Clinical Digest

Preventing Cross Infection Associated With Spirometers

Spirometers are potential sources of respiratory cross infection. The American Thoracic Society and the European Respiratory Society recommend that all parts in contact with mucosal surfaces be disinfected, sterilized, or replaced for each patient. However, they do not state the optimal frequency of those practices on tubing, valves, manifolds, or sensors.

Using disposable bacterial/viral in-line filters in portable flow-based spirometers may help reduce the risk of cross infection—say researchers from Polytechnic University of Marche and University of Pisa, both in Italy—but their widespread use is hampered by cost, and there is conflicting evidence regarding their effectiveness.

In a study of 900 male railway workers undergoing periodic examination, researchers tested bacterial mobilization and contamination in 2 types of spirometer: a turbine-type spirometer and an unheated Fleisch-type pneumotachograph. The participants' age, smoking habits, symptoms of acute or chronic respiratory conditions, and current antibiotic treatments all were recorded.

The spirometers were fitted with disposable in-line filters or cardboard mouthpieces. In each of 30 sessions, 30 participants performed a forced vital capacity (FVC) test with each spirometer using in-line filters, followed by another FVC through each spirometer using the cardboard mouthpieces. An artificial inspiration also was performed to evaluate bacterial mobilization. The bacterial growth analysis was assessed at 3 time points in each session: before the start of the test, after the first participant used the spirometer, and after the thirtieth participant used the spirometer. New in-line filters or cardboard mouthpieces were applied with each FVC test, but the sampling device was not subjected to high-grade disinfection until after all the samples were collected.

After simulating an inspiration using a specially designed device, bacterial mobilization was evaluated by counting the number of colony-forming units (CFUs) on the agar plate that was placed inside the sampling device. Spirometer contamination also was assessed by removing the sensors and pressing the proximal part onto plate count agar. Plates then were incubated for 48 hours and CFUs were counted.

Researchers found both bacterial mobilization during the simulated inspiration and spirometer contamination both were significantly greater in the tests using the cardboard mouthpieces vs those using in-line filters. Moreover, samples containing > 100 CFUs were never observed in the spirometers with in-line filters. Tests with cardboard mouthpieces suggested greater bacterial contamination during inspirations through the turbine-type spirometer than through the Fleisch-type pneumotachograph, but the differences were not significant.

While their data suggest in-line filters may effectively reduce the risk of cross infection, the researchers caution that they may not block smaller micro-organisms, such as viruses. With regard to the cardboard mouthpieces, the researchers note that both spirometers were unheated; a heated pneumotachograph, or drying the spirometers between subjects, probably would have reduced the risk of bacterial mobilization related to condensation and droplets of sputum.

Researchers say the use of a new filter before each test will protect the patients tested on either type of spirometer, even in situations of heavy use, such as those that occur in occupational settings. One-way valve mouthpieces, they suggest, may be an inexpensive solution for expiratory-only tests. They also conclude, however, that inspiratory maneuvers or accidental inspiration through the 2 flow-based spirometers fitted with cardboard mouthpieces are still completely safe when combined with disinfection and sterilization between patients.

Given that bacteria can be transmitted across filters, and different filters have different filtering abilities, test apparatuses should be cleaned regularly and decontaminated, the researchers say. Because the risk of contamination is greater with hospital apparatuses, and because their analysis only covered a single type of filter and 2 types of spirometers, they recommend further studies.

Quitting Smoking by Telephone

They're fun and can be useful, but how do "smartphone" applications (apps) rate as smoking cessation programs? To find out, researchers from George Washington University and the Academy for Educational Development, both in Washington, DC, and the National Cancer Institute in Rockville, Maryland, examined the content

of 47 smoking cessation iPhone apps offered in June 2009.

The researchers evaluated each app's approach to smoking cessation, whether it adhered to the best practices in smoking cessation (as recommended in the 2008 Clinical Practice Guideline for Treating Tobacco Use and Dependence, a PHS report), its popularity among iPhone users, and the relationship between characteristics. They found low levels of adherence, and say, in fact, that the apps most frequently downloaded had the lowest adherence scores.

