**Early Follow-Up After a Heart Failure Exacerbation**

**The Importance of Continuity**

Finlay A. McAlister, MD, MSc; Erik Youngson, MMath; Padma Kaul, PhD; Justin A. Ezekowitz, MB BCh, MSc

**Background**—Although early follow-up for heart failure (HF) is recommended, the time window and which physicians should do the follow-up are unclear. We explored whether (1) follow-up within 14 days and (2) physician continuity influence outcomes within 30 days of a HF exacerbation.

**Methods and Results**—Retrospective cohort of all adults in Alberta, Canada, with a first discharge from a hospital or an emergency department where HF was the most responsible diagnosis between April 2002 and November 2013, analyzed using Cox proportional hazards models with time-varying covariates. Of 39,249 adults (mean age, 76.1 years), 21,848 (55.7%) received follow-up from a familiar physician, 3,938 (10.0%) saw an unfamiliar physician, and 13,463 (34.3%) had no outpatient visits in the first 14 days after a hospitalization or emergency department visit for HF. The risk of death or hospitalization within 30 days was lower in patients who saw a familiar physician (16.9%; adjusted hazard ratio [aHR], 0.94; 95% confidence interval [CI], 0.89–0.99) than in those who saw an unfamiliar physician (20.0%; aHR, 1.05; 95% CI, 0.97–1.15) or those with no outpatient visits (22.0%; aHR, 1.00 [referent]). The composite of death or emergency department visit or hospitalization within 30 days was also less common with familiar physician follow-up (25.2%; aHR, 0.86; 95% CI, 0.82–0.89) compared with unfamiliar physicians (26.9%; aHR, 0.93; 95% CI, 0.87–0.99) or those with no outpatient follow-up within 14 days (47.5%; aHR, 1.00 [referent]).

**Conclusions**—Outpatient follow-up within 14 days after HF exacerbation requiring hospitalization or emergency department visit is associated with better outcomes, particularly if the follow-up is with a familiar physician. (Circ Heart Fail. 2016;9:e003194. DOI: 10.1161/CIRCHEARTFAILURE.116.003194.)

**Key Words:** continuity of patient care ■ emergency service, hospital ■ health services research ■ heart failure ■ physicians

Heart failure (HF) is one of the conditions for which hospitals deemed to have excessive 30-day readmission rates can be penalized by the Centers for Medicare and Medicaid Services. Continuity of care has been shown to be associated with better outcomes and less healthcare utilization for patients with chronic diseases managed in the outpatient setting.1,2 Although follow-up within 7 days after acute exacerbations of HF is associated with better outcomes,3 and frequency of early follow-up has increased over the past few years,4 outcomes still remain poor5 in the month after an acute exacerbation. Moreover, the 7-day follow-up window is often seen as unrealistic in many healthcare settings.

See Clinical Perspective

One of the factors potentially contributing to continued poor outcomes for patients after a HF exacerbation is fragmentation of care. We have previously shown that follow-up in the first month after a hospitalization or emergency department (ED) visit for HF with physicians familiar with that patient is associated with lower rates of subsequent hospitalization or ED visits over the next 6 months than early follow-up with another physician.6,7 However, it is unknown whether continuity of care within the first 2 weeks after a hospitalization/ED visit influences outcomes in the 30-day timeframe emphasized in the Affordable Care Act. We included patients who were seen in an ED and those discharged from the hospital because up to one third of HF exacerbations in Alberta are treated and released from the ED.7

**Methods**

**Setting and Data Sources**

The Canadian province of Alberta has a government-funded healthcare system providing universal free access to physicians, hospitals, and ED for ≈4 million people. To access specialist care in Alberta (including a multidisciplinary HF clinic), a patient has to be referred by their primary care physician. This study received ethics approval

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Continuity of Care and Heart Failure

from the Health Ethics Research Board at the University of Alberta with waiver of informed consent. We used deidentified linked data from 4 administrative databases for this study: the Discharge Abstract Database (which records the admission date, discharge date, the most responsible diagnosis, and up to 25 other diagnoses for all acute care hospitalizations in any of the 104 hospitals in Alberta), the Ambulatory Care Database (which records all patient visits to any of the 93 Alberta EDs and captures up to 10 diagnostic codes, including the most responsible diagnosis assigned by the attending ED physician at the time of discharge from the ED), the Health Practitioner Claims Database (which tracks all physician claims for services and includes up to 3 diagnoses per encounter), and the Alberta Health Care Insurance Plan Registry (which tracks vital status of all Albertans and includes date of death or emigration from the province).

