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TITLE: Gaps in Gastric Cancer Risk Factor Management: Analysis of Electronic Health Data and Provider/Patient Perspectives

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14. ABSTRACT This study addressed factors and their interactions contributing to disparities in testing and treatment of <i>H. pylori</i> (HP) infection and related gastric disorders (atrophic gastritis, gastric ulcer), and gastric cancer [GC; gastric adenocarcinoma (GCA), gastric non-Hodgkin's lymphoma (GL) and gastric MALT lymphoma (gMALT) diagnosis and treatment, among Latinos relative to non-Latinos at two affiliated but independent health systems in San Antonio, Texas. Secondary data re-abstraction and analysis showed that GCs represented 2.6% (n=600) of our population. Men and older individuals were at higher GC risk. Military insurance was 2.7 times as likely to be diagnosed as private insurance. Latinos had significantly (24%) higher GC risk than Whites. Moreover, Latinos without high school education (OR 1.24; 95% CI 1.01-1.52; p=0.04) or insurance (1.16; 0.97-1.39; p=0.10) had higher GC risk. Poverty and lack of insurance contributed to GC risk among minorities classified as Other (Asians, Native Americans, Multiracial; all p<0.01). Qualitative analysis of Oncology patient and provider interviews showed insurance as a major care barrier among providers. Spanish-speaking patients also identified more care barriers. Gastroenterology and primary care interviews are ongoing.					
15. SUBJECT TERMS <i>Helicobacter pylori</i> (<i>H. pylori</i>), gastric cancer, atrophic gastritis, gastric ulcer, health disparities, Hispanic, health insurance, time to diagnosis, time to referral, qualitative interviews					
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1. INTRODUCTION:

My central research question is: what factors and their interactions contribute to disparities in testing and treatment of *H. pylori* infection and related gastric disorder (atrophic gastritis, gastric ulcer), and gastric cancer [GC; gastric adenocarcinoma (GCA), gastric non-Hodgkin's lymphoma (GL) and gastric MALT lymphoma (gMALT) diagnosis and treatment, among Latinos relative to non-Latinos? Study goals are to be met via a mixed methods approach of secondary data collection/analysis of electronic health records (EHR) from two affiliated but independent health systems (Quantitative); and semi-structured interviews of providers, administrators and a random sample of eligible patients in primary care, gastroenterology and oncology clinics on their experiences of facilitators of and barriers to care for these disorders (Qualitative).

2. KEYWORDS:

Helicobacter pylori (*H. pylori*), gastric cancer, atrophic gastritis, gastric ulcer, health disparities, Hispanic, health insurance, social determinants of health, qualitative interviews

3. ACCOMPLISHMENTS:

What were the major goals of the project?

1. Gather and analyze electronic health record (EHR) data from two affiliated health systems (UTMed and UHS) – months 1-6 (analysis pending data re-extraction started 10/19; see Challenges)
 - a. IRB approval – months 1-6 (met 08/2019); HRPO approval not applicable
 - b. Prepare and submit manuscript for publication – months 6-8 (in progress; 10%)
2. Compare data from 2 health systems – months 4-12 (in progress; 50%, see 1 above)
 - a. Prepare/present results at national conference – months 6-12 (met 09/2019, 02/2020)
 - b. Prepare and submit manuscript for publication – months 8-12 (in progress; 10%)
3. Design and translate interview guides for providers, administrators and patients – months 13-15
 - a. HRPO approval – received 10/13/20; Continuing Review LOA submitted 11/5/20
4. Conduct semi-structured interviews with providers, administrators and patients from UTMEd/ UHS – months 15-24 (in progress; 60% -- all provider interviews completed; all Oncology and 3 Gastroenterology patient interviews)
5. Analyze interviews for qualitative themes – months 20-28 (in progress; 100% of provider interviews; 30% patient interviews)
 - a. Prepare/present results at national conference – months 24-36 (will present at TAMEST conference 6/20/22)
 - b. Prepare and submit manuscript for publication – months 28-36 (not started)

What was accomplished under these goals?

