

Gencer Baris (Orcid ID: 0000-0002-8954-9694)

# Improving atrial fibrillation outcomes through inter-clinician electronic consultation

**Short title:** E-consultation in AF patients

**Authors:** Nicolas Johnner, MD, PhD,<sup>1</sup> Baris Gencer, MD, MPH<sup>1,2</sup>

**Affiliations:** <sup>1</sup>Cardiology Division, Geneva University Hospitals, Geneva, Switzerland.

<sup>2</sup> Institute of Primary Health Care (BIHAM), University of Bern, Bern, Switzerland.

**Correspondence:**

Dr Baris Gencer, Cardiology Division, Geneva University Hospitals, Rue Gabrielle-Perret-Gentil 4, 1205 Geneva, Switzerland.

Institute of Primary Health Care (BIHAM), University of Bern, Bern, Switzerland.

Email: [baris.gencer@hcuge.ch](mailto:baris.gencer@hcuge.ch) or [baris.gencer@biham.unibe.ch](mailto:baris.gencer@biham.unibe.ch)

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## Editorial

The past decades have seen substantial technological advances and improvements in the diagnosis and treatment of a wide range of medical conditions, such as atrial fibrillation (AF) which, along with the multimorbid aging population, adds complexity in the process of care. The resulting fragmentation of the health care across numerous specialists has made the communication with the primary care physician a crucial component of coordinated care (1). The integrated management of AF includes three core objectives: 1) prevention of thromboembolism, 2) symptom control, and 3) management of associated comorbidities and cardiovascular risk factors. Optimal AF management therefore requires coordinated care across multidisciplinary teams, as recommended in the 2020 ESC Guidelines for the diagnosis and management of AF(2). Since AF is often diagnosed in the primary care setting, referral from the primary care physician to a cardiologist is a common initial step in integrated AF management. Despite its importance, communication between primary care physicians and specialists has been reported to be often lacking or inadequate(3). Shortcomings in the referral process may lead to clinician dissatisfaction, inadequate referrals, delayed referrals, negative patient experience, missing information, duplicate testing, and has been hypothesized to increase morbidity(4,5).

While primary care physicians usually refer their patients for in-person consultations with specialists, inter-clinician electronic consultation (e-consultation) was developed as a potential complementary or alternative tool to improve the process of care. E-consultation may be performed on a variety of web-based platforms, ranging from traditional email to dedicated platforms allowing to share electronic medical records (e.g. test results,..) and communicate with electronic referral systems using structured forms. Several studies have reported the potential role of e-consultation to improve access to specialized care with

timeliness of consultation and exchange of information between physicians, by avoiding inappropriate referrals and/or disruption of clinical information (3,6). However, data evaluating the effectiveness of e-consultation on clinical outcomes has been scarce(6).

In the present issue, Mazón-Ramos and colleagues(7) report the first study to show the prognostic benefit of e-consultation in AF management in the primary care setting. In this non randomized before-after design study, the authors collected data on 10488 patients with newly diagnosed AF who were referred by a pool of 301 primary care physicians to cardiologists between 2010 and 2019. Between 2010 and 2012, patients were referred through the traditional in-person consultation model. From 2013, an e-consultation program was implemented for all ambulatory referrals to the cardiology services (8). The e-consultation between the referring primary care physician and a cardiologist was the first step of the referral process. The reason for consultation and work-up results including electrocardiogram (ECG) and blood tests were shared asynchronously through an electronic medical record and analyzed by the referred cardiologist within 72 hours. The cardiologist was asked to provide comments and therapy recommendations to the primary care physician through the same platform and an in-person visit was scheduled when deemed necessary. The study found that 9.8% of referrals were managed through e-consultation alone without requiring in-person visit. Among patients who were scheduled for in-person visit, median waiting time decreased from 24 days in the control group (usual care) to 6 days with the intervention group (the e-consultation model). The latter was also associated with fewer cardiology work-up tests and fewer emergency visits. But the most impactful results pertain to clinical outcomes: interrupted time series analysis showed that the period following the introduction of the e-consultation model was associated with a higher use of oral anticoagulant (OAC), especially among patients at high thromboembolic risk (defined as a CHA2DS2-VASc score  $\geq 3$  for women and  $\geq 2$  for men), for whom OAC use increased from 44.8% in 2010 to 78.4% in 2019, with the majority being started on OAC before in-person consultation, resulting in a shorter time from referral to OAC initiation ( $22.5 \pm 8.1$  vs  $177.6 \pm 8.9$

days,  $p < 0.001$ ). When adjusting for age, gender, comorbidities, CHA<sub>2</sub>DS<sub>2</sub>-VASc score, healthcare utilization and OAC use, the incidences of cardiovascular hospital admission (6.0 [95% CI: 2.0-10.0] vs 8.0 [95% confidence interval (CI): 7.2-8.8] vs. per 100 patient-months,  $p = 0.002$ ), stroke admission (incidence relative risk = 0.09, 95% CI: 0.02-0.41) and all-cause mortality (incidence relative risk = 0.36, 95% CI: 0.33-0.39) decreased with the e-consultation model compared to usual care referral without any hemorrhagic safety concerns.