The researchers categorized each app according to its primary approach to smoking cessation, based on 5 categories identified by the National Tobacco Cessation Collaborative: (1) calculators (dollars saved and health benefits accrued over time since quitting), (2) calendars (days until and after the quit date), (3) hypnosis (apps that used hypnosis techniques), (4) rationing (apps that limited the number of cigarettes and/or the time in which cigarettes could be smoked), and (5) other (apps that did not fit into any of the aforementioned categories).

The researchers also coded the apps for their level of adherence to the PHS guideline using a 20-item index (for example, "recommend the use of approved medications"), with a scale that ranged from 0 (not present at all) to 3 (fully present). Lastly, they measured each app's popularity by looking at the frequency with which it was downloaded on 1 day (July 23, 2009).

Most (31.9%) of the apps available used a calculator approach, followed by calendar (28%), rationing (11%), hypnosis (6%), and other (23%). The apps in the "other" category tracked the number of cigarettes smoked daily, provided virtual cigarettes, used visualization techniques, and/or provided a way to connect to support for quitting.

Overall adherence scores ranged from 0 to 30 of a possible 60 points.

Image: Photos.com
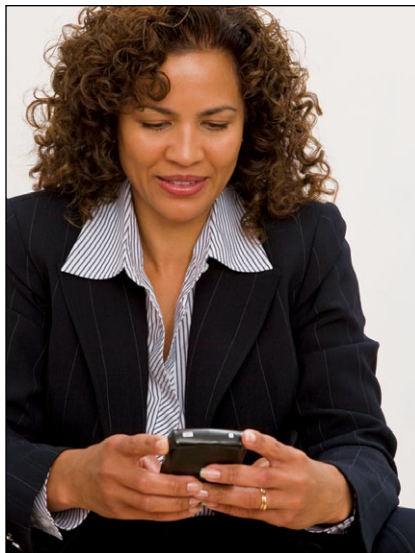
The mean adherence score for all 47 apps included in the study was 7.8 (SD, 8.5). Interestingly, the "deluxe" versions of apps had the same total adherence score as the basic versions, though they offered additional features and cost more. On average, only 11% of the apps "strongly" followed any given guideline. Calculator apps were most successful in adhering to the guidelines; calendar apps were least successful. None of the apps followed the guidelines to inquire about the tobacco-use status of the users, assess their willingness to quit, arrange for a follow-up, recommend the use of approved medications, or recommend the use of counseling and medication to quit smoking. Only 4% of the apps strongly followed the guideline to connect a user with a quitline or clinic, and only 9% used intratreatment social support. On the other hand, 1 in 4 apps strongly followed the guideline to enhance motivation toward smoking cessation by showcasing the rewards associated with quitting, such as presenting personalized information on the health benefits and money saved.

More than half of the downloads for the apps in the study were for hypnosis-based approaches, a finding consistent with other literature on what apps consumers seek for smoking cessation, the researchers say. However, those apps were among the lowest scoring on the adherence index. Few of the downloaded apps recommended treatment for the user, and none of them endorsed the use of medications or counseling.

The researchers note that smartphones still are not widely used, particularly among smokers, who tend to be in lower socioeconomic groups. Smartphones make up only 25% of the mobile phone market in the United States. The group using iPhones—25% of the total amount of smartphone users—is even smaller. But as more people, including smokers, begin using smartphones, the potential for workable smoking cessation apps grows. It's an opportunity, the researchers say, to provide smartphone users with evidence-based smoking cessation aids. Text messaging, they note, already has shown some promise in helping people quit smoking as well as modifying other health behaviors. Smartphones, they suggest, could supplement text message–based interventions with computer programs that can "weave together expert systems, games, multimedia (for example, music, video) and the Internet (for example, e-mail, social networking sites)" to boost success rates.