ORIGINAL ARTICLE

Interconception care during well-child visits by family physicians in the United States: A cross-sectional study

Kaku Kuroda MD, CAS[1,2] | Christopher P. Morley PhD, MA, CAS[1,3,4] |
R. Eugene Bailey MD[1]

[1]Department of Family Medicine, SUNY Upstate Medical University, Syracuse, New York, USA

[2]Department of General Medicine, University of Toyama, Toyama, Japan

[3]Departments of Public Health & Preventive Medicine, SUNY Upstate Medical University, Syracuse, New York, USA

[4]Department of Psychiatry & Behavioral Sciences, SUNY Upstate Medical University, Syracuse, New York, USA

Correspondence
Kaku Kuroda, Department of Family Medicine, SUNY Upstate Medical University, POBN, Suite 3V, 4900 Broad Road, Syracuse, NY 13215, USA.
Email: kaku555552007@gmail.com

Abstract

Background: Interconception care (ICC) by family physicians during well-child visits (WCVs) has been broadly advocated in principle but has not been widely implemented. We aimed to investigate ICC at WCVs by family physicians at our facility, focusing on four maternal risk factors, including maternal tobacco use, maternal depression, contraception, and folic acid supplementation.

Methods: Mothers who visited WCVs with children up to the age of 24 months at our university-affiliated clinic were screened for the four maternal risks. Brief interventions were provided to mothers with positive screening results. We investigated mothers at WCVs from December 1, 2020, to November 30, 2022. We performed descriptive and binary logistic regression analyses to determine the maternal demographic factors associated with positive screenings.

Results: Of 1143 WCVs, 205 mothers were evaluated. Screening was positive in the following rates: tobacco use 5.9%, depression 11.5%, contraception 73.6%, and folic acid supplementation 40.5%. Single marital status was associated with positive screening for smoking (odds ratio [OR] 8.689, $p=0.016$) and maternal depression (OR 3.470, $p=0.035$). Maternal education level lower than a high school diploma was associated with positive screening for folic acid intake (OR 4.975, $p=0.004$).

Conclusions: ICC conducted during WCVs by family physicians offers valuable opportunities to identify maternal risk factors and address modifiable factors that can influence future birth outcomes. Single marital status and educational level less than a high school diploma were more potent risk factors for maternal behavior in ICC. More research is needed to assess the outcomes of the interventions.

KEYWORDS
birth outcomes, family physicians, interconception care, well-child visits

1 | BACKGROUND

The maternal mortality rate in the United States has been increasing over the years based on the latest data from 2020.[1] Although the infant mortality rate in the United States over the same period was slightly lower than that of 2019, there were still 541.9 infant deaths per 100,000 in 2020.[2] The two leading causes of infant deaths were congenital malformations and low birth weight.[2] Of note, almost half of pregnancies are unplanned in the United States.[3] These are all factors that increase poor birth outcomes.

Several modifiable maternal risk factors contribute to poor birth outcomes.

- Maternal tobacco use is clearly a contributor to adverse birth outcomes, including low birth weight and increased perinatal mortality.[4] In the United States, 8.4% of pregnant women had smoked at any time during pregnancy in 2014.[5] The US Preventive Services Task Force (USPSTF) concluded that clinicians should ask all pregnant patients about smoking, advise them to stop smoking and provide behavioral interventions to quit smoking cessation.[6]
- Maternal depression during pregnancy is associated with adverse pregnancy outcomes, including premature delivery.[7,8] The USPSTF recommends the evaluation of depression in the general adult population, including pregnant and postpartum women.[9]
- Unplanned pregnancy is associated with adverse maternal and neonatal outcomes.[10] The American College of Obstetricians and Gynecologists (ACOG) recommends counseling on the modest risks and benefits of interpregnancy intervals more significant than 18 months.[11]
- Periconceptional folate supplementation reduces the risk of neural tube defects.[12]

