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Costas T. Lambrew Research Retreat 2021

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2021

A Period Seroprevalence (SARS-CoV-2) Survey in MHCCN Cancer Healthcare Workers (HCWs) Providing Patient Care during the Height of the Outbreak: A Registry Study (Initial Progress)

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Recommended Citation

Prescott, Jill; Knight, Caroline; Hobart, Erin; Saunders, Jamie; Caron, Kimberly; Neptune, Sandra; Brown, Patty; Lemire, Lisa; Breggia, Anne; Guerin-Staples, Susan L.; Lucas, Lee; Han, Paul; Kumar, Rachit; Carlson, Robert; and Remick, Scot, "A Period Seroprevalence (SARS-CoV-2) Survey in MHCCN Cancer Healthcare Workers (HCWs) Providing Patient Care during the Height of the Outbreak: A Registry Study (Initial Progress)" (2021). *Costas T. Lambrew Research Retreat 2021*. 6.

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Early observations of Covid-19 antibody seroprevalence of 1.5% in MHCCN HCWs is consistent with experience in rural settings that was reported during the pandemic in summer 2020.

A Period Seroprevalence (SARS-CoV-2) Survey in MHCCN Cancer Healthcare Workers (HCWs) Providing Patient Care during the Height of the Outbreak: A Registry Study (Initial Progress)

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Introduction

There is little information on the basic epidemiologic and serologic profile(s) of the novel SARS-CoV-2 coronavirus especially in HCWs employed in rural settings. We embarked on a period seroprevalence study in the MaineHealth Cancer Network (MHCCN) to document Covid-19 exposure in our rural cancer care workforce. Our *fundamental hypothesis* is that despite implementing procedures to safeguard patients and the use of appropriate PPE in the care of known source patients/PUIs in both the inpatient and outpatient cancer care settings a small, but not insignificant number of cancer care providers (hereafter referred to as cancer HCWs) will have evidence of exposure by virtue of plasma antibody seroconversion.

Participants & Methods

We plan to enroll 600 HCWs with patient-facing duties between March 1 and May 31, 2020 during the initial pandemic surge. Participants are required to have worn PPE during this time guided by level of PPE precaution: standard, droplet or airborne recommendation(s). HCWs (both inpatient and outpatient settings) are recruited based on analytic cancer case volume at our member institutions ensuring a representative sample across the MHCCN. All participants provided written informed consent and asked to complete 4 surveys: 1) *Brief Health & Medical History* 2) *Occupational Survey* 3) *HCW Occupational Risk Survey* and 4) an *End-of-Study Participant Survey*. At time of enrollment a screening antibody (Ab) test was performed using the *Roche Elecsys Anti-SARS-CoV-2 pan IgG* test (targets nucleocapsid Ab). A confirmatory antibody test was then performed for initial screen positives using the *Abbott Architect SARS-CoV-2 IgG* test (also targets nucleocapsid Ab). A test is considered positive if both Ab tests are positive. This dual antibody testing, while not truly orthogonal since the Ab targets are similar, was deemed appropriate in settings with low local area community cumulative Covid-19 incidence.

Results

To date, a total of 203 HCWs [180 (89%) females; with top 3 roles including: 86 (43%) RNs, 26 (13%) receptionists; and 15 MDs (8%)] have been enrolled. The top 3 sites include: 90 (44%) at Maine General; 61 (30%) MMC; 16 (8%) Waldo; and 36 (18%) from among SMHC, Memorial, Stephens, Franklin, Pen Bay and Lincoln.

- 3 (1.5%) HCWs have initial positive Covid Ab serology and continue on 3 month surveillance. One has completed the 3-month surveillance visit and has tested negative.
- 4 HCWs with confirmed diagnosis of Covid prior to enrollment tested negative at time enrollment. Of these, three were greater than 6 months after diagnosis and one was 6 weeks after diagnosis. Explanation(s) for this may include:
 - antibody response below detectable limits of the assays; or
 - true false negative test.

Nucleocapsid Ab	Spike Protein Ab	Interpretation of Serology Tests using the Roche Nucleocapsid and Spike Protein Anti-Sars-Cov2 Antibody Tests:
Negative (-)	Negative (-) (<0.8 U/mL)	No detectable antibody response to SARS-CoV-2 or vaccine if applicable.
Positive (+)	Negative (-) (<0.8 U/mL)	Suggestive of antibody response to SARS-CoV-2. No detectable response to vaccine if applicable.
Negative (-)	Positive (+) (≥0.8 U/mL)	Suggestive of antibody response to SARS-CoV-2 and/or antibody response to vaccine if applicable.
Positive (+)	Positive (+) (≥0.8 U/mL)	Suggestive of antibody response to SARS-CoV-2 and antibody response to vaccine if applicable.