Study Cohort

We identified all adult Albertans (age ≥20 years) discharged alive from an ED (treated and released) or after an acute care hospitalization between April 1, 2002, and November 30, 2013, with a most responsible diagnosis of HF (International Classification of Diseases-Tenth Revision [ICD]-10 code I50.x). This HF case definition was 99% specific and had a 91% positive predictive value when cross-validated in a chart audit of 4008 Albertan adults.9 We selected the patient’s first ED visit or hospitalization with a most responsible diagnosis of HF for our analysis. In a sensitivity analysis, we excluded patients discharged from the ED or hospital back to a long-term care facility.

Outcomes

Our primary outcome was death or admission to hospital within 30 days of the index visit (defined as date of ED visit for those treated and released in the ED or date of discharge for those who had been hospitalized at the time of their index HF visit). For index ED visits resulting in a hospitalization, the 30-day follow-up period did not start until after hospital discharge (thus, the hospitalization associated with the index HF visit was not counted as an outcome). This composite outcome of death or hospitalization is a patient-relevant outcome highlighted by the American Heart Association Get With the Guidelines—Heart Failure project and the Joint Commission.10,11 We also examined the composite of death or ED visit or hospitalization within 30 days of the index visit as a secondary outcome, as well as each outcome individually. Finally, we considered cardiovascular-specific (HF, ICD-10 I50.x; acute coronary syndrome, ICD-10 I21.x, I20.0; ventricular arrhythmias, ICD-10 I47.2, I49.0; sudden cardiac death, ICD-10 I46.1; stroke/transient ischemic attack, H34.1, I63.x, I64.x, I61.x, I60.x, G45.x; atrial fibrillation/flutter, I48.x) and HF-specific hospitalization and ED visits within 30 days.

Covariates

Comorbidities for each patient were identified using ICD-9 and ICD-10 previously validated1 case definitions from the Ambulatory Care Database and Discharge Abstract Database, using data from the index visit and all healthcare visits in the previous 12 months.

Continuity Measures

Time-dependent covariates were used to capture physician continuity categories during the first 14 days after the index visit (no physician visits; ≥1 visits with a familiar physician; all visits with unfamiliar physicians), thereby including all patients even if they had an event during this time and adjusting for potential differences in time to first (and subsequent) visits. Similar to previous studies,5,6,7 for our primary analysis, the physician continuity classification was locked-in at the end of the first 14 days (or at the time of an outcome event if it occurred within the first 14 days) and did not take into account further outpatient visits during the remainder of the observation period for each patient. In a sensitivity analysis, we defined follow-up on the basis of the first 7 days after the index HF visit, again using time-varying covariate analyses. We did not use a landmark analysis (ie, classifying patients by whether they saw a physician within 14 days and then analyzing outcomes only after that point) given the short time frame (30 days) for outcomes. However, to mitigate concerns that any positive findings might be driven by reverse causation (because patients who were readmitted early would have less chance to attend a follow-up visit), in another sensitivity analysis, we replicated the analysis of Hernandez et al12 by examining percentage follow-up at the hospital level in another sensitivity analysis.

We used the Health Practitioner Claims Database to identify all physicians each patient saw in the year before and at the time of their index HF visit and defined familiar physicians as those who had seen the patient at least twice in the previous year or at least once during their index HF visit. Patients were classified as having familiar physician follow-up even if they had visits with both familiar and unfamiliar physicians in the first 14 days. Two or more outpatient visits in the previous year with that patient in Canadian administrative data correlate well with patient self-report of that physician being their regular care provider.11 All physician visits were included regardless of the billing diagnosis.

We also expressed provider continuity using Breslau’s Usual Provider of Continuity, calculated as n/N, where n is the number of visits to the physician of interest and N is the total number of visits to any physician in that time frame, with Usual Provider of Continuity scores ranging from 0 (perfect discontinuity) to 1 (perfect continuity).13

Statistical Analysis

Baseline characteristics were compared between follow-up groups using χ² tests and ANOVA for categorical and continuous variables, respectively. The effect of physician continuity on the composite outcome of death or urgent hospitalization was analyzed using Cox proportional hazards models with time-varying covariates as already described and including prognostically and statistically significant baseline covariates. In a sensitivity analysis, we considered a Cox Frailty model for analyzing the primary outcome in which we included the same covariates and also included facility as a random effect to allow for correlation within each facility. P<0.05 were considered to be significant. All statistical analysis was performed using SAS 9.4 (SAS Institute, Cary, NC).