To improve poor birth outcomes, interconception care (ICC) effectively identifies and addresses maternal risk factors that impact future maternal and fetal outcomes.[13] ICC is defined as care provided to mothers between pregnancies to improve the health outcomes of mothers, newborns, and children.[14] The IMPLICIT network (Interventions to Minimize Preterm and Low birth weight Infants using Continuous quality Improvement Techniques) is a family medicine learning collaborative interested in improving birth outcomes and promoting women's health through innovative models of care.[15–17] One of its works is developing the IMPLICIT ICC model, which focuses on screening mothers for maternal risk factors during well-child visits (WCVs) from 0 to 24 months. WCVs are preventive health examinations regularly scheduled throughout a child's life, generally ending around 20 years old.[18] This model is ideally suited for family medicine; however, any practice that offers WCVs can take advantage of this unique model. The IMPLICIT ICC model includes screening and brief interventions for smoking, maternal depression, family planning, and prenatal vitamins with folate use.[16,17] The IMPLICIT ICC model has been broadly advocated but not widely implemented, and further studies are needed in various settings.

Our objective was to investigate the ICC among family physicians in our facility, focusing on maternal tobacco use, maternal depression, contraception, and folic acid supplementation. This project will better understand ICC and improve engagement and health outcomes for mothers and children for future studies.

2 | METHODS

2.1 | Background

This study was conducted at our university-affiliated community clinic located in Syracuse, New York, the United States. In the United States, approximately 15% of WCVs for children younger than 2 years of age are performed by family physicians.[19] Family physicians play a critical role in providing comprehensive reproductive care, from preconception care to postpartum care, throughout their reproductive years,[20] although the actual percentage of family physicians providing preconception care is not mentioned in the available search results. Our study was conducted in an outpatient setting. In our facility, family physicians follow-up with pediatric patients including newborns, and perinatal women from preconception to postpartum. Our facility is a community hospital that includes labor delivery and neonatal care. Family physicians are privileged to perform both intrapartum and postpartum care as well as newborn care.

2.2 | Study design

Cross-sectional study.

2.3 | Subjects

Mothers who take their children up to the age of 24 months to WCVs at our university-affiliated clinic underwent screening for four maternal risks detailed in the subsequent paragraph. For mothers with positive screening results, brief interventions were administered as outlined in the following "interventions" paragraph. Up to 24 months, WCVs are performed according to accepted guidelines at 2, 4 weeks and then at 2, 4, 6, 9, 12, 15, 18, and 24 months. Mothers of infants scheduled for acute visits were excluded from our data collection.

2.4 | Screening

Mothers received screening for four maternal risk factors (maternal tobacco use, maternal depression, lack of contraception, and lack of folic acid supplementation). We selected these four maternal risk factors based on the IMPLICIT Network ICC model.[16] To screen for

maternal tobacco use, the mother was asked if she was a current smoker, a former smoker, or a never smoker.

To screen for depression, we used the Patient Health Questionnaire 2 (PHQ-2), a screening tool for depression, with the following two questions[21]:

- Over the past 2 weeks, how often have you felt little interest or pleasure in doing things?
- Over the past 2 weeks, how often have you felt down, depressed, or hopeless?

If the PHQ-2 was positive, providers performed the PHQ-9.[22]

For contraception screening, the mother was asked what method of contraception she used. Depending on their effectiveness, contraception methods were classified as Tier 1 through 3.[23] Tier 1 included intrauterine devices, implants, and permanent sterilization. Tier 2 included a Depo shot, oral contraceptive pills, vaginal rings, and diaphragms. Tier 3 included condom use, withdrawal, sponge, spermicide, and fertility awareness. The mother was asked if she used either tier 1–3, no method, or if she was currently pregnant, trying to conceive, abstinent, or not sexually active with men.

For folic acid screening, the mother was asked if she was currently taking a multivitamin, prenatal vitamin, or folic acid supplement.

2.5 | Interventions

Brief interventions were provided to mothers with positive screening using the following methods. If the mother was a current smoker, family physicians provided a brochure on smoking cessation and provided brief counseling. If the PHQ-9 was positive, family physicians addressed the mother's immediate risk for harm. If mothers were not at immediate risk, mothers were provided a brochure regarding maternal mental health as a brief intervention. If the mother used a form of contraceptives other than tier 1, family physicians provided a brochure on contraceptive options. Family planning was discussed with mothers with a focus on birth spacing and highly effective birth control methods like long-acting reversible contraceptives (LARCs). If the mother did not consume folic acid, they were counseled on the benefits and given a brochure on the importance of folic acid supplementation. Figure 1 shows the picture of brochures for mothers with positive screening results for each of the four risk factors.

