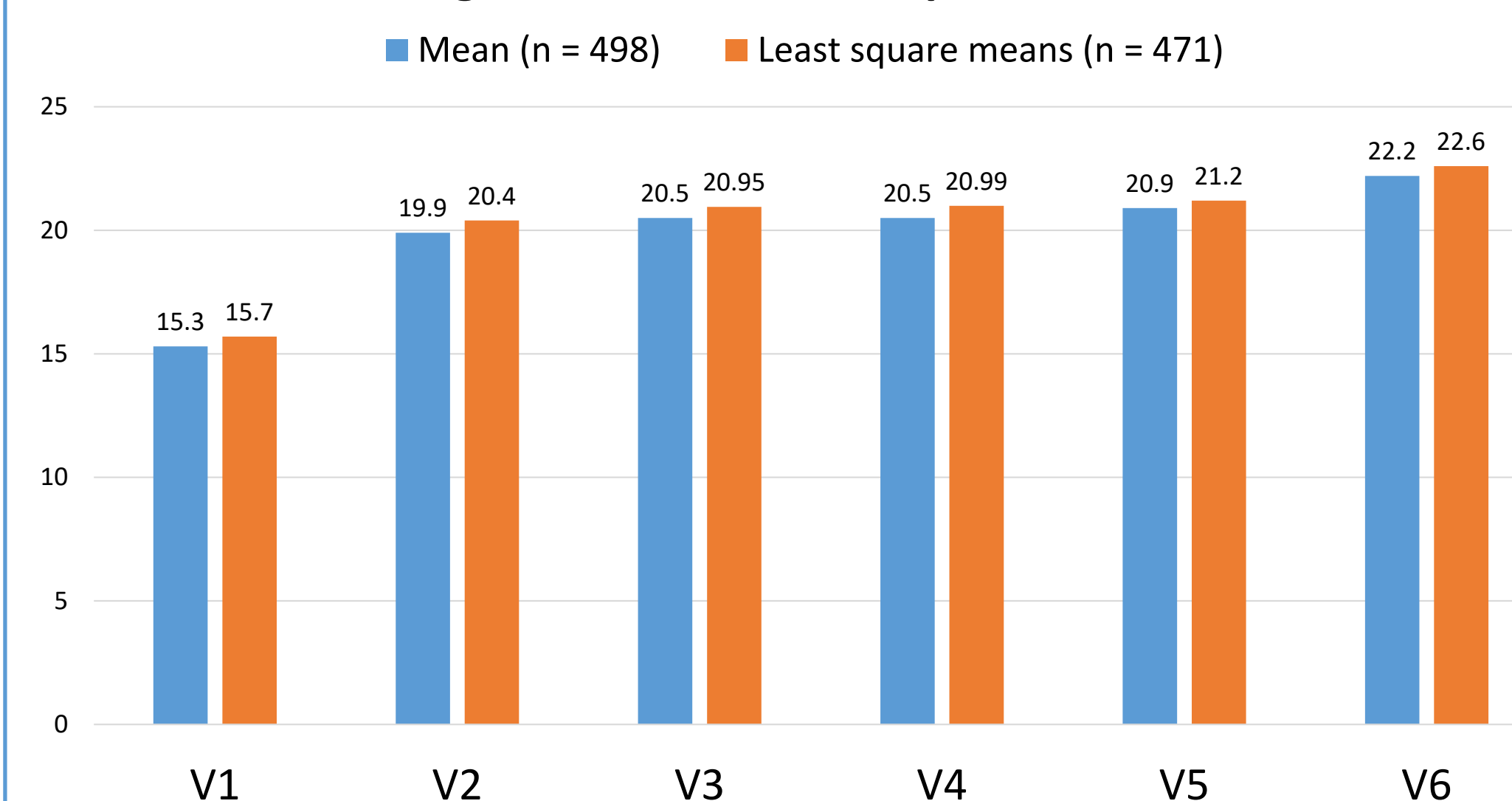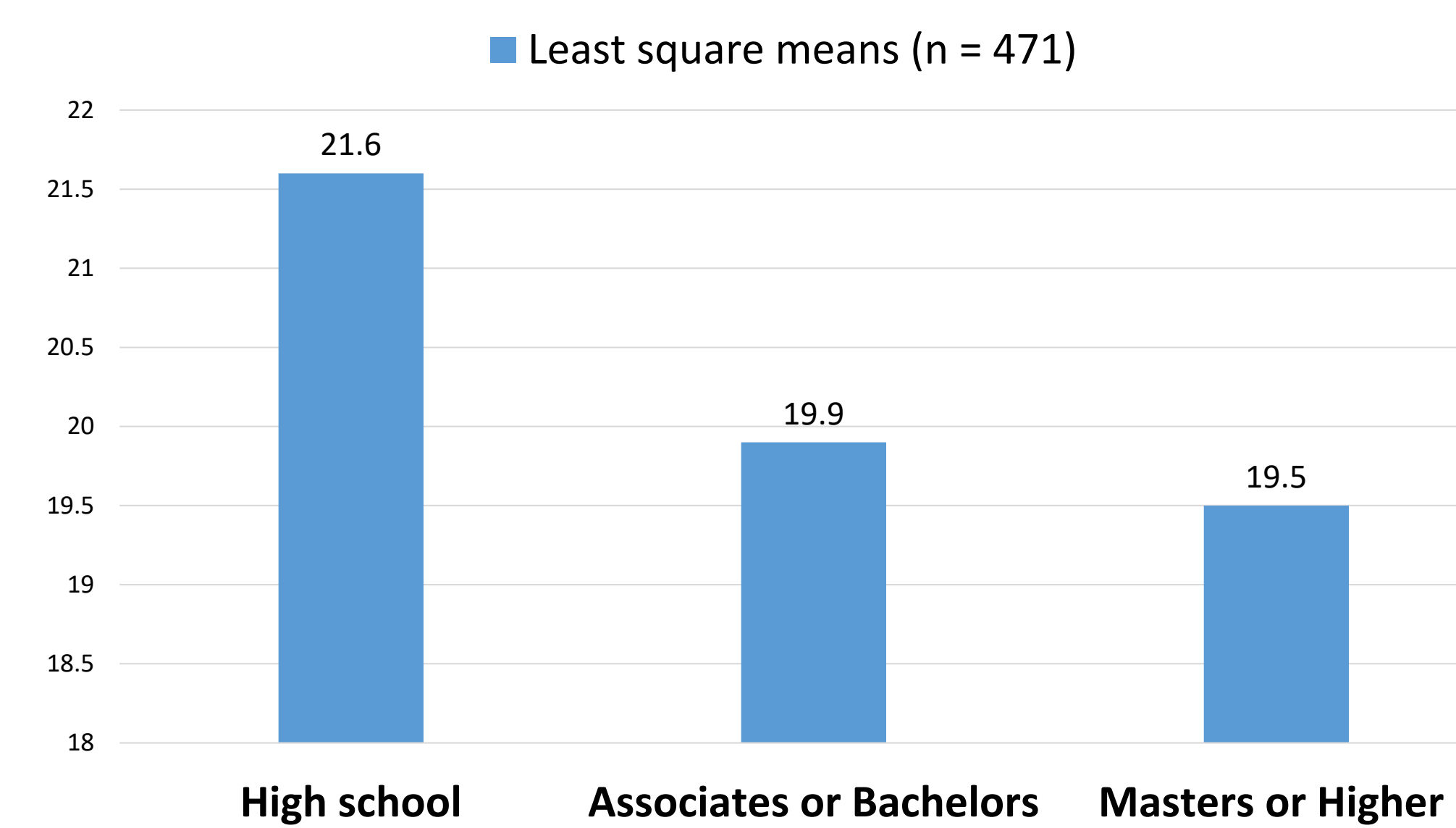| Please indicate your level of agreement with each of the following statements about the video you just watched	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
The doctor was familiar with the patient's medical history.	○	○	○	○	○
The doctor cared for the patient's well-being.	○	○	○	○	○
The doctor paid attention to the patient during the visit.	○	○	○	○	○
The doctor clearly explained the diagnosis and treatment to the patient.	○	○	○	○	○
The doctor was sincere and trustworthy.	○	○	○	○	○