Results

Of 39249 adults (mean age, 76.1 years) discharged from an ED or an acute care hospitalization with a most responsible diagnosis of HF seen over the 12 years of this study (Figure 1), 13463 (34.3%) had no outpatient visits in the first 14 days after a HF hospitalization/ED visit, 21848 (55.7%) saw a familiar physician, and 3938 (10.0%) saw unfamiliar physician(s) exclusively. Of the patients who saw a familiar physician within 14 days, 10.8% saw an Internal Medicine or Cardiology specialist (the familiar physician was either a specialist or they also saw an unfamiliar specialist in addition to their familiar physician) compared with 18.0% of the patients who only saw unfamiliar physician(s) within 14 days. Of all physician visits in the 14-day follow-up period (because some patients had multiple visits within 14 days), only 4.5% of familiar physician visits and 21.9% of unfamiliar physician visits were with a specialist. Although the proportion of patients with HF receiving early follow-up increased between 2003 and 2006 (Figure 2), it was relatively flat after that—although the proportion seeing a familiar physician for that early follow-up was stable between 2003 and 2014 (P=0.45), there was a statistically significant increase in those seeing an unfamiliar physician for early follow-up over the 12 years (from 8.0% in 2003 to 11.9% in 2014; P<0.0001).
Patients in our cohort were elderly, had extensive comorbidities, and frequently used the healthcare system in the year before their index HF visit (Table 1). Those patients without outpatient follow-up in the first 14 days were older, more likely to reside in rural areas, more likely to have dementia or COPD, and had fewer outpatient visits and fewer specialist assessments but more ED visits and/or hospitalizations in the year before their index date. Patients receiving familiar physician follow-up after the index HF visit had more comorbidities (diabetes mellitus, hypertension, renal disease, and atrial fibrillation) compared with those followed up by an unfamiliar physician and were also more likely to have had office visits in the preceding year (mean, 16.8 versus 10.5), including a higher proportion previously visiting a specialist (42.5% versus 32.0%).

Of those patients with at least 1 familiar physician visit in the first 14 days, the mean Usual Provider of Continuity score was 0.93 (SD 0.17): 92.9% of patients had follow-up with a physician who saw them at least twice as outpatients in the year before their index HF visit, 33.4% had follow-up with a physician who saw them during their index HF visit, and 26.3% had follow-up with physicians who saw them before and during their index visit.

Figure 1. Cohort flow diagram. †Left early includes dispositions of signed out or did not return from a pass (inpatient) and left without being seen or left against medical advice (emergency department [ED]). ‡Transfer to acute facility as final disposition but no corresponding hospitalization record found. HF indicates heart failure.

Figure 2. Physician follow-up within 14 d, by year. Years represent 12-mo fiscal periods ending on March 31 (eg, 2003 = April 1, 2002, to March 31, 2003).
The median time to the first outpatient physician visit was 8 days (quartile [Q] 1 to Q3, 4–19); 30.9% of patients had their first outpatient follow-up visit >14 days after discharge. Patients with any outpatient visits in the first 14 days had a median of 2 visits (Q1–Q3, 2–4) in the first 30 days after the index date. Among patients who saw a familiar physician within 14 days, the median time to visit was 6 days (Q1–Q3, 3–8), whereas among patients who saw an unfamiliar physician within 14 days, the median time was 7 days (Q1–Q3, 3–10).

### Outcomes During the First 30 Days
At 30 days, fewer patients in the familiar physician group (n=3690; 16.9%; Table 2) died or were admitted to hospital than those in the unfamiliar physician group (n=789; 20%) or the no follow-up visit group (n=2962, 22%). Only 11.5% of these events occurred before the first postdischarge visit. Repeat ED events within that month were also lower for the patients in the familiar follow-up group (30.9%) than for those in the unfamiliar follow-up (33.8%) or no follow-up (33.4%) group, despite the fact that the unfamiliar

### Table 1. Patient Characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Physician Continuity Within 14 d After Index Visit</th>
<th>Overall (n=39249)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No Visits (n=13463)</td>
<td>All Visits With Unfamiliar Physician(s) (n=39338)</td>
<td>≥1 Visit With Familiar Physician(s) (n=21849)</td>
</tr>
<tr>
<td>Men</td>
<td>6509 (48.3)</td>
<td>2090 (53.1)</td>
<td>11175 (51.1)</td>
</tr>
<tr>
<td>Age, mean (SD)</td>
<td>76.8 (13.7)</td>
<td>73.6 (14.3)</td>
<td>76.2 (11.8)</td>
</tr>
<tr>
<td>Rural postal code</td>
<td>3877 (28.8)</td>
<td>856 (21.7)</td>
<td>4964 (22.7)</td>
</tr>
<tr>
<td>Type of index visit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ED</td>
<td>4633 (34.4)</td>
<td>1524 (38.7)</td>
<td>7143 (32.7)</td>
</tr>
<tr>
<td>Inpatient</td>
<td>8830 (65.6)</td>
<td>2414 (61.3)</td>
<td>14705 (67.3)</td>
</tr>
</tbody>
</table>

