## Postoperative Patient Portal Messaging is Highly Burdensome and Associated with Increased Risk of Emergency Room Visit and Discharge and Any Readmission Across Elective Orthopaedic Procedures

David Bernstein<sup>1</sup>, Andreea Renata Lucaciu, Theresa Lynn Chua, Harold Fogel<sup>2</sup>, Stuart H Hershman<sup>2</sup>, Mitchel B Harris<sup>2</sup>, Daniel Tobert<sup>2</sup>

<sup>1</sup>Harvard Combined Orthopaedic Residency Program, <sup>2</sup>Massachusetts General Hospital

INTRODUCTION: There has been a rapid increase in the use of secure patient portal messaging to physicians and their care teams over recent years. While it may allow for improved communication, it also risks overburdening care teams. Further, the association of secure patient portal messaging with clinical outcomes and resource utilization is not well known. Thus, much of its measurable value may not be known, including within orthopaedic surgeon. In the present study, we had three aims: 1) to determine the number of postoperative messages sent over the study timeframe; 2) to assess the association of patients undergoing elective orthopaedic surgery who send a postoperative secure portal message within 90 days of surgery and emergency room visits without readmission; and 3) to assess the association of patients undergoing elective orthopaedic secure portal message within 90 days of surgery and emergency who send a postoperative secure portal message within 90 days of surgery and emergency not secure a postoperative secure portal message within 90 days of surgery and emergency room visits without readmission; and 3) to assess the association of patients undergoing elective orthopaedic surgery because portal message within 90 days of surgery and hospital readmission.

METHODS: All patients undergoing elective orthopaedic surgical procedures at a single, large, urban academic medical center between 2016 and 2023 were identified in our institutional database. Descriptive statistics were performed across the sample. Chi-squared and t-tests were used to compare characteristics between postoperative messengers and non-messengers for categorical and continuous variables, respectively. Two multivariable logistic regression analyses were conducted to assess factors associated with emergency room visit without readmission and hospital readmission.

RESULTS: A total of 56,427 patients who underwent 64,079 unique surgeries over the timeframe were identified and included. Overall, 580,531 secure patient portal messages were sent within 90 days of surgery. A greater percentage of patients of self-reported White race (23,736 [91% of 26,195] vs. 33,084 [86% of 38,514], p<0.001), Commercial insurance (15,600 [60% of 26,195] vs. 21,534 [56%], p<0.001), and who graduate college (11,717 [45%] vs. 13,858 [36%], p<0.001) sent postoperative secure messages to their orthopaedic surgeon and care team. Patients undergoing hip and knee arthroplasty sent the highest percentage (11,107 [42% of 26,195]) patient portal messages. When accounting for other factors, postoperative patient portal messaging was associated with increased odds of emergency room visit without readmission (OR: 1.22 [95% CI: 1.13 to 1.31], p<0.001) and any readmission (OR: 1.50 [95% CI: 1.41 to 1.59], p<0.001). Self-reported Black race (OR: 1.82 [95% CI: 1.59 to 2.10), p<0.001), Medicaid insurance (OR: 2.21 [95% CI: 1.93 to 2.53], p<0.001), hand procedures (OR: 2.84 [95% CI: 2.55 to 3.15], p<0.001), and foot and ankle procedures (OR: 3.26 [95% CI: 2.52 to 4.22], p<0.001) had the highest odds of emergency room visit without readmission. Hand procedures (OR: 2.26 [95% CI: 2.26 to 2.47], p<0.001) and Medicaid patients (OR: 1.42 [95% CI: 1.24 to 1.64], p<0.001) had the highest odds of any readmission after sending a patient portal message.

DISCUSSION AND CONCLUSION:

Over a seven year period, greater than half a million secure portal messages were sent by patients within 90 days of undergoing orthopaedic surgery, causing notable burden to care teams and orthopaedic surgeons. Further, our work can help orthopaedic surgeons identify those who may be at risk for potentially unnecessary emergency room visits or any readmission. Factors associated with these outcomes include patient portal messaging and many patient characteristics that further highlight health care disparities. The insights gained in our study are not only important clinically but financially as well with the growth of alternative payment models. Efforts to reduce the substantial burden of patient portal messaging are warranted, as well as to reduce postoperative health disparities and wasteful health care resource utilization.

Characteristic	Pseudo R-Squared: 0.04 Odds Ratio (95% Confidence Interval)	p-value
Age, years	1.01 (1.00 to 1.01)	0.35
Sex		0.35
Female	Reference	
Male	1.03 (0.97 to 1.09)	
Self-Reported Race		
White	Reference	
Black	1.18 (1.02 to 1.35)	0.02
Other	1.14 (0.97 to 1.33)	0.12
Unavailable/Declined	0.79 (0.64 to 0.98)	0.04
Asian	0.73 (0.57 to 0.94)	0.01
American Indian or Alaska Native/Native Hawaiian	1.36 (0.81 to 2.26)	0.24
Insurance Type		
Commercial	Reference	
Medicare	1.22 (1.14 to 1.32)	<0.003
Medicaid	1.42 (1.24 to 1.64)	<0.001
Other	0.92 (0.77 to 1.09)	0.34
Marital Status		
Married/Civil Union/Life Partner	Reference	
Single	1.14 (1.05 to 1.23)	0.002
Dworced/Legally Separated	1.32 (1.20 to 1.45)	<0.003
Widowed	1.31 (1.17 to 1.47)	<0.001
Declined/Unavailable	1.01 (0.79 to 1.28)	0.96
Education Level		
Graduated - College	Reference	
Graduated - High School	1.17 (1.08 to 1.26)	<0.001
Graduated - Graduate School / Post-Graduate	1.00 (0.91 to 1.09)	0.94
Unavailable	0.57 (0.50 to 0.64)	<0.003
Some College	1.18 (1.06 to 1.30)	0.002
Other	1.06 (0.90 to 1.25)	0.51
Some High School	1.09 (0.88 to 1.35)	0.42
8th Grade or Less	1.25 (0.98 to 1.59)	0.08
Associate, Vocational, or Technical Degree	0.70 (0.49 to 1.01)	0.06
Charlson Comorbidity Index	1.22 (1.19 to 1.25)	<0.001
Elective Procedure Type		
Hip or Knee Arthroplasty	Reference	
Cervical / Lumbar Spine Surgery	1.35 (1.26 to 1.46)	<0.001
Shoulder Arthroplasty	1.10 (0.996 to 1.21)	0.06
Hand	2.26 (2.06 to 2.47)	<0.001
Botator Cuff Benair	0.7510.59 to 0.971	0.03
Foot & Ankle	1.12 (0.80 to 1.56)	0.53
Postoperative Gateway Message Sent (Within 90 Davis)		
No.	Beference	
Vad	1 50/1 41 to 1 50)	-0.001

Characteristic	Pseudo R-Squared: 0.04 Odds Ratio (95% Confidence Interval)	p-value
Aze, years	1.00(1.00 to 1.01)	0.04
Sex		0.12
Female	Reference	
Male	0.94 (0.88 to 1.02)	
Self-Reported Race		
White	Reference	
Black	1.82 (1.59 to 2.10)	<0.001
Other	1.48 (1.26 to 1.74)	<0.001
Unavailable/Declined	0.96 (0.76 to 1.21)	0.75
Asian	0.95 (0.72 to 1.25)	0.72
American Indian or Alaska Native/Native Hawaiian	1.79 (1.05 to 3.03)	0.03
Insurance Type		
Commercial	Reference	
Medicare	1.26 (1.15 to 1.38)	<0.001
Medicaid	2.21 (1.93 to 2.53)	<0.001
Other	0.99 (0.81 to 1.20)	0.90
Marital Status		
Married/Civil Union/Life Partner	Reference	
Single	1.42 (1.30 to 1.56)	<0.001
Divorced/Legally Separated	1.32 (1.18 to 1.49)	<0.003
Widowed	1.21 (1.05 to 1.40)	0.01
Declined/Unavailable	0.95 (0.72 to 1.25)	0.70
Education Level		
Graduated - College	Reference	
Graduated - High School	1.18 (1.07 to 1.31)	0.001
Graduated - Graduate School / Post-Graduate	1.08 (0.96 to 1.21)	0.20
Unavailable	1.09 (0.96 to 1.23)	0.21
Some College	1.17 (1.03 to 1.33)	0.01
Other	0.96 (0.77 to 1.20)	0.71
Some High School	1.33 (1.07 to 1.67)	0.01
8th Grade or Less	1.42 (1.09 to 1.85)	0.01
Associate, Vocational, or Technical Degree	1.22 (0.85 to 1.76)	0.28
Charlson Comorbidity Index	1.14 (1.11 to 1.18)	<0.001
Elective Procedure Type		
Hip or Knee Arthroplasty	Reference	
Cervical / Lumbar Spine Surgery	1.36 (1.24 to 1.50)	<0.001
Shoulder Arthroplasty	1.30 (1.15 to 1.46)	<0.001
Hand	2.84 (2.55 to 3.15)	<0.003
Rotator Cuff Repair	1.19 (0.92 to 1.54)	0.19
Foot & Ankle	3.26 (2.52 to 4.22)	<0.001
Postoperative Gateway Message Sent (Within 90 Days)		
No	Reference	
Yes	1.22 (1.13 to 1.31)	<0.001