RESULTS

Figure 1: Overall Perception Score

Mean (n = 498): V1 15.3, V2 19.9, V3 20.5, V4 20.5, V5 20.9, V6 22.2
Least square means (n = 471): V1 15.7, V2 20.4, V3 20.95, V4 20.99, V5 21.2, V6 22.6

Table 1: Video Vignettes (V)

V1: physician documents on the computer during the encounter (EMR in-room during encounter)	**V4**: physician utilizes Google Glass for documentation by a remote scribe during the visit
V2: physician utilizes machine-based learning (MBL) software and Google Glass (GG) for documentation	**V5**: physician utilizes in-room scribe for documentation
V3: physician utilizes MBL software and GG for documentation and medical decision-making	**V6**: physician alone with no documentation occurring during encounter (EMR outside room after encounter)

Figure 1: The results show that amongst all video vignettes, the one in which the physician does not use EMR during the clinical encounter (V6) had statistically significant higher overall perception scores (mean = 22.2) compared to V5 (20.9), V3 and V4 (20.5), V2 (19.9) and V1 (15.3). Multivariable modeling identified all three of the univariably significant factors (sex, education, random vignette) as independent factors related to overall perception score. Adjusted least squares means (LSM) were calculated. Consistent with mean perception scores, results show that the vignette in which the physician does not use EMR during the clinical encounter (V6) had statistically significantly higher overall perception scores (LSM =22.6) compared to V5 (21.2), V4 (20.99), V3 (20.95), V2 (20.4) and V1 (15.7).