Healthcare resource use

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>At least 1 ED visit previous 365 d</th>
<th>No. of ED visits previous 365 d, mean (SD)</th>
<th>At least 1 hospitalization previous 365 d</th>
<th>No. of hospitalizations previous 365 d, mean (SD)</th>
<th>No. of office visits previous 365 d, mean (SD)</th>
<th>IM/Cardiology specialist office visit previous 365 d</th>
<th>IM/Cardiology specialist visit during index visit</th>
<th>Charlson score, mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10169 (75.5)</td>
<td>3.0 (5.2)</td>
<td>6504 (48.3)</td>
<td>1.0 (1.5)</td>
<td>10.2 (8.5)</td>
<td>3968 (29.5)</td>
<td>4888 (36.3)</td>
<td>4.1 (2.1)</td>
</tr>
<tr>
<td></td>
<td>2631 (66.8)</td>
<td>2.2 (3.6)</td>
<td>1533 (38.9)</td>
<td>0.7 (1.2)</td>
<td>10.5 (9.6)</td>
<td>1262 (32.0)</td>
<td>1625 (41.3)</td>
<td>3.8 (2.0)</td>
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<tr>
<td></td>
<td>15968 (73.1)</td>
<td>2.6 (4.6)</td>
<td>10092 (46.2)</td>
<td>0.9 (1.3)</td>
<td>16.8 (11.8)</td>
<td>9292 (42.5)</td>
<td>8898 (40.7)</td>
<td>3.9 (2.0)</td>
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<td>28768 (73.3)</td>
<td>2.7 (4.7)</td>
<td>18129 (46.2)</td>
<td>0.9 (1.4)</td>
<td>13.9 (11.0)</td>
<td>14522 (37.0)</td>
<td>15411 (39.3)</td>
<td>3.9 (2.1)</td>
</tr>
</tbody>
</table>

Comorbidities

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Diabetes mellitus</th>
<th>Hypertension</th>
<th>Dementia</th>
<th>Chronic obstructive pulmonary disease</th>
<th>Anemia</th>
<th>Cerebrovascular disease</th>
<th>Renal disease</th>
<th>Cancer</th>
<th>Peripheral vascular disease</th>
<th>Atrial fibrillation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4367 (32.4)</td>
<td>7158 (53.2)</td>
<td>1408 (10.5)</td>
<td>4681 (34.8)</td>
<td>2658 (19.7)</td>
<td>1151 (8.5)</td>
<td>2416 (17.9)</td>
<td>855 (6.4)</td>
<td>1099 (8.2)</td>
<td>4093 (30.4)</td>
</tr>
<tr>
<td></td>
<td>1195 (30.3)</td>
<td>1980 (50.3)</td>
<td>294 (7.5)</td>
<td>1201 (30.5)</td>
<td>635 (16.1)</td>
<td>257 (6.5)</td>
<td>560 (14.2)</td>
<td>187 (4.7)</td>
<td>270 (6.9)</td>
<td>1257 (31.9)</td>
</tr>
<tr>
<td></td>
<td>7441 (34.1)</td>
<td>12210 (55.9)</td>
<td>1314 (6.0)</td>
<td>7089 (32.4)</td>
<td>3946 (18.1)</td>
<td>1603 (7.3)</td>
<td>3646 (16.7)</td>
<td>1324 (6.1)</td>
<td>1806 (8.3)</td>
<td>8471 (38.8)</td>
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<tr>
<td></td>
<td>13003 (33.1)</td>
<td>21348 (54.4)</td>
<td>3016 (7.7)</td>
<td>12971 (33.0)</td>
<td>7239 (18.4)</td>
<td>3011 (7.7)</td>
<td>6622 (16.9)</td>
<td>2366 (6.0)</td>
<td>3175 (8.1)</td>
<td>13821 (35.2)</td>
</tr>
</tbody>
</table>

P values calculated using χ² test (binary/categorical) or ANOVA (continuous). CVD indicates cardiovascular; ED, emergency department; and IM, Internal Medicine.
follow-up group was more likely to see a specialist in the first month (24.3% versus 17.8%) and had fewer comorbidities at baseline.

**Effect of Physician Continuity After HF Hospitalization or ED Event**

Familiar physician follow-up in the first 14 days post index date was associated with a lower risk of death or hospitalization at 30 days (adjusted hazard ratio [aHR], 0.94; 95% confidence interval [CI], 0.89–0.99; Table 3) compared with follow-up with unfamiliar physicians only (aHR, 1.05; 95% CI, 0.97–1.15) or no follow-up (referent). This association was similar when the 2454 patients discharged from hospital/ED index visit to a long-term care facility were excluded (aHR, 0.93; 95% CI, 0.88–0.98, for familiar physician follow-up) and whether we examined all-cause events or HF-specific events (Table 3).