Preliminary Survey Results - Continued

Of the 203 participating HCWs, 3 were Covid-19 Ab positive; and 4 were Covid-19 Ab negative (false-negatives) with known Covid-19 diagnosis (see table).

Summary of Covid-19 antibody negative in setting of known Covid-19 confirmed diagnosis				
On Study	Roche / Abbott Ab test	Covid-19 Dx	Interval Covid-19 Dx to Ab test	Comment
11/30/20	+/-	3/22/20	8 mos. prior to Ab test	False negative vs. Ab response waned.
12/18/20	+/- 3 mos. f/u: +/-	4/1/20 "	8.5 mos. prior to Ab test 11.5 mos. prior to Ab test	False negative vs. Ab response below detectable limits Ibid.
2/12/21	-/-	1/1/21	1.5 mos. prior to Ab test	False negative vs. no Ab response.
2/13/21	-/not done	3/23/20	11 mos. prior to Ab test	False negative vs. no Ab response.

Cancer Care Setting Correlation (N=7)

- 3 Ab positive and 2 Covid-19 confirmed HCWs: Outpatient Clinical
- 1 Covid-19 confirmed HCW: Inpatient & Outpatient Clinical
- 1 Covid-19 confirmed HCW: Outpatient Non-clinical

Exposure Level/PPE Correlation (N=7)

- 1 Ab positive HCW: High - Requiring 'airborne' precautions: goggles, surgical mask, N95 mask, gown & gloves
- 0 cases: Moderate - Requiring 'droplet' precautions: surgical mask, eye covering, & gloves with increased protection added as necessary
- 2 Ab positive and 4 Covid-19 confirmed HCWs: Low - Requiring 'standard' precautions: surgical mask, eye protection & gloves

Household COVID Exposure Correlation (N=7)

- 3 Ab positive and 4 Covid-19 confirmed HCWs lived in households greater than 1
- 3 Ab positive and 2 Covid-19 confirmed HCWs had positive household exposure
- 2 Covid-19 confirmed HCWs had no positive household exposure
- 3 Ab negative HCWs had positive household exposure correlation (N=203)

Household Health History (N=196)

- 11 members with Auto-Immune Disease
- 1 member with Auto-Immune and Cancer
- 1 member with Auto Immune and other
- 8 members with Cancer
- 2 members with Cancer and other
- 1 members with Infectious Disease
- 1 member with Organ Transplant
- 6 members with other

Total of 28 HCWs with a household member who has at least one reportable health history

(N=196)	Accuracy of Testing Confidence (%)	Reassurance from COVID Testing Results (%)
Extremely	14	12
Very	39	32
Fairly	17	21
Somewhat	13	15
Not At All	2	5
No Response	15	15

Discussion

- Over initial third (n=203) of our projected enrollment, 3.4% of HCWs are either antibody positive (n=3) or have known Covid-19 diagnosis (n=4).
- Community spread is likely the predominant driver of exposure to Covid-19 vs. occupational exposure.
- It is difficult reconcile false negative antibody responses in 4 HCWs with known Covid-19 infection.
- Of 196 of survey respondents, 14.2% of HCWs have immunocompromised members at home. This has implications for a rural cancer workforce during a pandemic.
- A limitation of our study is that medical history and survey responses were self-reported; participants could omit answering any question they were not comfortable answering.
- NorDx has brought to operational status a new antibody testing platform - the Roche Elecsys Anti-SARS-CoV-2 S (spike protein target) test. The study is being amended and this replaces the Abbott test. This change permits true orthogonal testing (different antibody viral targets – nucleocapsid antigen and spike protein) and inferences about antibody immune response to Covid vaccination(s) is now discernible. The readouts are outlined in the panel to the left. Additionally, this platform may be more discriminating and confirm antibody response in known HCWs with Covid-19 infection and thus limit false negative results.

Conclusion: Early observations of Covid-19 antibody seroprevalence of 1.5% in MHCCN HCWs is consistent with experience in rural settings that have been reported during the pandemic in summer 2020 [MMWR 2020 (Aug 31); 69:1-7 (Early Release)].

[Supported in part by NIH grant nos.: 1UG1 CA239771 & 3UG1 CA239771-02S1.]