of indeterminate test results, representing a more appropriate approach in the light of evidence-based medical diagnosis and decision making.

Murilo Foppa, MD, DSc  
Bruno Schneider de Araujo, MS  
Adriana Macari, MS  
Roberta Reichert, MS  
Jose Roberto Goldim, PhD

Author Affiliations: Hospital de Clinicas de Porto Alegre, School of Medicine and Cardiology Graduate Program, Universidade Federal do Rio Grande do Sul, Porto Alegre, Brazil.

Correspondence: Dr Foppa, Cardiology Division, Hospital de Clinicas de Porto Alegre, Rua Ramiro Barcelos 2350, Room 2061, Porto Alegre 90035-903, Brazil (mfoppa@gmail.com).

Author Contributions: Dr Foppa had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. Study concept and design: Foppa, Schneider de Araujo, Macari, Reichert, and Goldim. Acquisition of data: Schneider de Araujo, Macari, and Reichert. Analysis and interpretation of data: Foppa. Drafting of the manuscript: Foppa. Critical revision of the manuscript for important intellectual content: Schneider de Araujo, Macari, Reichert, and Goldim. Statistical analysis: Foppa. Obtained funding: Foppa. Administrative, technical, and material support: Schneider de Araujo, Macari, and Reichert. Study supervision: Foppa and Goldim.

Financial Disclosure: None reported.

Funding/Support: This study was supported by an unrestricted grant from FIPE/HCPA (Hospital de Clinicas de Porto Alegre Institutional Research Fund).


Association Between Physician Competence at Licensure and the Quality of Asthma Management Among Patients With Out-of-Control Asthma

Asthma is a serious public health problem, and suboptimal asthma management has been identified as an important cause of asthma morbidity. Physicians play a pivotal role in establishing asthma control, but there is considerable variation among physicians in their approach to asthma management that does not appear to be explained by differences in patient populations.

Effective management of asthma requires mastery of a number of interrelated physician skills. There is an increasing effort to directly teach these skills, particularly collaborative communication with patients, in medical school and specialty training programs. In 1993, Canada was the first country to require successful demonstration of clinical and communication skills on national medical licensure examination. The United States enacted the same requirement in 2005. Our objective was to determine whether higher scores in medical knowledge and clinical and communication skills would be associated with the quality and outcomes of management for patients with poorly controlled asthma in the first 1 to 8 years in practice, after adjusting for differences in patient, physician, and practice characteristics.

Methods. A cohort was assembled comprising all physicians who took the national clinical skills licensing examination (Medical Council of Canada: Qualifying Examination Part II) between 1993 and 1996. For each physician, we used linked longitudinal patient histories from prescription and health services administrative data to assemble a dynamic cohort of all patients aged 5 to 60 years with a diagnosis of asthma between 1993 and 2003. We focused our analysis on patients whose asthma was out of control at the time of the first visit to study physicians in outpatient settings, based on excess use (>250 doses) of fast-acting β-agonists (fenoterol, terbutaline, and salbutamol) in the past 3 months. We excluded patients with a diagnosis of chronic obstructive pulmonary disease in the 12 months prior to the visit.

Each patient was followed up for 6 months after the first visit to a study physician for out-of-control asthma to assess (1) multiple emergency department (ED) visits with a primary diagnosis of respiratory-related conditions (International Classification of Diseases, Ninth Revision 490.x [bronchitis], 493.x [asthma], 465.9 [upper respiratory infection], 466.x [acute bronchitis], and 786.x [symptoms involving the respiratory system]) and (2) use of an inhaled corticosteroid (ICS) (fluticasone propionate, budesonide, flunisolide, beclomethasone dipropionate, and triamcinolone acetonide).

We used the generalized estimation equation extension of multivariable logistic regression for correlated data with an autoregressive first-order AR(1) correlation structure. Patients were the unit of analysis and were clustered within study physicians. In addition to physician characteristics (physician sex, specialty, examination scores), we adjusted for practice characteristics (practice workload and practice population profile) and patient characteristics (age, sex, socioeconomic status, number of visits to study physicians). Examination scores were standardized to have SD=100, and the adjusted change in odds of a given outcome was estimated per 1 SD in the respective score.

Results. From 1993 to 2003, a total of 90,078 patients with asthma received care from 609 study physicians in an outpatient setting for respiratory-related conditions. Of these, 3,981 patients (4.4%) had out-of-control asthma at the first respiratory-related visit to study physicians, and 1,960 patients (2.2%) were prescribed asthma medication by the study physician at the visit.
During the 6-month follow-up, 380 (9.6%) of the 3981 patients with out-of-control asthma made multiple ED visits. The physicians of multiple ED users were more likely to be general practitioners and to have a lower practice volume. Of 1960 patients with out-of-control asthma who were prescribed any asthma medication by the study physician at the index visit, 1361 patients (69.4%) were prescribed an ICS. Female physicians and respiratory specialists were more likely to prescribe an ICS.