1. Gather and analyze electronic health record (EHR) data from two affiliated health systems (UTMed and UHS) – The PI received pilot funding from the Geographic Management of Cancer Disparities (GMAP) program Region 3 on 7/20 for \$7500 over 1 year to obtain Biostatistics Core support to analyze Aims 1 and 2 data. Analyses of 5/20 cohort dataset began and halted when need for data re-extraction was discovered in 9/20.
 - a. IRB approval (Expedited; PHI present in socioeconomic status and clinic notes data) – months 1-6 (met 08/2019); HRPO approval not applicable
 - b. Prepare and submit manuscript for publication – months 6-8 (in progress; 10%). Further delays in data analysis occurred due to systemic errors discovered by data warehouse personnel. Processes were updated and data re-extraction started 10/20. Due to multiple delays on the data warehouse side, PI received new datasets 6/3/21, and additional variables 6/9/21.
2. Compare data from 2 health systems –cleaning of re-extracted data completed. We extracted structured EMR data on adults at our institution aged 18+ with gastric diagnoses (n=23,320; 2007-2020), using ICD9/10 diagnostic codes and key words. We derived Census block-level SDoH data from the American Community Survey. We used logistic regression with statistical interaction between variables to estimate ethnicity-modulated SDoH effects on GC risk. The tables below show our cohort data with bivariate analyses of GC risk and demographic/SDoH interactions. GCs represented 2.6% (n=600) of our sample (N=23,320). Over 50% of GCs were male or Latino; ~25% were Medicare- or privately insured. Compared to private, military-insured had higher odds of GC (2.67; 1.19-5.40; p=0.01). In contrast, **uninsured**, **underinsured** and government had lower odds (ORs 0.31-0.56; all p<0.01). Living in lowest-income neighborhoods also increased GC risk (1.3; 1.01-1.69; p=0.045). Latinos had significantly higher GC risk than Whites (OR 1.24; 95% CI 1.02-1.51; p=0.03). Latinos without high school education (1.24; 1.01-1.52; p=0.04) or insurance (1.16; 0.97-1.39; p=0.10) had higher GC risk. Poverty and lack of insurance also contributed to GC risk among minorities classified as Other (Asians, Native Americans, Multi-racial; all p<0.01).

Characteristic	Demographics		Logistic Regression ²		
	No Cancer N = 22,720 ¹	Cancer N = 600 ¹	OR ₂	95% CI ₂	p-value
Age	47 (35, 57)	62 (52, 70)			
Sex					
Female	12,600 (55%)	258 (43%)			
Male	6,561 (29%)	318 (53%)			
Unknown	3559 (16%)	24 (4%)			
Race/Ethnicity					
White	5,830 (26%)	169 (28%)	—	—	
Black	1,232 (5.4%)	37 (6.2%)	1.22	0.83, 1.74	0.3
Hispanic	10,025 (44%)	309 (52%)	1.24	1.02, 1.51	0.031
Other	5,633 (25%)	85 (14%)	1.03	0.75, 1.38	0.9
Payer Class					
Private	3,797 (17%)	140 (23%)	—	—	
Carelink	9,153 (40%)	116 (19%)	0.45	0.35, 0.58	<0.001
Government	1,676 (7.4%)	21 (3.5%)	0.51	0.31, 0.80	0.005
Medicaid	1,454 (6.4%)	51 (8.5%)	1.26	0.89, 1.75	0.2
Medicare	2,356 (10%)	171 (28%)	0.88	0.68, 1.13	0.3
Medicare + Medicaid	72 (0.3%)	5 (0.8%)	0.57	0.14, 1.60	0.4
Military	102 (0.4%)	9 (1.5%)	2.67	1.19, 5.40	0.01
Missing	844 (3.7%)	45 (7.5%)	1.17	0.81, 1.66	0.4
Other	1,188 (5.2%)	11 (1.8%)	0.31	0.15, 0.58	<0.001
Self-Pay	2,078 (9.1%)	31 (5.2%)	0.56	0.36, 0.86	0.011
MINORITYPOP_2016_5Y_QUARTILE					
Q1	4,995 (23%)	183 (32%)	—	—	
Q2	4,807 (22%)	95 (17%)	0.66	0.50, 0.85	0.002
Q3	4,733 (21%)	101 (18%)	0.73	0.56, 0.94	0.016
Q4	7,619 (34%)	185 (33%)	0.75	0.60, 0.93	0.01
MEDINCOME_2016_5Y_QUARTILE					
Q1	5,200 (24%)	110 (20%)	—	—	
Q2	5,150 (24%)	125 (23%)	1.23	0.93, 1.61	0.14
Q3	5,733 (26%)	152 (28%)	1.28	0.99, 1.67	0.061
Q4	5,594 (26%)	162 (30%)	1.3	1.01, 1.69	0.045
UNEMPLOYED_2016_5Y_QUARTILE					
Q1	4,976 (22%)	144 (26%)	—	—	
Q2	5,540 (25%)	159 (28%)	0.95	0.75, 1.20	0.7
Q3	5,126 (23%)	119 (21%)	0.76	0.58, 0.98	0.034
Q4	6,512 (29%)	142 (25%)	0.75	0.59, 0.96	0.02