However, any physician follow-up (whether familiar or unfamiliar) within 14 days was associated with a lower risk of death, ED visit, or hospitalization: aHR 0.86 (95% CI, 0.82–0.89) for patients followed up by familiar physicians and aHR 0.93 (95% CI, 0.87–0.996) for those followed up by unfamiliar physicians. Results were similar after excluding the 2454 patients sent to long-term care facilities: aHR 0.85 (95% CI, 0.81–0.88) for death, ED visit, or hospitalization with familiar physician follow-up and aHR 0.92 (95% CI, 0.86–0.99) for unfamiliar physician follow-up.

**Subgroup Analysis: Site of Index HF Event**

We analyzed the site of the index HF event (either hospitalization or ED), and the patterns were similar (death or hospitalization with familiar physician follow-up: aHR, 0.92 [95% CI, 0.87–0.98] for those whose index HF event was a hospitalization and aHR, 0.94 [95% CI, 0.86–1.03] for those with index HF event in the ED).

**Sensitivity Analyses**

We reran all analyses using a 7-day window for classifying patients into follow-up groups. Patterns were similar to those of our main analysis with a 14-day follow-up interval although the associations did not reach statistical significance because of smaller sample sizes (Table I in the Data Supplement).

As there was variation in short-term follow-up rates between the 123 EDs and acute care hospitals in Alberta included in this study (Q1–Q3, 40.5%–68.8% for any follow-up within 14 days and Q1–Q3, 41.2%–60.2% for familiar physician follow-up within 14 days), in a post hoc sensitivity analysis, we included facility as a random effect in the Cox models. Results were nearly identical, supporting our a priori hypothesis that outcome risks would not be affected by facility clustering. For the primary outcome of death or hospitalization within 30 days, familiar physician follow-up was aHR 0.94 (95% CI, 0.89–0.99) and unfamiliar physician follow-up was aHR 1.06 (95% CI, 0.97–1.15) compared with the reference group of no follow-up visits within 14 days. For our secondary outcome of death or ED visit or hospitalization within 30 days, familiar physician follow-up was aHR 0.86 (95% CI, 0.83–0.90) and unfamiliar physician follow-up was aHR 0.95 (95% CI, 0.89–1.02), compared with the reference group of no follow-up visits within 14 days.

Finally, our sensitivity analysis replicating the work of Hernandez et al confirmed that even when examined at the hospital level, familiar physician follow-up was associated with better outcomes but without a clear dose–response gradient (akin to findings of Hernandez et al): aHRs for death or ED visit or hospitalization within 30 days were 0.79 (95% CI, 0.75–0.83) for patients discharged from Q2 facilities (55.1%–56.3% familiar physician follow-up), 0.80 (95% CI, 0.76–0.84) for those discharged from Q3 facilities (56.9%–59.5% familiar physician follow-up), and 0.92 (95% CI, 0.88–0.97) for those discharged from Q4 facilities (>59.5% familiar...
physician follow-up), all were compared with Q1 (lowest rate of familiar physician follow-up at <54.2%) as the reference class.

Discussion
We found that more than two thirds of patients in Alberta with a HF exacerbation necessitating an ED visit or hospitalization were seen in an outpatient clinic within 14 days of discharge. We also found that >80% of these patients were followed up by a physician who had previously seen them. Both of these proportions are higher than recent reports from the United States,3,4 which may in part reflect the single-payer integrated healthcare system that exists in Canada. Although follow-up with any physician was associated with reduced risk of a repeat ED visit, only follow-up with a familiar physician was associated with a statistically significantly lower risk of subsequent death or hospitalization within the 30-day time frame emphasized in the Affordable Care Act. Although event rates were not high enough at 30 days in this analysis to perform secondary analyses broken down by type of physician, in our earlier article6 examining 12-month outcomes, we did find that the benefits of familiarity were similar whether the familiar physician was a specialist (aHR, 0.88; 95% CI, 0.81–0.95) or a primary care physician (aHR, 0.87; 95% CI, 0.81–0.91).