After adjusting for patient and physician characteristics, higher communication scores were associated with a significantly lower risk of multiple ED visits; a reduction in risk of 10% per 1-SD increase in score (odds ratio, 0.90; 95% confidence interval, 0.81-1.00). Higher medical knowledge, clinical decision making, and communication examination scores were all significantly associated with the increased likelihood of prescribing ICS (approximately a 4%-7% increase per 1-SD increase in each score) (Table).

**Comment.** Our study demonstrates that physicians with better knowledge, clinical skills, and communication ability engage in more appropriate asthma prescribing and their patients with out-of-control asthma have fewer subsequent multiple ED visits. Our results are consistent with previous studies that have supported the predictive validity of licensing examinations by demonstrating the association between higher scores and the ability to make appropriate diagnostic and treatment decisions.7,8

Moreover, our study suggests that each domain of asthma management is potentially related to a different...
component of clinical competence. As most medical schools use objective structured clinical examinations to assess performance during training, earlier remediation of suboptimal level of performance could ultimately improve the quality of asthma management in practice. Because these skills sets are required to manage other chronic conditions, the establishment of minimum performance benchmarks during training could have an overall positive effect on the quality of chronic disease management.

Yuko Kawasumi, PhD
Pierre Ernst, MD, MSc, FRCPC
Michal Abrahamowicz, PhD
Robyn Tamblyn, PhD

Author Affiliations: Department of Epidemiology, Biostatistics, and Occupational Health, McGill University, Montreal, Quebec, Canada (Drs Kawasumi, Abrahamowicz, and Tamblyn); Department of Medicine, McGill University Health Centre, Montreal (Drs Ernst, Abrahamowicz, and Tamblyn); Center for Clinical Epidemiology, Lady Davis Research Institute, Jewish General Hospital, Montreal (Dr Ernst); and Centre for Health Services and Policy Research, University of British Columbia, Vancouver, British Columbia, Canada (Dr Kawasumi).

Correspondence: Dr Kawasumi, Centre for Health Services and Policy Research, University of British Columbia, 201-2206 East Mall, Vancouver, BC V6T 1Z3, Canada (ykawasumi@chspr.ubc.ca).

Author Contributions: Study concept and design: Kawasumi, Ernst, and Tamblyn. Acquisition of data: Tamblyn. Analysis and interpretation of data: Kawasumi, Abrahamowicz, Ernst, and Tamblyn. Drafting of the manuscript: Kawasumi. Critical revision of the manuscript for important intellectual content: Kawasumi, Abrahamowicz, Ernst, and Tamblyn. Statistical analysis: Kawasumi. Obtained funding: Tamblyn. Administrative, technical, and material support: Kawasumi. Study supervision: Abrahamowicz, Ernst, and Tamblyn.

Financial Disclosure: None reported.


Smartphones in Clinical Practice, Medical Education, and Research

Cellular phone technology and additional hardware were integrated into personal digital assistants and they evolved into smartphones. The installation of high-speed cellular networks with near-universal coverage has allowed these devices to show their full potential, which also benefits users in the medical community. Long-term Evolution technology (LTE), the high end of the fourth generation (4G) of mobile networks, offers speeds up to a hundred times faster than 3G. Currently, 64% of US physicians own smartphones, but this is predicted to increase to 81% penetration by 2012.

Anatomy and Physiology of Smartphones. Hardware. Today’s high-end smartphones feature capacitive (finger gesture enabled) or noncapacitive (stylus enabled) high-resolution touch screens, discrete or screen keyboards, communication ports such as mini-USB, infrared, Bluetooth, wireless local area network radios, assisted global positioning technology, electronic compasses, accelerometers, gyroscopes, proximity and ambient light sensors, microphones and cameras for videoconferencing, and inductive, cable-free battery charge technology.

Software. The most critical aspect of any computer is the software it is running, since it ultimately determines usability, usefulness, and user adoption (see eTables 1 and 2 and eFigures 1-3; http://www.archinternmed.com). Other important aspects include multitasking, adherence to industry standards, and availability of native software applications (Figure and eFigure 2) vs simple mobile Web pages (Web apps) (Figure and eTable 1).

Smartphone Applications. Clinical Practice. Most health care professionals desire current clinical information and decision support at the point of care. Smartphones can provide both by accessing traditional medical textbooks, professional society guidelines, drug references, and institution-specific therapy standards. Medical calculators simplify the bedside use of medical equations, scores, stratification, and risk prediction and prevention models. Smartphones can assist with physical examinations using applications to check hearing, eyesight, and color recognition; evaluate mental status; or photograph or video document physical findings.

Taking full advantage of current technology means wireless retrieving of the most up-to-date information anywhere anytime. The National Library of Medicine’s “PubMed for handhelds” engine and third-party applications offer searches structured by diseases and conditions, medical specialties, differential diagnosis, drugs and medications, and journals and medical news or use a latent semantic analysis framework.

Our patients expect information about their conditions, the treatments, and procedures we offer them. Illicit semantic analysis framework.

| ARCH INTERN MED/VOL 171 (NO. 14), JULY 25, 2011 WWW.ARCHINTERNMED.COM 1294 |

©2011 American Medical Association. All rights reserved.