This study is the first to report an improvement in hard clinical outcomes following the introduction of an e-consultation program in AF patients. The most notable aspect of this study is the substantial statistical power provided by its considerable sample size and study duration. The resulting data is an important contribution to the field and the authors should be congratulated for their impressive work.

One should keep in mind some of the limitations of this study when interpreting its results. First, uncontrolled before-after studies tend to overestimate the benefit of new interventions and are more likely to be confounded with co-interventions that can occur over the study duration. While the authors judiciously use interrupted time series analysis to account for pre-existing temporal trends and evaluate the effectiveness of a complex intervention in real-practice, it remains difficult to adjust for all potential confounders and infer for causality. For instance, the increase in the use of non-vitamin K antagonist oral anticoagulants (NOACs) compared to vitamin K antagonist (VKA), which went from 27% in 2017 to 95% in 2020, was also attributable to the changes in local drug approval regulation, as well as to the evolution of practice according to the updated scientific guidelines. Secondly, because e-consultation facilitates access to care, the population of patients referred to the cardiology department through the traditional model likely differed from the e-consultation model population, thereby introducing another potential source of selection bias. Nevertheless, the findings reported in this study have important implications for the effectiveness of e-consultation programs in real life since randomized controlled trials are not always representative of the patients treated in clinical practice. Third, the external validity of the

study needs also to be questioned according to the local setting and density of cardiologists in the healthcare system.

In a systematic review of 21 studies, including 2 randomized trials, Oseran et al.(6) found cardiology e-consultation programs to result in greater access to care, shorter waiting times, and higher cost-efficiency. In the largest randomized trial comparing cardiology e-consultation to traditional referral by primary care physicians, Olayiwola et al.(9) studied 590 patients referred by 36 primary care physicians in a community health center in Connecticut, USA, from a medically underserved population. E-consultation was associated with a nearly 50% increased likelihood of receiving consultation from a cardiologist, shorter waiting time (5 vs. 24 days) and 69% of e-consultations were resolved without in-person visit. The risk of emergency department visits within 6 months of the referral request was also lower in the e-consultation group compared to the control group (1.7 vs. 5.8%, respectively); of note, 29% of emergency department visits in the control group occurred while the patient was awaiting in-person cardiology visit. While an improvement in guideline-directed therapy has been reported in other specialties(10), there was a lack of evidence regarding hard clinical outcomes. To our knowledge, Mazón-Ramos et al. were first to report the clinical effectiveness of an e-consultation model, initially in heart failure patients in another analysis from the same registry(11), for whom e-consultation was associated with lower heart failure-related mortality and lower cardiovascular mortality.

The timeliness provided by e-consultation models appears to be particularly fitting for the initial management of newly diagnosed AF. While AF is a chronic condition that often requires lifelong management, it is characterized by a progressive natural history in which adverse outcomes may be avoided through adequate early management. As shown in the Framingham study (N=5209), the risk of cardiovascular complications and death is highest in the first year following AF diagnosis(12). OAC therapy is the main prognostic intervention in AF management and has been reported as the strongest predictor of survival in AF patients(13). In addition, the EAST-AFNET 4 trial showed that early rhythm control (within 1

year of first AF diagnosis) reduced the composite of cardiovascular death, stroke and hospitalization for heart failure or acute coronary syndrome (hazard ratio = 0.79, 96% CI: 0.66-0.94,  $p=0.005$ )(14). Therefore, timely referral from the primary care physician to the cardiologist is crucial to reduce avoidable and deleterious delay in the clinical management of AF. Of note, the use of a wearable ECG was also shown to be feasible in primary care and offers another perspective that could potentially improve the screening of AF cases. More data are currently undertaken to evaluate the impact of new technological tools in the management of patients with AF(15).

In conclusion, the findings reported by Mazón-Ramos et al. are the first evidence that introducing an e-consultation model in the primary care setting results in improved clinical outcomes for AF patients. Given that e-consultation most prominently improves waiting times and interspecialty coordination, it appears most likely to improve clinical outcomes for conditions that benefit from time-sensitive therapeutic interventions and multidisciplinary management. In addition, since e-consultation offers better access to care and cost-efficiency, it may be most impactful in underserved and cost-sensitive communities.

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