When family physicians identify the need for additional care or when mothers seek further interventions, we typically schedule follow-up appointments with their primary care physician, except in emergencies, such as when a patient expresses suicidal ideation. Regarding smoking, physicians offer follow-up appointments to discuss or initiate smoking cessation. In the case of depression, physicians provide follow-up appointments to discuss the need for psychotherapy or pharmacological treatment, or physicians may refer mothers to social workers and psychiatrists for further evaluation. In matters of contraception, we schedule follow-up appointments to discuss contraception options or to perform contraceptive procedures at our facility. For folic acid supplementation, physicians either prescribe prenatal vitamins or recommend purchasing folic acid-containing products at pharmacies.

2.6 | Duration

This study enrolled mothers who took their children to WCVs from 1 December 2020 to 30 November 2022.

FIGURE 1 Brochures for mothers with positive screening results for each risk factor (the figure reproduced with permission from SUNY Upstate Medical University).

2.7 | Data collection and analysis

We collaborated with the Department of Information Management and Technology to incorporate standardized questions to extract information from the electronic medical record (EMR) for data collection using the Epic EMR system.

We conducted a cross-sectional, descriptive analysis to investigate maternal demographic characteristics, frequency of implementing screening for mothers, positive screening rates, and brief intervention rates for mothers with risk factors.

We first compared mothers who were positive for each test and those who were negative using either the chi-square test or Fisher's exact test for categorical variables (maternal marital status, maternal education level, insurance type, and maternal race) and the t-test for continuous variables (maternal age at childbirth and the number of living children). Variables were included in the final multivariate model if initial bivariate tests suggested an association at the $p < 0.20$ level.

Next, we performed a binary logistic regression analysis to determine the maternal demographic factors associated with positive screenings. A multivariate logistic regression model was used to calculate the adjusted odds ratio (OR) with a 95% confidence interval (CI) for the risks of positive screening of four risk factors.

The level of statistical significance was set at $p < 0.05$. All statistical analyses were performed using the IBM SPSS Statistics version 28.

2.8 | Ethical considerations

This project utilized existing, anonymized patient data. The institutional review board (IRB) at SUNY Upstate Medical University granted an exemption from review for this project, using IRBNet for electronic administration and managing IRB requests (reference number: 2031838-1).

3 | RESULTS

Data were collected from 275 mothers of 310 children in 1043 WCVs. However, 70 mothers were not included in the data analysis due to missing data; therefore, data from 205 mothers were analyzed. When surveyed, missing data mainly occurred due to the provider's time constraints, provider's error, or mothers not being present (e.g., the grandmother brought the child to the WCV). Maternal demographic features are summarized in Table 1.

Regarding the four risk factors of maternal tobacco use, maternal depression, contraception, and folic acid intake, the positive screening rates were 5.9% (12/203), 11.5% (21/183), 73.6% (145/197), and 40.5% (79/195), respectively. The number of mothers screened positive for all four, three, and two factors were 0, 8, and 48, respectively. Among mothers who screened positive for two or three factors, a trend toward coexistence of positive screenings for lack

of contraception use and folic acid supplementation was observed; otherwise, no trend was noted.

For participants with positive screening results for tobacco use, contraception uses other than tier 1, and lack of folic acid intake, the rates of brief interventions provided to mothers were 58.3% (7/12), 40% (58/145), and 39.2% (31/79), respectively. For mothers with positive screening for depression, PHQ-9 was performed for further evaluation. PHQ-9 was positive in 42.9% (9/21), and a brief intervention was provided in 77.8% (7/9). Figure 2 shows a patient flow diagram.