Figure 2: Overall Perception Score based on highest level of education

Least square means (n = 471): High school 21.6, Associates or Bachelors 19.9, Masters or Higher 19.5

Figure 2: Multivariable modeling also showed that those with lower education had statistically significant higher perception scores. Specifically, participants with high school as highest education had higher scores (LSM =21.6) than those with associates/bachelors (LSM=19.9) and masters/higher (LSM=19.5).

DISCUSSION

The vignette depicting the least interaction with the EMR received the most positive overall perception score, while the vignette depicting the physician utilizing the EMR during the interaction received the least positive overall perception score. Given the vignette with the most distracted interpersonal contact between the patient and physician scored the lowest, it appears patients most value having the full attention of the physician and have less strong sentiments differentiating the logistics of data transcription and medical decision-making, provided they feel engaged by the interaction. Therefore, we suggest maximizing face-to-face time in the integration of technology into the clinical encounter. We feel this will allow for increased perceptions of personal attention within the encounter.

Another significant finding identified the greatest overall acceptance of the vignettes by the group with the lowest education. Extrapolating to our general U.S. population, in which 2/3 of adults have a high school education or less, the overwhelming majority of adults appear to be accepting of implementing assistive technology in the exam room.

FUTURE RESEARCH

Based on these results, we can consider an interaction with no in-room documentation the "gold standard", which increases patient perceptions of physician familiarity, care, attention, trustworthiness, and diagnostic explanation.[1]

Future research should aim to compare the "gold standard" to current practice and iterations of our other clinical scenarios with the aim of identifying strategies to improve and integrate in-room technology to equal and exceed the "gold standard".

First steps may include comparison of the "gold standard" scenario to multiple versions of a particular technology with potential to decrease documentation time and/or enhancement of medical decision-making.

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REFERENCES

1. https://dashboard.healthit.gov/quickstats/quickstats.php
2. https://www.healthit.gov/policy-researchers-implementers/meaningful-use-regulations
3. Sinsky C, Colligan L, Li L, Prgomet M, Reynolds S, Goeders L, Westbrook J, Tutty M, Blike G. Allocation of Physician Time in Ambulatory Practice: A Time and Motion Study in 4 Specialties. *Ann Intern Med.* 2016;165(11):753-760
4. Arndt BG, Beasley JW, Watkinson MD, Temte JL, Tuan WJ, Sinsky CA, Gilchrist VJ. Tethered to the EHR: Primary Care Physician Work-load Assessment Using EHR Event Log Data and Time-Motion Observations. *Annals of Family Medicine.* 2017;15(5):419-426.
5. Shanafelt TD, Dyrbye LN, Sinsky C, Hasan O, Satele D, Sloan J, West CP. Relationship Between Clerical Burden and Characteristics of the Electronic Environment With Physician Burnout and Professional Satisfaction. *Mayo Clin Proc.* 2016;91(7):836-848.
6. Linzer M, Levine R, Meltzer D, Poplau S, Warde C, West CP. 10 Bold Steps to Prevent Burnout in General Internal Medicine. *J Gen Intern Med.* 2014;29(1):18-20.
7. American Health Information Management Association (AHIMA). "Using Medical Scribes in a Physician Practice" Journal of AHIMA 83, no.11 (November 2012): 64-69 [expanded online version]. AHIMA Website: http://library.ahima.org/doc?oid=106220#.WfoII1WGOUk. Accessed 1 November 2017.
8. Gidwani R, Nguyen C, Kofoed A, Carragee C, Rydel T, Nelligan I, Sattler A, Mahoney M, Lin S. Impact of Scribes on Physician Satisfaction, Patient Satisfaction, and Charting Efficiency: A Randomized Controlled Trial. *Annals of Family Medicine.* 2017;15(5):427-433
9. Shultz CG, Holmstrom HL. The Use of Medical Scribes in Health Care Settings: A Systematic Review and Future Directions. *JABFM.* 2015;28(3):371-381.
10. Bank AJ, Obetz C, Konrardy A, Khan A, Pillai KM, McKinley BJ, Gage RM, Turnbull MA, Kenney WO. Impact of Scribes on Patient Interaction, Productivity, and Revenue in a Cardiology Clinic: A Prospective Study. *ClinicoEconomics and Outcomes Research.* 2013;5:399-406.
11. Miller N, Howley I, McGuire MJ. 5 Lessons for Working with a Scribe. *Family Practice Management.*2016;23-27.
12. Prochaska MT, Press VG, Meltzer DO, Arora VM. Patient Perceptions of Wearable Face-Mounted Computing Technology and the Effect on the Doctor-Patient Relationship. *Appl Clin Inform.* 2016;7(4):946-953.
13. Suki AI, Inc. Suki for Primary Care. 2020. https://www.suki.ai/for-primary-care. Accessed 28 May 2020.

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