Our findings confirm previous US research that early outpatient follow-up is associated with better 30-day outcomes in patients with HF.1 However, our finding that physician continuity is associated with even lower rates of adverse outcomes is novel. This result is consistent with primary care studies in other healthcare settings (including Europe, the United Kingdom, the United States, and Australia), showing that patients with greater physician continuity were more likely to receive guideline-consistent care and less likely to use EDs or require hospitalizations, particularly patients with chronic conditions or multiple comorbidities.1,2,13–16 Our current study also corroborates our previous analyses showing the benefits of longer-term (1- and 6-month) physician continuity for patients with HF discharged from the hospital6 or the ED 7 on 6- and 12-month outcomes. The apparent benefits of physician continuity over follow-up with any physician may well help explain the negative results from programs such as the Virtual Ward17 or HF telemonitoring programs18 designed to increase contact with the medical system but not necessarily with a patient’s regular provider

Table 3. Association Between Physician Continuity Within 14 Days After Index Visit and 30-Day Outcomes

<table>
<thead>
<tr>
<th>Physician Continuity Within 14 d After Index Visit</th>
<th>Events Within 30 d Per 100 Patients</th>
<th>HR (95% CI)</th>
<th>aHR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Death or all-cause hospitalization within 30 d</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No visits</td>
<td>23.6</td>
<td>1 (ref)</td>
<td>1 (ref)</td>
</tr>
<tr>
<td>All visits with unfamiliar physician(s)</td>
<td>20.5</td>
<td>0.97 (0.88–1.05)</td>
<td>1.05 (0.97–1.15)</td>
</tr>
<tr>
<td>≥1 visit with familiar physician(s)</td>
<td>19.2</td>
<td>0.92 (0.88–0.97)</td>
<td>0.94 (0.89–0.99)</td>
</tr>
<tr>
<td>Death or all-cause ED visit or all-cause hospitalization within 30 d</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No visits</td>
<td>45.1</td>
<td>1 (ref)</td>
<td>1 (ref)</td>
</tr>
<tr>
<td>All visits with unfamiliar physician(s)</td>
<td>33.8</td>
<td>0.86 (0.80–0.92)</td>
<td>0.93 (0.87–0.996)</td>
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<tr>
<td>≥1 visit with familiar physician(s)</td>
<td>32.5</td>
<td>0.85 (0.81–0.88)</td>
<td>0.86 (0.82–0.89)</td>
</tr>
<tr>
<td>Death or cardiovascular ED visit or cardiovascular hospitalization within 30 d</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No visits</td>
<td>19.6</td>
<td>1 (ref)</td>
<td>1 (ref)</td>
</tr>
<tr>
<td>All visits with unfamiliar physician(s)</td>
<td>15.3</td>
<td>0.92 (0.83 – 1.01)</td>
<td>0.98 (0.89 – 1.08)</td>
</tr>
<tr>
<td>≥1 visit with familiar physician(s)</td>
<td>13.9</td>
<td>0.86 (0.81 – 0.91)</td>
<td>0.88 (0.83 – 0.93)</td>
</tr>
<tr>
<td>Death or HF most responsible diagnosis hospitalization within 30 d</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No visits</td>
<td>10.5</td>
<td>1 (ref)</td>
<td>1 (ref)</td>
</tr>
<tr>
<td>All visits with unfamiliar physician(s)</td>
<td>9.5</td>
<td>0.98 (0.87–1.11)</td>
<td>1.08 (0.95–1.22)</td>
</tr>
<tr>
<td>≥1 visit with familiar physician(s)</td>
<td>8.1</td>
<td>0.85 (0.79–0.91)</td>
<td>0.91 (0.84–0.99)</td>
</tr>
<tr>
<td>Death or HF most responsible diagnosis ED visit or HF hospitalization within 30 d</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No visits</td>
<td>17.1</td>
<td>1 (ref)</td>
<td>1 (ref)</td>
</tr>
<tr>
<td>All visits with unfamiliar physician(s)</td>
<td>13.0</td>
<td>0.90 (0.81–1.00)</td>
<td>0.97 (0.88–1.08)</td>
</tr>
<tr>
<td>≥1 visit with familiar physician(s)</td>
<td>11.9</td>
<td>0.84 (0.79–0.89)</td>
<td>0.86 (0.81–0.92)</td>
</tr>
</tbody>
</table>

Continuity is time-varying until 14 days (or time of event), at which point it is locked-in for duration of 30-day follow-up. aHR obtained from Cox proportional hazards models adjusting for age, sex, Charlson score, number of ED visits in previous 6 months, number of physician office visits in previous year, rural residence, specialist seen during index visit, LTC admission in 30 days after index visit, diabetes mellitus, dementia, atrial fibrillation, and previous myocardial infarction or coronary revascularization. aHR indicates adjusted hazard ratio; CI, confidence interval; ED, emergency department; HF, heart failure; and HR, hazard ratio.
(which may thus increase fragmentation of care for participating patients). It seems reasonable to hypothesize that healthcare providers (physicians or nurses/pharmacists) who have a longer-term relationship with a patient are likely to have a better sense of that patient’s unique situation and the numerous nonmedical issues that influence hospitalization risk. Indeed, quality improvement strategies designed to improve the coordination of care for patients with chronic conditions have been shown to reduce hospitalizations in multiple healthcare settings, including the United States, and team familiarity with a patient was shown to be one of the key attributes of HF disease management programs that improved outcomes. Thus, we think that future efforts in the ED or at hospital discharge to optimize outcomes for patients with HF should focus not only on promoting early follow-up but also on enhancing follow-up with healthcare providers who know the patient.

As comorbidities are the major driver of outcomes in patients with HF (more than two thirds of repeat visits in patients with HF are for non-HF diagnoses), we examined all-cause outpatient visits and all-cause readmissions rather than HF-specific events. Indeed, the composite outcome of mortality or all-cause urgent readmissions in the first 30 days after discharge has been advocated as a better indicator of quality of care in HF than process of care measures. Regardless, the association between early outpatient follow-up with a familiar physician and fewer outcomes was present in both HF-specific events and in all cardiovascular events and all-cause events (Table 3).

Our study has several strengths: we were able to categorize physician continuity and define outcomes using population-based data in a universal healthcare setting with 100% capture of all outpatient, ED, and hospital visits in a single Canadian province. Although the Alberta government initiated a program to enhance access to specialized multidisciplinary HF clinics in 2008, <10% of Albertans with HF were seen at these clinics even after access improved and thus the overall impact on 30-day readmissions was minimal in Alberta (17.5% readmissions in the 2 years before versus 17.3% in the 2 years after program implementation). Although the Alberta administrative databases do not include physiological parameters or indicators of severity of HF, the outcomes we examined (death, all-cause hospitalization, or all-cause ED visits) are relevant regardless of cause, ejection fraction, or New York Heart Association class. In contrast to many previous studies examining physician continuity, we used time-varying covariate analyses to account for immortal time bias and did not exclude early events (a flaw in landmark analyses).

However, there are some limitations to our analysis. We were unable to assess and control for the dissemination of information about patients to outpatient physicians; however, the availability of discharge summaries within 14 days of discharge is uncommon in Canada and even direct verbal communication between hospital and outpatient physicians was not found to have any impact on readmission rates. We have no information on scheduled follow-up visits that patients chose not to attend and thus cannot make any inferences about physician intent. Moreover, we do not have any information on the length of follow-up visits or the quality/comprehensiveness of care offered at those visits; however, all visits were in the outpatient setting. Our data sets also only capture interactions with physicians and thus we cannot adjust for frequency of nursing or pharmacist follow-up; however, there are no disease management programs operating in Alberta that do not involve face-to-face clinic visits with a physician. Although we were unable to explore the impact of physician specialty with this data set, in previous analyses, we have demonstrated that 88% of outpatient follow-up visits for Albertans with HF are with general practitioners and that less than one twelfth of patients with HF discharged from an Alberta hospital are seen in a specialized multidisciplinary clinic. Differences in baseline patient characteristics were unavoidable because of the observational nature of our study, but we mitigated these by using multivariable analyses. Although some may question the generalizability of our findings derived within the Canadian healthcare setting to the United States, the demographics of our patients and the frequency of readmissions is similar to reports from the United States and our sensitivity analysis to mimic the study by Hernandez et al demonstrated nearly identical results for the relative benefits of early outpatient follow-up at the hospital level. We acknowledge that outpatient care within the Canadian system may be more physician heavy than in some areas of the United States and we would encourage investigators in other areas to see whether our findings extend to outpatient follow-up by nonphysician healthcare providers. Finally, the most important limitation to any observational study such as ours is the possibility of unmeasured confounders (including confounding by indication) driving the results: patients who are sicker (and have worse outcomes) may be more likely to receive early outpatient visits. However, this confounder would bias our study toward the null, meaning we would have been less likely to have found lower event rates with familiar physician follow-up because those patients had greater comorbidity burdens and were at higher risk. On the contrary, attending a follow-up visit with a familiar physician may be a marker for the healthy user effect, which could have biased our results to favor familiar physician follow-up.

Given these limitations and the impossibility of disentangling the influence of timing, type of physician, familiarity, and differing fragmentation of care on the outcomes we examined, we cannot definitively conclude that physician continuity improves outcomes despite the strength and consistency of the associations we report. However, as the only randomized trial on this topic was conducted >30 years ago, we think it is unlikely that a randomized trial will ever answer this question and observational data will be the best evidence we can bring to bear on this question.

In conclusion, the first key finding from our study is that outpatient follow-up after an acute HF exacerbation is associated with better outcomes even if it is within 14 days (benefits were previously thought to only accrue with follow-up within 7 days). Given the recent report from the Michigan See You in 7 Collaborative about how difficult it is to significantly increase 7-day follow-up visits even
with substantial investment,28 our findings are important for clinicians and health system planners in both Canada and the United States. The second key finding is that such follow-up is best done by a physician familiar with the patient. Continuity of care is one of the fundamental building blocks for any high-performing healthcare system, but the current guideline emphasis on prompt follow-up after hospitalizations or ED visits may result in system changes to enhance rapid access to care that further fragment care—in Alberta, we have seen a statistically significant increase in early follow-up with unfamiliar physicians over the past 12 years but no difference in familiar physician follow-up rates was observed. We believe that this may well negate some of the potential benefits possible with early follow-up and that outcomes for patients with a recent HF exacerbation may be optimized by facilitating early follow-up with a physician familiar with their case—either their primary care physician or a physician who had seen them when they had their index HF visit.

Acknowledgments
Dr McAlister helped in study design. All authors helped in collection and interpretation of data. E. Youngson and Dr McAlister helped in analysis of data. Dr McAlister and E. Youngson helped in drafting the article, and all authors helped in critical revisions of the article and approval for submission.

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Disclosures
None.

References
24. van Walraven C, Davis D, Forster AJ, Wells GA. Time-dependent bias was common in survival analyses published in leading
Although early follow-up for heart failure is recommended, the time window in which physicians should do the follow-up is unclear. Previous studies have focused on follow-up within 7 days, but this is hard to achieve in many healthcare settings. We explored whether (1) follow-up within 14 days and (2) physician continuity influence outcomes within 30 days of a heart failure exacerbation. Of 39,249 adults (mean age, 76 years) with an acute heart failure exacerbation resulting in an emergency department visit or a hospitalization, 34% had no outpatient visits in the next 14 days, 56% received follow-up from a familiar physician, and 10% saw an unfamiliar physician. Compared with no outpatient follow-up within 14 days, the risk of death or hospitalization within 30 days was lower in patients who saw a familiar physician (adjusted hazard ratio, 0.94; 95% confidence interval, 0.89–0.99); the risk of death or hospitalization or emergency department visit within 30 days was less common with either familiar physician follow-up (adjusted hazard ratio, 0.86; 95% confidence interval, 0.82–0.89) or unfamiliar physician follow-up (adjusted hazard ratio, 0.93; 95% confidence interval, 0.87–0.996). We conclude that (1) outpatient follow-up within 14 days is associated with better outcomes and (2) outcomes are best if such follow-up is done by a physician familiar with the patient.
Early Follow-Up After a Heart Failure Exacerbation: The Importance of Continuity
Finlay A. McAlister, Erik Youngson, Padma Kaul and Justin A. Ezekowitz

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EARLY FOLLOW-UP AFTER A HEART FAILURE EXACERBATION: THE IMPORTANCE OF CONTINUITY

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Padma Kaul,³ PhD

Justin A. Ezekowitz,³ MB BCh MSc
**eAppendix Table 1. Sensitivity analysis defining continuity in first 7 days after discharge (instead of 14 days)**

<table>
<thead>
<tr>
<th>Physician continuity within 7 days after index visit</th>
<th>Events within 30 days per 100 patients</th>
<th>HR (95% CI)</th>
<th>aHR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Death or hospitalization within 30 days:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No visits</td>
<td>22.2</td>
<td>1 (ref)</td>
<td>1 (ref)</td>
</tr>
<tr>
<td>All visits with unfamiliar physician(s)</td>
<td>20.0</td>
<td>0.94 (0.86 - 1.03)</td>
<td>1.02 (0.93 - 1.12)</td>
</tr>
<tr>
<td>&gt;= 1 visit with familiar physician(s)</td>
<td>20.0</td>
<td>0.95 (0.90 - 0.998)</td>
<td>0.97 (0.92 - 1.02)</td>
</tr>
<tr>
<td><strong>Death or ED visit or hospitalization within 30 days:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No visits</td>
<td>49.6</td>
<td>1 (ref)</td>
<td>1 (ref)</td>
</tr>
<tr>
<td>All visits with unfamiliar physician(s)</td>
<td>36.6</td>
<td>0.85 (0.79 – 0.92)</td>
<td>0.92 (0.85 – 0.99)</td>
</tr>
<tr>
<td>&gt;= 1 visit with familiar physician(s)</td>
<td>36.4</td>
<td>0.86 (0.83 – 0.90)</td>
<td>0.87 (0.84 – 0.91)</td>
</tr>
</tbody>
</table>