¹ Median (IQR); n (%)

² OR = Odds Ratio, CI = Confidence Interval; adjusted for age and sex

Cancer Risk: Race/Ethnicity and SDoH Interaction Models

Characteristic	OR _i	95% CI _i	p-value
Race_Ethnicity * MEDINCOME_2016_5Y_DEID			
Black * MEDINCOME	1	1.00, 1.00	0.8
Hispanic * MEDINCOME	1	1.00, 1.00	>0.9
Other * MEDINCOME	1	1.00, 1.00	0.3
Race_Ethnicity * MINORITYPOP_2016_5Y_QUARTILE			
Black * MINORITYPOP	1.2	0.85, 1.71	0.3
Hispanic * MINORITYPOP	1.17	0.98, 1.40	0.09
Other * MINORITYPOP	1.24	0.94, 1.64	0.13
Race_Ethnicity * NOHS_2016_5Y_QUARTILE			
Black * NOHS	1.14	0.75, 1.73	0.5
Hispanic * NOHS	1.24	1.01, 1.52	0.04
Other * NOHS	1.33	0.97, 1.82	0.074
Race_Ethnicity * MEDINCOME_2016_5Y_QUARTILE			
Black * MEDINCOME	0.84	0.60, 1.17	0.3
Hispanic * MEDINCOME	0.9	0.74, 1.09	0.3
Other * MEDINCOME	0.86	0.64, 1.15	0.3
Race_Ethnicity * UNEMPLOYED_2016_5Y_QUARTILE			
Black * UNEMPLOYED	1.06	0.76, 1.49	0.7
Hispanic * UNEMPLOYED	1.02	0.85, 1.22	0.8
Other * UNEMPLOYED	1	0.74, 1.34	>0.9
Race_Ethnicity * UNINSURED_2016_5Y_QUARTILE			
Black * UNINSURED	1.05	0.75, 1.47	0.8
Hispanic * UNINSURED	1.16	0.97, 1.39	0.1
Other * UNINSURED	1.45	1.11, 1.90	0.006
Race_Ethnicity * POOR_2016_5Y_QUARTILE			
Black * POOR	1.11	0.76, 1.64	0.6
Hispanic * POOR	1.12	0.91, 1.37	0.3
Other * POOR	1.51	1.10, 2.08	0.012

_i OR = Odds Ratio, CI = Confidence Interval

Other = Asian, American Indian or Alaska Native, More than one race, Unknown, Declined to provide, Missing

a. prepare and submit manuscript for publication – months 8-12 (in progress; 10%). In the meantime, PI and colleagues published one first-author on gastric cancer epidemiology in the U.S., Texas and South Texas, and one co-author gastric cancer mortality at the local cancer center (see Other Publications below).

3. Design and translate interview guides for providers, administrators and patients – months 13-15 (completed)

a. HRPO approval – received 10/13/20; Continuing Review LOA submitted 11/5/20

4. Conduct semi-structured interviews with providers, administrators and patients from UTMEd/UHS – months 15-24 (in progress; 70% -- all provider interviews, all Oncology patient interviews completed) – with assistance of new RC, PI contacted at least 5 providers and 2 administrators from each of 3 specialties (primary care, gastroenterology, oncology – 26 total interviews). Due to COVID restrictions, PI conducted all interviews via telephone and recorded speakerphone conversations on a data recorder. Audio files were uploaded to Landmark Associates for transcription, and verbatim transcripts downloaded.

5. Analyze interviews for qualitative themes – months 20-28 (in progress; 40% of provider interviews) – Oncology provider and patient analysis showed insurance as a barrier identified by providers/administrators. There were differences between Spanish and English-speaking patient experiences. Analysis of common themes from individual domains in other specialties is ongoing.

What opportunities for training and professional development has the project provided?

Training: The PI is attending monthly webinars in the Spotlight for Research Integrity series. This takes the place of the course on Responsible Conduct of Research.

Professional development: The PI presented quantitative data via poster and a rapid-fire abstract session at the Advancing the Science of Cancer in Latinos conference in Feb 2022. She will also present quantitative and qualitative data at the TAMEST conference in June 2022. The PI also participated in an NCI sponsored Grantwriting Workshop in Mar 2022 through the Early Investigator Advancement Program.

