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## Acknowledgements:

BP: No conflicts of interest.

BH: Dr. Hollenbeck is supported by grant AHRQ R01 HS025707. As Associate Editor for  
UROLOGY, he receives support from Elsevier.

BN: Dr. Nallamothe is a co-inventor on U.S. Utility Patent Number US 9,962,124 as well as a  
Provisional Patent Application (54423) that use software technology with signal processing and  
machine learning to automate the reading of coronary angiograms, held by the University of  
Michigan. The patent is licensed to AngioInsight, Inc., in which he holds ownership shares and

**This is the author manuscript accepted for publication and has undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process, which may lead to differences between this version and the Version of Record. Please cite this article as doi: 10.1111/1475-6773.13929**

receives consultancy fees. The University of Michigan also has filed patents on his behalf related to the use of computer vision for imaging applications in gastroenterology, with technology elements licensed to Applied Morphomics, Inc., in which he has no relationship or stake. He has received funding from Janssen Pharmaceuticals and Apple, Inc in the last 3 years.

Hospital-cardiologist integration often occurs without a practice acquisition

## Abstract

**Objective:** To describe how much of the recent increase in hospital-cardiologist integration has come from acquisitions of physician practices compared to individual employment decisions.

While the role of physician practice acquisitions has received considerable attention in the news, integration may also be driven by individual physicians accepting employment at hospital-based practices.

**Data sources:** American Medical Association Physician Masterfile and Medicare data.

**Study design:** Analysis of changes in hospital-cardiologist integration from 2011-2018. We measured increases in integration and changes in the number of independent and hospital-owned practices.

**Data collection/extraction methods:** N/A

**Principal findings:** 18 percent of cardiologists were integrated in 2011, rising to 25 percent in 2016. Of this rise, 48 percent occurred with no acquisitions. Physicians who had completed residencies in the past five years (early-career physicians) had higher rates of integration which also increased over time: the percentage of early-career physicians joining hospital systems rose from 25 to 32 percent, indicating rapid growth in the number of physicians who began their careers working in hospital-based sites.

**Conclusions:** A large and growing portion of hospital-cardiologist integration came from hospital employment at the individual physician level. Future policies focused on preserving competition and affordability may benefit from better understanding this form of consolidation.

**Keywords:** vertical integration; hospital-physician integration; physician employment; hospital workforce; outpatient care delivery; delivery system organization; physician practice organization

### **What is Known**

- Hospital-physician integration has been increasing rapidly for the past decade.
- Cardiology has experienced some of the largest surges in integration of any specialty.
- The importance of non-acquisition consolidation – i.e., individual cardiologists accepting employment at hospital-owned practices without a merger or acquisition – remains poorly understood.

### **What This Study Adds**

- Nearly 50 percent of hospital-cardiologist integration activity in our study occurred without any acquisition.
- Early-career cardiologists were especially likely to work for hospital-owned practices, with marked increases in rates of integration among early-career physicians from 2011 to 2016.
- Much of the ongoing consolidation between hospitals and physicians involves no mergers or acquisitions. Research in this topic would benefit from both group-level and physician-level analyses.

## Introduction

Hospitals and physicians have become increasingly integrated in recent years.<sup>1-3</sup> This trend, in which hospitals employ physicians either directly or indirectly through ownership of physician practices, has gone by several terms, often hospital-physician integration (sometimes hospital-physician vertical integration or hospital employment of physicians). Integration has been especially pronounced in cardiology, in which hospital employment of physicians has steadily risen since 2011.<sup>4</sup> Understanding this trend is critical to health care affordability since integration has been associated with patients using lower-quality hospitals, anti-competitive changes in outpatient markets, and higher spending;<sup>5-8</sup> meanwhile, evidence for its effects on quality improvement has been underwhelming.<sup>9-14</sup>

The Biden administration has shown increased interest in promoting competition, including health care specifically.<sup>15,16</sup> Industry observers have advised that relevant authorities are poised to consider broader definitions of competitive harm in health care.<sup>17</sup> While the specifics of new approaches are yet to be defined, this underscores the timeliness of a deeper understanding of hospital-physician integration. In this paper we do not aim to provide a legal analysis of antitrust policy options; instead, we provide data on a consolidation issue that may be useful to experts at the Federal Trade Commission, the Department of Justice, and state antitrust authorities.

This paper decomposes the swell in integration into two types: integration through acquisitions and integration through individual employment decisions. Both result in more consolidated provider markets, but the relative prevalence of these different types is a gap in the literature with important implications. The first type – hospital acquisitions of physician practices – garners considerable attention from the popular press and scholars. On rare occasions, vertical acquisitions of large physician groups by hospitals have been challenged by antitrust agencies.<sup>18</sup>

Most practice acquisitions, however, go unchallenged because they are too small.<sup>19</sup> Moreover, not all integration occurs through acquisitions: the second type of integration occurs among physicians who individually leave independent (i.e., non-hospital-owned) practices in favor of hospital-owned practices or among physicians who complete their training and immediately proceed to hospital employment. To our knowledge, no antitrust cases have ever been brought against a hospital employing one doctor. Yet when these numerous individual employment arrangements are taken in aggregate, their effect on the total level of consolidation in a market may be considerable.

For example, a market for cardiology services might become consolidated by a hospital making several high-profile acquisitions of large cardiology practices, resulting in the hospital supplying most of the cardiology services. Alternatively, a market might become equally consolidated by a hospital serially employing individual cardiologists from those practices. The result – a single dominant firm offering cardiology services – is the same. Market entry (which, if easy, would constrain anti-competitive behavior) may be difficult for cardiologists if new entrants find it difficult to obtain admitting privileges; in the past, market incumbents have sometimes used barriers like this to restrain competition.<sup>20,21</sup>

No studies to our knowledge have quantified the role of individual-level employment decisions in provider consolidation, which we call non-acquisition consolidation. Our research questions were: how much of the recent increase in hospital-cardiologist integration comes from practice acquisitions compared to non-acquisitions – and – how important are early-career physicians in this phenomenon? We join two important data sources to describe the important role of non-acquisition consolidation, especially among early-career physicians, in reshaping hospital-physician relations.

## Methods

In our main analysis, we used the 2016 American Medical Association's Physician Masterfile (the most recent year available to us under our data use agreement), Medicare Data on Provider Practice and Specialty (MD-PPAS) for 2011 and 2016, and Medicare 20 percent Part B claims files for 2011 and 2016. Since 2016 was the most recent year for which we had both Masterfile data and Medicare data, our analysis focused on hospital-cardiologist integration up until and including this year. The 2011-2016 timeframe was characterized by rapid acceleration in hospital-cardiologist integration, so this was an ideal window to study. For completeness and to offer insights as recent as possible, we also used the Medicare 20 percent Part B claims for 2018 (the most recent claims year available to us) to calculate and report the prevalence of hospital-cardiologist integration, though we do not have Masterfile information for 2018.

The Masterfile contains a record for nearly every physician in the United States (irrespective of membership in the American Medical Association) and indicates the year in which a physician completed training, making it an effective source for measuring the physician labor force.<sup>22</sup> With the Masterfile, we observed physicians who completed training in any previous year up to and including 2016, allowing us to evaluate how trends in physician employment have changed across generations of physicians. The MD-PPAS dataset identifies the primary practice of each Medicare-billing physician. We used both specialty codes (e.g., specialty listed as "Cardiology", "Cardiac Electrophysiology", or "Interventional Cardiology") and procedures (e.g., insertion of coronary stents) to identify clinically active cardiologists (Appendix 1A). Medicare claims indicate the setting (office or hospital outpatient department) in which physicians render services. Appendix 1A provides details, sample sizes, and inclusion criteria.

We defined integration using a claims-based algorithm developed by Neprash and colleagues (2015 *JAMA Internal Medicine*)<sup>23</sup> and used in other peer-reviewed work<sup>24-26</sup> that makes use of the place of service information submitted on every Medicare claim (Appendix 2); we supplemented this with a keyword search of employer name (Appendix 5). We defined early-career physicians as those who completed their training within the last five years; established physicians were those who completed training six or more years ago. Five years is an arbitrary cutoff, but it corresponds to the span of our data and helps to provide at least some sense of how integration rates changed across cohorts of physicians (our conclusions were not affected by varying the threshold by a year or two in either direction). We defined a practice as a unique tax identifier number (TIN) from the MD-PPAS datasets (Appendices 1-4). We calculated how much of the increase in integration between 2011 and 2016 came from individual physicians accepting employment at hospital-owned practices compared to becoming employees through acquisitions (Appendix 1B). We defined acquisitions and non-acquisitions by applying a series of rules to TINs over time. Briefly, an individual physician who left an independent practice for a hospital-owned practice (in the absence of the independent practice becoming hospital-owned) we classified as a non-acquisition. By contrast, physicians who stayed with a practice that became hospital-owned were classified as acquisitions. We constructed our approach to be conservative; if anything, there was more non-acquisition activity than we estimated here (Appendix 1B). We also measured whether there were fewer independent (non-hospital-owned) practices over time (Appendix 4).

Last, we supplemented the above analysis by ruling out a potential alternative explanation. Our results could be confounded if physicians begin their careers at a hospital (i.e., integrated), then leave to form their own practices; early-career physicians would then naturally be

disproportionately hospital-employed. We rule this trajectory out in two ways. First, we show that the tendency to work for hospital systems grew sizably over our study window, even among early-career cardiologists. Second, for further evidence that the change we observed in integration rates was likely to persist, we examined the career behavior of a previous generation of physicians. We identified cardiologists who completed their training in 2007 and immediately took a job with a hospital (i.e., were integrated in 2008). We then calculated whether, nearly a decade after completing their training, those same physicians were still working for hospitals. This allowed us to assess whether the decision to work for a hospital was persistent over time.

A limitation in our study is our reliance on Medicare data: our findings apply only to cardiologists who treated Medicare patients (thereby excluding those, for example, who treated only pediatric patients or commercial patients). However, we include most practicing US cardiologists, and since cardiovascular conditions are especially common among Medicare patients, our sample is relevant to a core part of the patient population. In addition, while our combination of the Masterfile with Medicare data enables novel insights, we do not have access to other data sources, such as practice surveys, that could help illuminate this topic; we aim here to provide a foundation and invite future researchers to use alternative data sources and methodologies that further expand the knowledge base. Last, vertical integration is not the only form of consolidation which merits scrutiny; although outside our research scope, hospital, insurer, and physician markets have been consolidating for years.<sup>27</sup>

## **Results**

We identified 21,394 cardiologists who met our inclusion criteria in 2011 (3,824 integrated) and 23,089 cardiologists in 2016 (5,869 integrated) (Appendix 1). While we know of no data source that includes a complete universe of cardiologists with the practice ownership information

required for our study, previous estimates imply that our sample includes close to 90 percent of all active adult cardiologists.<sup>28</sup> We confirmed an increase in integration: there were 2,045 more integrated cardiologists in 2016 relative to 2011 (a 53 percent increase). The proportion of integrated physicians rose from 2011 to 2016 for both established (from 17 to 24 percent) and early-career (from 25 to 32 percent) cardiologists (Table 1). In 2011, 18 percent of all cardiologists were integrated; by 2016, 25 percent; and by 2018, an estimated 29 percent, confirming a rapid and sustained increase in integration (Appendix 5).

Over half (56 percent) of all integrated cardiologists in 2016 had become integrated between 2011 and 2016, consistent with a surge in integration during this time (Figure 1). These recently-integrated physicians totaled 3,173. Among these, a small majority had become integrated through an acquisition. However, 48 percent became integrated without an acquisition. These cardiologists were either established physicians who left independent practices to individually enter hospital employment or physicians who took integrated jobs immediately after their training.

Figure 2 further breaks down these 3,173 recently-integrated physicians by career stage. The majority of those who had become integrated without an acquisition were early-career physicians (about 59 percent). The majority of those who had become integrated via an acquisition were established physicians (about 91 percent).

Increases in integration from 2011 to 2016 among early-career cardiologists persisted across men, women, country of birth and country of medical training (Table 1). The exceptions to this trend were women, who were more likely to be integrated in both 2011 and 2016 compared to any other population group.

We examined changes in the numbers of hospital-owned and independent practices (Table 1). We identified 5,505 independent practices in 2011. By 2016, this number had declined 15 percent to 4,691. By contrast, hospital-owned practices proliferated from 605 to 734 (a 21 percent increase).

We found that a small majority of the physicians who began their careers as hospital-integrated physicians in 2008 were still integrated in 2016, while just under half had left for private practice. Conversely, 13 percent of cardiologists who began independent had become integrated by 2016. The net effect was a cohort that became more integrated, not less, over time. While these figures display reasonably high persistence of employment setting (i.e., integrated cardiologists did not leave en masse for independent practice) there was also some fluidity in the market (Appendix 6).

## **Discussion**

In this descriptive study of hospital-cardiologist integration, we found a rapid and sustained increase from 2011 to 2018 in the proportion of cardiologists who worked for hospital-owned practices, consistent with related work.<sup>4</sup> We add that nearly half of this increase in integration – 48 percent – occurred without an acquisition. We further add that early-career physicians played an outsized role, with the proportion working for hospital-owned practices jumping from 25 percent to 32 percent. The landscape changed markedly: 15 percent of independent practices disappeared while the number of hospital-owned practices grew by 21 percent. Together, these findings suggest that while group practice acquisitions are one important mechanism of market consolidation, provider markets are also at risk of becoming consolidated simply through a series of individual employment arrangements.

Three results strike us as particularly important. First, over a study window of only six years, we observed a large shift in the proportion of early-career cardiologists that were hospital employees (from 25 percent of post-fellowship cardiologists in 2011 to 32 percent in 2016). Extrapolating this trend, by 2030, over 50 percent of cardiologists completing their fellowships will join hospital-owned practices. Second, physicians joining the workforce in 2016 faced a different landscape: we observed 15 percent fewer independent groups and 21 percent more hospital-owned groups. Newly-minted physicians exit medical school with over \$200,000 in educational debt,<sup>29</sup> which may make it risky or undesirable to secure the financing needed to start their own practices. These factors may help explain their higher rates of hospital employment. Third, our supplemental analyses of a previous cohort of physicians suggested that at least half of physicians who initially join hospital-owned practices are there to stay. A little under half of the integrated physicians did move into independent practices, suggesting some fluidity – but the previous cohort became, overall, more integrated over time.

Our data may be useful to policymakers seeking to understand the ways in which provider markets can become consolidated. Previous researchers found that the vast majority of physician groups grew through piecemeal acquisitions that were too small to raise antitrust flags.<sup>19</sup> We build on this by showing that in nearly half the integration we observed, there was not even an acquisition. Thus, even if antitrust authorities had the resources and desire to litigate every acquisition, great and small, nearly half of all hospital-physician integration would still go unchallenged. As it stands today, antitrust agencies already face strong limits on their ability to scrutinize small acquisitions. States with cost containment models may be concerned with market consolidation; Massachusetts, for example, reviews major mergers and acquisitions.<sup>30</sup> Consolidation that accumulates through piecemeal employment may, in certain cases, result in

hospital dominance of a market that could approach monopolization of physician services, at least in specialties and geographies where payers have few alternatives. Hospitals as dominant employers may also raise monopsony concerns about wages that fall below competitive levels.<sup>31</sup> Such markets merit attention.

In addition, a workforce-based framework could foster creative solutions: one point of intervention for policymakers could be physicians nearing the end of their fellowships, such as workforce incentive programs to join or form independent practices. Such programs may be especially critical right now, as the pandemic has brought many practices to the brink of closure,<sup>32</sup> which may increase the rate of acquisitions and/or make recruitment and retention especially difficult.

Investigators who study hospital-physician vertical integration may note that studying integration from both physician-level and practice-level perspectives will make the knowledge base more comprehensive. Future research that illuminates these employment dynamics will help policymakers as they seek to support affordability and access in the face of weakening provider market competition.

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Table

Table 1. Distribution of cardiologist employment and number of practices from 2011 to 2016

	2011	2016
Total counts by integration type		
All	21,394 (100%)	23,089 (100%)
Integrated	3,824 (18%)	5,869 (25%)
Independent	17,570 (82%)	17,220 (75%)
Total counts by early career and established		
All	21,394 (100%)	23,089 (100%)
Established	18,283 (85%)	19,853 (86%)
Early Career	3,111 (15%)	3,236 (14%)
Among Established Physicians:		
All	18,283 (100%)	19,853 (100%)
Integrated	3,031 (17%)	4,828 (24%)
Independent	15,252 (83%)	15,025 (76%)

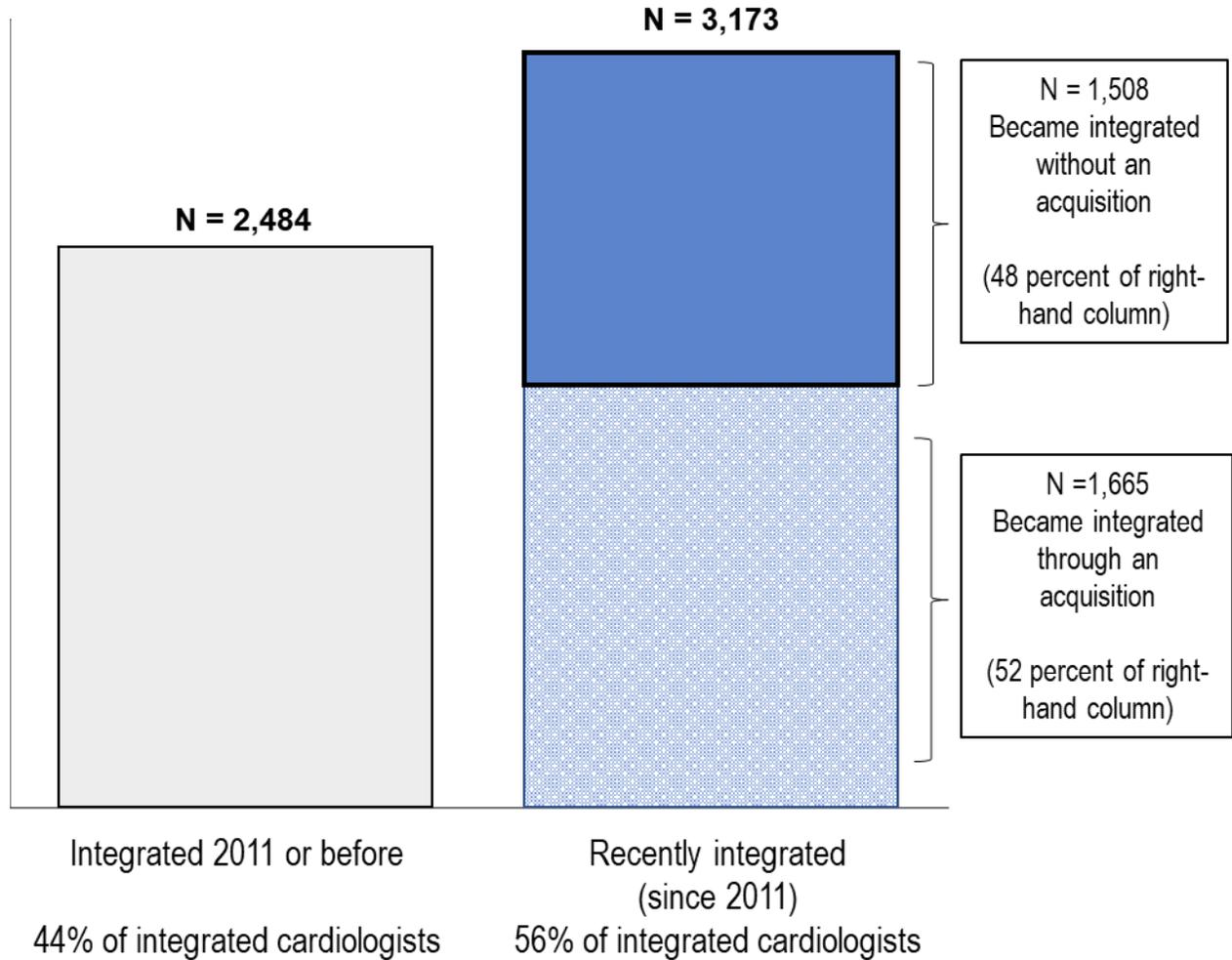
Among Early Career Physicians:		
All	3,111 (100%)	3,236 (100%)
Integrated	793 (25%)	1,041 (32%)
Independent	2,318 (75%)	2,195 (68%)
Percent of U.S. cardiologists integrated, by demographic characteristics		
Women	38%	37%
Men	23%	31%
Foreign-born	24%	31%
US-born	27%	33%
Foreign-trained	26%	33%
US-trained	24%	31%
Number of distinct practices		
Independent	5,505	4,691
Hospital-owned	605	734

Note: Independent physicians are those working for practices that are not hospital-owned, i.e., independent practices. Integrated physicians are those working for hospital-owned practices. In 2011, early-career cardiologists were those who had completed their training between 2007 and 2011. In 2016, early-career cardiologists were those who had completed their training between

2012 and 2016. Demographic categories are from the Physician Masterfile. The number of practices was calculated as the number of unique TINs for each year and employment setting. An integrated practice was defined as a TIN in which at least 50 percent of its cardiologists were hospital-integrated (results not sensitive to this threshold; Appendix 4).

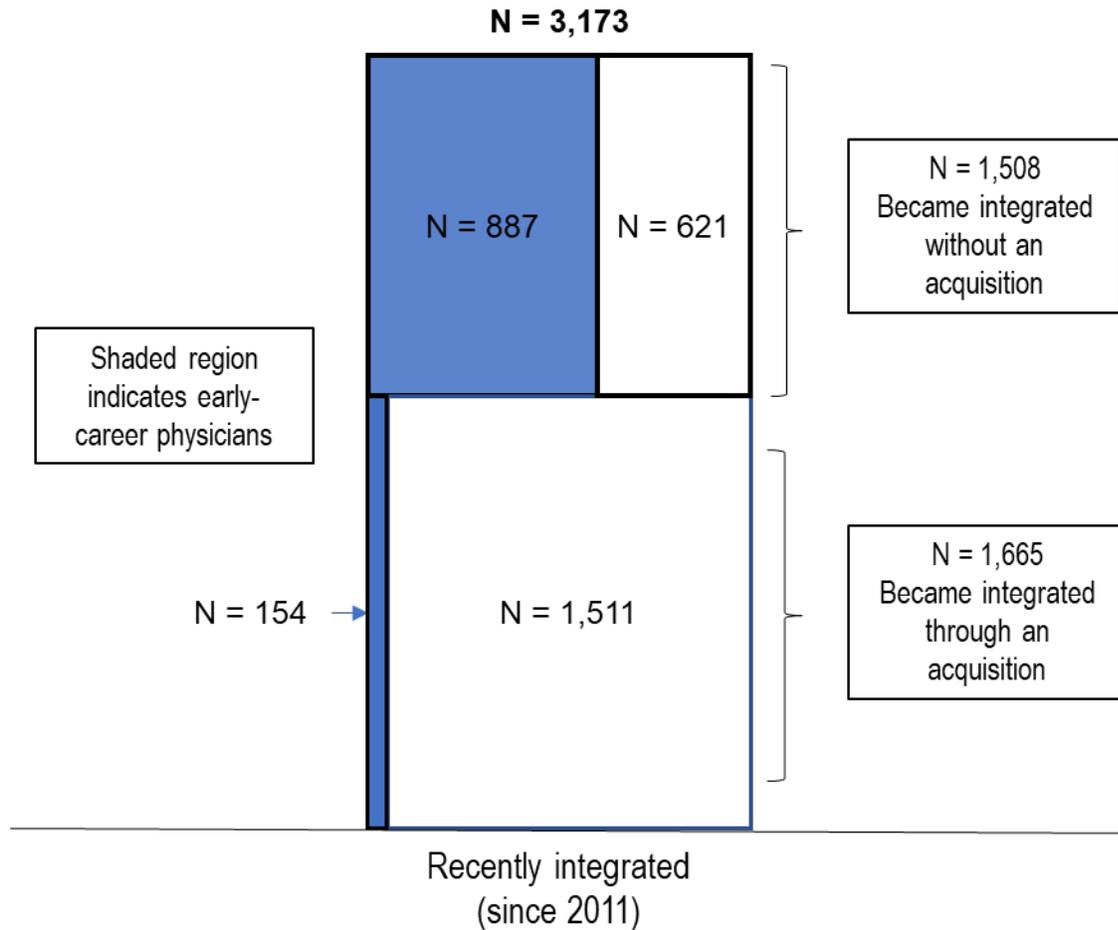
Figures

Figure 1. Hospital-integrated cardiologists in 2016



Note: As of 2016, there were 5,869 integrated cardiologists; 212 were excluded from this figure because their 2011 integration status could not be determined, e.g., foreign-born physicians who moved to the U.S. between 2011 and 2016. Of all remaining 5,657 cardiologists (2,484 + 3,173), many had integrated recently (56%), corroborating reports of rapid acceleration of hospital-cardiologist integration. Of this recent integration, a large minority – 48 percent – occurred in the absence of any merger or acquisition.

Figure 2. Recently integrated cardiologists by career stage



Note: This graph provides further detail of the 3,173 cardiologists from the rightmost column in Figure 1, i.e., physicians who had recently joined hospital-owned practices. The shaded region indicates early-career physicians (had completed fellowships within the previous five years) while the blank region indicates established physicians (six or more years since completing fellowship). Among physicians who had recently integrated and did so without an acquisition, about 59 percent (887 of 1,508) were early-career.