We examined the association between positive screening and maternal demographic characteristics. All covariates were included in the final multivariate model based on the results of the initial bivariate tests. Table 2 contains the adjusted OR of positive screening of the four risk factors for each variable listed in Table 1. Marital status was associated with positive screening for smoking (OR 8.689, 95% CI 1.507–50.108, $p = 0.016$) and positive screening for maternal depression (OR 3.470, 95% CI 1.091–11.043, $p = 0.035$). In addition, having a maternal education level lower than a high school degree was associated with positive screening for folic acid intake (OR 4.975, 95% CI 1.675–14.779, $p = 0.004$).

4 | DISCUSSION

This study investigated the application of ICC during WCVs by family physicians at our facility, focusing on screening modifiable maternal behavioral risk factors that impact the outcomes of future pregnancies.

The results of this study suggest that ICC during WCVs by family physicians provides opportunities to address modifiable maternal risk factors that can improve future birth outcomes. In the present study, risk factors in 205 mothers were on the agenda in the clinic visits, which were not for themselves but for their children. This feasibility of using WCVs to detect maternal risk factors extends opportunities to discuss critical issues for birth outcomes over routine visits between pregnancies without scheduling maternal visits. We suggest two significant points to make this ICC model practical. First, this ICC was conducted with a 4-point brief screening and interventions; thus, it was not too time-consuming to interfere with WCVs. Second, the family medicine setting fits into this ICC model. As shown in previous studies, the consistency of maternal attendance in the WCVs and the accessibility of mothers in family medicine clinics allows family physicians to practice ICC regularly.[16] It was also reported that mothers were highly receptive to being advised by their child's physician, even if they were not planning another pregnancy.[15] We believe that this compatibility arises from family-oriented care, given its consideration of the entire family unit. In the previous study of ICC during WCVs, contraception was the area that yielded the most prominent change from usual WCVs because maternal family planning has never been recommended as part of pediatric regular WCVs.[17] Furthermore, smoking and maternal depression are issues that

Demography	Number of mothers
Maternal age at child's birth (range)	27.80 ± 6.19 (16–41)[a]
Marital status	
Married/Cohabitating	109
Single	91
Education level	
High school diploma or equivalent (GED) or higher diploma	175
Less than high school diploma or equivalent	23
Insurance type	
Private insurance	70
Medicaid/Medical assistance/Self-pay	127
Race	
Caucasian	74
African American	94
Other	32
Number of living children	
1	83
2	44
3	38
4	18
5	6
6	6

TABLE 1 Maternal demographic characteristics.

Abbreviation: GED, General Educational Development.

[a]Maternal age is shown as mean $\pm$ standard deviation.

impact not only the mother but also her entire family. It is also known that family physicians are the most suitable for providing preconception care and take a critical role in addressing reproductive health for both men and women.[24] Since family physicians provide care the most to dyads across the reproductive life cycle in the ambulatory primary care setting,[20] this ICC model perfectly fits into family-oriented care to promote the health and well-being of the entire family.

Our study findings also suggest that single marital status and educational level less than a high school diploma were more potent risk factors for maternal behavior in ICC. In the analysis of the association between positive screening for maternal risk factors and maternal demographic characteristics, single marital status was found to be associated with maternal smoking and depression, and the level of maternal education less than a high school diploma was associated with a lack of folic acid intake. Previous studies investigating preconception care have also demonstrated that marriage is associated with a reduced risk of preterm delivery, having small-for-gestational-age infants, and neonatal intensive care unit admissions.[25] Additionally, lower levels of education were associated with a more significant number of risk factors for poor preconception and interconception health.[26] Our study findings support the need for careful screening of mothers with single marital status and lower educational status. However, at the same time, the present study showed no association between positive screening and other maternal demographics,

including maternal age, race, type of insurance, or number of living children. In the ICC model in our study, the subjects are mothers who take their children to WCVs. The goal of ICC, as implemented by family physicians, is to enhance the opportunity to improve health outcomes for both mothers and children within their family dynamics by mitigating not only individual aspects but the entire spectrum of maternal risk factors. Therefore, the overall results of the present study suggest that screening subjects should not be limited based on maternal demographic features for all four screening domains. This is not limited to family practice but applies to any practice that performs WCVs.

Our study had several limitations. First, generalizability might be limited because the study was conducted at a single facility. We believe that this single-center study may represent a model for ICC programming during WCVs by family physicians affiliated with small facilities. Second, our institution should improve screening and intervention rates and missing data. However, even though higher screening and intervention rates might have yielded different results, we believe that the present study's findings still accurately reflect the situation in our facility, considering the number of mothers analyzed and the comprehensive enrollment of mothers in our study. Third, answers were self-reported, and providers entered the data into the EMR. Thus, there might have been recall bias and misclassification bias. Finally, we still need data on how ICC impacts future birth outcomes. More long-term research is necessary to investigate
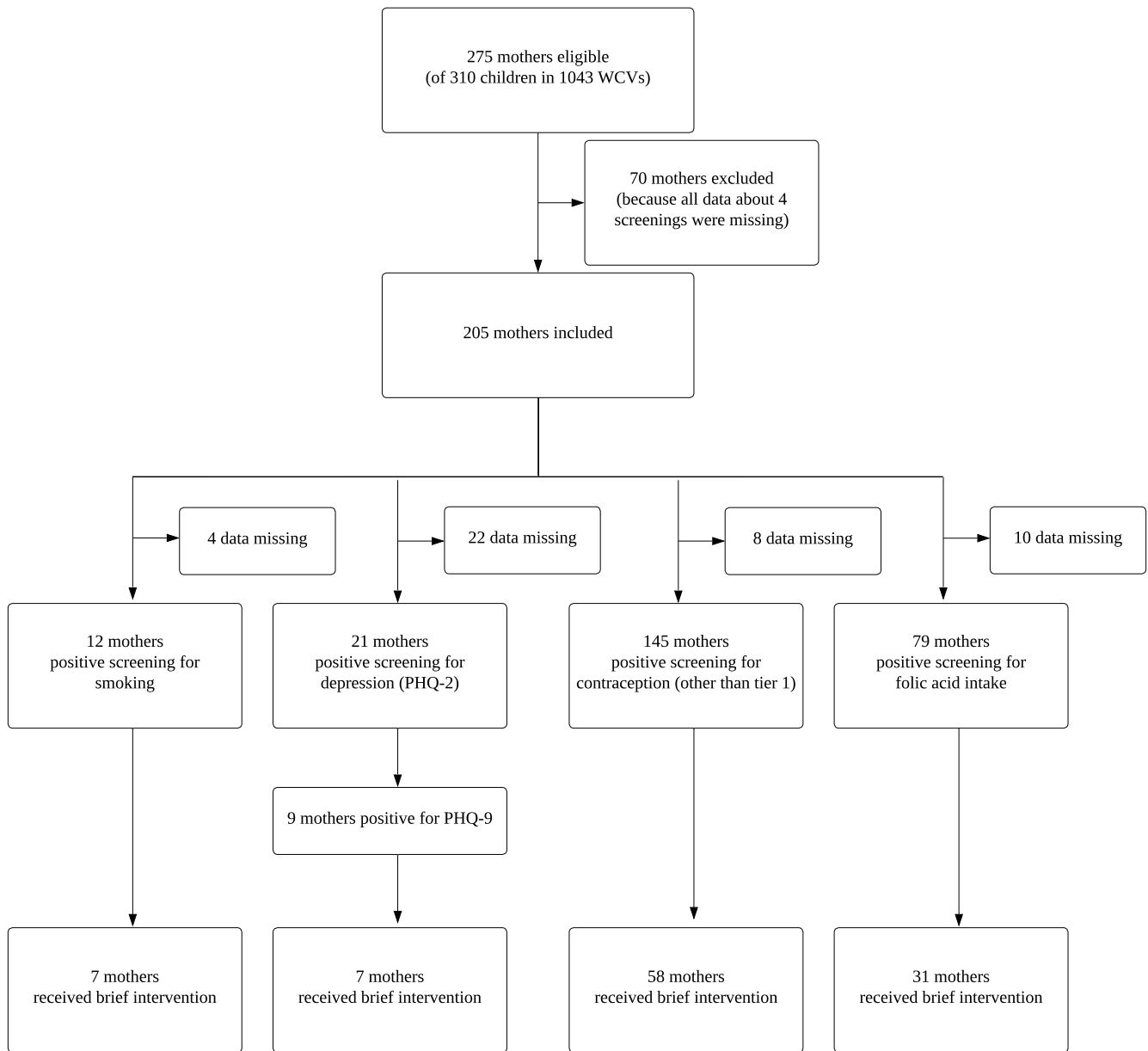
FIGURE 2 Patient flow diagram.

future outcomes in subsequent pregnancies in mothers who undergo these screenings and interventions.

Despite these limitations, this ICC model by family physicians has the potential to enhance mothers' opportunities to improve their families' health outcomes. This ICC model can be implemented in other countries whenever WCVs are carried out. On the contrary, family physicians may require some adjustments to apply this ICC model to contexts outside the United States. For instance, in Japan, it is still uncommon for family physicians to provide care for pediatric populations, not only for acute primary care but also for health checkups with regular WCVs.[27] In such cases in Japan, the ICC model can be adapted for use in children's acute visits, group health checkups conducted at municipal health centers, or involving pediatricians in ICC with close communication with mothers' primary care physicians. While other healthcare professionals were not included

in our study, other disciplines, such as public health nurses, might become involved in this ICC model if it is more suitable in different contexts. Further implementation of this ICC model in other countries is needed to adapt family-oriented ICC to their healthcare systems.

5 | CONCLUSIONS

This study has shown that ICC conducted during WCVs by family physicians offers valuable opportunities for identifying maternal risk factors and addressing modifiable factors that can influence future birth outcomes. An analysis of the association between the positive screening of maternal risk factors and maternal demographic characteristics showed that single-mother marital status was associated with higher positive screening rates for tobacco use and depression

TABLE 2 Multivariate logistic regression analysis for positive screening in each risk factor.

	Screening positive in tobacco use		Screening positive in depression		Screening positive in contraception		Screening positive in folic acid intake	
	OR	*p*-Value	OR	*p*-Value	OR	*p*-Value	OR	*p*-Value
Maternal age at childbirth	1.113	0.083	0.917	0.111	1.004	0.913	0.973	0.419
Marital status								
Married/Cohabiting	1.00 (ref)		1.00 (ref)		1.00 (ref)		1.00 (ref)	
Single	8.689	0.016	3.470	0.035	2.131	0.064	1.147	0.705
Maternal education								
High school degree or higher degree	1.00 (ref)		1.00 (ref)		1.00 (ref)		1.00 (ref)	
Less than high school	3.246	0.140	1.271	0.748	1.578	0.457	4.975	0.004
Maternal insurance type								
Private insurance	1.00 (ref)		1.00 (ref)		1.00 (ref)		1.00 (ref)	
Medicaid/Medical assistance	2.105	0.418	0.496	0.261	1.469	0.382	1.663	0.213
Maternal race								
Caucasian	1.00 (ref)		1.00 (ref)		1.00 (ref)		1.00 (ref)	
African American	0.411	0.252	1.009	0.989	0.595	0.268	1.541	0.297
Others	0.744	0.765	1.185	0.836	0.429	0.103	1.777	0.252
Number of living children	1.047	0.853	1.360	0.168	0.877	0.392	1.190	0.229

and a lower education level was associated with reduced folic acid intake. However, based on the general results of our study, we believe that subjects enrolled in screening programs should not be limited by specific socio-demographic characteristics of the mother to address not only individual aspects but the entire spectrum of maternal risk factors in their family dynamics. More research is planned to assess the results of these screenings and evaluate the effectiveness of interventions.

CONFLICT OF INTEREST STATEMENT
The authors have stated explicitly that there are no conflicts of interest in connection with this article.

DATA AVAILABILITY STATEMENT
Data may be obtained from a third party and are not publicly available.

ETHICAL APPROVAL
This project utilized existing, anonymized patient data, and was formally granted an exemption from review by SUNY Upstate Medical University institutional review board, under category 4(ii) as described in the U.S. Code of Federal Regulations (Reference number: 2031838-1).

PATIENT CONSENT INFORMATION
This project was formally granted an exemption as above.

CLINICAL TRIAL REGISTRATION
None.

ORCID
Kaku Kuroda https://orcid.org/0000-0001-6134-5465

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