How were the results disseminated to communities of interest?

Nothing to report

What do you plan to do during the next reporting period to accomplish the goals?

Goal 1: acquire final clean dataset from the data warehouse – completed.

Goal 2: analyze dataset with help of Biostatistics Core; describe changes if any to the cohort; conduct longitudinal data analyses. Prepare/present results at a national conference and submit manuscripts for publication.

Goal 3: Submit IRB amendments for patient interview guides and surveys - completed. Obtain permission to contact eligible patients from participating providers. Complete patient interviews. Conduct qualitative analyses of all interviews throughout this process. Present preliminary results at a national conference. Prepare and submit manuscript for publication.

4. IMPACT:

What was the impact on the development of the principal discipline(s) of the project?

Nothing to Report

What was the impact on other disciplines?

Nothing to report

What was the impact on technology transfer?

Nothing to report

What was the impact on society beyond science and technology?

Nothing to Report

5. CHANGES/PROBLEMS:

Changes in approach and reasons for change

Due to COVID-19 restrictions and PI personal illness, patient interviews were halted from Oct 2021-Mar 2022.

Actual or anticipated problems or delays and actions or plans to resolve them

PI requested a NCE in order to complete remaining patient interviews and analyses.

Changes that had a significant impact on expenditures

No patient payment expenses were incurred while interviews were halted.

Significant changes in use or care of human subjects, vertebrate animals, biohazards, and/or select agents

Significant changes in use or care of human subjects

Nothing to report

Significant changes in use or care of vertebrate animals

Not applicable

Significant changes in use of biohazards and/or select agents

Not applicable

6. PRODUCTS:

- **Publications, conference papers, and presentations**

Journal publications.

Dorothy Long Parma, MD, MPH; Susanne Schmidt, PhD; Edgar Muñoz, MS; Amelie G. Ramirez, DrPH. Gastric cancer burden and late-stage diagnosis in Latino and non-Latino populations in the United States and Texas 2004-2016: a multilevel analysis. Accepted to *Cancer Medicine* 2021. Acknowledgment of federal support (Yes).

Books or other non-periodical, one-time publications.

Nothing to report

Other publications, conference papers and presentations.

***Dorothy Long Parma, MD, MPH;** Jonathan A. Gelfond, PhD; Roman Fernandez, MS; Amelie G. Ramirez, DrPH. Social determinants of health impact gastric cancer risk in South Texas minorities. Advancing the Science of Cancer in Latinos conference, Feb 2022

- **Website(s) or other Internet site(s)**

Nothing to report

- **Technologies or techniques**

Nothing to report

- **Inventions, patent applications, and/or licenses**

Nothing to report

- **Other Products**

Databases/datasets – re-extracted/revised cohort dataset of UTMEd/UHS patients with diagnoses of *H. pylori* (HP) infection, atrophic gastritis, gastric ulcer, gastric adenocarcinoma, gastric (non-Hodgkin’s) lymphoma, gastric MALT lymphoma from 2007-2020. This version of dataset includes antibiotic regimens; repeat HP testing for HP-positive individuals; referrals to specialty services and encounters/completed appointments; census tract/block-level socioeconomic status data for ~97% of the cohort

7. PARTICIPANTS & OTHER COLLABORATING ORGANIZATIONS

What individuals have worked on the project?

Name: Dorothy Long Parma, MD, MPH
Project Role: PI
Researcher Identifier: ORCID ID 0000-0001-8059-3392
Nearest person month: 9
Contribution to project: Supervised data extraction, cleaning, organization and analyses, recruited providers and conducted provider interviews; created transcription summaries; wrote manuscripts/abstracts
Funding support: Institutional (3 person-months)

Name: Raquel Romero, MD, MPH
Project Role: Research Coordinator
Researcher Identifier: ORCID ID 0000-0002-7716-3364
Nearest person month: 2.4 (Dec 2020-present)
Contribution to project: assisted in contacting providers for semi-structured interview, creating transcript summaries of transcribed provider interviews, analyzing qualitative interview data
Funding support: HRSA U5ARH39480 (Allison PI) (1.2 person-months); Elizabeth Dole Foundation (Delgado PI) (1.2 person-months); Bexar County Health Collaborative (Tsevat PI) (0.15 person-months)

Has there been a change in the active other support of the PD/PI(s) or senior/key personnel since the last reporting period?

Nothing to report

What other organizations were involved as partners?

8. SPECIAL REPORTING REQUIREMENTS

QUAD CHARTS: see Appendices.

9. APPENDICES: