A Longitudinal Analysis of Electronic Cigarette Use and Smoking Cessation

Although electronic cigarettes (e-cigarettes or electronic nicotine delivery systems) are aggressively promoted as smoking cessation aids,[1] studies of their effectiveness for cessation have been unconvincing.[2,3] One randomized trial comparing e-cigarettes with and without nicotine with a nicotine patch found no differences in 6-month quit rates.[2] Population-based, longitudinal studies have also not shown associations between e-cigarette use and quitting.[4,5] A longitudinal, international study found that, although 85% of smokers who used e-cigarettes reported using them to quit, e-cigarette users did not quit more frequently than nonusers (P = .52).[4] Among US quitline callers, e-cigarette users were less likely to have quit at 7 months than nonusers.[5] We conducted a longitudinal analysis of a national sample of current US smokers to determine whether e-cigarette use predicted successful quitting or reduced cigarette consumption.

Editor's Note page 813

Methods | Participants were current smokers recruited from the Knowledge Networks (now GfK)[6] probability-based web-enabled panel who completed baseline (November 2011) and follow-up (November 2012) surveys. Of the 1549 participants from the 2011 survey who remained on the panel in 2012, 1189 were smokers and 81.3% completed the follow-up survey. Respondents who provided nonsensical data were excluded, yielding 949 participants. The institutional review board of the University of California, San Francisco, approved the study; all participants provided written electronic informed consent.

Baseline e-cigarette use was measured with the yes-or-no question, "Other than cigarettes, have you used electronic cigarettes in the past 30 days (even once)?" Cigarettes used per day (continuous variable), time to first cigarette (<30 vs ≥30 min) and intention to quit (never, not in next 6 months,

Table. Descriptive Characteristics of Participants Who Reported Current (Past 30 d) Cigarette Smoking at Baseline and Were Retained at 1-Year Follow-up

Variable	Entire Sample (N = 949)	Baseline Non-E-cigarette Users (n = 861)	Baseline E-cigarette Users (n = 88)	Test Statistic	*P* Value
Quit at 1-year follow-up, %	13.5	13.8	10.2	χ^2 = .88, *df* = 1	.35
Variable at baseline					
Female sex, %	52.4	50.8	68.2	χ^2 = 9.72, *df* = 1	.002
Age, %, y					
18-29	9.4	8.4	19.3		
30-44	20.5	21.4	12.5	χ^2 = 13.33, *df* = 3	.004
45-59	46.4	46.5	45.5		
≥60	23.7	23.8	22.7		
Education, %					
Less than high school	9.2	8.8	12.5		
High school	39.6	39.0	45.5	χ^2 = 8.02, *df* = 3	.045
Some college	32.6	32.4	34.1		
College and higher	18.7	19.7	8.0		
Race/ethnicity, %					
White, non-Hispanic	75.3	75.0	78.4		
Black, non-Hispanic	10.4	10.3	11.4		
Other, non-Hispanic	2.6	2.8	1.1	χ^2 = 3.18, *df* = 4	.53
Hispanic	8.3	8.7	4.5		
>1 race, non-Hispanic	3.3	3.1	4.5		
Days smoked in past 30, mean (SD)	26.3 (8.6)	26.3 (8.6)	26.3 (8.6)	*t* = −0.04	.98
Cigarettes smoked per day, mean (SD)	14.5 (9.7)	14.4 (9.6)	16.1 (10.4)	*t* = −1.57	.41
Time to first cigarette smoked, %, min					
<30	59.0	57.9	69.0	χ^2 = 3.97, *df* = 1	.046
≥30	41.0	42.1	31.0		
Intention to quit, %					
Never expect to quit	12.4	13.1	5.7		
Will quit, but not in next 6 mo	57.0	57.3	54.5	χ^2 = 6.44, *df* = 3	.09
Will quit in next 6 mo	23.8	23.0	31.8		
Will quit in next 30 d	6.8	6.7	8.0		

Abbreviation: *df*, degrees of freedom.

within next 6 months, within next month) were measured at baseline and follow-up. Bivariate comparisons were conducted using χ^2 tests, *t* tests, and analyses of variance. Multivariate logistic regression analyses on quit status at 1-year follow-up, and multivariate linear regression analyses on cigarettes used per day at follow-up controlling for consumption at baseline were conducted. Regression analyses including demographic variables (age, sex, education, ethnicity) found that none of these variables were significant, so they were omitted from the final models.

Results | Significantly more women, younger adults, and individuals with less education used e-cigarettes (**Table**). At baseline, a greater proportion of e-cigarette users reported smoking their first cigarette less than 30 minutes after waking compared with nonusers (69.0% vs 57.9%; $P = .046$). Baseline e-cigarette use was not significantly associated with greater intention to quit smoking ($P = .09$).

E-cigarette use at baseline did not significantly predict quitting 1 year later (OR, 0.71 [95% CI, 0.35-1.46]; $P = .35$). A second model including intent, consumption, and dependence covariates found that intention to quit (OR, 5.59 [95% CI, 2.41-12.98]; $P < .001$) and cigarettes smoked per day (OR, 0.97 [95% CI, 0.94-0.99]; $P = .02$) significantly predicted quit status; past 30-day e-cigarette use did not (OR, 0.76 [95% CI, 0.36-1.60]; $P = .46$).

Among participants who reported smoking at both baseline and follow-up (n = 821), e-cigarette use at baseline was not associated with a change in cigarette consumption ($P = .25$), controlling for baseline cigarette consumption.

Discussion | Consistent with the only other longitudinal population-level study with 1-year follow-up that we are aware of,[4] we found that e-cigarette use by smokers was not followed by greater rates of quitting or by reduction in cigarette consumption 1 year later. We lacked detailed data on e-cigarette use characteristics, such as frequency, duration, use patterns, or motivation for use. Our smoking cessation data were self-reported. Although 13.5% of the sample quit smoking, the low numbers of e-cigarette users in this sample (n = 88), particularly e-cigarette users who quit smoking (n = 9), may have limited our statistical power to detect a significant relationship between e-cigarette use and quitting.

Nonetheless, our data add to the current evidence that e-cigarettes may not increase rates of smoking cessation. Regulations should prohibit advertising claiming or suggesting that e-cigarettes are effective smoking cessation devices until claims are supported by scientific evidence.

Rachel A. Grana, PhD, MPH
Lucy Popova, PhD
Pamela M. Ling, MD, MPH

Author Affiliations: Center for Tobacco Control Research and Education, University of California, San Francisco (Grana, Popova, Ling); Division of General Internal Medicine, Department of Medicine, University of California, San Francisco (Ling).

Corresponding Author: Pamela M. Ling, MD, MPH, Center for Tobacco Control Research and Education, University of California, San Francisco, 530 Parnassus Ave, Ste 366, San Francisco, CA 94143 (pling@medicine.ucsf.edu).

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Editor's Note

If Only Electronic Cigarettes Were Effective Smoking Cessation Devices

Harm reduction is one of the pillars of modern public health. For example, when people criticized methadone treatment as only substituting one drug for another (heroin), public health advocates pointed to research showing that methadone use led to users decreasing or ceasing their heroin use and living more functional lives. Thus, as a harm reduction proponent, I would be willing to put aside the fact that any product with the name "cigarette" (e- or otherwise) causes me reflex tachycardia and support electronic cigarettes (e-cigarettes or electronic nicotine delivery systems) if there were good data indicating that they helped smokers to stop.

Unfortunately, the evidence on whether e-cigarettes help smokers to quit is contradictory and inconclusive. Grana and colleagues increase the weight of evidence indicating that e-cigarettes are not associated with higher rates of smoking cessation. Using longitudinal data from a web-enabled panel, they found that among smokers use of e-cigarettes was not associated with quitting 1 year later or smoking fewer cigarettes.

Although there are no data showing that e-cigarette use helps with cessation, there is potential harm. In particular,

e-cigarettes are currently unregulated. Therefore, the tough restrictions on the sale of tobacco to minors do not exist for e-cigarettes. Also, the limitations on where people can smoke do not currently apply to e-cigarettes, with the result that the progress on changing social norms through smoking bans may be threatened. Finally, we simply do not know what potential harm e-cigarettes may cause to their users.

E-cigarettes should be regulated by the US Food and Drug Administration as a drug-delivery device. I agree with Grana and colleagues that sellers of e-cigarettes should not be able to advertise them as smoking cessation devices without sufficient evidence that they are effective for this indication.

Mitchell H. Katz, MD

Do Physicians Spend Less Time With Patients in Contact Isolation? A Time-Motion Study of Internal Medicine Interns

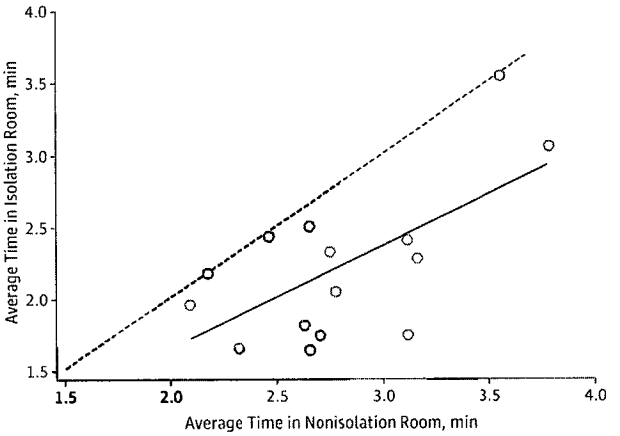
The use of contact isolation precautions for patients colonized or infected with drug-resistant or easily transmissible organisms is a widely accepted strategy for reducing transmission of hospital-associated infections. Although hospitals throughout the country have implemented these practices at great logistical and financial expense, there are few high-quality data to support their use.

Isolation precautions have unintended consequences, including a reduction in time spent with health care providers, lower patient satisfaction, and more preventable adverse events.[1-3] Only a few small studies have measured the impact of contact isolation on time spent by health care providers with patients. Given recent advances in spatial tracking technology, we set out to measure differences in time spent by internal medicine interns with patients in contact isolation rooms compared with those in nonisolation rooms.

Methods | The study was approved by the University of California, Los Angeles institutional review board. Using tracking devices attached to hospital identification badges, we collected real-time data on the location of 15 internal medicine interns working in our hospital between October 1, 2012, and December 31, 2012. The devices work by emitting radio-frequency identification (RFID) signals to a network of receivers located throughout our hospital. Based on the strength of the signal relative to the receivers, the location of the asset can be mapped to within a 5-foot radius.

For each intern, the tracking system recorded exact start and end times for each specific location they entered in the hospital. By combining these data with data on the isolation status of each room on a ward where all patients have individual rooms, we were able to compare time spent in isolation vs nonisolation rooms. New patient admissions typically occur in the Emergency Department, and therefore the encounters on the selected ward were primarily patient follow-up visits. SAS software, version 9.3 (SAS Institute Inc), was used to create a mixed model, and individual interns were used as random effects in the model.

Figure. Average Time per Visit Spent by Interns to Isolation vs Nonisolation Rooms



Each data point represents 1 intern. Dashed line shows where values would be if time in isolation and nonisolation rooms were equal. Solid line shows the least-squares regression for the relationship between isolation room and nonisolation room time among interns (Pearson $r = 0.65$). There were 15 total observations.

Results | There were 1156 encounters with isolated patients and 2467 encounters with nonisolated patients over 3 months of continuous observation. Interns visited isolated patients less often (2.3 visits per day compared with 2.5 visits per day) ($P < .001$) and spent less time per visit with isolated patients (2.2 minutes per visit compared with 2.8 minutes per visit) ($P < .001$) (**Figure** and **Table**). Thus, on average, interns spent 5.2 minutes per day with each of their isolated patients compared with 6.9 minutes per day with each of their nonisolated patients ($P < .001$).

Discussion | We were surprised to discover that interns spend little time in direct contact with their patients, and even less time with those patients in contact isolation. Interestingly, in the most recent time-motion study of intern work flow, Block et al[4] found that interns spent an average of 7.7 minutes per follow-up visit per day, which is comparable to our average of 6.9 minutes per patient per day for nonisolation patients. Nevertheless, the fact that trainees spend less time with isolated patients might explain why these patients experience more adverse events and have lower overall satisfaction,[3,5] particularly if senior residents and attending physicians exhibit the same behavior.

Our results support a growing body of literature suggesting that contact precautions may impede patient care. Infection prevention strategies that minimize the barrier between physicians and patients, including hand hygiene, antimicrobial stewardship, and, as has recently been suggested, universal decolonization,[6] should continue to be investigated because these methods may be more effective at reducing the spread of resistant organisms and less disruptive to patients.